Outline Specifications

Willow Grove 102 N. York Rd. Renovations
Montgomery County
Willow Grove, PA 19090

NPPH23-0136

Issued for Bid
June 16, 2026

DIVISION 00 - INTRODUCTORY INFORMATION

00 01 01 PROJECT TITLE PAGE

00 01 10 TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 10 INSTRUCTION TO BIDDERS
00 03 01 GENERAL CONTRACTOR BID FORM
00 03 02 HVAC/MECHANICAL CONTRACTOR BID FORM
00 03 03 ELECTRICAL CONTRACTOR BID FORM
00 03 04 PLUMBING CONTRACTOR BID FORM
00 03 05 FIRE PROTECTION CONTRACTOR BID FORM
00 04 01 A132-2019 OWNER-CONTRACTOR CMA
00 04 02 A232 - 2019 GENERAL CONDITIONS CMA
00 04 03 A310 - BID BOND
00 04 04 A312 - PAYMENT BOND
00 04 05 A312 - PERFORMANCE BOND
00 05 01 EXHIBIT A - MONTGOMERY COUNTY PARTICIPATION GOALS
00 05 02 EXHIBIT B – SITE ACCESS AND DRUG TESTING REQUIREMENTS
00 05 03 EXHIBIT C - ASSET MANAGEMENT DATA MONTGOMERY COUNTY
00 05 04 -SECTION NOT USED-
00 05 05 OWNER CONTROLLED INSURANCE PROGRAM
00 05 06 NON-COLLUSION AFFIDAVIT
00 05 07 NON - DISCRIMINATION AFFIDAVIT
00 05 08 RESPONSIBLE CONTRACTOR ORDINANCE
00 05 10 PRIME CONTRACTOR INFORMATION FORM
00 06 01 PREVAILING MINIMUM WAGE DETERMINATIONS
00 07 01 ELECTRONIC RELEASE FORM

APPENDIX DOCUMENTS

- Hazardous Building Material Evaluation Report
- Logistics Plan
- Bidding / Construction Schedule.

Outline Specifications

Willow Grove 102 N. York Rd. Renovations
Montgomery County
Willow Grove, PA 19090

NPPH23-0136

Issued for Bid
June 16, 2026

DIVISION 00 - INTRODUCTORY INFORMATION

00 01 01 PROJECT TITLE PAGE
00 01 10 TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 10 INSTRUCTION TO BIDDERS
00 03 01 GENERAL CONTRACTOR BID FORM
00 03 02 HVAC/MECHANICAL CONTRACTOR BID FORM
00 03 03 ELECTRICAL CONTRACTOR BID FORM
00 03 04 PLUMBING CONTRACTOR BID FORM
00 03 05 FIRE PROTECTION CONTRACTOR BID FORM
00 04 01 A132-2019 OWNER-CONTRACTOR CMA
00 04 02 A232 - 2019 GENERAL CONDITIONS CMA
00 04 03 A310 - BID BOND
00 04 04 A312 - PAYMENT BOND
00 04 05 A312 - PERFORMANCE BOND
00 05 01 EXHIBIT A - MONTGOMERY COUNTY PARTICIPATION GOALS
00 05 02 EXHIBIT B – SITE ACCESS AND DRUG TESTING REQUIREMENTS
00 05 03 EXHIBIT C - ASSET MANAGEMENT DATA MONTGOMERY COUNTY
00 05 04 -SECTION NOT USED-
00 05 05 OWNER CONTROLLED INSURANCE PROGRAM
00 05 06 NON-COLLUSION AFFIDAVIT
00 05 07 NON - DISCRIMINATION AFFIDAVIT
00 05 08 RESPONSIBLE CONTRACTOR ORDINANCE
00 05 10 PRIME CONTRACTOR INFORMATION FORM
00 06 01 PREVAILING MINIMUM WAGE DETERMINATIONS
00 07 01 ELECTRONIC RELEASE FORM

APPENDIX DOCUMENTS

- Hazardous Building Material Evaluation Report
- Logistics Plan
- Bidding / Construction Schedule.

DIVISION 01 - GENERAL REQUIREMENTS

01 10 00 SUMMARY OF WORK
01 12 00 MULTIPLE CONTRACT SUMMARY
01 21 00 ALLOWANCES
01 23 00 ALTERNATES
01 25 00 SUBSTITUTION PROCEDURES
01 26 00 CONTRACT MODIFICATION PROCEDURES
01 29 00 PAYMENT PROCEDURES
01 31 00 PROJECT MANAGEMENT AND COORDINATION
01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION
01 33 00 SUBMITTAL PROCEDURES
01 40 00 QUALITY CONTROL
01 50 00 TEMPORARY FACILITIES AND CONTROLS DRAFT
01 60 00 PRODUCT REQUIREMENTS
01 61 16 VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS
01 70 00 EXECUTION AND CLOSEOUT REQUIREMENTS
01 91 13 GENERAL COMMISSIONING REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

02 41 00 DEMOLITION

DIVISION 03 - CONCRETE

03 20 00 CONCRETE REINFORCING
03 30 00 CAST-IN-PLACE CONCRETE

DIVISION 04 - MASONRY

04 20 00 UNIT MASONRY
04 26 16 ADHERED MASONRY VENEER
04 72 00 CAST STONE MASONRY
04 73 00 MANUFACTURED STONE MASONRY

DIVISION 05 - METALS

05 12 00 STRUCTURAL STEEL FRAMING
05 21 00 STEEL JOIST FRAMING
05 31 00 STEEL DECKING
05 50 00 METAL FABRICATIONS
05 52 13 PIPE AND TUBE RAILINGS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 00 ROUGH CARPENTRY
06 16 00 SHEATHING - DUP
06 41 00 ARCHITECTURAL WOOD CASEWORK
06 61 00 CAST POLYMER FABRICATIONS
06 83 16 FIBERGLASS REINFORCED PANELING

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 16 16 CRYSTALLINE WATERPROOFING
07 21 00 THERMAL INSULATION
07 42 13 METAL WALL PANELS
07 42 13.23 METAL COMPOSITE MATERIAL WALL PANELS – 3A COMPOSITES USA, INC
07 54 00.13 THERMOPLASTIC AND SBS MODIFIED BITUMINOUS HYBRID ROOFING – GAF
07 62 00 SHEET METAL FLASHING AND TRIM
07 71 00 ROOF SPECIALTIES
07 72 00 ROOF ACCESSORIES
07 84 13 PENETRATION FIRESTOPPING
07 92 00 JOINT SEALANTS

DIVISION 08 - OPENINGS

08 06 71 DOOR HARDWARE SCHEDULE
08 11 13 HOLLOW METAL DOORS AND FRAMES
08 12 00 INTERIOR ALUMINUM DOOR AND GLAZING FRAMES
08 14 16 FLUSH WOOD DOORS
08 17 00 INTEGRATED DOOR OPENING ASSEMBLIES
08 43 13 ALUMINUM-FRAMED STOREFRONTS
08 44 18 GLAZED STEEL CURTAIN WALLS

08 58 00 INTERIOR ALUMINUM BULLET RESISTANT SLIDING TRANSACTION WINDOW
08 71 00 DOOR HARDWARE
08 71 13 POWER DOOR OPERATORS
08 80 00 GLAZING
08 88 13 FIRE-RATED GLAZING

DIVISION 09 - FINISHES

09 05 61 COMMON WORK RESULTS FOR FLOORING PREPARATION
09 21 16 GYPSUM BOARD ASSEMBLIES
09 22 16 NON-STRUCTURAL METAL FRAMING
09 30 00 TILING
09 51 23 ACOUSTICAL PANEL CEILINGS
09 54 22 RECYCLED POLYESTER FELT CEILINGS - USG
09 65 00 RESILIENT FLOORING
09 67 00 FLUID-APPLIED FLOORING
09 68 13 TILE CARPETING
09 72 00 WALL COVERINGS
09 84 30 SOUND-ABSORBING WALL AND CEILING UNITS
09 91 13 EXTERIOR PAINTING
09 91 23 INTERIOR PAINTING

DIVISION 10 - SPECIALTIES

10 14 19 DIMENSIONAL LETTER SIGNAGE
10 14 23 PANEL SIGNAGE
10 22 26 OPERABLE PARTITIONS
10 26 00 WALL AND DOOR PROTECTION
10 28 00 TOILET ACCESSORIES
10 44 00 FIRE PROTECTION SPECIALTIES
10 75 00 FLAGPOLES

DIVISION 11 - EQUIPMENT

11 81 29 FACILITY FALL PROTECTION

DIVISION 12 - FURNISHINGS

12 24 49 WINDOW ROLLER SHADES

12 48 13 ENTRANCE FLOOR MATS AND FRAMES

DIVISION 14 – CONVEYING EQUIPMENT

14 24 23 HYDRAULIC PASSENGER ELEVATORS

DIVISION 21 - FIRE SUPPRESSION

21 05 00 COMMON WORK RESULTS FOR FIRE SUPPRESSION

21 05 23 GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

21 11 00 FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

21 12 00 FIRE-SUPPRESSION STANDPIPES

21 13 00 FIRE-SUPPRESSION SPRINKLER SYSTEMS

DIVISION 22 - PLUMBING

22 05 23 GENERAL-DUTY VALVES FOR PLUMBING PIPING

22 05 29 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

22 05 53 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

22 07 19 PLUMBING PIPING INSULATION

22 08 00 – GENERAL COMMISSIONING REQUIREMENTS

22 10 05 PLUMBING PIPING

22 10 06 PLUMBING PIPING SPECIALTIES

22 14 29 SUMP PUMPS

22 40 00 PLUMBING FIXTURES

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 01 30.51 HVAC AIR-DISTRIBUTION SYSTEM CLEANING

23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

2305 19 METERS AND GAUGES FOR HVAC PIPING

23 05 23 GENERAL-DUTY VALVES FOR HVAC PIPING

23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

23 05 48 VIBRATION AND SEISMIC CONTROLS FOR HVAC

23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

23 07 13 DUCT INSULATION

23 07 19 HVAC PIPING INSULATION
23 08 00 COMMISSIONING OF HVAC
23 09 13 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC
23 09 23 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC
23 23 00 REFRIGERANT PIPING
23 31 00 HVAC DUCTS AND CASINGS
23 33 00 AIR DUCT ACCESSORIES
23 62 13 PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS
23 72 00 AIR-TO-AIR ENERGY RECOVERY EQUIPMENT
23 81 29 VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

DIVISION 25 - INTEGRATED AUTOMATION

25 08 00 COMMISSIONING OF INTEGRATED AUTOMATION

DIVISION 26 - ELECTRICAL

26 05 05 SELECTIVE DEMOLITION FOR ELECTRICAL
26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33.13 CONDUIT FOR ELECTRICAL SYSTEMS
26 05 33.16 BOXES FOR ELECTRICAL SYSTEMS
26 05 48 VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 05 73 POWER SYSTEM STUDIES
26 05 83 WIRING CONNECTIONS
26 09 23 LIGHTING CONTROL DEVICES
26 24 16 PANELBOARDS
26 27 26 WIRING DEVICES
26 28 13 FUSES
26 28 16.13 ENCLOSED CIRCUIT BREAKERS
26 28 16.16 ENCLOSED SWITCHES
26 29 13 ENCLOSED CONTROLLERS
26 32 13 ENGINE GENERATORS
26 36 00 TRANSFER SWITCHES

26 51 00 INTERIOR LIGHTING
26 56 00 EXTERIOR LIGHTING

DIVISION 27 - COMMUNICATIONS

27 10 00 STRUCTURED CABLING
27 11 00 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 15 00 INTEGRATED ACCESS CONTROL HARDWARE DEVICES
28 46 00 FIRE DETECTION AND ALARM

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 01 90 OPERATION AND MAINTENANCE OF PLANTING

SECTION 011000
SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Owner-furnished products.
6. Contractor-furnished, Owner-installed products.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and drawing conventions.
11. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.03 PROJECT INFORMATION

A. Project Identification: Willow Grove Annex Renovation

1. Project Location: 102 North York Rd., Willow Grove, PA 19090

B. Owner: Montgomery County

C. Architect: NORR

D. Construction Manager as Advisor (CMa): Skanska USA Building Inc.

1. Construction Manager as Advisor has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager as Advisor.
2. The Construction Manager as Advisor is indicated throughout these specifications as CMa. Any reference to Construction Manager is intended to refer to the CMa.

1.04 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

   a. The scope of this project is a complete renovation to both the interior and exterior of the existing four-story building. The demolition includes the demolition of entire exterior facade and entire interior space with the exception of the existing egress stairs and utility rooms. A new exterior facade will be provided along with a new interior fit- out. Minor additions will be provided at each floor. The project will include renovations to the mechanical, plumbing, electrical, and fire protection systems. A new gas service will be provided to the building. Exterior upgrades including paving, sidewalks, site walls and landscaping. The site includes an adjacent parking lot. See civil drawings.

B. Type of Contract:

   1. Project will be constructed under coordinated, concurrent multiple contracts. See Section 011200 "Multiple Contract Summary" for a description of work included under each of the multiple contracts. Contracts for this Project include the following:

      a. General Construction (GC)

      b. Mechanical (HVAC) Work (MC)

      c. Plumbing (PC)

      d. Fire Protection (FPC)

      e. Electrical Work (EC)

1.05 WORK BY OWNER

A. General:

   1. This Section, Work By Owner, is intended to discuss activity performed under contracts outside of the **five (5)** multiple-prime contracts to which these specifications apply.

   2. Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.06 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations as indicated by requirements of this Section and as noted on the Site Logistics Plan.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not use or disturb portions of Project site beyond areas in which the Work is indicated except as approved by Owner.

   1. Limits:

      a. All deliveries and trash removal can occur during normal business hours.

      b. For the purpose of the Base Bid, Contractor may assume that all work inside and outside the building will occur during regular business hours.

   2. Building Access

      a. There are no restrictions to accessing the building access.

      b. The General Construction Prime Contractor shall provide signage, markings and other protection to distinguish access paths and provide appropriate warning related to the flow of construction.

      c. Tools and Materials are to be contained within designed construction areas.

d. Keys required for construction access will be provided by the County.

1) Each Prime Contractor's foreman will be issued a key for the building.

3. See Section 015000 Temporary Facilities and Controls for further information regarding use of driveways, walkways and entrances: Refer to Construction Logistics Plan included in the Appendix Folder on Bonfire which is part of the Project Manual. Keep driveways, loading areas, and entrances serving premises clear and available to emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

c. Where sidewalk or doorway closures are required provide protection of work areas and signage to clearly direct the public to alternative paths and points of access.

1.07 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

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

B. On-Site Work Hours: 7:00 AM – 3:30 PM Monday through Friday, unless otherwise indicated.

1. Off Hours: 5:00 PM to 6:00 AM

C. Building Security Coordination

1. There are no security requirements to enter the Willow Grove Annex Building. All personnel requesting to work on site must pass a background check and drug test in accordance with the OCIP requirements.

2. The General Construction Prime Contractor shall be responsible to establish in cooperation with the Owner/CMa, a protocol for securing all construction access points during and at the end of each shift.

3. The General Construction Prime Contractor shall ensure that the site fence is closed and locked at the end of every workday.

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

1. Notify Owner not less than ten (10) business days in advance of proposed utility interruptions.

2. Obtain Owner's written permission before proceeding with utility interruptions.

E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruptions to CMa.

1. Notify Owner not less than five (5) business days in advance of proposed disruptive operations.

2. Obtain Owner's written permission before proceeding with disruptive operations.

3. Contractor must comply with Upper Moreland Township's noise ordinances if applicable.

F. Controlled Substances: Use of tobacco products within the existing building is not permitted.

1.08 SPECIFICATION AND DRAWING CONVENTIONS

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

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

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

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

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 12 00

MULTIPLE PRIME CONTRACT SUMMARY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes a general summary, and not all inclusive, of each contract, including responsibilities for coordination and temporary facilities and controls.

B. Specific requirements for Work of each contract are also indicated in individual Specification Sections and on Drawings.

C. Related Requirements:

1. Section 011000 "Summary" for the Work covered by the Contract Documents, restrictions on use of Project site, phased construction and work restrictions.

2. Section 013100 "Project Management and Coordination" for general coordination

1.03 DEFINITIONS

A. Construction Manager as Advisor (CMa): Referred to herein as CMa or CM.

1.04 WORK BY OWNER

A. Moving services associated with temporary relocations of personnel.

B. Moving and temporary storage of furniture from work areas.

1.05 ACCESS TO SITE

A. General: Contractors shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not use or disturb portions of Project site beyond areas in which the Work is indicated except as approved by Owner.

1. Limits: Refer to drawings and logistics plan(s).

a. Coordinate the use of the available space onsite. If necessary, provide offsite storage of materials and equipment if space is not available on site.

2. Owner Activities & Operations:

a. The building will be unoccupied prior to the start of the interior and exterior demolition.

The GC Prime scope includes to remove and dispose of all FFE items left behind after owner moves out on T&M.

C. Building Access

1. Refer to logistics plans included as an Appendix in the contract documents. The logistic plans shall be followed at all times.

2. The General Construction Prime Contractor shall provide and maintain signage, markings and other protection to distinguish access paths and provide appropriate warnings related to the flow of construction.

3. Tools and Materials are to be contained within designed construction access areas except for tools and materials required for approved work outside designated construction access areas. Tools and materials found outside of designated construction and construction access areas will be confiscated. No tools shall be left unattended.

D. See Section 01 50 00 Temporary Facilities and Controls for further information regarding use of stairs, driveways, walkways and entrances: Refer to Construction Logistics Plans included as an appendix document.

1. Schedule deliveries to minimize use of driveways and entrances by construction operations.

2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

3. Where sidewalk and doorway closures are required provide protection of work areas and signage to clearly direct the public and building workers to alternative paths and points of access.

4. Hoisting is not permitted over walkways, exit doors and driveways without posting a signal person to prevent personnel or vehicle traffic form entering the area.

5. Swinging loads over occupied buildings is not permitted.

1.06 COORDINATION WITH OCCUPANTS

A. N/A

1.07 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

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

2. On-Site Normal Work Hours: 7:00 AM – 4:30 PM Monday through Friday. Contractors intending to work outside normal work hours and/or weekends shall receive approval by the CMa or Owner.

3. Off Hours: 4:30 PM to 7:00 AM. Weekend work

4. If second shift is required hours shall be: 1st shift – 7:00 AM – 4:30 PM / 2nd shift – 4:30

PM – 12:00 AM.

B. Project Security, Background Checks and Badging Requirements

1. Background checks will be required for all personnel that work on site. See OCIP manual for further instructions.

C. Existing Utility Interruptions: Coordinate with CMa and County prior to any utility interruptions.

1. Notify CMa not less than ten (10) business days in advance of proposed utility interruptions.

D. Obtain Owner's written permission before proceeding with utility interruptions.

E. Other General Provisions

1. The use of tobacco, alcohol, vaping, marijuana, illegal substances and/or other similar substances is prohibited. Workers found using these substances will be immediately removed from the project.

2. Weapons including but not limited to firearms, mace, explosives are prohibited on site. Any person found with weapons will be permanently removed.

1.08 PROJECT COORDINATION

A. All Prime Contractors shall each be fully responsible for the coordination of the work performed by their own forces and those of their contractors. Each of these Contractors is also responsible to cooperate with each other and with the CMa to coordinate the entire work insofar as their individual work affects the work of the others and the whole. See Section 013100 – Project Management and Coordination and Section 013200 Construction Progress Documentation for LEAN PROCEDURES which includes requirements for participation in specification coordination and scheduling activities.

B. MEP Coordination

1. All Prime contractors are required to fully participate in the MEP coordination process. Reference 01 31 00 for further requirements.

2. Mechanical Prime will be the lead for MEP coordination process.

3. Mechanical (HVAC) Prime will facilitate meetings and updates with all prime contractors.

4. General guidelines

a. Provide clearances for ceiling construction, access doors, clearances for above ceiling equipment, valve access, filter change access, equipment maintenance, damper access

b. Locate accessible items above accessible ceilings to the greatest extent possible.

C. Scheduling: Refer to specific requirements listed in specification 013100 & 013200. All Prime Contractors shall coordinate the scheduling activities of their work and to assist in preparation of an overall project schedule. Baseline schedule and monthly updates will be managed by CMa. Each Multiple-Prime Contractor shall be fully responsible for the development and maintenance of a project schedule associated with their own work, updated as required to coordinate with the overall project schedule.

D. The CMa's coordination activities include, but are not limited to, the following:

1. Facilitate overall coordination of the Work.

2. Coordinate, schedule, and facilitate approval of interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.

3. Facilitate coordination of completion of interrelated punch list items.

4. Coordinate preparation of Project record documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.

5. Coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.

1.09 GENERAL REQUIREMENTS OF CONTRACTS (ALL PRIMES)

A. Extent of Contract: Unless the Agreement contains a more specific description of the Work of each Contract, requirements indicated on Drawings and in Specification Sections determine which contract includes a specific element of the Project.

1. Contractor acknowledges and agrees that it has taken into account all items necessary to complete the Work of each contract. The Work shall be provided in accordance with the Contract Documents and shall include, but not limited to all labor, supervision, material, supports, engineering, tools, equipment, access to work, hoisting, rigging, transportation, permits, taxes, insurance, fees, warranties and guarantees required to perform the complete Work as shown or described in this Summary and the Contract Documents. Contractor shall include all items necessary and/or implied but not necessarily detailed on the Contract Documents or as may be required by local codes and jurisdictions for complete and working systems. No extra compensation will be allowed for any errors or omissions on the part of the Contractor or its contractors and/or Suppliers.

2. It is the responsibility of each contractor to review all the Contract Documents provided. All Contract Drawings, Specifications, and supplemental information are part of each contract. Where specifications, drawings, other information provided contain conflicting information, then the provisions, terms, and conditions of the more stringent shall take precedence.

3. Contractor has visited the site and is familiar with all work conditions. Contractor has reviewed existing conditions in the field and is familiar with security requirements, traffic regulations and other restrictions affecting access to the Work.

4. All prime and sub-tier contractors are required to be licensed with all jurisdictions required including but not limited to the State of Pennsylvania, the Municipality of Upper Moreland Township, etc.

5. Contractor will secure and pay for all permits required to complete this scope of work outside of the building permit including but not limited to street & sidewalk closures (which includes lost parking revenue), utility tie ins, etc. Owner will be responsible for the cost of the general building permit. Contractor is responsible to fill out necessary forms, submit to Upper Moreland Township and file after award. Contractor will pay for the general building permit and submit for reimbursement. No mark-ups will be allowed.

6. All contractors are to use Trimble Unity Construct (formerly e-Builder) as the PMIS. All submittals, RFIs, Certified Payroll, and Invoicing must be submitted using this system. Training will be provided to the contractor upon request.

7. All Prime Contractors are required to participate in the Skanska Asset Management Program. Warranty, Technical Data, Closeout Documentation, Owner Training, Maintenance and Care information submitted and approved. Scheduled Value on AIA is $25,000 per Prime.

8. All Contractors are required to secure all tools, equipment, and materials at the end of each workday.

9. Provide labor and supervision to assist with all AHJ inspections and specialty inspections.

10. Contractor is fully knowledgeable of all applicable Municipality of Upper Moreland Township, Pennsylvania Dept. of Transportation (PENNDOT) and Manual on Uniform Traffic Control Devices (MUTCD) requirements, Southeastern Pennsylvania Transportation Authority (SEPTA) requirements, and will comply with same throughout the duration of this project.

11. Contractor shall reference historical drawings, photographs and other information provided in conjunction with design documents to determine the full scope of work and means and methods necessary to complete the work of this bid package.

12. Contractor shall provide updated As Built CAD file at the completion of all improvements installed by this contract. This includes denoting active and abandoned utilities encountered. As builts related to utility and site improvements shall be completed by a licensed surveyor and all deviations from the design documents clearly noted.

13. Contractor is responsible to resolve labor disputes and jurisdictional claims for all work associated with this bid package.

14. Limited parking is available at the adjacent parking lot. Coordinate site access/parking with GC Prime. Reference Logistics Plan for contractor parking locations.

15. All street closures must be approved by the CMa and owner.

16. Delivery and Storage:

    a. Reference logistics plans provided for site storage and staging.

    b. All materials and equipment shall be delivered to the site and stored at locations coordinated with all other Contractors. Each Contractor shall be responsible for proper care and protection of materials stored on site and shall protect and be responsible for any damage to stored materials. If stored material impacts other contractors work, remove or relocate materials as necessary.

17. All Prime Contractors superintendents will accompany the AHJ and CMa during inspections. If re-inspection is required for incomplete work, the responsible Prime contractor will be required to compensate the CMa and AHJ for re-inspections.

18. All contractors must complete all work on the exterior of the west elevation as promptly as possible due to a limited temporary easement window with Burger King. Prime contractors are required to coordinate with the Owner and Construction Manager at Risk (CMa) by clearly outlining their intended scope of work and identifying any prerequisite activities that

must be finished before their work can commence. This information must be submitted to the CMa within 15 days of the Notice to Proceed (NTP).

19. Construction Cleaning

    a. General Contractor will provide and maintain dumpsters at the exterior of the building for all prime contractors use. Each Prime Contractor shall remove trash and construction debris DAILY throughout the construction duration, and each Prime Contractor shall provide means of transport for trash to the exterior dumpsters provided. Each prime contractor shall rough broom sweep work areas DAILY at the end of each shift.

    b. Access pathways shall be kept clean and free of debris.

    c. Areas that are not kept clean per the contract requirements or cleaned in a timely manner (DAILY) will be cleaned by others, as directed by the CMa at the Contractor's expense.

    d. All contractors are responsible for cleaning tools, work surfaces and all common surfaces as required to prevent and mitigate the spread of infectious diseases. Each prime and sub-tier contractor is required to develop and implement protocols to protect its workers including cleaning, temperature screening and other measures deemed necessary.

    e. Any materials or debris that can be windblown must be secured at all times. Contractors must take into account the conditions and potential for high winds as work progresses and take all precautions necessary to prevent items from blowing off the roof.

20. Contractor understands temporary lighting will be provided at the levels required by OSHA by the Electrical Prime after demolition is complete. If additional lighting is required to perform work of this bid package, each Prime Contractor will provide the additional temporary lighting needed.

21. All contractors are responsible to provide their own temporary power until the temporary power distribution is completed by the Electrical Prime Contractor.

22. All contractors are responsible for providing the necessary commissioning support for their respective equipment.

23. Prime Contractors are required to submit a sample AIA G732 and G703 listed by project specifications (feature of work), floor level, Career Links Center, along with a labor and material breakdown for approval by the CMa. The approved AIA Schedule of Values will be for the purpose of creating the Prime Contractor's monthly Pencil Copy and Requisition. Please reference 012900 – Payment Procedures.

24. When submitting a change order or allowance adjustment, Prime Contractors are required to provide all subcontractor and material suppliers quotes and proposals with a labor and material breakdown. Indicate any potential schedule impacts associated with the submitted change order. The intent is to expediate the approval process. Please reference 012600 Contract Modification Procedures.

25. All prime contractors are to review the Low Voltage Responsibility Matrix located in section 2.03.

1.10 GENERAL SAFETY REQUIREMENTS

A. Each prime contractor is fully responsible for all aspects of safety for their scope of work including but not limited to supervision, planning, training, project orientations and coordination with other contractors.

B. Prime contractors and associated contractors working onsite shall comply with all applicable government regulations, specific client rules and regulations, and requirements dictated within the project specification requirements. If any of these standards, requirements, rules or procedures conflict, the most stringent one will prevail.

C. It is the responsibility of ALL Prime Contractors to make sure their employees and contractors understand all job site rules, safety procedures and come to the site prepared to complete their scheduled work with clear direction from the Prime Contractor on the scope of the work, schedule, current drawings, specifications and sketches.

D. Minimum PPE will include hard hat, high visibility clothing, cut resistant gloves – minimum level 3, safety glasses and sturdy work boots/Foot protection & work attire including long pants and sleeved shirts. ANSI reflectivity requirements must be met when working in traffic and/or at night. It is the Prime Contractor's responsibility to provide additional PPE as required for their task. PPE shall be worn at all times.

E. Each prime shall submit a Project Specific Safety & Environmental Plan addressing the hazards of their scope of work and mitigation plans to control the hazards. Plan shall be submitted two weeks prior to the start of the prime's work for review by the CMa and Owner. The format of the PSSP shall follow the template provided by CMa. Contractors shall refer to the table contained below to reference minimum worker training requirements. The PSSP shall:

1. Identify each component of the work that the contractor is responsible for completing.

2. Identify hazards associated with the work and the proper equipment and tools to perform the work.

3. Plan adequate and sufficient controls to protect their work crews.

4. If the project specific safety plan needs revision due to scope of work changes, unanticipated or new hazards, other condition changes, etc., then all work pertaining to that work component will stop until a new project specific safety plan is completed.

PSSP Minimum Worker Training Requirements		
Topic	**Who Needs Training**	**What Training is Needed**
Project Specific Safety Orientation	All project management, supervision, and workers entering the project	Safety rules and procedures contained in the Safety & Health Management Program (SHMP), site-specific emergency action plan, each worker's responsibilities, disciplinary program, and warm up and stretching exercises

Hazard Communication	All workers entering the project	Hazard Communication Basic Training (Refer to Hazard Communication Program in this SHMP)
Hazardous Chemical or Substance	Workers exposed to a hazardous chemical or substance	Specific Hazard Communication Training (Refer to Hazard Communication Program in this SHMP)
Respiratory Protection	Workers required to wear respiratory protection, including common dust masks	OSHA 29 CFR 1910.134 & 139 or 1926.103
Fall Protection	Any worker who might be exposed to a fall hazard	• The nature of fall hazards • Procedures for erecting, disassembling, maintaining and inspecting fall protection systems. • Use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, controlled access zones and other fall protection. • Procedures for handling equipment and erection of overhead protection • Fall protection standards. • Rescue Plan
PPE	Workers using PPE	Refer to section on PPE or regulatory standards
Forklifts	Operators of powered industrial trucks	• Types of trucks operated. • Hazards of the workplace • Hands-on performance evaluation
Confined Spaces	Any worker attending to, supervising, entering or working within a confined space	• Hazards of the space • Duties of entrants, attendants, supervisors • Air monitoring

Permit-Required Confined Spaces	Any worker attending to, supervising, entering or working within a permit-required confined space	• Hazards of the space • Duties of entrants, attendants, supervisors • Measures used to eliminate or control hazards. • Air monitoring requirements • Emergency procedures/rescue equipment • Communications • Permitting procedure • PPE
Excavations/ Trenches	Workers entering or working within an excavation/trench	• Hazards of the space (slides, cave-ins, water accumulation, etc.) • Safe means of access/egress • Proper support system procedures (erection, maintenance, disassembly and inspection)
Lockout/Tagout	Workers affected by hazardous energy sources	• Nature of known hazardous energy sources. • Project-specific Lockout/Tagout procedures
Gas Welding & Cutting	Workers conducting gas welding and/or cutting	• The safe use of fuel gas
Arc Welding & Cutting	Workers conducting arc welding and/or cutting	• What to do with unattended machines and electrode holders • Operations around water • Shielding arc welding
Hot Work	Workers conducting hot work activities	• Hazards of the area • Permits • Duties of Fire Watch • How to use a fire extinguisher

Scaffolding	Workers working from scaffolding	• The nature of any known hazards • Proper erection, maintenance and disassembly of fall protection systems • Falling object protection • Material/equipment handling from scaffold. • Maximum load-carrying capacity • Scaffold tagging system. • Access and egress
Crane Baskets	Workers working from crane baskets	• Safe work rules • 100% fall protection • Lift plans contents • Emergency procedures
Silica	Workers potentially exposed to Respirable crystalline silica	• Hazards of Respirable crystalline silica • Understanding Table 1 • If needed, respiratory protection program

F. Crew Daily Pre-Task Safety & Hazard Analysis Planning (DHA)

1. A Daily Pre-Task Safety & Hazard Analysis Plan will be completed daily by each crew performing work on this project. The CMa will provide a template if requested by the contractors.

2. Each foreman/first-line supervisor will analyze task(s) to be performed by their crew and identify the work sequences, hazards, training, controls and emergency action plans necessary to protect workers from the identified hazards.

3. The work will be broken down into individual steps (i.e., all the steps the work crew will have to take in order to complete that task); the known hazards associated with the work; and the hazard controls (tools, safety equipment, safety rules, safe work practices, etc.). This is a time for workers to provide input into the pre-task plan.

4. Foreman/first-line supervisors will review the plan with their respective work crew so that each worker is aware of what work activities will occur during the shift, what hazards to be aware of and how to properly control or eliminate those hazards. Each worker will sign the

plan stating that they understand the work activities, hazards and controls. This is also an acknowledgement that each worker agrees to work according to the plan.

5. The completed pre-task plan shall be posted in a conspicuous location near the work activity.

6. Those tasks with similar work can use prior pre-task plans, but the plan must still be dated and reviewed with crewmembers at the beginning of the shift. If the scope of work changes or a new hazard appears during the work, the first-line supervisor will stop their crewmembers and revise the pre-task plan.

7. End of shift sign off. Each worker is required to sign off at the end of shift confirming that any injuries were reported.

G. Hazardous Materials

1. A survey has been performed by the owner and included as part of the bidding documents. Each prime contractor and their subcontractors shall review the report and understand the hazardous materials that exist onsite. Removal of hazardous materials shall be performed by competent worker that meet the requirements of AHJ's and in accordance with all applicable laws and regulations.

a. Each contract shall provide awareness training to their workers prior to mobilizing onsite.

2. In the event unknown suspected hazardous materials are uncovered during the course of the work, all workers shall stop work and notify the CMa and Owner.

H. Each contractor will be held in strict accordance will all safety and environmental regulations and requirements. Any worker that fails to follow the policies will be dealt with in accordance with the disciplinary program as described below. Prime and/or contractor supervision (inclusive of onsite and office personnel) that oversee workers that have reoccurring safety or disciplinary infractions will be removed from the project site in addition to worker(s) violating the project requirements.

1. Disciplinary Program

a. At-risk behavior on this project that could contribute to an incident or injury will not be tolerated. Each worker has an individual responsibility to work safely, and each first-line supervisor is responsible to correct at-risk behavior of workers under their direction.

b. At-risk behaviors considered Immediately Dangerous to Life or Health that may result in immediate termination from the project, include, but are not limited to:

i. Failure to follow the Fall Protection Policy

ii. Failure to follow the Substance Abuse Policy

iii. Possession of firearms, explosives or dangerous weapons

iv. Theft and other criminal activity

v. Entering or allowing to enter an unprotected trench or excavation.

vi. Failure to follow lockout/tagout procedures.

vii. Fighting, horseplay, or practical joking

viii. Entering or allowing to enter, a confined space without following procedures.

ix. Unsafe and/or reckless operation of motorized vehicles or equipment

c. For those acts or practices not considered Immediately Dangerous to Life or Health the following will apply:

i. First occurrence: Verbal, written warning, and/or re-training by the prime contractor

ii. Second occurrence: Written warning, re-training, suspension, or termination from the project

iii. Third occurrence: Termination from the project

I. No work will be performed on any energized electrical circuit, buss-bars, equipment, or panels unless an approved written work plan is developed in accordance with Chapter 1 of NFPA 70E and submitted to Skanska for review prior to performance of work.

J. Electrical equipment and tools used on this project shall be inspected by a competent person to prevent any worker from receiving an accidental electrical shock. This rule will apply to all cord sets, portable electrical equipment, tools and appliances not part of any permanent building or structural electrical systems.

K. All temporary cords will be three wire, 16 gauge or heavier, with a hard or extra hard duty rating.

L. Electrical Cord Management

1. All cord sets will be elevated above the work surface when practical.

2. Wire, nails, or other conductive material will not be used to hang or attach cord sets or welding leads.

3. Cord sets that cross roadways will be protected from damage by vehicle and equipment traffic by devices such as hose bridges.

M. General Electrical Requirements

1. Light stringers and halogen lamps will have the lamps protected from accidental contact or breakage and will be hung per manufacturer specifications.

2. UL approved covers are required on all panels, load centers, pull boxes, etc. prior to energizing. Necessary steps will be taken to prevent unauthorized or unqualified workers access to energized electrical parts or equipment.

3. Additional Fall Protection Requirements

a. Prime contractors, subcontractors, vendors, or other third-party individuals will take all practical measures to eliminate, prevent, and control fall hazards. All work will be planned with the intent to eliminate identified fall hazards. When a fall hazard has been identified and cannot be eliminated, then effective means of fall protection will be implemented. Acceptable fall protection systems included the following:

a. Guardrail systems

b. Safety netting

c. Covers for floor, roof and wall openings.

d. Positioning device systems

e. Protection from falling objects.

f. Personal fall arrest systems

4. Retractable lifelines shall be utilized with personal fall arrest systems; lanyards will not be acceptable.

5. 100% Fall Protection Required. All employees will be 100 percent protected while working six feet or higher off the ground or when hazards below six feet dictate enforcement at a lesser height. This policy will apply to all contractors, even when OSHA allows for exceptions. In the event where local statutes require fall protection at less than six feet the more stringent standard will apply.

6. Workers engaged in steel erection activities, including but not limited to connecting, decking, and bolt up, are not exempt from the 100 percent fall protection requirements when working from heights of six feet or greater.

N. Fire Protection and Prevention

1. Prime contractor shall develop and provide a Fire Protection Plan in accordance with OSHA 29 CFR 1926 Subpart F.

2. All activities that require welding, cutting or an open flame is present require a minimum of 2-hour fire watch. Provide continuous fire watch, including off hours, for temporary heating using open flame units. Refer to specification 01 50 00 Temporary Facilities & Controls for further fire watch requirements.

3. Any temporary structures or protection shall be construction of non-combustible material or have a fire resistance rating of one (1) hour.

4. Hot work is defined as the use of open flames, other heat sources, and/or spark producing devices in areas where combustible or flammable materials are present and/or where there is potential for explosion or fire. Hot work activities include burning, welding, cutting, grinding or other operations that produce a flame, heat, or sparks.

a. Prior to performing “Hot Work” operations, workers shall notify the CMa in accordance with requirements set forth in the contract documents. The CMa will coordinate with the owner’s activities and provide written confirmation before any hot work can commence.

O. Flammable Liquid Storage & Dispensing

1. Storage of flammable liquids are to be stored in fireproof containers as required by OSHA.

2. No flammable, combustible, or explosive gasses or liquids are permitted to be stored on the roof over night.

3. Gas powered generators are not permitted on the roof.

P. Prime Contractor Safety Personnel

1. Each contractor shall designate an experienced and fully trained member of the Contractor's organization at the Project Site whose duty shall include the prevention of accidents and the enforcement of the project safety requirements relating the contractor's work.

    a. Contactors shall coordinate, through the Construction Manager, and conduct, weekly onsite safety inspections. Prime Contractors shall designated safety representative, with a focus on the contractor's safety duties and responsibilities. Contractors shall submit a formal report of their findings, within one day, and advise Montgomery County for corrective actions to address any issues identified during the walk through.

2. Contractors that have less than thirty (30) workers on-site (including tiered subcontractors) will designate a safety representative prior to mobilization. This on-site safety representative will be a competent worker who has completed at least 30 hours of OSHA awareness training and who may have other on-site duties. This worker must be onsite at all times to serve in this capacity.

    a. Contractors that have thirty (30) or more workers (including tiered subcontractors) will provide a full-time on-site safety professional upon mobilization. This person shall have no other responsibilities.

    b. Contractors will submit the resume of their proposed safety professional or representative to be reviewed by the CMa. The CMa will determine if the proposed safety professional or representative has the training and experience required for this project. This person will have the authority and responsibility to ensure the proper implementation of safety requirements stipulated within their PSSP and project requirements.

    c. Contractor safety professionals and representatives will have the full authority to implement safety corrections and recommendations. Subcontractor safety professionals and representatives will have authority to stop any work they deem unsafe.

3. When prime contractor crew sizes are larger than 30 workers, inclusive of sub tier contractors, the contractor shall employ a full-time on-site safety professional. This individual shall be dedicated to safety oversight and not have a dual role. The safety professional shall have the following minimum qualifications:

    a. Five years construction experience, one year of which includes on-site construction safety responsibilities.

    b. Specialized training relevant to scope of work.

    c. OSHA 30-hour construction safety awareness course.

    d. Working knowledge of safety regulations and hazard control methods.

    e. Demonstrated ability to conduct safety training.

    f. The minimum duties of the designated safety professional and/or representative will be:

i. Investigate any incident or near miss and report the findings to Skanska.

ii. Attend safety meetings as required by CMa.

iii. Conduct regular safety meetings with workers to instruct them on project safety practices and requirements.

iv. Conduct written daily safety inspections of their work activities and make available to Skanska for review to ensure compliance with safe work practices and this Safety & Health Management Program.

Q. Take direction from Owner & CMa related to timely abatement and control of hazards.

R. Safety Meetings

1. Safety personnel are required to attend all meetings stipulated in the “Lean Procedures” including but not limited to Last Planner and Daily Huddles.

2. The CMa will conduct safety meetings monthly. These meetings will last one (1) hour and review all aspects of safety onsite. Each prime contractor safety personnel and key subcontractors shall attend.

S. Silica- if there is a potential for silica exposure, the contractor shall submit a Silica Control Plan. If the contractor opts not to follow Table 1 from OSHA 1926.1153 Respirable crystalline Silica standard, historical data must be provided.

T. Radios, headphones, and other music devices are prohibited. Any contractor employee using these devices will be removed from the project.

U. Testing and Inspections

1. All Prime Contractors shall fully cooperate with any Testing and Inspection agencies retained by Montgomery County including implementation of any remedial work recommended as a result of such inspections. It will be the responsibility of the Contractors to provide proper coordination and timely notification to the testing agency, inspecting authorities, etc. Reference the design specifications provided for further information.

2. All re-inspection cost due to failures and non-conformance will be the responsibility of contractor. Any and all specialized testing and/or inspections needed for temporary or permanent construction methodologies, not described in the design specifications, are the responsibility of the appropriate Prime or sub-tier contractor.

3. All Prime Contractors shall fully cooperate with any local and/or State inspection authority and coordinate inspections including any remedial work recommended as a result of such inspections. Any premium labor costs associated with such inspections will be the responsibility of the Contractor. Contractors shall identify inspection dates on weekly work schedule.

4. Prime Contractors will provide labor to assist in inspections by the AHJ and independent testing agencies.

V. Hazardous Materials

1. The Owner performed a hazard survey of the existing building. The report is part of the bidding documents and the Prime Contractors are responsible to review the report and its

findings. The General Contractor is responsible for the hazardous material abatement and shall follow all applicable EPA and OSHA regulations. The GC shall understand the potential for mold at the exterior walls caused from water infiltration. The proper regulations and guidelines shall be followed when removing the exterior façade and interior partitions.

2. If suspicious material is identified that potentially contains ACM or hazardous materials, the Prime Contractors shall notify the CMa and halt work operations immediately. The situation will be reviewed by the Owner and a course of action determined. If necessary, the Owner will perform additional testing of the suspicious materials.

W. Daily Construction Reports

1. Daily Construction Reports shall be submitted electronically to the CMa and should be completed per project specifications. Each Prime Contractor is required to complete and submit daily reports which shall be written and signed by the contractors lead supervisor or foreman on site. The CMa will verify the reports to ensure details are accurately documented. Payments may be withheld upon failure to submit these reports.

X. Site Condition Reports

1. Submit at time of discovery of differing conditions. All primes are responsible to review the project conditions prior to starting their work. Contractors shall report prior to the start of work any differing conditions and/or damages part of existing materials that are existing to remain. Issues that are not reported will be the responsibility of the prime contractor.

Y. Adjacent Buildings and Structures

1. Damages

a. All Contractors are cautioned that, because this work will be performed in close proximity and adjacent to existing occupied properties, all precautions, protection and care must be exercised to protect existing structures in accordance with good safety practices. This is particularly applicable to protection of pedestrians. The Contractor is responsible for any damage, which may occur to the property of the Owner or adjacent private or public properties which in any way results from the acts or neglect of his employees. In addition to repairing the damage at the expense of the Contractor, all damages thereto including damage to existing utilities and paving arising from operations under the Contract. Repair and protection is the Contractor's responsibility regardless of the assignment of responsibility for inspection, testing or similar services.

Z. Finished Work & Protection

1. All Contractors are wholly responsible for the protection of finished work, both their own and that of others, as may be required to perform their own work. Each Contractor is responsible for any damage which may occur to the property of any other Contractor connected with the work or to adjacent private or public properties, or to any portion of the structure that in any way results from the acts of or neglect of his/her employees.

AA. Substitutions: Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the work.

BB. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Section 015000 "Temporary Facilities and Controls," each contractor is responsible for the following:

1. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.

2. Computers, printers and office supplies necessary for its own activities.

3. Temporary enclosures for its own construction activities.

4. Staging and scaffolding for its own construction activities.

5. General hoisting facilities for its own construction activities.

6. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.

7. Progress cleaning of work areas affected by its operations on a daily basis.

8. Secure lockup of its own tools, materials, and equipment.

9. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

CC. Each Contractor must inspect the roof areas daily for material and debris that can be blown from roof and take all measures to prevent same.

2.00 GENERAL CONSTRUCTION CONTRACT

The work of the General Construction Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the drawings and as described in the contract description. The work is not restricted by the division of drawings or specifications. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes and governing jurisdictions.

Specification	Description
a) Division 00	Procurement and Contract Requirements
b) Division 01	General Requirements
c) Division 2	Existing Conditions
d) Division 3	Concrete
e) Division 4	Masonry
f) Division 5	Metals
g) Division 6	Wood, Plastics, and Composites
h) Division 7	Thermal and Moisture Protection
i) Division 8	Openings
j) Division 9	Finishes
k) Division 10	Specialties
l) Division 11	Equipment
m) Division 12	Furnishings
n) Division 13	Special Construction
o) Division 14	Conveying Equipment
p) Division 31	Earthwork
q) Division 32	Exterior Improvements
r) Division 33	Utilities
s) Division 34	Traffic Control Signage

1. The GC Prime Contractor shall provide a fully furnished, climate-controlled trailer with a minimum area of 700 square feet for shared use by the GC Prime and the CMa, available from the Notice to

Proceed through one month beyond the scheduled completion date identified in the bid schedule. The trailer shall include a dedicated office for the CMa furnished with two desks and two chairs, a conference room with a table for up to 12 people, and a 65-inch 4K television with a stand for meetings. The GC Prime shall also provide a refrigerator and microwave, high-speed broadband internet capable of supporting video conferencing, and shall be responsible for all associated internet service costs. Two portable toilets and one handwashing station, designated exclusively for office staff, shall be provided, with the GC Prime responsible for potable water supply and bi-weekly cleaning of the portable toilets. Electrical power will be supplied by the Electrical Prime Contractor. The trailer shall be located in the adjacent parking area shown on Drawing G050 and positioned to maximize available parking. The GC Prime shall secure the trailer, furnish a minimum of six keys to the CMa, and ensure all fencing and barriers include reflective signage and any impact protection devices required by the Authority Having Jurisdiction. The GC Prime shall obtain and maintain all necessary permits for this work, if required.

2. Contractor has visited the site and reviewed all areas of disturbance related to work of this bid package. Any existing improvements that require removal, demolition, relocation and/or protection to perform the work are considered part of this Contractors scope of work.

3. Provide ALL demolition indicated or required on the contract documents including, but not limited to, all Architectural, Structural, Site/Civil and MEP demolition. The MEP Contractors will cut, cap and safe active utilities to be demolished. The GC Prime Contractor will demolish utilities after confirming with the MEP Prime Contractor it is safe to do so. The GC Prime Contractor is also responsible for all refrigerant recovery. Provide all demolition that is not specifically excluded in this scope of work.

4. Exterior skin demolition includes, but is not limited to, brick, block back up, framing, window systems, brick angles, brackets, hazardous materials, coping, fixtures, and miscellaneous items attached to the exterior walls.

5. The Demolition Contractor will remove all MEP hangers and support systems.

6. GC Prime contractor to be fully involved with all aspects of the overhead coordination process.

7. Include patching openings in floors and walls to remain in place after utilities are removed.

8. Include patching demolition scars to match adjacent surfaces.

9. Safety guardrails to be installed on each floor during demolition as required by OSHA.

10. Include floor patching per manufacturers recommendations for floor finishes.

11. Include patching in the elevator shaft after removal of elevator equipment, utilities and related materials.

12. Include flash patching and skim coating up to 1/8” of all flooring surfaces that are to receive new flooring materials.

13. Provide all layout for use by all contractors. Layout on the floor, finish walls, openings, soffits and built in items. After the interior demolition is complete, survey the building to determine if the exterior walls are parallel and the building is square within itself. Inform the CMa and architect of any discrepancies. Provide control lines in each direction on each floor.

14. The GC Prime is required to complete all work on the exterior of the west elevation as quickly as possible, with particular attention to minimizing the duration that any scaffolding or access measures are in place. The demolition of the facade and installation of new work must be carefully

coordinated to ensure minimal delay and efficient progression. The goal is to have any form of access to the west elevation erected for as short a time as possible, as once access is removed, obtaining another easement for comeback work may be difficult. Therefore, it is critical that all work is fully completed before any access measures are removed. The GC Prime must coordinate with the Owner and CMa providing a clear scope and schedule of activities, including prerequisites, to ensure timely completion, and submit this information to the CMa no later than 15 days after the Notice to Proceed (NTP). GC Prime will provide use of access system to all primes. GC to coordinate with other primes to ensure all scopes are complete before removal of access system.

15. Contractor will include multiple crews and multiple scaffold systems to work multiple elevations simultaneously.

16. Contractor will remove the roofing system to avoid damage to the existing roof structure. Contractor will report to the CMA any existing roof structure members that are damaged prior to the removal of roof decking. Any roof framing members or structure damaged by this Contractor will be replaced at the Contractors expense.

17. Contractor includes all hazardous material abatement. Reference the GZA Pre-Renovation Hazardous Building Materials Report dated June 11, 2024. Contractor is responsible for hazardous material abatement indicated or implied in the documents. Contractor is responsible to review onsite conditions and be fully aware of the abatement scope. The hazardous report is intended to be a representation of the materials that exist onsite. It shall be assumed that materials that exist within these structures, similar to those that have been discovered to contain hazardous materials, will need to be removed and disposed of per the regulating authorities. This contractor is responsible for all containment provisions, removal, air monitoring & testing and other requirements per AHJ regulations. Provide all documentation and clearances once work is complete.

18. Contractor will employ multiple crews working on multiple floors simultaneously to complete the demolition in the time allotted on the bid schedule.

19. GC Prime Contractor will evacuate any hazardous liquids from equipment and dispose of offsite per environmental regulations and guidelines.

20. The GC Prime shall remove all trees and shrubs identified for removal in the contract documents. In addition, the GC Prime is responsible for removing and replacing any trees, shrubs, or overgrowth that obstruct access to the façade or existing concrete walls. Any plant material removed solely to facilitate construction access, and not explicitly indicated for removal in the contract documents, shall be replaced in kind upon completion of the work.

21. The GC Prime shall maintain all grass and planted areas to prevent the appearance of unsightly or overgrown vegetation throughout the duration of the project.

22. Contractors will coordinate overhead MEP rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.

23. In the event unknown suspected hazardous materials are uncovered during the course of the work, all workers shall stop work and notify the CMa and owner. The CMA will arrange for testing of materials uncovered that are not represented in the environmental assessment. Removal of unforeseen hazardous materials will be compensated for based on established unit prices.

24. Perimeter fencing shall consist of post-driven chain link fence. Gates shall be installed at the locations indicated on the logistics plan. At the west elevation, a temporary chain link fence with weighted bases shall be provided. Upon expiration of the easement agreement with Burger King, the temporary fence shall be relocated within the property limits. All fencing and barriers shall

include reflective signage and any impact protection devices required by the Authority Having Jurisdiction (AHJ). The contractor shall provide, maintain, and secure all necessary permits for this work, if required.

25. Contractor will provide site utility installation, utility relocation and utility removal/abandonment indicated. All utility work described will be documented for line and grade and updated on the on the as-built CAD file. Extend utilities through foundation wall and into the building to the first flange and cap provided by this Contractor. Provide water stop LINK SEAL at all building exterior wall subsurface penetrations. Provide testing, sterilizing and flushing for all installed utilities. Include sanitary, storm, domestic water and fire water installation. Coordinate with PECO for new incoming gas service.

26. Install and tie-in site storm water system prior to the installation of the new roof and roof drainage system. Coordinate work with Plumbing Prime Contractor.

27. GC Prime to demolish all piping indicated on Plumbing drawings. Plumbing PC to cut and cap all piping as necessary to facilitate demolition.

28. Contractor will scan (GPR) for utilities in the vicinity of new structures and foundation work prior to excavating. Include soft dig and vacuum excavation to locate utilities. Inform the Architect and CMa of any utilities that could impact the foundation work for new construction.

29. The GC Prime Contractor will provide fall protection at the roof level, perimeter of each floor and at deck openings for use by all trades.

30. The GC Prime Contractor will provide and maintain safe roof access for all Contractors use.

31. Provide and maintain three 20# multi use fire extinguishers on each floor and roof level. 15 TOTAL. Mount extinguishers on temporary stanchions or existing construction.

32. Contractor will provide snow removal. Remove snow when the snow event has substantially ended whether it is at night or weekends. Snow removal is required in all areas of construction, construction entrances, construction staging areas, parking lot on North side of York Road, and around construction office trailer(s) to include stairs. Spread calcium chloride on walking surfaces with ice.

33. GC Prime will immediately remove standing water on decks following any rain event or snow melt.

34. Contractor will maintain one stair tower unobstructed for the duration of the work. Provide temporary or permanent handrails in active stair tower.

35. Contractor will NOT use equipment to demolish any portions of the building that could cause stress to the structure.

36. GC Prime contractor shall ensure that during all excavation activities around the building perimeter, the existing footings are fully supported and remain structurally sound. At no point shall excavation undermine or compromise the integrity of the existing footings. Appropriate shoring, bracing, or other protective measures must be implemented as necessary to prevent any undermining or destabilization.

37. Contractor will avoid excessive loading on elevated decks. Remove debris without letting it accumulate on floors. If contractor intends to utilize equipment on elevated decks (scissor lifts, bobcat, skid steer, tow motor), their structural engineer must evaluate the live and dead load imposed by the equipment and confirm it’s use is not detrimental to the structure.

38. It is anticipated the curtainwall system will have a long lead time. Contractor will submit window system, entrance and metal panel system shop drawings, extrusion samples and glass samples for review within 20 (twenty) days after NTP to not delay the project. Clearly detail all window attachment details to structure or cold-formed metal framing.

39. The GC Prime Contractor shall provide temporary power and lighting for interior demolition activities using portable generators under their scope. Temporary power and lighting will not be available until substantial completion of demolition. Temporary power provided by the Electrical Prime Contractor is limited to general 20A circuits. The GC Prime Contractor shall supply additional generators as needed to support any power requirements beyond this capacity. Coordination with the EC Prime Contractor is required to identify any existing to remain (ETR) electrical equipment that may be affected by demolition activities and to ensure continued support where necessary.

40. Demolition bidders are required to visit the site to understand the full scope of the demolition work required. Include staging, protection, removal of debris, and removal of furniture and miscellaneous items and trash in the building not shown on documents.

41. Contractor will assume all painted surfaces contain lead and will take necessary measures to protect it's workers, workers of other Contractors and the public from lead dust exposure when demolishing, cutting, abrading, burning of drilling into painted surfaces.

42. Provide dust protection and containment during demolition and exterior restoration. Follow OSHA guidelines for working with, and exposure to, crystalline silica. Protect workers and the public from exposure to crystalline silica during exterior demolition work and any work that could produce airborne silica dust.

43. Contractor must take necessary measures to protect the adjacent properties from damage resulting from work related to this bid package.

44. In addition to the PA one call, perform Ground Penetrating Radar (GPR) and soft dig to locate existing utilities prior to performing any excavation. Contractor will temporarily support and protect utilities that are encountered during excavation. Additional materials are to be available on site to immediately repair any utilities damaged while performing this work. Immediately notify the CM of unforeseen underground utilities encountered. Include vacuum excavation for all new utility trenches and utility locating.

45. Backfill all utility trenches to grade with compacted DGA (densely graded aggregate) and remove excavated material from site.

46. Before spoils are removed from the site, contractor will test materials for contaminates. Provide an add/deduct unit price per cubic yard for contaminated material. Backfill with compacted DGA is already included and will not be calculated in the unit price.

47. Contractor will make arrangements with the AHJ for temporary sidewalk closure, signage and overhead protection for the duration of the project. Reference logistics plan provided. Include design, permits, signage, barricades, traffic markings and any miscellaneous items required by the AHJ. Maintain and remove when directed.

48. Contractor will provide DAILY Clean up for it's work and workers and that of it's Subcontractors. Provide dumpsters for legal disposal and recycling of trash and debris. Dumpsters provided by the GC Prime Contractor will be used by all Prime Contractors. Reference logistics plan.

49. If Contractor opts to install a trash chute, the chute and installation must be engineered, and follow all requirements by the regulating agencies. Provide dust containment and dust suppression as needed.

50. Contractor will padlock and secure all gates and building entrances at the end of each shift. Provide temporary exterior doors and cover window openings at grade for security. Provide 10 keys for locks to CM. GC must keep the building secure off hours.

51. GC Prime Contractor will provide and maintain portable temporary sanitary facilities and hand wash stations with water for use of all Contractors. Provide soap, and disposable towels at hand wash stations. Portable toilets are to be cleaned and sanitized a minimum of two times a week. Provide sufficient items described as per OSHA requirements. These are in addition to the portable toilets dedicated for use at trailers.

52. Coordinate installation of security hardware with the Electronic Security Systems Contractor and Electrical Prime Contractor.

53. Provide signage and sign support shown on drawings G030, G031, and as specified. Include miscellaneous steel framing required to support sign posts ups. Coordinate with the Electrical Prime Contractor for power installation.

54. GC Prime to install access panels for each Prime contractor. Assume five (5) access panels per prime. General Contractor will provide and install all wall and ceiling access panels shown on the architectural documents. The General Construction Contract will include layout, framing, blocking and finishing for the installation of access panels.

55. GC Prime is required to provide and install a Knox Box if required per the AHJ. Coordinate with the City Fire Marshall for model and specifications. EC Prime is required to provide any associated wiring if required.

56. GC is responsible for all in-wall blocking for equipment to be provided by others. Blocking requirements are based on all contract documents including but not limited to architectural, mechanical, electrical, plumbing, fire protection, audio-visual and interiors plans. GC Prime to include Fire-Rated plywood backing for all Electrical / Low-Voltage panels.

57. The GC Prime Contractor shall remove all electrical equipment not designated for reuse in the new work. Coordination with the Electrical Prime Contractor is required to confirm which equipment is to remain and to ensure proper disconnection and removal procedures.

58. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule. Compensation will not be considered for delays related to materials.

59. Concrete housekeeping pads and concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Review all drawings for concrete pad and curb locations. Any bases or pads needed but are not shown on the drawings will be provided by others. Coordinate locations with MEP Prime Contractors.

60. Provide and maintain temporary weather protection, temporary roofing, temporary enclosures, temporary heat, cooling, dehumidification, and ventilation per material manufacturer’s installation requirements/recommendations if work is scheduled by this contractor which requires specified climatized spaces ahead of scheduled weather tight milestone date. MC Prime Contractor will provide temporary heat/cooling once building is weathertight.

61. If the GC Prime Contractor intends to use the refurbished elevator for construction use, the following will apply.

    a. Provide the necessary inspections required for temporary operation of elevators.

b. Contractor will provide an operational inspection and annual inspections for the elevator and provide monthly maintenance and service for same.

c. Provide personnel to operate the elevator if required.

d. Provide elevator cab protection and temporary flooring in cabs. Protect elevator doors, jambs, ceilings, walls, control panel and sills from damage. Contractor is responsible to repair any damage to the elevator related to temporary usage.

e. Refurbish and re-inspect the elevator prior to substantial completion. The elevator will be in new condition at substantial completion.

f. Scheduling elevator use is the responsibility of the GC Prime Contractor.

g. Provide, and pay for, operational support for other contractors to perform work in the elevator shafts, pits or work that will be performed from the top of the elevator cab.

h. Provide extended warranties for the elevator and associated equipment.

i. The elevator is to be made available for the primary use of the FF&E contractor when the contractor is scheduled to start FF&E installations. This may occur prior to substantial completion of the project.

62. All firestopping sealants shall be single-sourced and coordinated among all prime contractors. Installation and material selection shall comply with Section 07 84 00 – Firestopping. The GC Prime Contractor shall lead coordination efforts to ensure compatibility and continuity of firestopping systems across all trades.

63. GC Prime Contractor is responsible for reviewing all existing and new wall construction in the building for code compliance as related to but not limited to fire rating, sound rating, air barrier. Review all new and existing steel construction passing through CMU block and drywall walls to install code complaint firestopping and caulk sealants based on the required wall rating.

64. All painting indicated on the MEP drawings shall be performed by the GC Prime Contractor. This work shall be coordinated with the Mechanical, Electrical, and Plumbing Prime Contractors to ensure proper sequencing and access. All painting shall comply with the requirements outlined in Section 09 90 00 – Painting and Coating.

65. The GC Prime Contractor shall be responsible for waterproofing existing foundations when exposed during excavation. All waterproofing work shall be performed in accordance with the methods and materials specified in the applicable specification sections.

66. This contractor shall review all contract documents to identify any work occurring within fifty (50) feet of the SEPTA right-of-way. If such work is identified, including the potential need to set a crane within this area, the contractor shall complete and submit the SEPTA PPW document to the CMa no later than ten (10) calendar days following the Notice to Proceed.

67. Provide temporary protection for materials installed by this contractor including, but not limited to, floors, roof system, walls, window systems, exterior skin materials, millwork/casework, doors and frames, elevator, until substantial completion and acceptance by the owner. Compensation will not be considered for replacement or repair of damaged materials prior to final acceptance.

68. All temporary construction provided by this bidder will be maintained, modified if necessary and removed when directed.

69. The GC Prime Contractor shall include a two-person paint crew available for up to forty (40) hours at the discretion of the CMa for touch-ups, corrections, or other painting needs identified during the project. The GC Prime shall keep all leftover paint available, properly labeled and stored, until the project punch list is complete to ensure color and finish consistency for any required touch-up work. All painting shall comply with Section 09 90 00 – Painting and Coating, including surface preparation, application methods, and material standards. Paint shall be stored in a secure, climate-appropriate location to prevent damage or degradation, and the GC Prime shall coordinate with other trades to avoid conflicts and ensure timely completion of painting tasks. Any unused paint shall be disposed of in accordance with local environmental regulations after final acceptance. This requirement does not relieve the GC Prime Contractor of the responsibility to correct any paint deficiencies caused by the GC Prime or its subcontractors and is separate from any punch list activities.

70. The General Construction (GC) Prime Contractor shall include 8 labor hours for a Carpenter Apprentice or Carpenter to perform repairs or replacements of damaged Acoustic Ceiling Tiles (ACT) that occur outside of the punch list process, at the discretion of the Construction Manager (CMa). All unused ceiling tiles provided under the contract shall be stored in a secure, accessible location on-site and remain available for this purpose until punch list activities are fully complete. Any replacement work shall match the existing ceiling system in size, color, and finish.

71. All elevator-related work, including removal, replacement, installation, adjustment, and associated tasks, shall be performed exclusively by the General Construction (GC) Prime Contractor’s designated elevator subcontractor. The elevator subcontractor shall be a firm regularly engaged in the installation and servicing of commercial elevator systems and shall possess all required licenses, certifications, and insurance necessary to perform the work in compliance with applicable codes and standards. The subcontractor shall have a minimum of five years of documented experience with similar elevator systems and demonstrate familiarity with the manufacturer’s installation and maintenance requirements. Coordination with other trades shall be the responsibility of the GC to ensure proper sequencing and safety during all elevator operations.

72. Provide all final cleaning labor, material, and equipment. Final cleaning will be provided at a standard that is acceptable for the Owner's occupancy. Submit cleaning products and materials satisfactory to manufacturer’s standards. Provide final cleaning for all interior and exterior areas and finishes including, BUT NOT LIMITED TO the following:

    a. Interior glazing system surfaces

    b. Exterior glazing system surfaces

    c. Floor finishes

    d. Millwork Casework

    e. Doors, frames and hardware.

    f. Wall surfaces

    g. mirrors

    h. Elevator

    i. Stairs and rails

    j. MEP and specialty rooms

k. Restrooms, water closets, lavatories, utility closets

l. Plumbing fixtures

2.01 HEATING, VENTINLATING, AND AIR CONDITIONING (HVAC) CONTRACT

The work of the HVAC Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

Specification	Description
a) Division 00	Procurement and Contract Requirements
b) Division 01	General Requirements
c) Division 2	Existing Conditions
d) 078413	Penetration Fire Stopping (as it applies)
e) 079200	Joint Sealants (as it applies)
f) Division 23	Heating, Ventilating, and Air-Conditioning (HVAC)

Related Sections	Description
a) Division 25	Integrated Automation
b) Division 22	Plumbing
c) Division 26	Electrical
d) Division 28	Fire Alarm

1. The General Trades Prime Contractor shall perform all mechanical demolition as indicated in the contract documents. The HVAC Prime Contractor shall be responsible for cutting, capping, and making safe all mechanical systems prior to demolition. Coordination between the General Trades and HVAC Prime Contractors is required to ensure safe and orderly execution of this work.

2. Coring, cutting and patching required for your work will be performed as part of this bid package.

3. Contractors will reference OSHA requirements related to working with lead and lead painted materials. Contractor will take necessary measures to protect it’s workers, workers of other Contractors and the public from lead dust exposure if cutting, abrading, burning of drilling into painted surfaces. Assume all painted surfaces contain lead.

4. MC Prime Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule. Provide a list of all known long lead material and equipment items. Submittals for these items are to be submitted for review no later than 15 (fifteen) days after NTP.

5. Contractor will include all hot and cold refrigerant lines, condensate lines, controls and equipment for a complete operational system. Not all piping sizes and distribution are shown on the drawings. Coordinate piping distribution and sizes with the equipment manufacturer.

6. Contractors will coordinate overhead MEP rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.

7. Coordinate equipment start up, both temporary and permanent, with Electrical Prime Contractor.

8. Provide and maintain temporary heating, cooling, ventilation, and dehumidification using permanent systems for the installation of architectural finishes. Reference the bid schedule for dates related to temporary startup of permanent systems for temporary use. Contractor will have the systems in temporary operation by this date.

9. The HVAC Contractor shall provide temporary heating, cooling, ventilation, and dehumidification using temporary systems from the point at which the building becomes weather-tight until the permanent HVAC systems are available for temporary operation.

10. Contractor will provide means to remotely monitor the equipment operation that will provide notification if the equipment is not functioning properly. Contractor will respond 24/7 to trouble shoot equipment operations. This applies to equipment in operation for temporary use.

11. For the use of temporary HVAC during construction, develop a methodology for moving air throughout the building to distribute heating, cooling, ventilation, and dehumidification, using permanent, and if necessary, temporary ductwork to provide adequate distribution of conditioned air.

12. Contractor will protect (via temporary filter media) all return ducts, air handling equipment, outside air plenums/louvers, and return registers during construction and during periods of operating the air handling units and equipment for temporary use. Contractor shall change and/or clean filters as required for project duration.

13. Upon substantial completion, or as directed by CMa, this contractor will provide a complete cleaning of the entire mechanical systems. Contractor will provide filter changes for all equipment immediately prior to Owner final acceptance. Filters will be new.

14. Contractor will provide the interim maintenance of the equipment during construction, startup, and temporary usage periods until acceptance by the Owner. This Contractor includes all extended warranties required for equipment used, started and operating prior to Owner acceptance. Warranties shall start on the date of substantial completion. Maintenance records shall be kept during this period and turned over to the CM upon request. The warranty period starts at Substantial Completion of the Project.

15. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule.

16. Reference reflected ceiling plans for locations of exposed to structure ceilings. Contractors will avoid installing systems in those locations when possible. All systems, piping, duct conduit and cabling serving the open ceiling areas is to be run neatly and in straight lines.

17. Concrete housekeeping pads and concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate size with the GC and provide layout. Any bases or pads needed for your installation not shown on the drawings will be provided by this bidder.

18. Provide floor, wall and roof penetration sealants and firestopping for this contractor's work per contract documents. All firestopping sealants shall be single-sourced and coordinated among all prime contractors. Installation and material selection shall comply with Section 07 84 00 – Firestopping. The GC Prime Contractor shall lead coordination efforts to ensure compatibility and continuity of firestopping systems across all trades.

19. Provide floor, wall and ceiling access panels for work related to this bid package. The GC Prime contractor will install the access panels.

20. All painting indicated on the MEP drawings shall be performed by the GC Prime Contractor. This work shall be coordinated with the Mechanical, Electrical, and Plumbing Prime Contractors to ensure proper sequencing and access. All painting shall comply with the requirements outlined in Section 09 90 00 – Painting and Coating.

21. All duct detectors shall be provided by the EC Prime Contractor and installed by the MC Prime Contractor.

22. Contractor will provide **DAILY** Clean up for it's work and workmen and that of it's Subcontractors. The GC Prime Contractor will provide a dumpster for contractors use.

2.02 ELECTRICAL CONSTRUCTION CONTRACT

The work of the Electrical Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

Specifications		Description
a)	Division 00	Procurement and Contract Requirements
b)	Division 01	General Requirements
c)	Division 2	Existing Conditions
d)	Division 3	Concrete (as it applies)
e)	078413	Penetration Fire Stopping (as it applies)
f)	079200	Joint Sealants (as it applies)
g)	092100	Gypsum Board Assemblies (as it applies)
h)	Division 26	Electrical
i)	Division 27	Communications
j)	Division 28	Electronic Safety and Security
k)	Division 31	Earthwork (as it applies)
l)	Division 33	Utilities (as it applies)

Related Sections		Description
a.	Division 14	Conveying Equipment
b.	Division 21	Fire Suppression
c.	Division 23	Heating Ventilation and Air-Conditioning
d.	Division 25	Integrated Automation

1. Contractor will include all electric, data, security, and A/V work including pathways, back boxes, junction boxes, conduits, and wire.
    a. Electrical work shown and or specified and as required for a complete electrical system installation.

b. Communications: All work shown and or specified. Final punch down and installation of actual equipment will be by others.

c. Electronic Safety and Security work shown and or specified and as required for a complete installation.

d. Audio/Visual: All work shown and or specified. Final punch down and installation of actual equipment will be by others.

e. See LV/AV/IT Matrix at the end of this specification section.

2. Disconnect and safe off the electric service to the building. Confirm with the utility company the power is terminated at the pole on Davisville Road. The service and transformers within the building will be removed by the General Trades Prime Contractor. Electrical Prime will remove, or coordinate removal of service cables from the building to the pole transformer. Provide in writing confirmation the electric service was terminated at the pole prior to interior demolition. The remainder of electrical demolition will be performed by the General Trades Prime Contractor.

3. Unless otherwise noted, remove all receptacles, lighting fixtures, lighting controls, junction boxes, telecommunication devices, speakers, and security devices back to source. Remove power for mechanical equipment and water heaters back to source.

4. Coring, cutting and patching required for your work will be performed by the Electrical Prime Contractor.

5. Concrete housekeeping pads and concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate size and layout with the GC. Any bases or pads needed for your installation not shown on the drawings will be included in this bid package.

6. Contractors will coordinate overhead MEP rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. This process will begin will the overhead coordination process led by the HVAC Prime. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.

7. Contractor will provide DAILY Clean up for it’s work and workmen and that of it’s Subcontractors. The GC Prime Contractor will provide dumpsters for use of all Contractors.

8. Provide the complete fire detection and fire alarm system as indicated in the documents.

9. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule.

10. Within 15 days of notice to proceed, contractor will submit shop drawings and product information for all electric panels, gear, generator and other long lead equipment.

11. Reference reflected ceiling plans for locations of exposed to structure ceilings. Contractors will avoid installing systems in those locations when possible. All systems, piping, duct and conduit serving the open ceiling areas is to be run neatly and in straight lines. All cable and wire will be in conduit at exposed ceilings. EC Prime to furnish and install EV Chargers.

12. Contractor will provide the interim maintenance of the new permanent electrical equipment during the construction, startup and commissioning periods until acceptance by the Owner. This

Contractor will include all extended warranties for equipment used, started and operating prior to Owner acceptance. Warranty period to being at date of substantial completion. Maintenance records shall be kept during this period and turned over to the CMa upon request. At a minimum, permanent electric systems will be used for the following prior to substantial completion.

a. Light and power during construction

b. Elevator electrical power- temporary and permanent

c. Permanent HVAC equipment used for temporary heat, cooling, and ventilation.

d. Early startup of systems for testing and commissioning

13. Reference the milestone date in the project schedule for startup of permanent HVAC equipment and systems for the use of temporary conditioning. Contractor must provide permanent power for early start-up of all equipment needed for temporary conditioning.

14. Contractor will operationally test the Fire Alarm System prior to AHJ Inspection. This test shall be witnessed by the CMa. The fire alarm system and integration with the fire protection system must be completely operational and pre-tested prior to scheduling the AHJ inspections. Provide labor to assist with all AHJ inspections.

15. Provide and maintain the Fire Alarm Systems. Coordinate with all Prime contractors for all interface equipment, testing, and inspections.

16. Work with the security hardware installer for connection to and testing all security hardware and door operation.

17. Contractor will install and make final connections to the Owner furnished equipment.

18. Contractor will provide and maintain a temporary power and lighting services to satisfy OSHA, NFPA, NEC and AHJ requirements once demolition is substantially complete.

a. Make arrangements with the utility company for a new temporary metered electric service. Size the temporary electric service to accommodate temporary power and temporary lighting for the project. Use of permanent equipment for temporary power is authorized. Provide GFCI protection for all power sources.

b. Within 5 days of notice to proceed, make application to PECO for the temporary electric service. Provide proof of application to the CM.

c. If necessary, provide temporary transformer through PECO

d. Contractor will secure an underwriter inspection for all work.

e. All equipment and material for the temporary electric service will be purchased new. The existing service and equipment will not be used for temporary electric.

f. Contractor includes application for and cost of all permits and inspections related to temporary electric work. Coordinate with utility company

g. Contractor includes the removal of all work associated with the temporary service when no longer needed and when directed by the CMa. Underground conduit will be capped underground at ends and abandoned in place.

h. Contractor includes any fees or connection charges associated with the connection by the utility company.

i. Consumption costs will be paid by the county to the utility company.

j. Install the main temporary panel in a weather proof enclosure. Protect sub-panels from weather. Distribute temporary electric and lighting on each floor when demolition on that floor is substantially complete. Provide a sub-panel and sufficient GFCI breakers to accommodate the temporary power needs.

k. In addition to general light and power, provide three 30A breakers in the temporary electric service for power needs of other contractors.

l. Provide LED fixtures and bulbs for all temporary lighting.

19. Provide and maintain temporary arc protection on overhead electric on Davisville Road. Coordinate work with the utility company. Include approximately two hundred (200'') feet of arc protection. Reference logistics plan. Coordinate this work with SEPTA as it appears the utilities are located within SEPTA ROW.

20. The permanent electrical service is to be available for temporary heating, cooling and dehumidification using permanent HVAC systems. Reference bid schedule for power availability for temp conditioning.

21. Switch over of the temporary service to the permanent service shall be at a time so as not to affect the on-going construction activities. There will not be additional compensation if conditions require that switchover be performed on overtime.

22. EC Prime to provide temporary electrical service to the job trailers. Coordinate with GC Prime. EC Prime is responsible for any and all one-time costs associated with installation and removal of this service. Owner shall pay for monthly usage.

23. EC Prime Contractor shall remove all site lighting on the north side of the building down to their bases and ensure all remaining wiring is made safe prior to the erection of any scaffolding. The removed lighting devices shall be stored in a manner that adequately protects them from damage. Following the removal of scaffolding, the devices will be reinstalled. The EC Prime Contractor must coordinate with other prime contractors before reinstalling to ensure that the reinstallation does not interfere with any subsequent work. Any devices damaged during removal, storage, or reinstallation shall be replaced in kind by the EC Prime Contractor.

24. Include a complete cleaning of all electrical panels, meter, gear, transformers and generator prior to final acceptance.

25. Provide floor, wall and roof penetration sealants and firestopping for this contractor's work. Firestopping to be single-source between all contractors. Coordinate with other primes.

26. Contractor will work with and assist the GC Prime Contractor with power requirements for the lighted signage. Provide internal wiring, boxes and final connections.

27. Provide floor, wall and ceiling access panels for work related to this bid package. GC Prime to install.

28. Include cost for electrical crew for standby for any observed holidays that fall during the normal work week when other trades are working on site.

29. Include power to any pigtail hook-ups of equipment needed by other trades.

30. GC Prime is required to provide and install a Knox Box if required per the AHJ. Coordinate with the City Fire Marshall for model and specifications. EC Prime is required to provide any associated wiring if required.

31. The Electrical (EC) Prime Contractor shall perform Wi-Fi heat mapping throughout the building to determine optimal Wireless Access Point (WAP) locations. Heat mapping shall be conducted after major wall and ceiling installations are complete but prior to final WAP placement to ensure accurate signal coverage. The contractor shall use industry-standard tools and methods to identify coverage gaps, interference zones, and signal strength variations. A report of findings, including recommended WAP locations and any necessary adjustments, shall be submitted to the Construction Manager (CMa) and Architect for review and approval before installation. All work shall comply with manufacturer guidelines and applicable network performance standards. Coordination with other trades is required to avoid conflicts with ceiling systems, lighting, and other overhead installations.

32. The following Low Voltage Responsibility Matrix has been developed by the Construction Manager (CM) as a coordination tool to assist in identifying the anticipated furnishing and installation responsibilities of various parties, including Prime Contractors, the Owner, and applicable Utilities, for elements of the low voltage systems.
    a. This matrix is provided for reference only and may not be fully accurate or inclusive of all aspects of the low voltage scope. It does not supersede the Contract Documents. All parties are responsible for reviewing the Contract Documents in full to determine their respective responsibilities.
    b. In the event that a specific item or system component is not listed in the matrix, the Prime Contractor responsible for the applicable Specification Section shall be deemed responsible for furnishing and installing that item in accordance with the Contract Documents.

Low Voltage Responsibility Matrix:

Each Prime is responsible to provide (furnish and install) all of their own raceways, pathways, junction boxes, supports, cutting, patching, sleeves, seals, blocking and connections within their systems as described within the 01

Prime contractors are responsible to employ the designated trade required to each task to install their system as complete.

Frame and Door Preparations include internal door raceways, mortised openings, mounting brackets, and wire back boxes for hardware devices for new and existing doors and frames as listed within Division 08.

	Furnished By:							Installed By:						
	General Contractor (GC)	Electrical Contractor (EC)	Mechanical Contractor (MC)	Plumbing Contractor (PC)	Fire Protection Contractor (FPC)	Owner	Utility	General Contractor (GC)	Electrical Contractor (EC)	Mechanical Contractor (MC)	Plumbing Contractor (PC)	Fire Protection Contractor (FPC)	Owner	Utility
Building Security System Interface														
Division 06 Wood Blocking & Plywood for Electric, LV, & AV	X							X						
Division 08 Hardware	X							X						
Division 08 Power Supplies	X								X					
Division 08 Power Supply line voltage conduit, wire, and connections		X							X					
Division 08 Power Supply low voltage conduit, wire, and connections		X							X					
Division 08 Lockset Wiring and connections between Locksets and Door Frame Transfer Device	X							X						
Division 08 Door Hardware Wire Harnesses From Door Frame Transfer Device to junction box	X								X					
Division 08 Door Hardware Frame and Door Preparations	X							X						
Division 08 Door Hardware Conduit Connections to Frame Preparation		X							X					
Division 08 Door Hardware Wiring Connections to Junction Boxes and Controlling Equipment		X							X					
Division 08 Door System Operators	X							X						
Division 08 Pneumatic Door Operator Systems	X							X						
Pedi stools for Operator Actuators and Card Readers	X							X						
Drain Lines and Weeps for Door Hardware Recessed in Floors	X							X						
Glazed System Frame and Door Preparations	X							X						
Card Reader Conduit to all Div. 08 Operators and Locksets		X							X					
Card Readers and wiring to all Operators		X							X					
Division 08 Fire Alarm Interface including conduit, wiring, relays, and connections		X							X					
Hardware layout and door and frame preparations on existing doors and frames.	X							X						
Door hardware not specified in division 08 is to be provided by designated Prime as designated in Division 01 12 00.														
Knox Box	X							X						
Knox Box (Low Voltage Wiring)		X							X					
Building Automated Controls System Interface														
24 hour Remote Monitoring System using permanent HVAC systems for temporary usage			X							X				
Line Voltage Surge Protection devices			X							X				
Transient Voltage Suppression devices			X							X				
BACnet conduit, wiring, and connections to Lighting controls & Occupancy systems			X							X				
Fire Alarm Interface to BAS including conduit, wiring, relays, modules, and connections		X							X					
Access Control interface with Building Automated System			X							X				
Communications Systems														
Division 27 Communications Pathways - Exterior		X							X					
Division 27 Communications Pathways - Interior		X							X					
Division 27 Communications - IT Room Cable Tray and Pathways		X							X					
Division 27 Communications - Racks		X							X					
Division 27 Communications - Fiber Patch Panels		X							X					
Division 27 Communications - Copper Patch Panels		X							X					
Division 27 Communications - Horizontal Cabeling and Outlets		X							X					
Division 27 Communications - Fiber Optics and Copper Risers		X							X					
Division 27 Communications - Fiber Optics and Copper Terminations		X							X					
Division 27 Communications - Patch Cords		X							X					
Division 27 Communications - Cross Connects		X							X					
Division 27 Communications - Active Electronics - Switches, Computers						X							X	
Division 27 Communications - Network Switches						X							X	
Division 27 Communications - Computers, Networking Equipment						X							X	
Division 27 Communications - PBX/VoIP						X							X	
Division 27 Communications - Phones						X							X	
Division 27 Communications - UPS Power - Local at Racks		X							X					
Division 27 WLAN System - Raceways		X							X					
Division 27 WLAN System - Cabeling and outlets		X							X					
Division 27 WLAN System - WLAN point installation						X			X					
Division 27 WLAN System - WLAN Point & Configure (Aruba)						X							X	
Division 27 Paging System - Pathways		X							X					
Division 27 Paging System - Equipment & Installation						X							X	
Division 27 Paging System - Cabeling		X							X					
Division 27 Audio / Visual Systems - Pathways		X							X					
Division 27 Audio / Visual Systems - Equipment & Installation		X							X					
Division 27 Audio / Visual Systems - Cabling		X							X					
Division 27 Area of Refuge Systems		X							X					
Division 27 Synchronized Clock Systems		X							X					
Division 28 CCTV System - Headend Equipment and Devices (Genetec Security System) License required		X							X					
Division 28 CCTV System - Pathways		X							X					
Division 28 CCTV System - Cabling & Installation		X							X					
Division 28 CCTV System - Computers						X							X	
Division 28 Access Control - Pathways		X							X					
Division 28 Access Control - Headend System						X							X	
Division 28 Access Control - Cabeling		X							X					
Division 28 Access Control - Equipment - Devices						X							X	
Division 28 Access Control - Badging						X							X	
Division 28 Site Security						X							X	
Division 28 Duress System		X							X					
Fire Protection Systems														
Pre-action fire protection control panels.					X							X		
Fire Alarm Interface including conduit, wiring, relays, modules, and connections		X							X					

2.03 PLUMBING CONSTRUCTION CONTRACT

The work of the Plumbing Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

Specifications		Description
a)	Division 00	Procurement and Contract Requirements
b)	Division 01	General Requirements
c)	Division 02	Existing Conditions
d)	078413	Penetration Fire Stopping (as it applies)
e)	079200	Joint Sealants (as it applies)
f)	092100	Gypsum Board Assemblies (as it applies)
g)	Division 3	Concrete
h)	Division 22	Plumbing
i)	Division 31	Earthwork (as applies)
j)	Division 33	Water Distribution (as it applies)

Related Sections		Description
a)	Division 23	Heating, Ventilating, and Air-Conditioning (HVAC)
b)	Division 25	Integrated Automation

1. The General Trades Prime Contractor will perform all plumbing demolition indicated. Disconnect and safe off the water service past the meter prior to interior demolition.

2. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule.

3. Contractor will provide DAILY Clean up for it’s work and workmen and that of it’s Subcontractors. The GC Prime contractor will provide a dumpster on site for contractor’s use.

4. PC Prime will install a temporary laundry sink on the first floor that will not impede construction. This sink to be available for use to all prime contractors.

5. Contractors will coordinate overhead MEP rough-in, wall construction and ceiling framing

to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.

6. Site storm underground will be installed by the GC Prime Contractor to a flanged connection inside the basement foundation wall. This Bidder will complete the plumbing systems inside the building.

7. Concrete housekeeping pads and concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate with the GC size and provide layout. Any bases or pads needed for your installation not shown on the drawings will be provided as part of this bid package.

8. Provide cutting, coring and patching related to the work of this bid package.

9. Contractors will reference OSHA requirements related to working with lead and lead painted materials. Contractor will take necessary measures to protect it's workers, workers of other Contractors and the public from lead dust exposure if cutting, abrading, burning of drilling into painted surfaces. Assume all painted surfaces contain lead. Reference the Hazardous Materials Survey prepared by Pennoni dated February 21, 2024, for additional information related to hazardous materials.

10. Provide sealants and firestopping at floor, roof and wall penetrations for this contractor's work per contract documents. Firestopping to be single source between all primes. Coordinate with all contractors.

11. Provide floor, wall and ceiling access panels for work related to this bid package. GC Prime contractor to install.

12. Provide under slab plumbing, saw cutting slab on grade, excavation, backfill and floor patching.

13. Coordinate installation of roof drains with GC Prime Contractor.

2.04 FIRE PROTECTION CONSTRUCTION CONTRACT

The work of the Fire Protection Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

Specifications		Description
a)	Division 00	Procurement and Contract Requirements
b)	Division 01	General Requirements
a)	Division 02	Existing Conditions
b)	078400	Fire Stopping (as it applies)
c)	079200	Joint Sealants (as it applies)
c)	Division 21	Fire Suppression

Related Sections		Description
a)	Division 28	Electronic Safety and Security

1. The fire protection prime contractor shall perform a comprehensive field survey of the existing sprinkler system to verify current conditions and assess any changes in the building's floor layouts as they occur. The contractor will be responsible for determining appropriate locations and modifications necessary to accommodate the revised floor plans.

2. The fire protection prime contractor will submit the design and all calculations to the design team and CMa for review prior to making any modifications in the field. The FP contractor shall make all necessary modifications to the existing sprinkler system to ensure full compliance with the updated floor layouts. These modifications must maintain or improve system performance and coverage as originally intended. Coordination with lighting locations and mechanical equipment shall be prioritized; sprinkler heads and piping must be arranged to avoid conflicts with lighting fixtures and related electrical components as well as any mechanical equipment.

3. All modifications, installations, and final sprinkler system configuration must strictly comply with all applicable NFPA standards, including but not limited to NFPA 13 (Standard for the Installation of Sprinkler Systems). The contractor shall perform all required hydraulic calculations, coverage assessments, and verify water supply adequacy to ensure compliance with NFPA requirements after modifications.

4. The FP contractor shall produce updated as-built drawings showing all revised sprinkler system layouts reflecting modifications performed based on delegated design decisions. Additionally, a compliance report confirming that the modified sprinkler system meets NFPA standards must be submitted. Any revised hydraulic calculations or engineering analyses required by code or project specifications should also be included.

5. Coordinate all flushing and filling, pre-testing and testing with the Electrical Prime Contractor. If fire alarm system is impacted, flush and fill, pre-testing and testing requests shall be made 72 hours in advance notice to the Electrical Prime, CMa, and Owner

6. Contractors will coordinate overhead MEP rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation. This begins with the overhead coordination process led by the HVAC Prime.

7. Contractor will expedite design and shop drawing submittals to meet the installation dates identified on the project schedule.

8. Concrete housekeeping pads or concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate and provide layout for shown concrete pads and curbs. Any bases or pads needed for your installation not shown on the drawings will be provided by this bidder.

9. Provide cutting, coring and patching for work related to this bid package. Contractors will reference OSHA requirements related to working with lead and lead painted materials.

10. Provide sealants and penetration firestopping for work related to this bid package. All firestopping to be single source among all primes. Coordinate with other contractors.

11. Contractor will provide DAILY Clean up for it’s work and workmen and that of it’s Subcontractors. The GC Prime Contractor will provide dumpsters in the alley between 18 West Airy and One Montgomery Plaza.

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order. Allowances are to be used at the sole discretion of the Owner. Any unused allowance will be credited back to the Owner via a deduct change order.

2. Contractor Markup: Prime contractors are not allowed mark up on labor, material and/or equipment when allowances are used. Sub tier contractors are allowed mark ups consistent with the Owner contract.

C. Types of allowances include the following:

1. Contingency allowances.

D. Related Requirements:

1. Section 01 22 00 "Unit Prices" for procedures for using unit prices.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. As applicable and at CMa’s request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 CONTINGENCY ALLOWANCE

A. Use the contingency allowance only as directed by CMa for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Use of allowance will be authorized on a unit price, T&M or Lump Sum basis at the Owners sole option.

C. Contractor's overhead and profit, on all work ordered by Owner under the contingency allowance are part of the Contract Sum and are not part of the allowance.

D. Each Prime Contractor's proposed Schedule of Values submitted for approval shall list the designated contract allowance as separate line items.

E. Each Prime Contractor shall proceed with all allowance work upon authorization from the Owner through CMa. When authorized on a unit price or T&M basis, the work shall be properly documented on a daily basis by Prime submissions of field tickets to the CMa for signature to verify the hours of work performed or other approved measure. Each ticket shall have a unique number listed that will be referenced during allowance reconciliation. The Owner, at their option, may reach an agreement with the Prime Contractor on a lump sum cost of the work, or a unit rate, at which the Prime Contractor shall perform the entire scope of work. The scope of the work is all inclusive and includes all labor, equipment, supervision, OSHA Safety compliance, materials and any other special conditions notated in the project documents.

F. The Owner retains sole control over the allowance amount in the contract. Upon completion of the authorized work- with a positive balance remaining for the allowance the Owner shall apply a contract credit in the form of a Change Order to each Prime's contract for the full remaining amount. If, during the course of the work the allowance amount is used up, the Owner will issue a Change order to the Prime Contractor for the overage amount. All work that has been properly authorized by the Owner and exceeds the completed allowance amount shall fall under the terms and conditions of the Change Order compensation section of the Contract Documents for allowable charges and mark-up.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.

2. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Existing Conditions (GC)

1. General Construction Prime Contractor shall include this allowance in the base bid.

2. Amount: $100,000

B. Allowance No. 2: Property Restoration and Landscaping at adjacent property (GC)

1. General Construction Prime Contractor shall include this allowance in the base bid.

2. Amount: $15,000

C. Allowance No. 3: Site Wall Repair/Replacement (GC)

1. General Construction Prime Contractor shall include this allowance in the base bid. 150SF (square feet) of repair is included in the base bid.

2. Amount: $30,000

D. Allowance No 4: Removal of Unsuitable/Contaminated Soils (GC)

1. General Construction Prime shall include this allowance in base bid.

2. Amount: $30,000

E. Allowance No. 4: Existing Conditions (MC)

1. Mechanical Prime Contractor shall include this allowance in the base bid.

2. Amount: $50,000

F. Allowance No. 5: Existing Conditions (EC)

1. Electrical Prime Contractor shall include this allowance amount in the base bid.

2. Amount: $50,000

G. Allowance No. 6: Existing Conditions (PC)

1. Plumbing Prime Contractor shall include this allowance in the base bid.

2. Amount: $50,000

H. Allowance No. 7: Existing Conditions (FPC)

1. Fire Protection Prime Contractor shall include this allowance in the base bid.

2. Amount: $30,000

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Section identifies each Alternate by number and describes the basic changes to be incorporated into the Work, if that Alternate is made part of the Contract.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

B. Applicable provisions of Bidding Requirements, Contract Requirements and other Division 1 sections.

1.03 ADMINISTRATIVE PROCEDURES

A. Referenced Sections of Specifications stipulate pertinent requirements for products and methods to achieve the Work stipulated under each Alternate.

B. Coordinate pertinent related Work and modify surrounding Work as required to properly integrate the Work under each Alternate, and to provide the complete construction required by the Contract Documents.

C. Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date.

D. “Schedule of Alternates” is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

E. Award of Alternates will be made in any order.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 SCHEDULE OF ALTERNATES

A. **Alternate Add No. A1** – (GC Prime Contractor) – Applied Film

   a. Apply bird-safe patterned film to existing glazing surfaces.

   b. Apply to all exterior-facing glass surfaces above the first floor.

   c. Comply with:

      i. ASTM D1044 – Resistance of Transparent Plastics to Surface Abrasion.

      ii. Manufacturer’s adhesion and durability standards.

      iii. Bird collision deterrence guidelines (ABC or CSA A460).

d. Basis of Design:
    i. Manufacturer –SOLYX Glass Finishes
    ii. Type/Spacing/Color – SX-BSFD Frost Dot Bird Safety Film
    iii. Warranty – 3 years from date of installation
e. Approved equals:
    i. An alternative product or manufacturer will be considered if demonstrated to be an approved equal. Submitted equals must meet or exceed the performance, appearance, spacing pattern, color, durability, adhesion, warranty, and bird-safety criteria of the Basis of Design and comply with the standards listed above. Provide product data, test reports, and warranty documentation for any alternates submitted.

B. **Alternate Add No. A2** – (GC Prime Contractor) – Applied Dots
a. Apply bird-safe dot pattern to glazing using approved adhesive or ceramic frit method.
b. Apply to all exterior-facing glass surfaces above the first floor.
c. Comply with:
    i. ASTM C1048 – Heat-Treated Flat Glass.
    ii. ASTM C1376 – Pyrolytic and Ceramic Frit Coatings on Glass.
    iii. Bird collision deterrence guidelines (ABC or CSA A460).
d. Basis of Design:
    i. Manufacturer – Feather Friendly
    ii. Spacing - Symmetry
    iii. Color – White or Light Grey
    iv. Warranty – 15-year product warranty
e. Approved equals:
    i. An alternative product or manufacturer will be considered if demonstrated to be an approved equal. Submitted equals must meet or exceed the performance, appearance, spacing pattern, color, durability, adhesion, warranty, and bird-safety criteria of the Basis of Design and comply with the standards listed above. Provide product data, test reports, and warranty documentation for any alternates submitted.

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

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 DEFINITIONS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Documentation: Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer. Show compliance with requirements for substitution and the following, as applicable.
   1. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   2. Coordination information, including a list of changes or revisions needed for other parts of the Wokr and to construct performed by Owner and separate contractors, that will be necessary to accomodate proposed substitution.
   3. Requested substitution is consistent with the Construction Documents and will produe indicated results.
   4. Requested substitution is consistent with the Construction Documents and will produce indicated results.
   5. Provide certification signed by each Prime Contractor indicating that the substitution will have no effect on their work, or if it does, have an effect, corroboration the list of revisions provided.
   6. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicale Specification Section. Significant qualities may include attributes such as preformance, weight, size, durablity, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

7. Product Data, including drawings and descriptions of products and fabrications and installation procedures.
8. Samples, where applicable or requested.
9. Certificates and qualifications data, where applicable or requested.
10. List of similar installation for completed projects with project names and addresses and names and addresses of architects and owners.
11. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
12. Detailed comparison of the Contractor's constuction schedule using proposed substitution with products specified for the Work, including overall effect on the Contract Time. If specified product or method of construction cannot be provided with the the Contract Time, include letter from manufacturer, on a manufacturer's letterhead, stating date of receipt of purchase order, lack of availablity, or delays in delivery.
13. Cost information, including a proposal of change, if any, in the Contract Sum.
14. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

C. Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submit request for Substitution for Cause immediately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are statisfied. If the following conditons are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements.
      a. Requested substitution is consistent with the Construction Documents and will produe indicated results.
      b. Requested substitution provides sustainable destin characteristics that specified product provided.
      c. Substitution request if fully documented and properly submitted.
      d. Requested substitution will not adversely affect Contractor's construction schedule.
      e. Requested substitution has received necessary approvals of authorities having jurisdiction.
      f. Requested substitution is compatible with other portions of the Work.
      g. Requested substitution has been coordinated with other portions of the Work.
      h. Requested substitution provides specifed warranty.
      i. If requested substitution involes more than on contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.03 RESOLUTION

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

B. Architect will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:
   1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.03 MINOR CHANGES IN THE WORK

A. Architect will issue through CMa supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Architect's Supplemental Instructions/Bulletin.

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: CMa will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by CMa are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or ten (10) days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include itemized costs of labor and supervision directly attributable to the change.
      d. Include allowable costs for overhead and profit, pursuant to requirements stated in the Contract Documents.
      e. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      f. Quotation Form: Use forms acceptable to Architect and CMa.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the CMa.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include itemized costs of labor and supervision directly attributable to the change.

5. Include allowable costs for overhead and profit, pursuant to requirements stated in the Contract Documents.
6. Include certification from other prime contractors that their work is unaffected or, if it is affected, related proposals from different prime contractors shall be submitted together.
7. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
8. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
9. Proposal Request Form: Use form acceptable to Architect.

1.05 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.06 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, the Contractor will issue a Change Order for signatures of Owner and Contractor on AIA Document **G731 - CMa**.

1.07 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: The CMa may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Refer to the General Conditions.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. General: This section specifies administrative and procedural requirements for modifications to the Work of the Contract.

1.2 DEFINITIONS

A. Bulletin
   1. A Bulletin is a proposed modification to the Contract Documents prepared and issued by the Architect that accomplishes one or all of the following:
      a. Clarifies or changes the Work.
      b. Furnishes information which is supplemental to the Contract which may or may not change the Contract Sum or Contract Time as specified in the Bulletin.
   2. A bulletin is not an order to proceed.
   3. No bulletin shall be issued to the Contractor by the Architect until such bulletin has been reviewed and approved for release by the Owner.

B. Modification: Refer to General Conditions, for definition of a Modification.

C. Change Order: Refer to General Conditions, for definition of a Change Order.

D. Construction Change Directive: Refer to General Conditions, for definition of a Construction Change Directive.

1.3 BULLETINS

A. Issuance of Bulletins: With the approval of the Owner, the Architect may issue Bulletins as defined above.
   1. Bulletins issued by the Architect are for information only. Bulletins are not to be considered as an instruction either to stop work in progress, or to execute the proposed change.
   2. Unless otherwise indicated in the Bulletin, within 10 working days of receipt of the Bulletin, the Contractor shall submit to the Architect for their review of a detailed Change Order request of cost necessary to execute any proposed change as described in the bulletin.
      a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, amounts of trade discounts, labor costs, re-stocking charges, legitimate markups and other costs associated with the proposed change.
      c. Identify any changes to Work already executed which, if not addressed in the Bulletin, will require revision as part of the proposed change.
   3. Include a statement in the Change Order Request indicating the effect the proposed change in the Work will have on the Contract Time.
   4. The Owner will review and respond to the Contractor's proposal within ten (10) working days after its receipt.

1.4 CHANGE ORDER PROCEDURES

A. Owner-Initiated Change Order Requests: A detailed description of proposed changes in the Work will be issued that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued are for information only. Do not consider them

2. Within 10 working days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
5. Include an updated Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Change Order Request: Should the Contractor discover a discrepancy, latent or other unforeseen conditions requiring modifications to the Contract Documents that was not previously noted, or determines upon receipt of clarification from the Architect that the work described may necessitate a Change Order, the Contractor shall promptly notify the Architect and Owner, of the intention to submit a Change Order request related to the item of Work.

C. Within ten (10) working days of such notice, the Contractor shall submit a Change Order request to the Owner and Architect; Change Order Proposal Requests shall include the following:
1. A statement outlining the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. A list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. An indication of applicable taxes, delivery charges, equipment rental, and amounts of trade discounts, labor costs, re-stocking charges, legitimate markups and other costs associated with the proposed change.
4. Coordination information, including a list of changes or modifications made necessary to other parts of the Work and to construction performed by separate contractors that will become necessary to accommodate the proposed change or modification.
5. Comply with requirements in Section 01 60 00 "Product Requirements “if the proposed change requires substitution of one product or system for product or system specified
6. Failure by the Contractor to include the above requirements in the change order request may cause rejection of the request in its entirety.

D. Approval of Change Order: Upon the Owner's approval of a Change Order Request or bulletin, the CM will generate, sign, issue and forward the Change Order for the signature of the Owner as provided in the Conditions of the Contract.

E. Commencement of Proposed Changes: Work on proposed changes that affect the Contract Sum and/or the Contract Time shall not be started until an approved signed Change Order has been received by the Contractor, unless otherwise directed by the Owner in writing.

F. Record of Changes: In all cases, the Contractor shall maintain an accurate account of labor and materials involved in the change.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Purpose: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Owner may direct the CM to issue a Construction Change Directive, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.

C. Records: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

D. Submittal of Data: After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 **COORDINATION**

A. Revision of Schedule of Values and Application for Payment: Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item.

B. Revision to Progress Schedule: Promptly revise Progress Schedule to reflect any change in Contract Time; revise schedules to adjust times for other items of work affected by the change and resubmit.

1.7 **DISPUTES**

A. Notification of Disagreement: Should the Contractor and Owner disagree about the value of the proposed change in the Contract Sum or Contract Time, the Contractor shall notify the Owner, in writing, stating the reason for the disagreement. Disagreement about the value of a Change Order does not relieve the Contractor of responsibility to proceed with the change as ordered and to seek settlement of the dispute under the pertinent provisions of the Contract Documents and in accordance with the provisions as specified herein.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 012900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.

2. Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.

3. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

4. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

5. Section 01 81 13 “Sustainable Design Requirements”

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to the Construction Manager for review and comment at earliest possible date, but no later than 20 days from NTP submittal of initial Applications for Payment. CM will coordinate review with Architect.
3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values coordinated with each phase of payment.
4. Sub-schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide sub-schedules showing values coordinated with each element.
5. Sub-schedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide sub-schedules showing values coordinated with the scope of each design services contract, as described in Section 01 10 00 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Owner's name.
   c. Owner's Project number.
   d. Name of Architect.
   e. Architect's Project number.
   f. Contractor's name and address.
   g. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703 Application and Certificate for Payment.
3. Arrange schedule of values to include the following General Conditions / General Requirements breakdowns:
   a. General Conditions
      i. Supervision
         1. Project Manager(s)
         2. Field Supervision
         3. Project Engineer/Administration
         4. Safety
      ii. Bonds
      iii. Taxes & Insurance
      iv. Permitting
      v. Clean Up
         1. Throughout project - Labor
         2. Final cleaning
      vi. Schedule Management
         1. Baseline development
         2. Monthly Update process
         3. Submittal Schedule / Log
      vii. Coordination
         1. Below Grade and Above Ceiling
         2. BIM Coordination (Refer to 01 requirements)
      viii. Temporary Facilities & Controls
         1. Temporary utilities and usage charges
         2. Temporary conditioning
         3. Temporary lighting
         4. Fencing & Barricades
         5. Street & Sidewalk closures including signage
         6. Temporary bathroom & handwashing facilities
         7. Other items as required or defined in the specifications.
      ix. QA/QC
         1. Commissioning (As Applicable, this can be included in trade line items)
         2. Testing/Inspection Requirements
            a. 3rd Party and Manufacturer req'd inspections
      x. Asset management Requirements
      xi. Close Out

1. As-Built Documentation
   - Complete and updated as-built drawings

- Record drawings reflecting all field changes
- Marked-up coordination drawings (as required)
- Digital and hard-copy submissions per contract requirements

2. O&M Manuals
   - Operations and Maintenance manuals
   - Equipment cut sheets
   - Manufacturer data
   - Maintenance schedules
   - Recommended spare parts lists
   - Warranty procedures
3. Training
   - Owner/end-user training sessions
   - Equipment demonstrations
   - Recorded training videos (as required)
   - Training sign-in sheets and completion records
4. Commissioning Support
   - Completion of commissioning deficiencies
   - Functional performance testing
   - Commissioning documentation turnover
5. Warranties and Guarantees
   - Equipment warranties
   - Material warranties
   - System warranties
   - Contractor warranty letter
   - Warranty matrix identifying coverage periods and contacts
6. Attic Stock and Spare Parts
   - Required spare parts
   - Extra materials
   - Cataloging and turnover to owner
7. Regulatory and Permit Closeout
   - Final inspections
   - Certificate of Occupancy (CO)
   - Permit sign-offs
   - AHJ approvals
   - Utility clearances
8. Final Cleaning
   - Final detailed cleaning
   - Removal of temporary facilities
9. Digital Turnover Requirements
   - BIM model updates (if required)
   - Asset tagging data
   - CMMS/import files
   - Electronic document archives
10. Financial Closeout
    - Final lien waivers
    - Affidavits of payment
    - Release of claims
    - Final subcontractor waivers
    - Consent of surety to final payment

11. Final Acceptance

4. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
   a. Related Specification Section or division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
      1) Labor.
      2) Materials.
      3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under the Contractor's Schedule of Values and each principal subcontractor's Schedule of Values for Project Closeout requirements in an amount totaling five percent (5%) of the Contract Sum and applicable subcontract amount. This amount shall include, but is not limited to, as-built and record drawings, O&M manuals, training, commissioning support, warranties and guarantees, attic stock and spare parts, permit and regulatory closeout documentation, final cleaning, digital turnover requirements, final lien waivers, affidavits, releases, and all other closeout requirements specified in the Contract Documents. The Closeout Cost line item shall not be invoiced, in whole or in part, until all required closeout documentation, deliverables, training, inspections, certifications, and punch list items have been completed, submitted, reviewed, and approved. Submission and approval of all closeout requirements shall be a condition precedent to the release of any payment associated with the Closeout Cost line item. The CMa, Architect/Engineer (A/E), and Owner shall have sole discretion in determining the completeness, acceptability, and approval of all closeout requirements and supporting documentation.

12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by the Construction Manager and paid for by Owner.

1. Process shall follow as noted below:
    a. All pay application processes will be submitted through E-Builder.
    b. Pencil copy submitted to CM and A/E for review
    c. Comments returned by CM/A/E within 7 days
    d. Prime contractors revise application and resubmits final notarized copy with back-up documents (certified payroll, local/dbe participation forms, lien waiver, steel certificates & stored material back-up, statement of accounts, and other required documents)
    e. CM and A/E review & certify invoice
    f. CM transmits to Montgomery County for processing

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Draft Application for Payment to CM by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Application for Payment Forms: Use AIA Document G732 ‘Application and Certificate for Payment, Construction Manager as Adviser Edition’ and AIA Document G703 ‘Continuation Sheet’ as forms for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:
    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.

G. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

H. Transmittal: Electronic copies, signed and notarized, of each Application for Payment to Construction Manager. Include waivers of lien and similar attachments if required.

I. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

J. Progress Payment Additional Documentation

1. Submit Local and Diverse Business Goal participation forms with each application. Submissions shall follow the guidelines defined in Exhibit A. Montgomery County will provide all necessary forms for the contractors to complete.
2. Electronic copies of daily reports for invoice month
3. Certified Payroll Reports (Must be submitted twice per month)

K. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors, suppliers & equipment vendors.
2. Fully executed subcontracts including suppliers and equipment vendors
3. Schedule of values.
4. Contractor's Start Up construction schedule.
5. Key personnel list
6. Submittal Register & schedule
7. Combined Contractor's Baseline construction schedule (preliminary if not final), incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
8. Products list (preliminary if not final).
9. Asset Management Information Strategy
10. Sustainable design action plans, including preliminary project materials cost data.
11. List of Contractor's staff assignments.
12. List of Contractor's principal consultants.
13. Copies of building permits.
14. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
15. Initial progress report.
16. Report of preconstruction conference.
17. Community Participation Plan per Exhibit A
18. Labor Rate Breakdown sheets for all contracts & subcontracts

L. Certificates of insurance and insurance policies.

1. Performance and payment bonds.
2. Data needed to acquire Owner's insurance.

M. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
      a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 70 00 "Execution and Closeout Procedures."
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

N. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Certification of completion of final punch list items.
   3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   4. Updated final statement, accounting for final changes to the Contract Sum.
   5. AIA Document G706.
   6. AIA Document G706A.
   7. AIA Document G707.
   8. Evidence that claims have been settled.
   9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   10. Final liquidated damages settlement statement.
   11. Proof that taxes, fees, and similar obligations are paid.
   12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section specifies administrative and procedural requirements for Project Management and Coordination by the CM, including but not limited to:

1. General coordination procedures.
2. Coordination drawings.
3. Lean Procedures
4. Requests for Information (RFIs).
5. Project Web site.
6. Project meetings

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

1.2 INFORMATIONAL SUBMITTALS

A. Subcontract List: Within twenty (20) days of Notice to Proceed, prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Subcontract list shall be updated weekly by prime contractor and submitted to CM. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within fifteen (15) days of Notice to Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site or elsewhere. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.3 PROJECT MEETINGS

A. General: CM to schedule and administer project meetings throughout the progress of the Work. Prepare agenda, conduct meetings, record meeting results, and distribute recorded proceedings and decisions to participants and other affected parties.

B. Regularly Scheduled Project Meetings

1. Notification: For meetings not regularly scheduled, give participants not less than three (3) days prior notice.

2. Attendees: The Owner, CM, Architect and their consultants, all Prime Contractors, their Project Executives, Project Managers and their Superintendents, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

3. 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 current status of the Project. Discuss items of significance that could affect progress including review of the present and future needs of each entity present and such topics as:

a. Lean procedures
b. Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the 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.
c. Critical Work sequencing and interface requirements.
d. Quality and Work standards.
e. Designation of responsible personnel.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for processing Applications for Payment.
h. Distribution of Contract Documents.
i. Submittal of Shop Drawings, Product Data and Samples.
j. Preparation of record documents.
k. Site utilization, use of the premises and access.
l. Office, Work and storage areas.
m. Equipment deliveries and priorities.
n. Non-compliance issues.
o. Bulletins and Change Orders.
p. Architect’s Supplemental Instructions (ASI’s) and Requests for information (RFI's).
q. Documentation of information for payment requests.
r. Off-site fabrication problems
s. Security.
t. Housekeeping.
u. Working hours.
v. Prior to the execution of the Work, and in addition to pre-construction or pre-installation meetings specified in technical specification sections, schedule a pre-construction conference with each sub-contractor to review product selection, the procedures for executing the Work and the coordination required with other trades.
w. Insurance COI Updates.

x. Applications for Payment and pencil copies.
y. Certified Payroll.
z. Waivers and Releases.
aa. O&M Manuals, Warranties.
bb. Start-ups and Commissioning.
cc. Safety.
dd. Housekeeping.

4. Reporting: No later than 5 days after each meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

C. Coordination Meetings

1. Conduct Project coordination meetings at regularly scheduled times convenient for parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation or pre-construction meetings.

2. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

3. Record meeting results and distribute copies within 3 days to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

D. Pre-Construction Conference

1. CM will schedule and conduct a preconstruction conference before starting construction and prior to the installation of building components, at a time convenient to Contractor, Owner and Architect, but no later than ten (10) days after execution of the Agreement or prior to commencement of work.

2. Schedule a pre-construction conference and organizational meeting, prior to commencement of each category of the Work to review the material selections, fabrication and installation procedures, and coordination among the various trades. The categories of Work shall generally correspond with the Sections of the Specifications. CM, Installer, manufacturers' representatives, and any trade that requires coordination with the Work, shall meet at the project site or other location as mutually agreed. Conduct the meeting to review responsibilities and personnel assignments. CM to record meeting results and distribute copies within 3 days to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

E. Lean Training and Pull Planning Meeting: CM will schedule and conduct a Lean Training and Pull Planning Meeting after submission of the Startup Construction Schedule, but no later than Twenty (20) days after execution of the Agreement.

1. CM to conduct the conference to train and familiarize all required project personnel, inclusive of each prime contractor and key subcontractors, with Lean procedures and then, as the foundation of the Lean process, develop a Pull Plan for a phase of the project based on the project knowledge of each participant having developed their individual start-up schedules.

2. Allow a minimum of 12 hours over 2 days for all required personnel.

3. Attendees: Owner, CM, Architect, and their consultants, contractor and its superintendent, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

F. Last Planner Meetings: CM will facilitate Last Planner Meetings on a weekly basis. The purpose of the meetings is to plan and coordinate the near-term work to allow coordination between prime contractors and their subcontractors.

1. CM to conduct the conference to develop and improve workflow on the project site based on commitments made and evaluation of results.

2. Allow a minimum of 1.5 hours per week for required attendees.

3. Required Attendees: CM, area foremen for the each of the prime contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

4. Topics may include the following:

a. Interface requirements.
b. Sequence of operations.
c. Status of submittals.
d. Deliveries.
e. Off-site fabrication.
f. Access.
g. Site utilization.
h. Temporary facilities and controls.
i. Work hours.
j. Hazards and risks.
k. Progress cleaning.
l. Quality and work standards.
m. Change Orders.

5. Minutes: CM will record and distribute meeting minutes.

G. Lean Daily Huddles: CM will conduct Lean Daily Huddles.

1. CM to facilitate the huddle to review work plans, evaluate performance against commitments and make adjustments to daily planned activities.

2. Allow a minimum of 30 minutes per day for required attendees.

3. Required Attendees: CM, area foremen for each of the prime contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

H. Special Meetings

1. Special meetings may be called as required, at a place and time as coordinated by the CM.

I. Project Closeout Conference

1. The CM will schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 90 calendar days prior to the scheduled date of Substantial Completion.

1.4 GENERAL COORDINATION PROCEDURES

A. General: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, fit, connection, and operation.

1. Sequence of Construction Activities Schedule: Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain coordinated results.

B. Accessibility in Limited Space: Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

C. Provisions for Later Installation: Make adequate provisions to accommodate items scheduled for later installation.

D. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Construction Manager and separate contractors if coordination of their Work is required.

E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.

2. Preparation of the schedule of values.

3. Installation and removal of temporary facilities and controls.

4. Delivery and processing of submittals.

5. Progress meetings.

6. Pre-installation conferences.

7. Project closeout activities.

8. Startup and adjustment of systems.

F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.5 COORDINATION DRAWINGS

A. General (All Primes): The Contractors shall produce and submit project specific information for coordination purposes, a set of color-coded "Coordination Drawings" to confirm that the work of subcontractors is coordinated.

1. Each prime shall provide 3-D REVIT coordination of their work with those of the other M/P/FP/E contractors as well as the concrete foundation, structural and architectural packages. As part of this effort each prime contractor and key subcontractors shall attend all coordination meetings & provide work plans on a weekly basis coordinated with the CM.

2. Mechanical Prime Contractor (MC) will lead the coordination process. The MC will provide a cloud-based model hosting site for use by the project team during the coordination process. The point cloud shall be converted to a REVIT LOD 300 standard model for use by all primes.

3. Drawings shall be drawn accurately to scale to show the interrelationship of components shown on separate shop drawings and shall indicate mechanical, plumbing, electrical, structural, fire protection, cable trays and contiguous architectural Work in sufficient detail so as to verify that contractors will accomplish their respective Work without conflicting with other contiguous trades. Refer to technical specifications for additional information.

4. The GC Prime Contractor is responsible for providing a centerline Tekla model detailing structural members, connections, and all other structural components. The GC Prime Contractor will provide this complete model to the Mechanical/HVAC Contractor to use for coordination. The Mechanical/HVAC will lead the coordination process, after receipt of the Tekla model, and develop the base floor plan drawings to be utilized by all prime contractors to prepare and model their respective work. Upon completion and sign-off by all Contractors, the Mechanical/HVAC Contractor shall submit final coordination drawings to Architect/Engineer for review and acceptance.

5. The Mechanical/HVAC prime shall provide means to host the coordination model for use by all other prime contractors throughout the entire duration of the project.

6. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

7. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

8. Indicate required installation sequences.

9. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

10. The following is a list of such Work requiring coordination drawings:

    a. Ceiling assemblies and cavities.
    b. Fire rated and acoustical partitions.

c. MEPFP, A/V, Low Voltage, Security Systems
d. Structural Systems

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate sub framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.

3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.

4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

6. Roof and Wall Penetrations: Indicate all penetrations required for all disciplines.

7. Mechanical and Plumbing Work: Show the following:

   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as equipment, dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.

8. Electrical, A/V & Low Voltage Work: Show the following:

   a. Runs of vertical and horizontal conduit 1-1/4 in. in diameter and larger.
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
   d. Location of pull boxes and junction boxes, dimensioned from column center lines.
   e. Main distribution for low-voltage conduit.
   f. A/V and Low voltage equipment and components

9. Fire-Protection System: Show the following:

   a. Locations of standpipes, mains piping, branch lines, pipe drops, fire pump and related components and sprinkler heads.

10. Security Systems

a. Runs of vertical and horizontal conduit 1-1/4 in. in diameter and larger.
b. Panels boards, cabinets and equipment

11. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractors' responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform the CM, who will direct the Contractors make suitable modifications and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.

2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format or PDF format as agreed upon.

3. Architect and/or consultants will furnish Contractors one set of digital data files of BIM model for use in preparing coordination digital data files.

a. Architect and/or consultants make no representations as to the accuracy or completeness of digital data files as they relate to Drawings. Prime contractors are solely responsible to modify, confirm dimensions in the field and incorporate changes as required to develop a fully coordinated model.
b. Digital Data Software Program: Drawings are available in REVIT
c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual or provided by A/E.

4. Modification of Original Coordination Digital Files: At completion of the Work, original coordination digital files shall be modified by Contractors to indicate as-built conditions and transmitted to the Owner.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.6 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

A. Architect's Supplemental Instructions (ASI): An Architect's Supplemental Instruction is an instruction issued by the Architect to make minor changes in the Work that are consistent with the Contract Documents, fall within the Contract Sum and do not involve an extension of Contract Time. This document describes the change and references any attached documents supporting the description.

1.7 PROJECT WEB SITE

A. Use the Owners or CM's Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:

1. Project directory.

2. Project correspondence.

3. Meeting minutes.

4. Contract modifications forms and logs.

5. RFI logs.

6. Schedule.

7. Submittal schedule.

8. Submittals logs.

9. Drawing and specification document hosting and viewing.

B. Managing the Project Management Information System (PMIS)

1. This project will utilize eBuilder for all facets of the project including but not limited to communication, document control management and invoicing. Each prime will be provided up to 5 access log-ins.

2. Access to the PMIS system shall be granted the entire length of the project and for 3 months after the final completion date.

3. All prime contractors will submit RFI's and submittals through E-Builder for processing to CMa and Architect. As part of the training and pre construction conference, PMIS system work flow will be established.

4. Prime Contractors are required to submit updated submittal registers on a weekly basis until all submittals have been issued. This shall be uploaded to E-Builderand sent to the A/E and CMa for coordination.

C. Project Quality Records and Documentation (In Addition to PMIS)
1. Use of ProCore Software.
   a. Contractor acknowledges use of Procore CM software for tracking items related to QA/QC, access to which will be provided by the CMa.
   b. Access to Procore project shall be granted the entire length of the project and for 3 months after the final completion date.
2. Test and Inspection Log: Contractor to record a log of all tests and inspections utilizing Procore Inspections. Recording of tests and inspections includes the following:
   a. Date test or inspection was conducted.
   b. Description of the Work tested or inspected.
   c. Date test or inspection results were transmitted to Architect.
   d. Identification of testing agency or special inspector conducting test or inspection.
   e. Result of inspection. Includes description of remedial work to complete in case of a failure.
   f. A copy of the testing agency/inspector’s report.
3. Punch List and Observations: Contractor acknowledges that use of Procore software includes not only entry of observations, punch list, tests, and inspections on the part of the Contractor, but also review and generation of responses to entries created by the CMa or AE in a timely manner.
   a. Observations will include items related to:
      1) Commissioning.
      2) Environmental.
      3) Quality.
      4) Safety.

5) Warranty.
6) Work to complete.

b. The AE design team will input non-conformance items, punch list, and other related observations utilizing Procore in conjunction with the CMa. Contractor acknowledges review and response to AE provided items must be done in Procore by the due date specific to each item. Responses to punch list must include comment and/or photos related to the punch list item detailing date of completion, work completed, and any related documentation prior to review by the CMa/AE team.

4. Commissioning: Cx Agent to utilize Procore to provide an issues log/action items to be provided to the responsible parties. Cx Agent will use the Commissioning Observation type to specify the issue, contributing conditions, contributing behavior, specific location if applicable, trade, assignees, and suggested actions.

5. The contractor shall use Procore Daily Logs to record all project activities on a daily basis. Entries must be completed by the end of each workday and include:
   a. Weather conditions.
   b. Workforce details by trade with headcount and hours worked.
   c. Equipment on site and its operational status.
   d. Deliveries received and materials installed.
   e. Safety observations and any incidents with corrective actions.
   f. Significant events or delays impacting progress.
   g. Coordination notes and meetings held.
   h. Photos documenting site conditions and progress.
   i. Daily logs must be accurate, timely, and reviewed by the CMa as part of ongoing project monitoring. Failure to maintain daily logs may result in withholding of payment until compliance is achieved.

D. Project PMIS and Training

1. The Owner will provide training on the usage and functionality of E-Builder. CMa will coordinate and schedule (2) training sessions within fifteen (15) business days of the Notice to Proceed. All primes are required to attend one or both sessions.

E. PMIS Closeout

1. Project PMIS will remain open for a period of three (3) months after Final Completion to allow all parties access to necessary information. The Owner has discretion to deny access to users at any time.

F. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement.

1.8 REQUESTS FOR INFORMATION

A. Definition: During the bidding process or progress of the Work, the Contractor may uncover situations for which they believe the Contract Documents are not clear in their requirements whereupon they may submit a Request for Information (RFI) to the CM. The CM will then forward to the Architect with recommendations.

B. Correspondence: Contractor correspondence related to the Work shall be addressed to the Architect.

C. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit to the Construction Manager an RFI in the form specified.

1. Construction Manager will return RFIs submitted to Architect by other entities controlled by Contractor with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

D. Conditions for Requests for Information: If, after issuance of the "Notice to Proceed" clarification from the Architect concerning questions which may have arisen during the course of the Work, the Contractors may initiate a process of standard form letters identified as "Request(s) for Information" (RFI) subject to the following conditions:

E. RFI Forms: Software generated form with substantially the same content noted below, and acceptable to the Architect and CM. RFI’s and attachments shall be submitted in PDF format.

1. RFIs shall contain specific reference to the project name, project number, name of Contractor, Architect, and the CM, drawing number and detail references, specification section and paragraph number, schedule type, or other related document which is pertinent to the Contractor's inquiry. The date of referenced documents or drawings must be clearly identified.

2. RFIs for the Architect shall be numbered sequentially and are not to be skipped, with the date of issue clearly noted. RFI's shall be submitted in an agreed upon electronic digital format and shall be forwarded to the Architect.

3. RFIs shall include all field dimensions, sketches, descriptions, measurements, photos, product data or other information necessary to fully describe items needing interpretation. Contractor is to provide a suggested solution. If the suggested solution may impact the Contract Time, Contract Sum, or schedule, the Contractor must state the impact.

4. RFIs shall originate only from the Contractor's on-site staff and shall be signed by the Contractor. RFI's submitted to the Architect by individuals other than the CM will not be accepted.

5. Architect and CM will respond to and return RFI’s to Contractor within 10 business days.

6. On receipt of Architect’s and CM’s action, update RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and CM within seven (7) days if Contractor disagrees with response.

   a. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request as appropriate.
   b. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

7. RFI logs shall reflect the date on which an RFI has been responded to in addition to when they have been fully resolved. If an RFI is delayed due to additional testing or information, this delay shall be noted and the response will read as such until the new information becomes available in which case a revision to that original RFI will be issued.

8. It shall be the responsibility of the Contractor to maintain an up-to-date electronic log of RFI's and to advise the CM, in writing of the status and disposition of RFI's at the weekly progress meetings.

F. RFI logs: Prepare, maintain, and submit tabular log of RFIs organized by the RFI number. Contractor's RFI logs should be provided one day prior to weekly meeting to intercept and mark up incorrect or misleading information.

1. RFI logs shall include the following information: Project name, name and address of contractor, name and address of CM and Architect, RFI number, including RFIs that were returned without action or withdrawn, RFI description, date RFI was submitted, and date Architect's and CM's response was received.

2. RFI logs shall reflect the date on which an RFI has been responded to in addition to when they have been fully resolved. If an RFI is delayed due to additional testing or information, this delay shall be noted and the response will read as such until the new information becomes available in which case a revision to that original RFI will be issued.

3. RFIs shall not be utilized by the Contractors to request approval of submittals or to solicit consideration by the Architect of a "substitution".

4. RFIs shall not be utilized by the Contractors to request any extension of Contract time or to request any revision of Contract cost. If the Contractors believes that the response received from the Architect to any RFI warrants adjustment of the Contract time or cost, he shall advise the CM in writing immediately upon receipt of the response.

5. RFIs shall not be utilized by the Contractors to request coordination information already indicated in the Contract Documents or to solicit clarification of comments that have been communicated to the Contractor by the Architect in the course of shop drawing review or the review of other required submittals.

6. The Owner reserves the right to assess the Contractors for the cost (based on time and materials) of the review process performed by the Architect and/or any of the Architect's or Owner consultants when RFI's fail to conform to the requirements stated herein, or in the opinion of the Architect, are unnecessary or frivolous (i.e.; the subject of the inquiry noted in the RFI is suitably and/or clearly addressed in the Contract Documents).

7. The Contractors shall submit RFI's sufficiently in advance of the Work to be performed as it relates to the Construction Schedule such that the Architect has ample time to review and respond to RFI's. The Architect will respond to RFI's sequentially in the order they are received.

8. Any written or electronic procedure selected by the Contractors to solicit responses to questions which arise during the course of the Work shall be required to comply with the procedures stated in paragraphs above.

9. RFIs not to be used for:
   a. Resolving Contractor error.
   b. Assisting in the development of a shop drawing.
   c. Confirming a conversation, correspondence, discussion, or decision.
   d. Requesting information not pertaining to the contracted scope of work.
   e. Seeking direction for client directed work or changes unrelated to deficiencies in the contract documents.

f. Seeking direction for contractor materials and methods procedures.

1.9 PROJECT MEETINGS

A. General: CM or required entity shall schedule and conduct the project meetings throughout the progress of the Work unless otherwise noted. The responsible entity will prepare agenda, conduct meetings, record meeting results, and distribute recorded proceedings and decisions to participants and other affected parties.

1. Each prime contractor project manager, superintendent and other project team members are required to attend meetings. Attendance is mandatory. Contractors who miss required meetings will be back charged at the sole discretion of the Owner and CM.

B. Regularly Scheduled Project Meetings

1. Notification: For meetings not regularly scheduled, give participants not less than three (3) days prior notice.

2. Attendees: The Owner, CM, Architect and their consultants, all Prime Contractors, their Project Executives, Project Managers and their Superintendents, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

3. 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 current status of the Project. Discuss items of significance that could affect progress including review of the present and future needs of each entity present and such topics as:

a. Lean procedures
b. Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the 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.
c. Critical Work sequencing and interface requirements.
d. Quality and Work standards.
e. Designation of responsible personnel.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for processing Applications for Payment.
h. Distribution of Contract Documents.
i. Submittal of Shop Drawings, Product Data and Samples.
j. Preparation of record documents.
k. Site utilization, use of the premises and access.
l. Office, Work and storage areas.
m. Equipment deliveries and priorities.
n. Non-compliance issues.
o. Bulletins and Change Orders.
p. Architect’s Supplemental Instructions (ASI’s) and Requests for information (RFI's).
q. Documentation of information for payment requests.
r. Off-site fabrication problems

s. Security.
t. Housekeeping.
u. Working hours.
v. Prior to the execution of the Work, and in addition to pre-construction or pre-installation meetings specified in technical specification sections, schedule a pre-construction conference with each sub-contractor to review product selection, the procedures for executing the Work and the coordination required with other trades.
w. Insurance COI Updates.
x. Applications for Payment and pencil copies.
y. Certified Payroll.
z. Waivers and Releases.
aa. O&M Manuals, Warranties.
bb. Start-ups and Commissioning.
cc. Safety.
dd. Housekeeping.

4. Reporting: No later than 5 days after each meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

C. Pre-Construction Conference

1. CM will schedule and conduct a preconstruction conference before starting construction and prior to the installation of building components, at a time convenient to Contractor, Owner and Architect, but no later than ten (10) days after execution of the Agreement or prior to commencement of work.

2. Schedule a pre-construction conference and organizational meeting, prior to commencement of each category of the Work to review the material selections, fabrication and installation procedures, and coordination among the various trades. The categories of Work shall generally correspond with the Sections of the Specifications. CM, Installer, manufacturers' representatives, and any trade that requires coordination with the Work, shall meet at the project site or other location as mutually agreed. Conduct the meeting to review responsibilities and personnel assignments. CM to record meeting results and distribute copies within 3 days to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

3. Agenda: Discuss items of significance that could affect progress, including the following:

a. LEAN Procedures
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long-lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Procedures for processing field decisions and Change Orders.
h. Procedures for RFIs.
i. Procedures for testing and inspecting.
j. Procedures for processing Applications for Payment.
k. Distribution of the Contract Documents.
l. Submittal procedures.
m. Preparation of record documents.

n. Use of the premises and existing building.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

D. Lean Training and Pull Planning Meeting: CM will schedule and conduct a Lean Training and Pull Planning Meeting after submission of the Startup Construction Schedule, but no later than Twenty (20) days after execution of the Agreement.

1. CM to conduct the conference to train and familiarize all required project personnel, inclusive of each prime contractor and key subcontractors, with Lean procedures and then, as the foundation of the Lean process, develop a Pull Plan for a phase of the project based on the project knowledge of each participant having developed their individual start-up schedules.

2. Allow a minimum of 12 hours over 2 days for all required personnel.

3. Attendees: Owner, CM, Architect, and their consultants, contractor and its superintendent, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

E. Last Planner Meetings: CM will facilitate Last Planner Meetings on a weekly basis. The purpose of the meetings is to plan and coordinate the near-term work to allow coordination between prime contractors and their subcontractors.

1. CM to conduct the conference to develop and improve workflow on the project site based on commitments made and evaluation of results.

2. Allow a minimum of 1.5 hours per week for required attendees.

3. Required Attendees: CM, area foremen for the each of the prime contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

4. Topics may include the following:
a. Interface requirements.
b. Sequence of operations.
c. Status of submittals.
d. Deliveries.
e. Off-site fabrication.
f. Access.
g. Site utilization.
h. Temporary facilities and controls.
i. Work hours.

j. Hazards and risks.
k. Progress cleaning.
l. Quality and work standards.
m. Change Orders.

5. Minutes: CM will record and distribute meeting minutes.

F. Lean Daily Huddles: CM will conduct Lean Daily Huddles.

1. CM to facilitate the huddle to review work plans, evaluate performance against commitments and make adjustments to daily planned activities.

2. Allow a minimum of 30 minutes per day for required attendees.

3. Required Attendees: CM, area foremen for each of the prime contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

4. Minutes: CM will record and distribute meeting minutes as required.

G. Special Meetings

1. Special meetings may be called as required, at a place and time as coordinated by the CM.

H. Pre-installation Conferences: Conduct a pre-installation conference at the Project site before each construction activity that requires coordination with other construction. Pre-installation conferences shall be scheduled 4-6 weeks prior to the specific activity commencing. Each prime contractor shall coordinate meeting dates.

1. Attendees: Prime contractors (Involved with direct coordination of work), Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.

2. Meeting Minutes: Prime contractor entity responsible for specific activity being reviewed. The prime contractor shall publish meeting minutes to all attendees within 72 hours of the meeting.

3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.

m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

7. At a minimum or unless specified in technical specifications, pre-installation conferences are required for:

a. Abatement / Demolition
b. Foundation modifications
c. Exterior skin / Brick Removal, Rebuild and Repointing
d. Exterior Skin – Curtainwall / Windows
e. Steel Supports
f. Roof Modifications
g. Finishes (Flooring, Ceilings & Walls)
h. Elevator Renovations

I. Progress Meetings: CMa will conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.

2. Attendees: In addition to Owner, Construction Manager, and Architect, each prime contractor, subcontractor, suppliers, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

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

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the

Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Access.
5) Site utilization.
6) Temporary facilities and controls.
7) Progress cleaning.
8) Quality and work standards.
9) Status of correction of deficient items.
10) Field observations.
11) Status of RFIs.
12) Status of proposal requests.
13) Pending changes.
14) Status of Change Orders.
15) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

J. Project Phase Closeout Conference: CMa will schedule and conduct a project closeout conference, at a time convenient to Contractor, Owner and Architect, but no later than twenty (20) days prior to the scheduled date of Substantial Completion.

1. Attendees: Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect or delay Phase closeout, including the following:

a. Procedures required prior to inspection for Substantial Completion.
b. Submittal of written warranties.
c. Requirements for demonstration and training.
d. Preparation of Contractor's punch list.
e. Coordination of separate contracts.
f. Owner's partial occupancy requirements.
g. Preparation for next Phase.
h. Installation of Owner's furniture, fixtures, and equipment.
i. Removal of temporary facilities and controls.

3. Minutes: Entity conducting meeting will record and distribute meeting minutes.

K. Project Closeout Conference: CMa will schedule and conduct a project closeout conference, at a time convenient to Contractor, Owner and Architect, but no later than ninety (90) days prior to the scheduled date of Substantial Completion of the final phase.

1. Attendees: Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect or delay Phase closeout, including the following:

   a. Preparation of record documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Submittal of written warranties.
   d. Requirements for preparing operations and maintenance data.
   e. Requirements for delivery of material samples, attic stock, and spare parts.
   f. Requirements for demonstration and training.
   g. Preparation of Contractor's punch list.
   h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   i. Submittal procedures.
   j. Coordination of separate contracts.
   k. Owner's partial occupancy requirements.
   l. Installation of Owner's furniture, fixtures, and equipment.
   m. Responsibility for removing temporary facilities and controls.

3. Minutes: Entity conducting meeting will record and distribute meeting minutes.

L. Coordination Meetings: CMa will conduct Project coordination meetings regularly scheduled times intervals, no less than monthly. The meeting frequency will be increased as the discretion of the CMa. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1. Attendees: In addition to Owner**,** Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

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

   a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
   b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

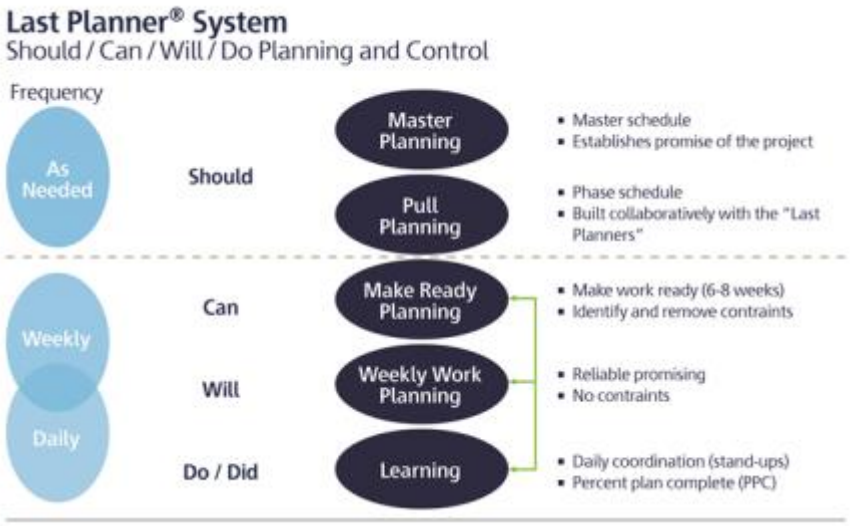
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.10 Lean CONSTRUCTION PRINCIPLES

A. Lean Construction Management: Montgomery County intends to implement the following Lean Construction Principles on this project. To the extent Lean Principles are implemented, Montgomery County will require all prime contractors to accommodate and participate.

B. "Last Planner System" (LPS) using Pull Scheduling and Percent Planned Complete (PPC) Tracking: The project will utilize the Last Planner System to develop and implement the detailed work plans for each phase of the project based on the master project schedule. That includes Pull Plans and Percent Planned Complete (PPC) tracking that will be utilized throughout the project according to the CMa's methodology.



C. Prime Contractor Last Planner Requirements

1. Prime Contractors shall understand that the CMa will be tracking major "promises

made".

2. All "promised" tasks shall be tracked in the matrix with a task description, Prime Contractor responsible, and promised completion date.

3. CMa will provide Prime Contractor feedback on their reliable promising performance during weekly Foreman's meetings.

4. CMa will provide an overall PPC rating to each Prime Contractor at the end of the project.

5. Prime Contractors and other key personnel noted in previous sections will attend pull planning meetings at the request of CMa Superintendent and/or Project Manager.

6. Actively participate in weekly work planning meetings to review past, current, and future work activities.

7. MUST prepare and submit Weekly Work Plans as agreed by the contract.

8. MUST report and track task completions on a weekly basis.

D. To implement the LPS effectively, it is critical for the Prime Contractors Foremen requires certain, specific behavior and actions on the part of the individual's firm, which are described as follows:

1. Prime Contractors foremen are expected to plan together with other trades in building a "Pull Schedule" for each major phase of work on the project in which they will be participating.

2. MUST participate in Pull Planning Sessions that his company is involved in and have necessary authority to make decisions on manpower, equipment, materials and other required resources to ensure commitments are met. (non-approved attendee, Proper notification, late, or no show, back charged for attendee's time.)

3. Has the ability to plan work for his organization and authority to make commitments to the project in order to execute that plan and/or the person that is able to commit manpower and material needs should be present at the meeting. The end goal of the last planner each week is to make legitimate and obtainable commitments.

4. MUST know and understand the latest information about the status of contract issues, submittals and shop drawings, material and equipment deliveries, RFI's and changes orders, safety training, labor, and construction equipment availability.

5. MUST attend and fully participate in Weekly Work Planning meetings (typically about an hour) and Daily Shift Startup Meetings (typically less than 15 minutes, sometime during the day as chosen by the team – not necessarily at startup).

6. Foreman/PM attend training, provided by CMa, to orient to this system. (Typically 8 hours).

E. Last Planner® System of Production Control

1. The Last Planner System of Production Control, or LPS, is an important component of lean construction and the one that has been widely implemented. The LPS was developed to produce predictable workflow and rapid learning. This produces maximum value to the Owner and Contractors by eliminating waste caused by

unpredictable workflow. Its use has enabled contractors to reduce the delivery time of the project and at the same time allowed specialty contractors to improve utilization of their resources.

2. This requires team members (owner, designer, CMa, prime contractors and their sub-contractors), to make and keep commitments based on their confidence that prerequisite work, design information, materials, labor and equipment will be ready so they can start and complete installations to meet Master Schedule milestones.

F. Pull Planning Meeting

1. In the Pull Planning Meeting, the CMa will facilitate the meeting and the Prime Contractors foremen structure the flow of work and design the network of commitments by identifying hand-offs between trades.

2. Each Prime Contractors foremen is considered a “Last Planner” in the LPS, and has the responsibility to plan their activities ten – twelve weeks ahead in a “Make Ready Schedule” and to identify crew assignments for the current and next week in a “Weekly Work Plan”.

3. Last Planners are asked to commit to performing work that they know can be made ready for their crews and to refuse to assign work they are not confident can be started and/or completed because it is not ready. It is this cycle of planning and commitment coupled with learning from seeing the results which creates reliable workflow.

4. The LPS is based on milestones from the Master Schedule, which are used to identify phases. The effort to determine work flow in the Phase Schedule takes place in a Pull Planning Session involving the Last Planners and in most cases the Project Manager, Owner, CMa and Designers and Prime contractor foreman/PM.

5. When this workflow plan is converted to a Gantt chart or CPM type schedule and reformatted/filtered to represent the next six-eight week’s work, it becomes known as the Make Ready Schedule and is the basis of planning and constraint identification. It also identifies those activities that must be included in the Weekly Work Plan (WWP) - the commitment list for the work force.

6. Typically, the Make Ready Schedule is developed on the project scheduling system (MS Project, Suretrack, Primavera P6, etc.) and the WWP is based on an Excel spread sheet.

7. An important part of the LPS is the monitoring and reporting of the team’s success in meeting their commitments and the learning developed when the failures are discussed, and improvement strategies put in place.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. General: The Construction Manager as Agent shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Contractor(s) with each other and with those of the Construction Manager as Agent, the Owner and the Architect. The Construction Manager as Agent shall assist in coordination of the Contractors' activities in accordance with the latest Approved Master Project Schedule and the Contract Documents.

B. Contractors shall provide the documentation of the progress of construction during performance of the Work and includes, but is not limited to:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Progress Schedule.
5. Daily Construction Reports and Progress Reports.
6. Schedule of Values and Trade Payments Breakdowns.
7. Construction Survey Data.
8. Material location reports.
9. Field condition reports.
10. Special reports
11. Construction Photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity: is an activity that must be completed before a given activity can be started.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The breakdown of the Contract Amount and assignment of specific costs to each activity in the Baseline Schedule. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by the Owner, Architect and Construction Manger as Agent.

C. Resource Loading: The allocation of manhours to each associated construction activity in the schedule for the purpose of determining crew size and labor allocation per activity and over the course of the project. Resources shall be loaded into the Baseline schedule and reviewed and approved at the beginning of the project by the Owner, Architect and Construction Manager as Agent.

D. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships and schedule logic forming a network of activities in the Master Schedule Network calculations determine when activities can be performed and the critical path of Project.

E. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration.

F. Event: The starting or ending point of an activity.

G. Float: The measure of leeway or slack in starting and completing an activity

1. Free float is the amount of time any single activity can be delayed without adversely affecting the early start of the following activity.

2. Total float is the measure of leeway in starting or completing an activity or any activity on the same activity path without adversely affecting the planned Project completion date for the schedule network.

H. Milestone: A key or critical point in time for reference or measurement. A milestone activity has no duration and identifies a significant date in the schedule network. Milestones can be start or finish type.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships which depicts the order and interdependencies of activities and the sequence in which work is to be accomplished.

J. Construction Manager as Agent: referenced herein as Construction Manager, CMa or CM. Responsibilities for scheduling are defined as noted.

1.3 SUBMITTALS

A. Contractors shall submit the following information to the CM, which shall be submitted for Architect’s review and comment or information.

B. Submittal Schedule: Submit an electronic copy of submittal schedule, within 15 day of NTP, using software, format and media storage as agreed upon, and labeled to comply with requirements for submittals. Include type of schedule (“Initial” or “Updated”) and revision date and revision number.

C. Submittals Log: An electronic version of an updated submittals log allowing the Architect live access to open and closed submittals and reports at all times, which will also be provided at weekly progress meetings or other agreed upon intervals. These logs are to be updated and coordinated with updated construction schedules throughout the project.

D. Start Up Construction Schedule: Within 10 calendar days after the NTP is received submit the Start Up Construction Schedule defining the planned operations detailed for the first 120 to 180 calendar days for approval. The Start Up Schedule may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as specified. The Start Up Schedule forms the basis for the Initial Contractors Schedule specified herein and must include all of the required plan and program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as permitting activities. The Start Up Construction Schedule must be approved by the Architect, Owner and / or Construction Manager.

E. Contractors Project Schedule Submission: Submit the Initial Project Schedule for integration into the Project Master within 20 calendar days after notice to proceed is issued. The schedule must demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. No payment will be made for work items not fully detailed in the Project Schedule.

F. Periodic Schedule Updates: Update the project schedule on a regular basis, monthly at minimum. Provide status updates with a consistent monthly data date (typically the last day of each month) within 10 days of the data date for each update or as defined in the specifications. Update information will include AS (Actual Start) AF (Actual Finish), RD (Remaining Duration) and Percent Complete and be updated on a monthly update form. Periodic Updates shall be reviewed by the Architect, Owner and / or CM.

G. Contractor's Construction Schedule: Submit an electronic copy of construction schedule, using Oracle Primavera P6 software in. xer format and labeled to comply with requirements for submittals. Include type of schedule (“Initial” or “Updated”) and revision date and revision number. P6 will be the sole software platform for the project unless otherwise noted.

H. Other Reports:

1. Daily Construction Reports: Submit electronic copies at weekly intervals.

2. Material Location Reports: Submit electronic copies at weekly intervals.

3. Field Condition Reports: Submit electronic copies at time of discovery of differing conditions.

4. Special Reports: Submit electronic copies at time of unusual event.

I. Photographic Media: Submit for Owner’s Documentation and Architect’s information.

1. Digital Images: Submit a complete set of digital image electronic files using software, format and media storage as agreed upon as a Project Record Document. Submit images that have same aspect ratio as the sensor, un-cropped.

a. Identification: Identify electronic media with the following information:

1) Name of Project.

2) Name and address of photographer.
3) Name of Architect.
4) Name of Contractor.
5) Date photograph was taken.
6) Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 QUALITY ASSURANCE

A. LEAN Procedures: See Section 01 31 00 – Project Management and Coordination.

B. Pre-Scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.

2. Verify availability of qualified personnel needed to develop and update schedule.

3. Discuss constraints, including work stages, interim milestones and partial Owner occupancy.

4. Review delivery dates for Owner-furnished products.

5. Review schedule for work of Owner's separate contracts.

6. Review submittal requirements and procedures.

7. Review time required for review of submittals and resubmittals.

8. Review requirements for tests and inspections by independent testing and inspecting agencies, including mock-up testing.

9. Review time required for completion and startup procedures.

10. Review and finalize list of construction activities to be included in schedule including activities for Procurement, Shop Drawing Submittals and Approvals, Material Fabrication, Mockups, Phases of Construction, Inspections, Startup and Testing, Punchlist, Turnover and Owner required activities.

11. Review procedures for updating schedule. Items to discuss include frequency of update (minimum monthly), Gathering update information / activity status, review of the draft updates, schedule revisions, recovery schedules (if required), reporting and final issuance of the update.

1.5 COORDINATION

A. Schedules and Reports of Construction Activities and Separate Contractors: Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors. During Periodic Updates Coordinate with each contractor to record the status of construction and integrate into the Master Project Schedule. Each contractor shall actively participate and attend all schedule update review meetings and have input in the Master Project Schedule.

B. Coordination of Contractors' Construction Schedules: Coordinate Contractors' Construction Schedules with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

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

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence. Review predecessors – successors for each activity and coordinate with all contractors to ensure dependent activities are documented in the schedule correctly.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTAL SCHEDULE

A. Preparation of Submittal Schedule: Prepare a submittal schedule arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates that contains a complete listing of submittals required by Contract. Submit the schedule to the Architect a minimum of 30 days prior to submitting any submittals grouped and regulated so as not to burden the reviewing facilities, while maintaining job progress. Organize the submittal schedule by specification section number. Each submittal is to be assigned the relevant section number and a sequential number for identification and tracking purposes. Each prime shall provide bi-weekly submittal schedule updates, including all pertinent information, until submittals are complete. Failure to submit timely and accurate submittal schedule will delay invoice processing.

1. The Submittal Schedule shall be submitted for the Architect's information. Include the following information:

a. Title of Submittal/Description.

b. Submittal Number (sequential).

c. Scheduled date for the first submittal.

d. Drawing Number (if applicable).

e. Applicable specification Section title and number.

f. Name of subcontractor/vendor.

g. Submittal category (action or informational).

2. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule

2.2 SUBMITTALS LOG

A. Submittals Log: Prepare, submit, maintain and update a single live electronic version of a submittals log for the entire project, using approved software, format and media storage as agreed upon. The submittals log shall be accessible to the Architect at all times and shall contain relevant information related to submittals and the submittal process progress which will be reviewed at the weekly progress meetings or other agreed upon intervals. The logs shall include at a minimum a complete list of required submissions per the project specifications, current status, submission or resubmission date, date required, revision, submittal number and submittal description. The submittals log shall provide the Architect and CMa with the ability to filter for open and reviewed items, have ongoing access to live updates, as well as confirm receipt and response dates for every submittal. The submittal log shall be based on the CSI numbering system and the Project specifications and shall be available to Project team members.

1. The submittal log shall be updated **weekly** until all submittals are received and submitted to the Architect and CMa for review.

2.3 SCHEDULE OF VALUES

A. Contractual Requirements: Refer to General Conditions and Division 01 specifications, for contractual requirements governing schedule of values.

B. Relation to Sections and Divisions of the Work: The schedule of values shall be related to Sections and Divisions of the Work, aggregating the total Contract Sum and shall include overhead and profit as separate line items.

C. Schedule of Anticipated Monthly Requisition Amounts: The Contractor shall also submit a schedule of anticipated monthly requisition amounts which shall be related to the progress schedule.

2.4 CONSTRUCTION SCHEDULE, GENERAL

A. Based on the bid schedule, sequencing, phasing and durations provided, the Contractor shall prepare a construction schedule in the format and program defined herein and which will be integrated into the Master Project Schedule prepared by the Construction Manager such that the Master Project Schedule shall be acceptable to each Contractor and binding with respect to the performance of the work of each Contractor for its own part. The process to develop the Master Project Schedule will be facilitated by the Construction Manager with participation by each Contractor. The Master Project Schedule will be the basis for measuring progress of work and performance and, upon acceptance by the CMa, Owner and A/E, the Contractor(s) will be the schedule of record.

The CMa shall be the Scheduler of Record for the Project Master Schedule. Each Contractor shall have input creating and developing his / her own schedule activities for their work. Each Prime Contractor will submit a listing of his/her activities in the appropriate format to the CMa for input in the Master Project Schedule. Activities should have Description, Duration, Manpower to complete that Activity, Predecessors and Successors, and sequence of construction. In Addition, each Prime Contractor will list out all required submittals, shop drawings, mockups, inspections, architect / engineers review and fabrication time for all materials required on the project. The contractors schedule submission shall allow time for

things such as, review time, inspections, site visits, fabrication, delivery, cure / drying to not affect the progress of work. Each Prime Contractor shall provide an acceptable construction schedule within 20 days of NTP which is compliant with the bid schedule and includes all tasks required to complete the contractor's work. All costs incurred by the Contractors in preparing and updating the Schedules are included in the Work of the Contract.

The bid schedule prepared by the Construction Manager (CMa) is intended as a guideline only and is not a fixed or mandatory sequence of work. Contractors may adjust logic and sequencing to accommodate their means and methods, provided that such adjustments do not compromise overall project coordination or quality. While milestone dates should be maintained as closely as possible to support project progress and stakeholder expectations, the only hard requirement is adherence to the final completion date established in the contract. Any proposed adjustments to sequencing that impact milestone dates shall be communicated promptly to the CMa for review and concurrence.

B. Computer Scheduling Software: Prepare schedules using current version of a as defined below.
   1. Use Oracle Primavera P6, version 16 or later. Include electronic schedule in. xer format with all schedule submissions. (use of an earlier version or different scheduling program requires the approval of the CMa)
   2. There shall be no additional costs for updating to the most current version of the required software even if this occurs during the project.

C. Contractor's Construction Schedule Preparation

   1. Develop the Contractor's Construction Schedule no later than twenty (20) days after Contract Award, NTP which timeframe is established to allow for the Project Master Schedule to be prepared within thirty (30) days.

      a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of CMa, Architect's and / or Owner's review of the schedule.

      b. Contractor(s) to submit cost and resource loaded schedule. Included with the contractors initial construction schedule submission will be allocation of cost and resources (manhours) loaded in the contractors activities. Costs shall not be frontloaded and equal the total value of the contractors contract sum. The cost loaded schedule will be the basis for monthly progress payments and tracking of work in place. Resource loading will include total manhours per activity and loaded as a resource into the Master Project Schedule for each work activity. The cost and resource loaded schedule will be approved by the Architect, Owner, and / or CMa.

   2. CMa will develop the Master Schedule WBS (Work Breakdown Structure), with input from the Contractor(s); the Contractor(s) integrate their activities and send to CMa for incorporation into Master Project Schedule.

   3. The Construction Manager will facilitate schedule workshops to develop the Project Master Schedule. Each Contractor shall attend all workshops required to review the integration of the Contractor's Construction Schedules into the Master Project Construction schedule. These meetings will be required until the final Master Project Schedule is developed and accepted by all parties. Additional schedule workshops

that are required will not constitute recovery of additional monies by the Contractor(s).

a. The CMa shall integrate the contractor's Construction Schedule into the Master Project Schedule. The contractors, in conjunction with the CMa, will coordinate all schedule activities, logic and other relevant schedule requirements including those of the various other Contractors into the Master Project Schedule. The Master Schedule development and coordination will be deemed complete until all entities agree, and all schedule requirements have been satisfied. The CMa will serve as the record-keeper of the Master Project CPM Schedule with input and accountability by all *separate* Contractors. The Master Project Schedule will be used to measure progress throughout the duration of the project. All contractors will partake in the Periodic updates of the Master Project Schedule.

4. Each Prime Contractor shall be responsible for the development of schedules subject to all the same requirements and appropriate for integration by the Construction Manager into the Master Project Schedule. All Prime Contractors are required to submit Schedule Activity Listings in an acceptable format to the CMa. The CMa shall have the right to reject any format that doesn't meet the CMa requirements. All Prime Contractors agree in advance that the integration of schedules is an iterative process and that durations are subject to adjustment, within reason, to align with the properly scheduled work of other prime contractors and subcontractors.

5. No claims for delay or additional costs associated with the work of preparing, updating and modifying schedules in order to compile an acceptable Master Project Schedule will be entertained by the Owner.

D. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques that meets the qualifications noted below. Submit qualifications for approval to CMa within 10 days of the NTP.

2. Meetings: Scheduling consultant shall attend all meetings related to Lean Process/Pull Planning, Development of the Project Master Schedule, Project progress meetings, Schedule update workshop meetings, alleged delays, and time impact.

3. Qualifications: Project scheduler or consultant shall have a minimum of 8 years scheduling experience with similar projects using Primavera P6. Scheduler qualifications for each prime contractor shall be submitted within 10 days of the Notice to Proceed. The CMa has the right to approve or disapprove of any proposed scheduling consultant.

E. Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify Critical Path and subsequent near-Critical Paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Award and procurement of trades/subcontractors
b. Preparation and processing of submittals.
c. Purchase of materials.
d. Delivery.
e. Fabrication. Mobilization and demobilization.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and Inspections
j. Punch list and final completion.
k. Final Inspections and Turnover (including required by the AHJ)
l. Activities occurring following final completion.

2. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often necessary to produce the CPM schedule within the limitations of the Contract Time.

3. Contract Modifications: For each proposed contract modification and concurrent its submission, prepare a Time-Impact Analysis (TIA) using a network fragment to the effect of the proposed change on the master project schedule.

   a. As determined by CPM analysis, only delays in activities which affect critical path dates and the overall Substantial Completion Date required by the Contract will be considered for a time extension.

      All TIAs shall be contemporaneous in nature and submitted within 15 days of the delaying event. It is the contractor’s duty to demonstrate the alleged delay is solely impacting the Critical Path and not concurrent with any other delays. Delays due to weather and / or Force Majeure will be deemed non-compensable, and the remedy will be time only (no compensation).
   b. Extensions of time granted to one Prime Contractor shall not affect any other Prime Contractor or any subcontractor except those identified and approved as part of the extension.

   c. If the Contractor requests a time extension of any milestone date or Contract completion date, the Contractor shall provide documentation as required by the CM to enable the CM to determine whether a time extension is appropriate under the terms the Contract. The Contractor shall submit the Time Impact Analysis which clearly identifies the delay or impact and its effect on the Critical Path. The impact must be solely on the Critical Path in order to recover time and/or compensation for the delay. The contract completion date will be adjusted only for causes specified in the Contract documents.

4. Initial Issue of Schedule: Prepare initial network diagram from an indicating straight "early start-total float." Identify critical activities. Prepare reports showing the following:

   a. Contractor or subcontractor and the Work or activity.
   b. Description of activity.
   c. Main events of activity.
   d. Immediate preceding and succeeding activities.
   e. Early and late start dates.
   f. Early and late finish dates.
   g. Activity duration in workdays.

h. Total float or slack time.

5. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

   a. Identification of activities that have changed.
   b. Changes in early and late start dates.
   c. Changes in early and late finish dates.
   d. Changes in activity durations in workdays.
   e. Changes in the critical path.
   f. Changes in total float or slack time.
   g. Changes in the Contract Time.

6. Use "one workday" as the unit of time for individual activities. Nonworking days and holidays shall be incorporated into the schedule in order to coordinate with the Contract Time.

7. The Contractor shall not schedule, allow or direct materials or products to be installed prematurely when it is obvious that such materials may be damaged by his own subsequent work or that of another Contractor. When recognized construction procedures or design requirements prescribe that materials be installed before execution of other work which may damage or deface such completed work, the Contractor shall then take such steps as are necessary to protect such completed work.

F. Work Breakdown Structure: Format schedule using Work Breakdown Structure (WBS) to delineate procurement packages, phases, work areas, etc. The base WBS for the project will be developed by the contractor(s) in conjunction with the Construction Manager. Develop the WBS to sufficiently organize and group activities so workflow can be easily understood. The Construction Manager shall have the right to reject or modify the Contractors proposed WBS.

1. Contractor(s) shall prepare schedule activities for their respective work including logic, relationships, durations, manpower, cost, and sufficient detail as required by the Construction Manager.

G. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

H. Activities: Treat each story or separate area as a separate Work Breakdown Structure (WBS) for each main element of the Work. Comply with the following:

1. Activities shall be sufficiently detailed to indicate each element of work, by specific trade and area the work is taking place.

2. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by CMa. Written approval will be required for activities greater than 20 days.

3. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

4. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

5. Startup and Testing Time: Include not less than fifteen (15) days for startup and testing. Start up activities must be sufficiently detailed.

6. Milestone: the CMa will provide a list of standard milestones to be incorporated into the contractor’s schedule. Milestones shall contain logic and be tied with relationships (no constraints). Milestones will identify significant start and finish dates within the schedule for the purpose of measuring progress and completion of major elements or areas of work.

7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion. Allow time for local authority (AHJ) inspections to obtain interim approvals, C of O and/or Substantial Completion Certificate.

8. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items on any phase and punch-list items and close-out requirements for final completion at final phase.

I. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section 01 11 00 "Summary of Work". Delivery dates indicated stipulate the earliest possible delivery date.

5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section 01 11 00 "Summary of Work". Delivery dates indicated stipulate the earliest possible delivery date.

6. Work Restrictions: Show the effect of the following items on the schedule:

   a. Coordination with existing construction

   b. Limitations of continued occupancies and egress / ingress pathways by existing occupants.

   c. Uninterruptible services.

   d. Partial occupancy before Substantial Completion.

   e. Use of premises restrictions.

f. Enabling work or temporary construction measures to support future Phases

g. Provisions for future construction.

h. Seasonal variations.

i. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    1) Subcontract awards.
    2) Submittals.
    3) Purchases.
    4) Mockups.
    5) Fabrication.
    6) Sample testing.
    7) Deliveries.
    8) Installation.
    9) Tests and inspections.
    10) Adjusting.
    11) Curing.
    12) Startup and placement into final use and operation.
    13) Final Inspection and turnover.

8. Construction Areas or Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    1) At a minimum the schedule should include the following:

        a) WBS Element

        b) Floor

        c) Building / Wing

        d) Sub Floor / Area

        e) Construction Category (i.e.: Sitework, Structure, Envelope, Roofing, MEPS Systems / Rooms, Vertical Transportation, Interior Fit out, Risers, Punchlist & Turnover)

        f) Other relevant project specific items

9. Milestones: Include milestones indicated in the Contract Documents Bid schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion and the following interim milestones:
    a. Project Award
    b. NTP (Commencement)
    c. Foundation Start/Pad Ready
    d. Foundation Complete To Grade
    e. Structure Start

f. Structure Top-Out
g. Last SOMD Pour
h. Facade Start
i. Façade Complete
j. Roof Complete
k. Temp Dry-In (ROOF & CW/WINDOWS COMPLETE)
l. Permanent Power Available (INCOMING SERVICE TO GEAR)
m. Conditioned Air Available
n. Start Fitout
o. Start Drywall
p. Start Ceiling Grid
q. Start Flooring
r. Start Punchlist (CONSTRUCTION COMPLETE / CLEAN)
s. Complete Construction For Floor / Area Turnover
t. Elevators Complete (STATE INSPECTION)
u. Substantial Completion / C OF O
v. Final Completion

10. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests. Schedule of value / S-Curve of Plan vs Actual costs as is relates to the schedule in order to forecast the construction costs per month or required time interval.

11. Resource Loading Requirements:

    a. Activities shall be loaded with resource assignments (manhours) within the Master Project CPM Schedule. Resource loading should reflect total manhour for each activity within the schedule. Resources shall be in units of hours and designated as a single material resource in the scheduling software (P6). Time Period Admin preferences must remain default “8.0hr / day, 40 hr / week, 172 hr / month, 2000 hr / year”. Calendar setting will be 8.0 hr / day.

12. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the master project schedule.

    a. Time Impact Analysis shall be performed in the following manner.

        1) Identify the Impacting event

        2) Model the event with the appropriate detail of activities (creating a fragnet)

        3) Estimate the duration for the new activities associated with the impact

        4) Add sequence and relationships to the added activities.

        5) Insert the new fragnet into a copy of the Master Project Schedule.

        6) Calculate the schedule and measure the effect of the Impact on the Project Completion Date and directly affected milestone.

7) Review the Time Impact Analysis and determine the impacts as a result of the change, and review a potential recovery plan.

J. Schedule Updating Process: Periodic updates will be performed on at least a monthly basis (if not more frequently). Each Contractor shall participate in the monthly update process. The established procedures, as defined in this specification section, will be utilized for progress monitoring and updating the Project Master Schedule, reporting and payment requests.

1. Schedule Updating Process: At no less than monthly intervals, as deemed necessary by the CMa, contractors will update the schedule to reflect actual construction progress and activities. Schedule updates will be issued on the 28th of each month (or mutually agreed upon time frame each month). The CMa will send out 'Schedule Update Forms' on a monthly basis, 2 weeks prior to the date established for the issuance of the Project Master Schedule Update. All Contractors will provide markups to the update forms with his / her schedule status information noting but not limited to all progress for their activities including Actual Starts, Actual Finishes, Remaining durations, and Projected Starts / Finishes. The contractor shall provide the update forms four (4) days following receipt of the form. The CMa will update the Project Master Schedule and issue a draft schedule update utilizing the information provided by the contractor(s) in the update forms. A schedule progress meeting workshop will be held approximately one week after to review the schedule, contractor updates, request sequence and/or logic changes and other comments. Within 2 days of the workshop meeting, each Contractor shall issue additional schedule updates and/or comments to be integrated into the updated Project Master Schedule. The CMa shall integrate changes and reissue the schedule to the Contractor(s) within 3 days and become part of the project record.

2. Contractor Update Forms

a. CMa will distribute Schedule Update Forms each month. Contractors will provide updates to the CMa by the 24th of each month.

b. Contractor shall provide a detailed report and written narrative with schedule update form that indicates all changes, including, but not limited to, changes in logic, durations, actual starts and finishes, added / deleted activities, and activity durations. Refer to timing as noted in this specification.

1) As the Work progresses, indicate final completion percentage for each activity.

2) All proposed logic changes by the contractors shall be proposed in conjunction with the update form submission. The contractor is responsible to identify the reasons for such changes and potential impact to other contractors and/or subcontractors. The proposed change will be reviewed during the monthly schedule workshop.

3. Distribution and Acceptance: CMa shall issue updated integrated Master Project Schedule to Contractors, Architect and Owner within three (3) days following receipt of Contractors comments following the schedule workshop.

a. Contractors shall review and accept the updated Master Project Schedule within three (3) days of receipt or, within the same period, notify Construction Manager as Agent of nonacceptance and reason therefore. (failure to respond will be deemed as acceptance of the schedule update by the Contractor).

b. Any notification shall be fully supported with specific details, references and other relevant data.

c. Contractors shall distribute accepted revised Master Project Schedule and any coordinated sub-schedules to their subcontractors within one (1) day of acceptance.

4. The CMa will issue the Master Project Schedule updates on a monthly basis with narrative and reports as follows.

a. Full Schedule report – sorted by WBS and Start/Finish

b. 4 week look-ahead construction schedule

c. Milestone Report Listing all Milestones and Level of Effort Activities

d. Critical Path Report – sorted by Total float path then Start/Finish

e. Predecessor – Successor Report but Activity ID

f. Narrative identifying critical issues impacting the schedule

K. Contractor Schedule Reports:

1. CPM Reports: In conjunction with the contractor's update forms and the monthly CPM schedule update process, the contractor shall submit reports via the web-based project management software. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in workdays (as based upon the schedule calendar utilized in the Scheduling Software).

a. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.

b. Predecessor-Successor Report: List of all activity predecessors and successors for each activity, sorted in ascending order by activity number and then early start date, or actual start date if known.

c. Total Float Report: List of activities sorted in ascending order of total float, then by Start Date for each activity followed by Finish Date for each activity.

d. A written schedule narrative to include the following at a minimum:

1) Executive Summary

2) Summary of work completed since the previous update.

3) Summary of Major Milestones completed and progress toward the next milestones

4) Status of major deliveries

5) Items affecting progress with listed deviations from the previous month

6) Upcoming work planned

7) Schedule revisions

8) Basis and assumptions

9) Impacts due to severe or unusually extreme weather conditions.

2. The contractors schedule report shall be issued with the submission of the contractors update form. Failure to provide the required update forms and reports is required before Applications for Payment are processed.

3. Upcoming Work Summary: Contractor to prepare summary report indicating activities scheduled to commence prior to submittal of next schedule update. Summarize the following issues:

a. Unresolved issues.

b. Unanswered Requests for Information.

c. Rejected or unreturned submittals.

d. Notations on returned submittals.

e. Pending modifications affecting the Work and Contract Time.

L. Recovery Schedule: When periodic update indicates the Work is ten (10) or more work days behind any milestone as identified in section 2.4.I.9, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished. Recovery plan should be based on actual data from subcontractors, suppliers and vendors with associated manpower listed. The Contractor shall take steps as necessary to improve the progress and shall submit for review, revised schedules to demonstrate that the rate of progress will be regained; without additional cost to the Owner.

2.5 CONTRACTORS LOOKAHEAD SCHEDULE

A. 3 Week Look-Ahead Schedule: Contractors shall submit an electronic 3 Week Look-Head Schedule each Friday for incorporation into a master project 3 Week Look Ahead Schedule. Contractors will utilize the look ahead schedule template provided by the CMa. Weekly submissions will be in a live MS excel file format.

1. General Contractor Prime shall incorporate all prime contractors Look-Ahead Schedules into a singular file on a weekly interval and distribute the schedule to the entire project team in a live MS excel file format each Monday unless an alternate date is identified by the CMa. 3 Week Look-ahead must include area of work, floor level and estimated manpower for the activity. Format should be at minimum MS Excel schedule template provided by the CMa and identify relationships to other activities. The Look-Ahead schedule should be consistent with the Project Master Schedule. Any deviations including but not limited to logic, overall sequence, and/or duration must be identified. Deviations will be discussed at project meetings.

2.6 STARTUP CONSTRUCTION SCHEDULE

A. Startup Construction Schedule is intended to be preparatory to preliminary Pull Planning activity defined in Lean Procedures. The Startup Construction Schedule should generally reflect milestones contained in Bid Schedule and Master Project Schedule as defined in the Contract Documents. Included with the Startup Construction Schedule framework should be a fully developed Work Breakdown Structure (WBS) for the entire project. The WBS will be further detailed as the Master Construction Schedule is developed. This initial schedule should be considered preliminary and prepared only to allow Contractor to participate knowledgably in a Pull Planning process that will result in further direction in response to constraints determined jointly by the Contractor(s), A/E, Owner and the Construction Manager.

1. Contractor(s) shall prepare a Startup Construction Schedule including Milestones and detailed WBS and submit to the CMa within ten (10) days of the NTP. The Startup Construction Schedule shall include all activities anticipated in the first four to six months of the project and include but not limited to procurement, submittals, mobilization and enabling, coordination and construction. The schedule shall be developed in Primavera P6.

B. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule. Bar-chart or Gantt Schedule shall consist of Activity ID, Activity Description, Original Duration, Remaining Duration, Early Start, Early Finish and define the entire Contractual Construction Timeline.

C. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first one hundred twenty (120) days of construction. Indicate all Milestones into the Startup Schedule for further development in Pull Planning Sessions. Include fully detailed Work Breakdown Structure with skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

D. The Startup schedule, compliant with the contract requirements, shall be submitted prior to the first payment application request.

2.7 PROGRSS REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.

2. List of separate contractors at Project site.

3. Approximate count of personnel at Project site.

4. Equipment at Project site.

5. Material deliveries.

6. High and low temperatures and general weather conditions.

7. Accidents.

8. Meetings and significant decisions.

9. Unusual events (refer to special reports).

10. Stoppages, delays, shortages, and losses.

11. Meter readings and similar recordings.

12. Emergency procedures.

13. Orders and requests of authorities having jurisdiction.

14. Change Orders received and implemented.

15. Construction Change Directives received and implemented.

16. Services connected and disconnected.

17. Equipment or system tests and startups.

18. Partial Completions and occupancies.

19. Substantial Completions authorized.

B. Construction Survey Data: Take settlement readings of the Work at a predetermined number of points selected by the Architect. Take readings weekly until the Work is substantially completed or until such time as the Architect directs. Record survey data and submit to the Architect on a weekly basis. Furnish certification from a Registered Land Surveyor who shall verify periodically that portions of the Work are located in accordance with the Drawings and at the required elevations. Upon completion of foundation walls, submit to the Architect a certified survey showing that dimensions, elevations, angles and the location of the building is in accordance with the Contract Documents. When enclosing walls are completed, submit a survey certifying their location and plumbness.

C. Material Location Reports: At appropriate intervals, or as requested, prepare a comprehensive list of materials delivered to and stored at the Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list, a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

1. Material stored prior to previous report and remaining in storage.

2. Material stored prior to previous report and since removed from storage and installed.

3. Material stored following previous report and remaining in storage.

D. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.8 SPECIAL REPORTS

A. General: Submit special reports directly to CMa within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise CM in advance when these events are known or predictable.

2.9 CONSTRUCTION PHOTOGRAPHS

A. Digital Images: Provide images in uncompressed PDF, TIFF or JPEG format, produced by a digital camera with minimum sensor size of 8.0 megapixels.

B. The contractor shall provide a minimum of 25 digital photo images per day when its working on site. Photos shall be submitted as separate files with the daily report. Photos shall be time stamped and labeled to identify location and/or area.

C. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

D. Maintain key plan with each set of construction digital images that identifies each photographic location.

E. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.

2. Field Office Images: Maintain one set of images in the field office at Project site, available at all times for reference. Identify images same as for those submitted to CMa and Architect.

F. Quantity and Timing of Construction Photographs

1. Preconstruction Photographs: Before starting construction, take digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

2. Periodic Construction Photographs: Take color, digital photographs, weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

G. Final Completion Construction Photographs: Take color digital photographs after date of Substantial Completion for submission as Project Record Documents

END OF SECTION

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017000 – “Execution and Closeout Requirements” for submitting operation and maintenance manuals, record Drawings, record Specifications, and record Product Data

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Project Web Site : A web-based information management software system to be hosted by Montgomery County E-Builder will be required to be used by all project team members to share and communicate construction contract documents, submittals, rfi’s, punch-lists and other project data.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and CMa and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's and Construction Manager's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Number of Resubmittals: Resubmittals in excess of two (2) and any resubmittal subsequent to a submittal having received a “No Exceptions Taken” or “Approved as Noted / No resubmittal Required” mark will be subject to charge. Charges for excess resubmittals will include Architect’s and CMa costs for handling and review at standard billable rates, plus any other Owner’s handling charge. Applicable charges will be paid to the Architect and CMa by the Owner who will back-charge the Contractor.

B. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

    a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Digital Drawing Software Program: The Contract Drawings are available in REVIT and/or AutoCAD.

c. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual as Exhibit J.
d. The following AutoCAD data files will by furnished for each appropriate discipline:

1) Floor plans.
2) Reflected ceiling plans.
3) Elevations.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect and CMa reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on CMa's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow seventeen (17) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. CMa will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty one (21) days for initial review of each submittal.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

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

a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number:

1) 18WA-061000.01.

b. Resubmittals shall include an alphabetic suffix after another decimal point:

1) 18WA-061000.01.A.

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Construction Manager**,** containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Specification paragraph number or drawing designation and generic name for each of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.
r. Other necessary identification.
s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and CMa on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web Site specifically established for Project.

    a. Architect, through CMa, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: If paper copy is accepted by CMa in lieu of required electronic submittal, submit five (5) paper copies of each submittal unless otherwise indicated. Architect, through CMa, will return two (2) copies.
3. Informational Submittals: If paper copy is accepted by CMa in lieu of required electronic submittal, submit three paper copies of each submittal unless otherwise indicated. Architect and CMa will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a notarized statement on original paper copy certificates and certifications where indicated.

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

1. If information must be specially prepared for submittal because standard 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.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample

sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through CMa, will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three (3) sets of Samples. Architect and CMa will retain two (2) Sample sets; remainder will be returned.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

F. Asset Management Data: Comply with requirements stipulated in Section -017000 “Execution and Closeout” and Exhibit C. Each prime contractor shall submit information submittals for review by CMa.

1. Asset Management Data: Provide itemized asset and attribute information per the project Submittal Schedule and in consideration of Exhibit C, Section 4.c Asset Data Drop Phases. Data must be submitted in accordance with

Specification 017000 Execution and Closeout Requirements, Section 1.4 Asset Management Data.

2. Asset Management Data: Managed Assets are defined as any fixture, furnishing, equipment, or similar element to the facility installed as part of the project contained in one of the functional areas and systems defined as “in-scope” for the asset management information strategy, requiring routine maintenance, containing information required by a facilities engineer to conduct work order maintenance, and is not a consumable replaced on a regular schedule.

3. Prime contractors inclusive of all subcontractors shall provide an itemized digital log of in-scope assets and corresponding attributes using a template supplied by the Contractor, along with information and examples outlined in Exhibit C.

4. Prime contractors shall submit requested data for review within 40 days of the NTP. Periodic follow-up review meetings will be held to review progress. Attendance is mandatory. Contractors are responsible for the accuracy of the submittals and itemized asset and attribute information. All revisions needed is the responsibility of the contractors.

5. Interim and final payment will be dependent on the successful completion and submission of asset management submittals and data.

G. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

H. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

I. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

J. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

K. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

L. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

M. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

N. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

R. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

S. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and CMa. Submittals without Contractor’s approval stamp will be returned with no action.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND CMa'S ACTION

A. Action Submittals: Architect and CMa will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and CMa will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

1. For Information Only: Indicates that item submitted as an Action Submittal is considered by the Architect and the CMa as an Informational Submittal. No action is taken, nor to be inferred.

2. Make Corrections As Noted: Marks on the submittal by the reviewer indicate changes to be made to the submittal or information required to be considered by the Contractor.

3. No Exceptions Taken: The reviewer has made no marks on the submittal.

4. Rejected: Construction elements to which the submittal applies are not in compliance with the Contract Documents and/or they are not the selected option(s) and are not to be used on the project.

5. Revise and Resubmit: Used in conjunction with “Make Corrections Noted,” construction elements to which the submittal applies MAY NOT be used on the project until the submittal has been revised and resubmitted by the Contractor and the submittal has received a mark allowing its use on the project.

6. Resubmit for Record Only: Construction elements to which the submittal applies MAY be used on the project AND the Contractor is required to make revisions to the submittal consistent with reviewer’s comments and resubmit for the record.

7. No Further Submission Required: Used in conjunction with “Make Corrections Noted,” construction elements to which the submittal applies MAY be used on the project and no further submission is required.

B. Informational Submittals: Architect and CMa will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and CMa will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and CMa.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000
QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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

1.03 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or CMa.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
   2. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics. Option: May be proposed as an alternative to testing of on-site integrated exterior mockups.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.05 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior or laboratory mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.06 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

1.07 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

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

1.08 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
      d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
      e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
      f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or CMa.
   2. Notify Architect and CMa seven (7) days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's and CMa's approval of mockups before starting work, fabrication, or construction.
      a. Allow seven (7) days for initial review and each re-review of each mockup.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   7. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

M. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.09 9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
      a. Notify CMa and Owners Testing Agency sufficiently in advance of work requiring inspection or observation to allow for scheduling, but in no case less than 72 hours.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
      a. Notify CMa and Contractor's Testing Agency sufficiently in advance of work requiring inspection or observation to allow for scheduling, but in no case less than 72 hours.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect, CMa, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect, CMa, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   6. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
   1. Distribution: Distribute schedule to Owner, Architect, CMa, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:
   1. Notifying Architect, CMa, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through CMa, with copy to Contractor and to authorities having jurisdiction.
3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect and CMa.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and CMa's reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section specifies administrative and procedural requirements for Temporary Facilities and Controls.

B. Administrative and Procedural Minimum Actions: Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in other Contract Documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication that such temporary activity is not required for successful completion of the work and compliance with requirements of the Contract Documents.

C. Arrangement for, Provision and Maintenance of Temporary Facilities and Controls: Arrange for, provide and maintain temporary facilities and controls as required for the proper and expeditious prosecution of the Work. Pay costs including fuel, power and water used until final acceptance of the Work unless the Owner makes arrangements for the use of completed portions of the Work after Substantial Completion in accordance with the provisions of the General Conditions.

D. Acceptable Locations for Temporary Connections: Provide and maintain temporary connections to utilities and services in locations acceptable to the Owner, Architect, CMa and local authorities having jurisdiction thereof. Make installations in a manner subject to the acceptance of such authorities and the Architect. Remove temporary installations and connections when no longer required and restore the services and sources of supply to proper operating condition.

1.2 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the Work.

1.3 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations and authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.

B. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner and CMa, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

1.5 EQUIPMENT

A. General: Provide new equipment, or undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4 in. heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 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.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

1.6 TEMPORARY ELECTRICITY AND LIGHTING

A. Temporary Lighting System: Provide and maintain a temporary lighting system to satisfy at least the minimum requirements of safety and security, and to maintain the progress of the Work. The temporary lighting system shall be maintained to afford general illumination in areas of the Project and any additional illumination, where necessary, in the areas of the Project where work is being performed. Temporary wiring shall be maintained in a safe manner and utilized so as not to constitute a hazard to persons or property.

B. Permanent Power and Lighting System: The permanent power and lighting system, or a portion thereof, may be used provided the Contractor: (1) obtains the approval of the Owner; (2) assumes full responsibility for the entire power and lighting system; and (3) pays costs for power, operation, maintenance and restoration of the system.

C. Removal of Temporary Electrical Equipment and Wiring: At the completion of the Work remove temporary electrical equipment and wiring and replace worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

1.7 TEMPORARY HEATING, COOLING AND VENTILATING

A. Temporary Heat and Maintenance of Temperature: Provide temporary heat as required during construction to protect the Work from freezing or frost damage and to ensure suitable conditions for the construction operations of trades. Where work is being conducted, maintain the temperature as specified in the various sections of the Specifications but not less than 45 deg. F. Do not allow the temperature to reach a level which will cause damage to any portion of the Work. N/A for work on roof levels.

B. Removal of Temporary Heating Equipment and Piping: At the completion of the Work remove temporary heating equipment and piping and replace worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

1.8 TEMPORARY WATER

A. Drinking Water: Furnish drinking water with suitable containers and cups for use of employees. Locate drinking water dispensers where work is in progress.

B. Drainage or Collection of Water: Make provisions for drainage or collection of excess or spilled water.

C. Removal of Temporary Water Service Equipment and Piping: At the completion of the Work, remove temporary water service equipment and piping and replace worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

D. Temporary water service in the building will be provided by the Plumbing Prime Contractor.

1.9 TEMPORARY SANITARY FACILITIES

A. The GC Prime Contractor will provide and maintain temporary sanitary facilities for use by all trades. Provide sufficient facilities for the number of workers on site. Clean and sanitize the facility at a minimum of two times a week. Adjacent to the temporary sanitary facilities, provide and maintain temporary hand wash stations with water, hand soap and hand sanitizer.

B. All contractors are responsible to wipe down and clean tools and surfaces on a periodic basis with virucide cleaners and other measures necessary to protect workers. GC will be responsible to wipe down and clean public surfaces within project fence including gates as per CDC Guidelines and OSHA guidance on preparing workplace for COVID 19. In addition, temperature screening will not be provided by Montgomery County. Contractors will be responsible for any temperature screening required throughout the entire phase.

1.10 TEMPORARY FIRE PROTECTION

A. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

B. Fire Watch: All Prime contractors are responsible for providing fire watch for their scope performed. Fire watch shall be performed per OSHA standards and with a hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure. Fire watch commences at the completion of hot work. Fire watch shall last minimal 1 hour beyond the completion of hot work, and 2 hours on all roofs, within existing or occupied buildings or over flammable materials which cannot be removed. All hot work and Fire Watch activities on or within existing or occupied buildings shall be coordinated 72 hours in advance with the CMa and Owner.

1.13 TEMPORARY FENCE

A. Maintenance of a Temporary Fence: maintain a temporary galvanized fence to enclose the area at the job site and to effectively guard and close in the designated area. gates of substantial construction, cross-braced, hung on heavy strap hinges, with suitable hasps and padlocks.

B. Removal of Temporary Fence and Barricades: Remove the fence upon completion of the Work or at such time before final completion as directed by the CMa. upon inspection and acceptance.

C. Reference Site Plan & Logistics plans. Temporary fence will be provided and maintained by the General Construction Prime Contractor to secure construction areas until this work is completed and accepted by the CMa.

1.14 SECURITY AND PROTECTION

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

B. Precautions Against Fire: Take adequate precautions against fire, keep flammable material at an absolute minimum and ensure that such material is properly handled and stored. Except as otherwise provided herein, do not permit fires or open salamanders in any part of the Work.

C. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

D. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

1.15 SURFACE WATER AND SNOW CONTROL

A. Removal of Snow and Ice: Remove snow and ice as necessary for the protection and performance of the Work.

1.16 PROJECT IDENTIFICATION AND SIGNS

A. Display of Signs or Advertisements: No signs or advertisements will be allowed to be displayed on the premises without the acceptance of the Owner and CMa.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: For temporary construction, provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by CMa. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2 in. mesh, 0.148 in. thick, galvanized steel, chain-link fabric fencing; minimum 8 ft. high with galvanized steel pipe posts; minimum 2-3/8-in. OD line posts and 2-7/8-in. OD corner and pull posts, with 1-5/8-in. OD top rails. Provide galvanized barbed-wire top strand if required for security.

D. Gypsum Board: Minimum 1/2 in. thick by 48 in. wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C36 and Section 09 21 16 "Gypsum Board Assemblies".

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively. Comply with and Section 07 21 00 "Thermal Insulation".

F. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

G. Water: Potable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Location of Facilities: Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required. Coordinate with all other Primes and CMa.

B. Provision for Ready for Use Facilities: Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

A. Location: Locate storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access and as approved by the Owner and CMa. Note: Field Offices will be located on the 10th Floor of One Montgomery Plaza (OMP)

B. Incombustible Construction: Provide incombustible construction for offices, shops, and sheds located within construction area Comply with NFPA 241.

C. Maintenance of Support Facilities: Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

3.3 OPERATION, TERMINATION, AND REMOVAL

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

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

C. Water-filled Piping: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

D. Termination and Removal: Unless indicated otherwise, Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

E. Property of Contractor: Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Recycled Material Requirements

B. Trade Practices Act Requirements

C. Product option requirements.

D. Maintenance Materials

PART 2 PRODUCTS

2.01 RECYCLED MATERIAL REQUIREMENTS

A. In accordance with Section 108, Recyled Materials, of the Commonwealth Procurement Code (62 P.S. 108), all insulation products incorporated into the Project shall contain the following minimum percentages, by weights, of post consumer recovered paper or recovered material.
   1. Cellulose Loose-Fill Spray-On: 5% Postconscumer Recovered Paper
   2. Perlite Composite Board: 23% Postconscumer Recovered Paper
   3. Plastic Rigid Foam, Polyisoyanurate/Polyurethane:
      a. Rigid Foam: 9% Recovered Material
      b. Foam In-Place: 5% Recovered Material
      c. Glass Rigid Foam: 6% Recovered Material
      d. Phenolic Rigid Foam: 5% Recovered Material
      e. Rock Wool: 50% Recovered Material

2.02 TRADE PRACTICES ACT REQUIREMENTS

A. All products shall comple with teh the requirements of the Trade Practices Act (71 P.S. 773.101, et seq.). The Act prohibits the Owner from purchasing or permitting to be furnished or used, in any public works, aluminum or steel products made in a foreign country which has been detremined as "discriminating" by the Commonwealth.

B. Aluminum or Steel Products means aluminum or steel products rolled, formed, shaped, drawn, extruded, forged cast, fabricated, or otherwidw similarly processed, or processed by a combination of two or more of such operations, from aluminum or steel not made in the United States.

C. The countries of Brazil, South Korea, Spain and Argentina have been found to decriminate against certain aluminum and steel products made in Pennsylvania. Therefore, the purchase or use of those countries' products, as listed below, is not permitted:
   1. Brazil: Welded carbon steel pipes and tubes; carbon steel wire rod; tool steel; certain stainless steel bar; stainless steel wire rod and cold-form stainless steel bar; pre-stressed concrete steel wire strand; hot-rolled carbon steel plate in coil; hot-rolled carbon steel sheet, and cold-rolled carbon steel sheet.
   2. Spain: Certain stainless steel products, including stainless steel wire rod, hot-rolled stainless steel bars and cold-formed stainless steel bars; pre-formed stainless steel bars; pre-stressed concrete steel wire strand; certain steel products including hot-rolled steel plate; cold-rolled carbon steel plate, carbon steel structural shapes, galvanized carbon steel sheet, hot-rolled carbon steel bars, and cold-rolleed carbon steel sheet.
   3. South Korea: Welded carbon steel pipes and tubes, hot-rolled carbon steel plate, hot-rolled carbon steel sheet and galvanized steel sheet.
   4. Argentina: Carbon steel wire rod and cold-rolled carbon steel sheet.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirement for installer certification that they did not use any non-compliant products.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Composite wood.
   4. Products making up wall and ceiling assemblies.
   5. Thermal and acoustical insulation.

B. Interior of Building: Anywhere inside the exterior weather barrier.

C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers 2017, v1.2.

D. CHPS (HPPD) - High Performance Products Database Current Edition at www.chps.net/.

E. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.

F. GreenSeal GS-36 - Adhesives for Commercial Use 2013.

G. SCS (CPD) - SCS Certified Products Current Edition.

H. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

C. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Inherently Non-Emitting Materials.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section specifies administrative requirements for execution and closeout requirements.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected by governing authorities and/or agencies, and that Work is complete in compliance with Contract Documents and ready for inspection.

B. Substantial Completion:

1. Work is not Substantially Complete unless following has been completed:

   a. All Work, other than incidental corrective or punch list work, including appropriate cleaning.
   b. Obtain applicable occupancy permits, pressure vessel permits, elevator permits, and similar approvals or certificates by Authorities Having Jurisdiction, assuring Contractor's and Owner's full access and use of completed Work.
   c. Contractor's punch list of items to be completed or corrected and written request for inspection has been submitted to CM and Architect.
   d. Complete final start-up and testing and commence instruction and training sessions on major systems including HVAC and controls, telephone and intercom, data communications, fire alarm, fire sprinkler, security, and clocks.
   e. Make final changeover of locks and transmit new keys to Owner and advise Owner of changeover in security provisions.
   f. Submit proof of required extended insurance coverages.
   g. Designated systems and components are commissioned and usable.
   h. Utilities are connected and operating normally.
   i. As-Built Drawings, Operation and Maintenance Manuals, and Warranties have been submitted, reviewed and approved.
   j. Asset Management Data has been submitted, reviewed and approved in accordance with this Specification, Specification 011200 Multiple Contract Summary and Exhibit C.
   k. Work is accessible by normal vehicular and pedestrian traffic routes.

2. Occupancy of Work by Owner does not indicate that Work is Substantially Complete or is acceptable in whole or in part.

3. Issuance of Certificate of Substantial Completion does not indicate final acceptance of Project by Owner, and Contractor is not relieved of any responsibility for Project except those outlined by document.

4. When Contractor considers Work, or designated portion thereof, is substantially

complete, he/she shall submit to CM and Architect:

a. Written notification Work, or designated portion thereof, is substantially complete
b. A list of items to be completed or corrected

5. Within a reasonable period of time after receipt of such notice, Architect will make an inspection to determine status of completion.

6. Should Architect determine that Work is not substantially complete:

a. Architect will promptly notify CM and Contractor in writing, giving reasons thereof.
b. Contractor shall remedy deficiencies in Work and send a second written notice to CM and Architect.
c. Architect will re-inspect Work.

7. When Architect, on basis of an inspection, determines that Work or designated portion thereof is Substantially Complete he/she shall prepare for submission to Contractor a list of items to be completed or corrected (aka Punchlist).

a. Contractor shall fully cooperate with such efforts to establish Punchlist.
b. Punchlist items shall be completed within 90 days after Date of Substantial Completion.

8. When Architect agrees that Work is substantially complete, he/she will:

a. Provide punch list to Construction Manager, who will attach it to their prepared Certificate of Substantial Completion, which shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.

C. Requirements Preparatory to Final Inspection:

1. Punchlist items shall be completed.

2. Temporary facilities and construction shall be removed from Site.

3. Building and Site shall be thoroughly cleaned as specified herein.

4. Systems and equipment shall function and operate as designed to meet specified requirements.

5. Contractor’s personnel or manufacturer’s authorized representatives where applicable, shall have completed instruction for Owner’s personnel in proper operation and maintenance of systems, equipment, and other portions of Project.

6. Operational instructions for equipment shall be mounted and posted as needed.

7. Electrical panels shall be properly labeled (typewritten), valves, pipes ducts, etc., properly marked and color-coded.

8. Submittals; refer to Section 01 33 00 “Submittal Procedures”.

9. Forward certificates to CM and Architect with a letter requesting inspection.

D. Final Inspection:

1. After preparatory requirements have been completed, Contractor shall notify CM and Architect so that final inspection can be performed.

    a. Contractor shall schedule final inspection in a sequential manner to facilitate inspection.

2. CM and Architect shall perform inspection of Project within 7 days following receipt of certifications and notification.

3. Should CM and Architect determine that Work is not complete for final inspection:

    a. Contractor shall be promptly notified in writing, stating reasons.
    b. Contractor shall immediately remedy deficiencies in Work and send a second written notice to CM and Architect.
    c. CM and Architect will re-inspect Project within 7 days following receipt of notification.

4. When CM and Architect concur that Project is finally complete, CM will request Contractor to make closeout submittals.

E. Re-inspection Fees:

1. Architect will make only one (1) inspection each to determine Substantial Completion and Final Completion. If these inspections determine that work does not comply with claims of status by Contractor, either because of major items not completed or an excessive number of punch list items, successive inspections requested by Architect shall be charged to Contractor as follows.

    a. Owner will compensate Architect for such additional services.
    b. Owner will then deduct, by change order, amount of such compensation from Final Payment to Contractor.

F. Final Payment:

1. Prior to approval of final request for payment, Contractor shall have completed following items and placed on file with CM:

    a. Release of liens from subcontractors signed by each.
    b. Written or printed operating instructions or manuals. This material shall not be submitted with shop drawings. When manuals or printed operating instructions for equipment are specified, they shall be delivered to CM.
    c. Systems completely in operation with balancing completed in compliance with specifications.
    d. Completion of punch list corrections or provided a value of uncompleted items.
    e. Final requisition to list previous and additional change orders, requests of extras, previous requests for extension of time, etc.
    f. Certification of final inspection from municipal agencies as needed.

G. Submit Final Application for Payment in compliance with procedures and requirements stated in Contract.

1.3 FINAL CLEANING

A. Condition of Premises and the Job Site: Maintain the premises and the job site in a reasonably

neat and orderly condition and free from accumulations of waste materials and rubbish during the entire construction period. Remove crates, cartons and other flammable waste materials or trash from the Work areas each working day.

B. Cleaning of Generally Unfinished Spaces: Elevator shafts, electrical closets, pipe and duct shafts, chases, furred spaces and similar spaces which are generally unfinished shall be cleaned and left free from rubbish, loose plaster, mortar drippings, extraneous construction materials, dirt and dust.

C. Chutes, Hoists and Receptacles: Remove rubbish by means of chutes, hoists or receptacles. Do not drop or throw rubbish or waste from one level to another within or outside the building.

D. Care of Finished Spaces: Care shall be taken by workmen not to mark, soil or otherwise deface finished surfaces. In the event that finished surfaces become defaced, clean and restore such surfaces to their original condition.

E. Schedule of Clean Up: Clean up immediately upon completion of each trade's work.

F. Cleaning of Areas to Be Painted and Finished: Clean areas in which painting and finishing work is to be performed just prior to the start of this work, and maintain these areas in a clean condition. Cleaning includes the removal of rubbish, broom cleaning of floors, the removal of any plaster, mortar, dust and other extraneous materials from finish surfaces, and surfaces that will remain visible after the Project work is complete. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Remove labels that are not permanent labels. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

G. Preparation of Building for Occupancy: In addition to the cleaning specified above and the more specific cleaning which may be required in various sections of the Specifications, prepare the building for occupancy by a thorough cleaning, including washing (or cleaning by other appropriate methods) surfaces on which dirt or dust has collected and by washing glass on both sides. Wash exterior glass using a window cleaning contractor specializing in such work. Provide and maintain adequate runner strips of non-staining reinforced Kraft building paper on finished floors for protection. Leave equipment in an undamaged, bright, clean, polished condition. Re-cleaning will not be required after the Work has been accepted unless later operations of the Contract make re-cleaning necessary.

H. Cleaning of Site: Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

I. Completion of the Work: Upon completion of the work, dismantle the temporary construction facilities and remove construction equipment, fences, scaffolding, surplus materials and rubbish of every kind from the site.

J. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a legal manner.

1.4 ASSET MANAGEMENT DATA

A. Owner has the goal to achieve day one operational readiness, using a computerized

maintenance management system (CMMS) for work order management, preventive maintenance, space management, capital management, and other related functions. In furtherance of the goal of day one operational readiness, the Developer (Skanska) aims to collect managed asset data in a structured format from the network of Contractors furnishing and installing said managed assets through their contractual relationship with Contractor.

B. This Specification, along with Specification 011200 Multiple Contract Summary and Exhibit C, defines information deliverable requirements specific to the Procurement and Installation phases to be provided by Seller (suppliers/vendors), where direct procurement contracts between a Seller, Installing Subcontractor, and Contractor exist.

C. Developer defines an in-scope managed asset that falls within the governance of the Asset Management Information Strategy, referred to as Managed Asset, as any installed item that physically resides within the systems and functional areas outlined in Exhibit C that:

1. Requires routine maintenance or has a preventive maintenance schedule

2. Has attributes a facility manager would need to reference in performing work order maintenance

3. Is not consumable or otherwise replaced on a predetermined schedule

D. Each unique managed asset will be categorized into a general functional grouping, referred to as Asset Type. Every unique asset will require one or more sets of attributes or meta-data, referred to as Asset Data, related to their asset type grouping. Exhibit C, Appendix A: Asset Type List, provides a matrix of the asset types that reside in each project specification section and the attribute sets required by the Seller or Subcontractor responsible for those specification sections at the various data drops described in Exhibit C, Table 4.1: Asset Data Drop Phases.

E. All relevant asset attributes will be obtained iteratively during the phased data drops summarized in Exhibit C, Table 4.1: Asset Data Drop Phases.

F. Representative examples of what Developer defines as managed assets are described in Exhibit C, Table 4.2. Table 4.2 is not all encompassing, but rather meant to serve as a reference to expand on the definition.

G. Note Professional Videography requirements in Exhibit C Appendix A:
Asset Type List.

H. Contractors with managed assets in their work packages are required to provide asset data as it relates to the performance, properties, and characteristics of managed assets to satisfy their contractual obligations for the respective work package. Contractors with responsibility to furnish or install managed assets falling within the governance of the Asset Management Information Strategy, as defined in this document, shall perform the following tasks:

1. Incorporate cost to furnish asset data as described by this exhibit into their bid. Bidder may be asked to break out this cost in their bid sheet.
2. Within 15 days of bid submission, Contractor shall provide contact information for the representative of their firm with whom the Asset Management Data Integrator will coordinate asset data expectations and deliverables upon Subcontract award.

3. Coordinate all required activities to submit asset data through the designated Asset Management Data Integrator.

4. Attend through conference call, web meeting, or in-person meeting, a post-award briefing with the Asset Management Data Integrator to review Contractor expectations for completion and submission of required asset data.

5. Use the Developer-provided spreadsheet template or similar electronic form to capture required asset data, completely and accurately.

6. Follow any direction given by Asset Management Data Integrator to provide completed asset data with regard to specific units, format, nomenclature, or other data or naming standards as required.

7. Use the submittals systems and procedures as prescribed in specification Section 013300 Submittal Procedures and confirmed by the Asset Management Data Integrator in the post-award briefing.

8. In addition to these required tasks, Contractors may also expect that:

9. Developer will provide Contractors documentation, instructions, and on-call help to assist in completing asset data forms through the Asset Management Data Integrator or other designated representatives of Developer.

10. Developer does not expect that any one asset will require in excess of 40 attributes and considers 20 minutes per managed asset a reasonable estimate of time to complete asset data requirements.

1.5 OPERATING AND MAINTENANCE DOCUMENTATION

A. Manuals: Under the direction of the Contractor, each subcontractor shall furnish operation and maintenance instruction manuals. The manuals shall contain the manufacturers' instructions for each item of equipment and apparatus furnished under the Contract, together with any additional data as may be required by the various sections of the Specifications. Furnish manufacturer's original brochures.

1. Provide Operating and Maintenance Documentation in electronic PDF form to the Architect and CMa. Assemble each manual into a composite electronically indexed file.

2. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

3. Printed O&M binders are not required. Owner shall access Operation and Maintenance information via digitally catalogued PDF files, organized in accordance with Section 1.6 Organization herein.

B. Endorsement: By submission of manuals, the Contractor acknowledges, that each of the manuals is complete and accurate.

C. Submittal of Manuals: Prior to the Contractor's applications for final payment, and as a condition to approval of the applications, each subcontractor shall deliver to the Contractor the manuals arranged in proper order, indexed, and endorsed. Assemble the manuals for all divisions of the Work, review them for completeness, and submit them to the CMa. If hardcopy format is required by Owner, deliver the manuals in suitable transfer cases indexed and marked for each division of the Work

1.6 ORGANIZATION

A. Contents

1. Prepare a table of contents for each volume, with each product or system description identified.

B. Part 1 - Directory

1. List names, addresses, and telephone numbers of Architect, CM and Contractors.

2. List subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service, including nights, weekends, and holidays.

C. Part 2 – Asset Management Data

D. Part 3 - Operation and Maintenance Instructions

1. Arrange instructions by system and subdivide by specification section.

2. Identify following for each category:

a. List of equipment
b. Parts list for each asset
c. Startup and operating procedures
d. Maintenance procedures for equipment and systems
e. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions and detrimental agents
f. Names, addresses, and telephones of subcontractors and suppliers

E. Part 4 - Project documents and certificates

1. Shop drawings and product data

2. Startup reports

3. Test and balance reports

4. Commissioning reports

5. Spare parts list

6. Training materials

7. Certificates

8. Photocopies of warranties and bonds

1.7 OPERATING INSTRUCTIONS

A. Operating instructions shall be divided into four subsections as follows:

1. Start-up - Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable. If equipment is fully automatic, a statement to that effect shall be all that is needed. If a specific sequence or steps shall be performed, give step-by-step instructions in proper sequence. If timing (such as warm-up between power-on and adjustment) is important, clearly state specific minimum time needed at proper point in procedure. Refer to controls and indicators by panel; make references consistent with nomenclature used in illustrations and tables of

controls and indicators. If preliminary settings differ from different modes of operations, give procedures for each mode.

2. Operation - Give detailed instruction in proper sequence for each mode of operation. When, for a given action on part of operator, alternate equipment responses are possible, give appropriate operation reaction to each.

3. Emergency Operation - If some functions of equipment can be operated while other functions are disabled, give instructions for operations under these conditions. Include here only those alternate methods from operation (from normal) that operator can follow when there is a partial failure or malfunctioning of components, or other unusual condition.

4. Shutdown - Include instructions for stopping and securing equipment after operation. If a particular sequence is needed, give step-by-step instructions in that order.

1.8 MAINTENANCE INSTRUCTIONS

A. Maintenance instructions shall be divided into two subsections as follows:

1. Preventive Maintenance - Provide a schedule for preventive maintenance. State, preferably in tabular form, recommended frequency of performance for each preventive task (cleaning, inspection, and scheduled overhaul).

   a. Provide instruction and schedules for routine cleaning and inspection, with recommended lubricants where applicable.
   b. If periodic inspection of equipment is needed for operation, cleaning, or other reasons, indicate items to be inspected and give inspection criteria for, but not limited to motors, controls filters, heat exchangers, etc.
   c. Provide instruction for minor repairs or adjustments needed for preventive maintenance routines. Minor repairs and adjustments shall be limited to repairs and adjustments that may be performed without special tools or test equipment, and that require no special training or skills. Identify test points and give values for each.

2. Corrective Maintenance - Provide instructions predicated upon a logical effect-to cause trouble-shooting philosophy to minimize equipment down time. Instructions and data shall appear in normal sequence of corrective maintenance, for example, troubleshooting first, repair and replacement of parts second, and then parts list.

   a. Trouble-shooting - shall describe general procedure for locating malfunctions and shall give, in detail, any specific remedial procedures or techniques. Data shown is intended to isolate only most common equipment deficiencies. Trouble-shooting tables, charts, or diagrams may be used to present specific procedures. A guide to this type shall be a three column chart. Columns shall be entitled Malfunction, Probable Cause, and Recommended Action. Information shall be alphabetically arranged by component, and each component shall, in turn, list deficiencies that may be expected. Each deficiency shall contain one or more problems with a recommended correction.
   b. Repair and Replacement - Indicate procedures most likely to be needed in maintenance of systems and equipment. Information included here shall consist of step-by-step instructions for repair and replacement of defective items. Include all information needed to accomplish repair and replacement, including information such as torque values. Identify tools, special equipment, and materials that may be needed. Identify uses for

maintenance equipment. Paragraphs shall contain headings to identify topics covered.

c. Safety Precautions - shall comprise a listing of safety precautions and instructions to be followed before, during, and after repairs or adjustments are made or routine maintenance is performed.

B. Spare Parts Lists:

1. Include recommended spare parts for equipment furnished for Project. List shall include a tabulation of descriptive data for all electrical electronic spare parts and all mechanical spare parts for each type of equipment or system. Each part shall be properly identified by part number and manufacturer.

1.9 Submission Requirements

A. For Final Inspection: Submit one digital copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned with Architect’s comments. Revise content of documents as needed prior to final submittal.

B. Submit final volumes revised, in PDF and if requested, as hardcopies, within 10 days following final inspection.

C. PDF Format: PDF format for Operation and Maintenance Manuals shall be organized using the same method as the hard copy manuals. Parts and specifications sections shall be bookmarked and have searchable functionality.

D. Verify with Owner for additional PDF File organization.

1.10 OPERATING AND MAINTENANCE TRAINING AND INSTRUCTIONS

A. Items in Detailed Review: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.

2. Record documents.

3. Spare parts and materials.

4. Tools.

5. Lubricants.

6. Fuels.

7. Identification systems.

8. Control sequences.

9. Hazards.

10. Cleaning.

11. Warranties and bonds.

12. Maintenance agreements and similar continuing commitments.

B. Demonstration of Procedures: As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up.

2. Shutdown.

3. Emergency operations.

4. Noise and vibration adjustments.

5. Safety procedures.

6. Economy and efficiency adjustments.

7. Effective energy utilization.

C. Video Recordings: Videography documenting equipment startup, inspections and/or training shall adhere to the following requirements:

1. Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

2. At beginning of each training module, record each chart containing learning objective and lesson outline.

3. Provide high quality color video recordings with menu navigation in format acceptable to Professional.

4. Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

5. Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

6. Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

7. Provide video recordings used as a component of training modules in same format as recordings of live training.

1.11 PROJECT RECORD DOCUMENTS

A. Contractual Requirements: Refer to General Conditions, for contractual requirements governing record documents.

B. Record Set: Make a complete and accurate record of the changes or deviations from the Contract Documents and shop drawings, indicating the Work as actually installed. The Contractor, and the subcontractor for each part of the Work, shall record the changes under the

direction of the Contractor as the Work progresses. Neatly and correctly mark such changes on blackline prints of the Drawings affected, or on a copy of the Specifications, together with appropriate supplementary notes. Arrange the record Drawings in proper order and index the shop drawing information in accordance with the various sections of the Specifications. Keep the record set of Drawings, shop drawings and Specifications at the job site for review by the Architect or Owner.

1. Provide version of record set drawings in PDF format, indexed by discipline, and drawings series within each discipline.

C. Endorsement: At the completion of the Work the Contractor acknowledges, that each of the revised prints of the Drawings and Specifications constitutes a complete and accurate record of the Work as installed or constructed.

D. Record of Changes or Deviations from the Contract Documents and the shop drawings: As the work progresses keep a complete and accurate record of changes or deviations from the Contract Documents and the shop drawings, indicating the Work as installed. Show changes neatly and correctly on the affected document using black line prints of the Drawings or the Specifications, with appropriate supplementary notes. Keep this record set of Drawings, shop drawings and Specifications at the job site available to the Architect and Owner.

E. Delivery of the Record Documents: Prior to application for final payment, and as a condition to its acceptance by the Architect and Owner, deliver the record documents in proper order. Deliver the records digitally or in suitable transfer cases, indexed and marked, for each Division of the Work.

F. Responsibility of the Contractor: Acceptance of such records by the Architect or Owner shall not be a waiver of any deviation from the Contract Documents or the shop drawings or in any way relieve the Contractor from his responsibility to perform the Work in accordance with the Contract Documents and the shop drawings to the extent they are in accordance with the Contract Documents.

G. Sustainable Building Manual: The Contractor shall compile a Sustainable Building Manual of items required in Section 01 81 13 "Sustainable Design Requirements", in a loose-leaf binder with tabs for each section of the specifications which has such a requirement. Provide subdivided tabs by the specific requirement (Low Emitting Materials, Recycled Content, Certified Wood). The Contractor shall include each product data, manufacturer's specifications and installation requirements, certifications and other data which specifically address each product's compliance with specified requirements. The Contractor shall maintain 3 copies of this binder. One on site for the Contractor's use, one with the Owner's Environmental Consultant, and the final one to be submitted to the Owner at Project Completion.

1.12 WARRANTIES AND GUARANTEES

A. Terms of the Contractor’s Special Warranties and Guarantees: Refer to the General Conditions for terms of the Contractor's special warranties and guarantees of workmanship and materials.

1. Warranties and guarantees required by the Technical Sections of the Specifications shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guarantees made by the Contractor under requirements of the Contract Documents.

B. Definitions

1. Standard Product Warranties and/or Guarantees are preprinted written documents

published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

2. Special Warranties and/or Guarantees are written documents required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties and/or guarantees or to provide greater rights for the Owner. When a special warranty and/or guarantee is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for Owner's approval prior to final execution.

C. Submission Requirements

1. Submit documents to Owner and Architect within 10 days following Date of Substantial Completion. For item accepted after Date of Substantial Completion, submit documents within 10 days following each individual acceptance.

a. When a designated portion of Work is completed and occupied or used by Owner, by separate agreement with Contractor during construction period, submit properly executed warranties to Owner within 15 days of completion of that designated portion of Work.

2. When special warranty is required to be executed by Contractor, or Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by required parties. Submit a draft to Owner.

D. Organization

1. Compile specified warranties and service and maintenance agreements. Execute and assemble documents from subcontractors, suppliers, and manufacturers.

2. Prepare a table of contents, in an orderly sequence, with information as follows:

a. Product or assembly
b. Firm, with name of principal, address, and telephone number
c. Scope
d. Date of beginning and duration of warranty, bond, or service agreement
e. Provide information for proper procedure to be followed in case of failure, and in instances that may affect validity of warranty.

1.13 WARRANTY REQUIREMENTS

A. Written warranties made to Owner are in addition to implied warranties and shall not limit duties, obligations, right and remedies otherwise available under law, nor shall warranty periods be interpreted as limitations on time in which Owner can enforce such other duties, obligations, rights, or remedies.

B. Manufacturer’s disclaimers and limitations on product warranties shall not relieve Contractor of warranty on Work that incorporates products, nor shall it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

C. Warranties shall become valid and operative upon issuance of Certificate of Substantial Completion.

D. For items of Work delayed beyond Date of Substantial Completion, provide an updated schedule within 10 days after acceptance, listing date of acceptance as start of warranty.

E. Related Damages and Losses:

1. When correcting warranted and/or guaranteed Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted and/or guaranteed Work.

F. Reinstatement of Warranty and/or Guarantee

1. When Work covered by a warranty and/or guarantee has failed and been corrected by replacement or rebuilding, reinstate the warranty and/or guarantee by written endorsement. The reinstated warranty and/or guarantee shall be equal to the original warranty and/or guarantee with an equitable adjustment for depreciation.

G. Replacement Cost

1. Upon determination that Work covered by a warranty and/or guarantee has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents.

2. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

H. Owner's Recourse: Written warranties and/or guarantees made to the Owner are in addition to implied warranties and/or guarantees, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty and/or guarantee periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties and/or Guarantees: The Owner reserves the right to reject warranties and/or guarantees and to limit selections to products with warranties and/or guarantees not in conflict with requirements of the Contract Documents.

I. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, guarantee, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

J. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties and/or guarantees do not relieve the Contractor of the warranty and/or guarantee on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties and/or guarantees with the Contractor.

K. Documents to be Provided to the Owner Prior to Final Payment: Prior to final payment and before the issuance of a final Certificate for Payment, in accordance with the provisions of the General Conditions, provide the following documents directly to the Owner:

1. Warranties and/or Guarantees: The warranties and/or guarantees required by the General Conditions and any other extended warranties and/or guarantees stated in the technical Sections of the Specifications.

2. Release or Waiver of Liens: As required by the General Conditions.

3. Service and Maintenance Contracts: Furnish properly executed contracts for any extended service or maintenance as required by the technical sections of the Specifications.

1.14 CERTIFICATE OF OCCUPANCY

A. Filing of Documents with the Architect for Transmittal to the Owner: Prior to final payment and before the issuance of a final Certificate for Payment, in accordance with the provisions of the General Conditions, file the following documents with the Architect for transmittal to the Owner:

B. Certificate of Occupancy: Where the local law at the site of the building requires either a temporary and/or permanent Certificate of Occupancy, obtain and pay for these certificates and deliver to the Architect.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 019113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Owner’s operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

C. The Commissioning Authority is employed by Construction Manager on behalf of Owner.

D. **The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.**

1.02 SCOPE OF COMMISSIONING

A. HVAC System, including:
   1. Major and minor equipment items.
   2. Piping systems and equipment.
   3. Ductwork and accessories.
   4. Control system.
   5. Variable frequency drives.

B. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.03 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: General startup requirements.

B. Section 230800 - Commissioning of HVAC: HVAC control system testing; other requirements.

C. **Section 250800 - Commissioning of Integrated Automation.**

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect; in that case, submit to Architect first.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, **Microsoft Word**.
   5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. **Provide detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, factory test reports, and full warranty information, including all responsibilities of the Owner to keep the warranty in force. The installation, start-up and checkout materials that are actually shipped with the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CXA. The CXA may request further documentation necessary for the commissioning process.**
   4. **In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning assistance, and training.**
   5. **Provide system specific receipt verification forms that will be used to verify that all major system components when received at the job site are free from damage and are in accordance with the engineering specifications and the submittals that have been approved by the architect / engineer and the owner.**
   6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Instrumentation shall meet the following standards:
   1. Be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance.
   2. Be calibrated within the manufacturer’s recommended intervals with calibration tags permanently affixed to the instrument being used.
   3. Be maintained in good repair and operation condition throughout the duration of use on this project.

B. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the contractor for the equipment being tested.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

A. Commissioning Authority has prepared the Commissioning Plan.
   1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.
   5. Commissioning of HVAC equipment will be in phases, based on the project schedule.

3.02 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.03 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. The following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.

5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
4. When asked to review the proposed Checklists, do so in a timely manner.

D. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.04 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by

the Commissioning Authority **and as approved by the equipment representatvies** with input by and coordination with Contractor.

2. Examples of Functional Testing:
    a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
    b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
    c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
    d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
2. Verify that sensors with shielded cable are grounded only at one end.
3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
2. Connect a signal generator in place of sensor.
3. Connect ammeter in series between transmitter and building automation system control panel.
4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.

7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg.
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
9. Hot Water Coil and Boiler Water Temperature: 1.5 degrees F.
10. Cooling Coil, Chilled and Condenser Water Temperatures: 0.4 degrees F.
11. Natural Gas and Oil Flow Rate: 1 percent of design.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.

3.06 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: **Testing will be to prescribed percentages and random. After similar failures, the testing will stop until an explanation is found and the problem is correct.**

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Commissioning Authority using dataloggers.
   3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
   4. Provide **electronic copies, in PDF format,** of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
   5. Graphical output is desirable and is required for all output if the system can produce it.
   6. Monitoring may be used to augment manual testing.

3.07 OPERATION AND MAINTENANCE MANUALS

A. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

B. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

C. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 011000 - Summary: Sequencing and staging requirements.

C. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

D. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

F. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

G. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

H. Section 02 08 00: Asbestos Removal

I. Section 02 09 70: PCB Remediation

J. Section 02 81 00 : Miscellaneous Hazardous Material Removal

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

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

1.04 SUBMITTALS

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

B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

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

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Refer to drawings for scope of items to be removed or salvaged for relocation.

B. Remove paving and curbs as required to accomplish new work.

C. Remove other items indicated, for salvage and relocation.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permit.
   7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations.

F. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

G. 1. See Spec Section 02 81 00 - Misc Hazardous Material Removal, and Hazardous Testing Reports.

H. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Comply with requirements of Section 017419 - Waste Management.
   2. Dismantle existing construction and separate materials.
   3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 30 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 30 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Protect interior structures & finishes from weather, mositure and deterioration during demoltion
      a. Repair and or replace deteriorting building elements due to exposure to the elements. Repair or replace deteriorating elements as required per manufacturer prior to installion of interior flooring, paint, and high performance coatings.
         1) GC responsible for coordination with manufacturer's and manufacturer reps.
   3. Protect existing concrete slabs, Drape slabs, from water pooling, water infiltration, spalling chipping and cracking.
      a. Pay particular attention to protect the drap slab's paper back wire mesh/ drape assembly from deterioration and mold groth. GC will be responsible for all mold/ paper back slab deterioration remediation.
   4. Remove all rust from steel, or other metal structurs, underslab mesh, supports etc.
   5. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   6. Repair adjacent construction and finishes damaged during removal work.
   7. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

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

B. Remove from site all materials not to be reused on site; comply with requirements of Section 017419 - Waste Management.

C. At the end of every work day, Leave site in a clean condition (broom swept), ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 032000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 042000 - Unit Masonry: Reinforcement for masonry.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI MNL-66 - ACI Detailing Manual; 2020.

C. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

F. CRSI (DA4) - Manual of Standard Practice; 2018, with Errata (2019).

1.04 SUBMITTALS

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

B. Shop Drawings: Comply with requirements of ACI MNL-66 Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.

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

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars.
   1. Comply with ACI CODE-318 steel reinforcing design strength requirements for splices in tension and compression.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Accommodate placement of formed openings.

C. Comply with applicable code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 014000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Concrete foundation walls.

E. Concrete reinforcement.

F. Joint devices associated with concrete work.

G. Miscellaneous concrete elements, including equipment pads and equipment pits.

H. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 032000 - Concrete Reinforcing.

B. Section 079200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.

F. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.

G. ACI PRC-308 - Guide to External Curing of Concrete; 2016.

H. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

I. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

J. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

O. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.

1.04 SUBMITTALS

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

B. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.

2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.

C. Test Reports: Submit report for each test or series of tests specified.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
2. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 032000.

B. Reinforcement Accessories:
1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
3. Provide plastic or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.
4. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C33/C33M.

C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 BONDING AND JOINTING PRODUCTS

A. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.

2.06 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.

2.07 MIXING

A. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

D. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.05 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.09 PROTECTION

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

END OF SECTION

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Mortar and grout.

C. Reinforcement and anchorage.

D. Flashings.

E. Lintels.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Loose steel lintels.

B. Section 061000 - Rough Carpentry: Nailing strips built into masonry.

C. Section 079200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2020a.

C. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2025b.

D. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2018.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

H. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

I. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016, with Editorial Revision (2018).

J. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

K. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

L. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2022.

M. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick; 1998 (Reapproved 2018).

N. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile; 2017.

O. ASTM C55 - Standard Specification for Concrete Building Brick; 2017.

P. ASTM C56 - Standard Specification for Structural Clay Nonloadbearing Tile; 2013 (Reapproved 2017).

Q. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.

R. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2021.

S. ASTM C73 - Standard Specification for Calcium Silicate Brick (Sand-Lime Brick); 2017.

T. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2021.

U. ASTM C91/C91M - Standard Specification for Masonry Cement; 2018.

V. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units; 2019.

W. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

X. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

Y. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

Z. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

AA. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

BB. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

CC. ASTM C476 - Standard Specification for Grout for Masonry; 2020.

DD. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

EE. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

FF. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

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

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
   1. Include calculations or selections from the manufacturer's prescriptive design tables that indicate compliance with the applicable building code and project conditions.
   2. Include the design engineer's stamp or seal on each sheet of shop drawings.

D. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.

E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

F. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

G. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

H. Designer's Qualification Statement.

I. Manufacturer's Qualification Statement.

J. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Fire Rated Assemblies: Comply with applicable code for UL (FRD) Assembly No. U905.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Load-Bearing Units: ASTM C90, normal weight.
      a. Exposed Faces: Manufacturer's standard color and texture.
   3. Nonloadbearing Units: ASTM C129.
      a. Hollow block, as indicated.

2.02 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 040511.

B. Masonry Cement: ASTM C91/C91M, Type N.
   1. Colored Mortar: Premixed cement as required to match Architect's color sample.

C. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
   1. Not more than 0.10 percent alkali.

D. Hydrated Lime: ASTM C207, Type S.

E. Mortar Aggregate: ASTM C144.

F. Grout Aggregate: ASTM C404.

G. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): Match existing.

H. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.

B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

2.04 LINTELS

A. As indicated on drawings.

2.05 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Interior, non-loadbearing masonry: Type O.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

3.03 COLD AND HOT WEATHER REQUIREMENTS

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

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

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.06 LINTELS

A. Install loose steel lintels over openings.

B. Maintain minimum 8 inch bearing on each side of opening.

3.07 GROUTED COMPONENTS

A. Reinforce bond beams with 1, #5 bar, 1 inch from bottom web.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

3.08 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

E. Form expansion joint as detailed on drawings.

3.09 BUILT-IN WORK

A. Install built-in items plumb, level, and true to line.

B. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

3.10 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Alignment of Columns: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.11 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.12 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 042616
ADHERED MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin brick.

B. Mortar.

C. Accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

B. ASTM C1088 - Standard Specification for Thin Veneer Brick Units Made from Clay or Shale; 2023.

C. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

D. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2021.

1.04 SUBMITTALS

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

B. Product Data: Provide data for masonry units, mortar, grout, and adhesive.

C. Samples: Submit four samples of masonry units to illustrate color, texture, and extremes of color range.

1.05 MOCK-UPS

A. Construct a mock-up panel sized 4 feet long by 4 feet high; include mortar, grout, adhesives, accessories, substrate, and representative wall openings in mock-up.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

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

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 THIN BRICK

A. Manufacturers:
   1. Endicott Clay Products Co: www.endicott.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Thin Brick: ASTM C1088.
   1. Type: TBX.
   2. Size: Manufacturer's standard Modular.
   3. Thickness: 5/8 inch.
   4. Tolerances: 1/16 inch.
   5. Color, Texture, Range, Special Shapes: As indicated on drawings.
   6. Protective Coating: Wax.

2.02 MORTAR MATERIALS

2.03 MORTAR MIXES

A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, non-loadbearing masonry: Type N.
   3. Interior, non-loadbearing masonry: Type O.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

2.04 THIN BRICK PANEL SYSTEM

A. Thin Brick Panel System with Mesh Backing: Thin brick factory-mounted and -aligned on mesh sheets.
   1. Adhesive: Manufacturer's recommended type.
   2. Grout: Manufacturer's recommended type.
   3. Manufacturers:
      a. BOD: Tabs II. See drawings.
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 INSTALLATION

A. Thin Brick:
   1. Exterior Applications: Comply with TCNA (HB) Method W201, W202, or W244E.

B. Thin Brick Panel System: Install according to manufacturer's written instructions.

3.03 MASONRY FLASHINGS

A. Whether or not specifically indicated on drawings, install masonry flashing to divert water to exterior at locations where downward flow of water is interrupted.
   1. Extend flashings full width at such interruptions at least 6 inches, minimum, to form watertight pan.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down to form drip.

3.04 CONTROL AND EXPANSION JOINTS

A. Form joints as detailed on drawings.

3.05 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Clean soiled surfaces with cleaning solution.

3.06 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 047200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Exterior wall units, including wall caps.

1.02 RELATED REQUIREMENTS

A. Section 040511 - Masonry Mortaring and Grouting: Mortar for setting cast stone.

B. Section 042000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

C. Section 079200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2025.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

J. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023.

1.04 SUBMITTALS

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

B. Product Data: Test results of cast stone components made previously by the manufacturer.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

1.05 MOCK-UPS

A. Provide full size cast stone components for installation in mock-up of exterior wall.

B. See Section 014000 - Quality Requirements for additional requirements.

C. Approved mock-up will become standard for appearance and workmanship.

D. Mock-up may remain as part of the completed work.

E. Remove mock-up not incorporated into the work and dispose of debris.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Polycor Natural Stone, A Polycore Inc. Company: www.polycor.com/#sle.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural granite, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
   4. Color: see drawings
   5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Admixtures: ASTM C494/C494M.

E. Water: Potable.

F. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

I. Mortar: Portland cement-lime, as specified in Section 040511 ; do not use masonry cement.

J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 042000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.02 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
1. Rake mortar joints 3/4 inch for pointing.
2. Remove excess mortar from face of stone before pointing joints.
3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
4. Leave the following joints open for sealant:
   a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   b. Joints in projecting units.
   c. Joints between rigidly anchored units, including soffits, panels, and column covers.
   d. Joints below lugged sills and stair treads.
   e. Joints below ledge and relieving angles.
   f. Joints labeled "expansion joint".

3.03 CLEANING

A. Keep cast stone components clean as work progresses.

B. Clean completed exposed cast stone after mortar is thoroughly set and cured.
1. Wet surfaces with water before applying cleaner.
2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
3. Remove cleaner promptly by rinsing thoroughly with clear water.
4. Do not use acidic cleaners.

3.04 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 047300
MANUFACTURED STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered manufactured stone masonry veneer (AMSMV).

B. Installation materials.

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Through-wall masonry flashings.

1.03 REFERENCE STANDARDS

A. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

B. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

C. ASTM C1780 - Standard Practice for Installation Methods for Cement-Cased Adhered Masonry Veneer; 2020.

D. ICC-ES AC51 - Acceptance Criteria for Adhered Manufactured Stone Masonry Veneer; 2018, with Editorial Revision (2021).

E. NCMA (AMSV) - Installation Guide and Detailing Options for Compliance with ASTM C1780 for Adhered Manufactured Stone Veneer; Current Edition, Including All Revisions.

F. NCMA TEK 20-01 - Key Installation Checkpoints for Manufactured Stone Veneer; 2014.

G. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 SUBMITTALS

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

B. Product Data: Provide data for AMSMV units, lightweight synthetic stone veneer, mortar, lath, rainscreen drainage material, and water-resistive barrier, including:

C. Shop Drawings: Submit detail drawings depicting proper installation and flashing techniques. Coordinate locations with those found on drawings.

D. Verification Samples: For each finish product specified, two samples, minimum size 12 inches square, representing actual product, color, patterns and texture.

1.05 MOCK-UPS

A. Construct mock-up panel 4 feet long by 4 feet high; include AMSMV, lightweight synthetic stone veneer, mortar, accessories, substrate, and representative wall openings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect products from precipitation combined with freezing temperatures. Do not install products with visible frozen moisture.

1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

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

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Adhered Manufactured Stone Masonry Veneer (AMSMV):
   1. See drawings.

2.02 MORTAR APPLICATIONS

A. At Contractor's option, mortar may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

2.03 MORTAR MIXES

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of specified strength in accordance with ASTM C270 with addition of water only.
   1. Type: Type S.
   2. Color: Standard gray.

PART 3 EXECUTION

3.01 PREPARATION

3.02 INSTALLATION - AMSMV

A. Install AMSMV with a cementitious mortar setting bed to a scratch coat backing surface, in accordance with AMSMV manufacturer's instructions, NCMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.

B. Mortar Joints: Concave.
   1. Style: Tight fit joints.

C. Caps: Install capstones where located on drawings.

3.03 CLEANING

A. Clean soiled surfaces with cleaning solution.

3.04 PROTECTION

A. Protect finished work from rain during and for 48 hours following installation.

B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

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. Structural steel.
   2. Grout.

1.03 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
   2. Welded built-up members with plates thicker than 2 inches.
   3. Column base plates thicker than 2 inches.

1.04 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 anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
   1. Power source (constant current or constant voltage).
   2. Electrode manufacturer and trade name, for demand critical welds.

D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator shop-painting applicators and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.
   6. Nonshrink grout.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control and special inspection reports.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 Endorsement P2 Endorsement P3 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of double angle shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using schematic details indicated and AISC 360.
   2. Use Load and Resistance Factor Design; data are given at factored-load level.

B. Moment Connections: Type FR, fully restrained.

2.02 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
   1. W-Shapes: 60 percent.
   2. Channels, Angles-Shapes: 60 percent.
   3. Plate and Bar: 25 percent.
   4. Cold-Formed Hollow Structural Sections: 25 percent.
   5. Steel Pipe: 25 percent.
   6. All Other Steel Materials: 25 percent.

C. W-Shapes: ASTM A 992/A 992M.

D. Channels, Angles-Shapes: ASTM A 36/A 36M.

E. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50.

F. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50.

G. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.

H. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

I. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
   1. Weight Class: Standard unless noted otherwise.
   2. Finish: Black except where indicated to be galvanized.

J. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

K. Steel Forgings: ASTM A 668/A 668M.

L. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
   1. Finish: Mechanically deposited zinc coating.
   2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Unheaded and Headed Anchor Rods: ASTM F 1554, Grade as indicated.
   1. Configuration: Straight or Hooked as indicated.
   2. Nuts: ASTM A 563 heavy-hex carbon steel.
   3. Plate Washers: ASTM A 36/A 36M carbon steel.
   4. Washers: ASTM F 436, Type 1, hardened carbon steel.
   5. Finish: Plain unless otherwise noted

F. Threaded Rods: ASTM A 36/A 36M, ASTM A 449, or ASTM A 572/A 572M, Grade 50.
   1. Nuts: ASTM A 563 heavy-hex carbon steel.
   2. Washers: ASTM A 36/A 36M carbon steel.
   3. Finish: Plain unless otherwise noted.

G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.04 PRIMER

A. Primer: Comply with Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

B. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

C. Primer: SSPC-Paint 23, latex primer.

D. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

E. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 ASTM A 780/A 780M.

2.05 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.06 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
   5. Galvanized surfaces.
   6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
   4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
   5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
   6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."

8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.09 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   3. Ultrasonic Inspection: ASTM E 164.
   4. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

2.11 TRADE PRACTICES ACT

A. Refer to Section 016000 Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved in advanced and in writing by the engineer of record. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.06 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

D. Touchup Priming: Cleaning and touchup priming are specified in Section 09 96 00 "High-Performance Coatings."

END OF SECTION

SECTION 052100
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Open web steel joists, with bridging, attached seats and anchors.

1.02 RELATED REQUIREMENTS

A. Section 051200 - Structural Steel Framing: Grouting base plates and bearing plates. Superstructure framing.

B. Section 051200 - Structural Steel Framing: Superstructure framing.

C. Section 053100 - Steel Decking: Bearing plates and angles.

D. Section 053100 - Steel Decking: Support framing for openings less than 18 inches in decking.

E. Section 055000 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.03 REFERENCE STANDARDS

A. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

B. SJI 100 - Standard Specifications for K-Series, LH-Series, and DLH-Series Open Web Steel Joists, and for Joist Girders; 2020.

C. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

D. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Open Web Joists: SJI Type K Joists:
   1. Provide bottom chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standard.
   3. Minimum End Bearing on Concrete or Masonry Supports: Comply with referenced SJI standard.
   4. Finish: Shop primed.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

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

2.02 FINISH

A. Shop prime joists as specified.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect joists with correct bearing on supports.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

C. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.

D. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

E. Do not field cut or alter structural members without approval of joist manufacturer.

END OF SECTION

SECTION 053100
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof deck.

B. Metal form deck.

C. Supplementary framing for openings up to and including 18 inches.

D. Bearing plates and angles.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

D. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

E. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporation: www.canam-steeljoists.ws.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 STEEL DECK

A. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.

B. Metal Form Deck: Corrugated sheet steel:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.

B. Welding Materials: AWS D1.1/D1.1M.

C. Fasteners: Galvanized hardened steel, self tapping.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gauge, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.

2.05 TRADE PRACTICES ACT

A. Refer to Section 016000 Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.

C. Weld deck in accordance with AWS D1.3/D1.3M.

D. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

E. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

F. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

A. Section 055213 - Pipe and Tube Railings.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

D. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

E. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

I. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Stainless Steel, General: ASTM A666/A666M, Type 304.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

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

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

C. Lintels: As detailed; prime paint finish.

2.05 FINISHES - STEEL

A. Prime paint steel items.

B. Prime Painting: One coat.

2.06 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I color anodized.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Placement of anchors in masonry.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. AISC 207 - Standard for Certification Programs; 2023.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

G. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

D. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
   2. Intermediate Rails: 1-1/2 inches diameter, round.
   3. Posts: 1-1/2 inches diameter, round.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.

E. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, galvanized finish.

B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.04 TRADE PRACTICES ACT

A. Refer to Section 016000 Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

B. Anchor railings securely to structure.

C. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof-mounted curbs.

B. Roofing cant strips.

C. Fire retardant treated wood materials.

D. Communications and electrical room mounting boards.

E. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

B. AWPA U1 - Use Category System: User Specification for Treated Wood; 2021.

C. PS 1 - Structural Plywood; 2009 (Revised 2019).

1.03 SUBMITTALS

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

B. Product Data: Provide technical data on wood preservative materials.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: Kiln-dry or MC15.

C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.02 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: Kiln-dry (15 percent maximum).

C. Surfacing: S4S.

D. Species: Douglas Fir.

E. Grade: No. 2, 2 Common, or Construction.

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84. Board to be field painted (full extents).

2.04 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

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

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Handrails.
   3. Grab bars.
   4. Restroom accessories.
   5. Wall-mounted door stops.
   6. White boards.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   2. Install adjacent boards without gaps.
   3. Size and Location: As indicated on drawings.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

3.05 CLEANING

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 061600
SHEATHING - DUP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating sheathing.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing.

1.03 ABBREVIATIONS AND ACRONYMS

A. AWB: Air- and Water-Resistive Barrier.

B. MgO: Magnesium Oxide.

1.04 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2021.

E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

I. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

J. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate sheathing manufacturer's fastener requirements with structural base wall system contractor and exterior cladding system contractor; coordinate fastener types.

B. Preinstallation Meetings: Review scope of work and schedule; meeting agenda includes:
   1. Mock-ups.
   2. Interface requirements of sheathing and structural base wall system substrate.
   3. Interface requirements of sheathing and exterior cladding system applied over sheathing.

1.06 SUBMITTALS

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

B. Product Data: For each sheathing type, indicate manufacturer's sheathing panels.

C. Shop Drawings:

1. Elevations: Indicate locations of sheathing, locations of sheathing penetrations, and detail call-outs.
    a. Drawing Scale: 1/8 inch to 1 foot, minimum.
2. Details: Typical and nontypical project-specific details at utility penetrations.
    a. Where manufacturer's sheathing installation instructions include multiple options and methods, indicate project-specific options and methods.
3. Manufacturer’s demonstrated compliance with NFPA 285 assembly.
4. Sample product warranty.

D. Manufacturer's Instructions: Sheathing panel system installation instructions.

1.07 QUALITY ASSURANCE

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

B. Documents at Project Site: Maintain at project site one copy of shop drawings and manufacturer's installation instructions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver products to project site in wrapped, protected, unbroken packaging with product identification labeling.

C. Store sheathing panels flat, under cover, and elevated above grade; store in original shipping packaging; avoid continuous exposure to moisture and direct sunlight.

D. Limit sheathing panel stack height in accordance with manufacturer's written instructions.

E. Store sealants in controlled environment between 33 degrees F and 70 degrees F temperature.

F. Handle sheathing panels without damaging or chipping.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Installer Warranty: Provide 10-year limited warranty commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. DuPont de Nemours, Inc: www.dupont.com/#sle.

B. Substitutions: Not permitted.

C. Source Limitations: Provide sheathing products from single manufacturer.

2.02 INSULATING SHEATHING

A. Description: Composite panels composed of foam insulation fused to MgO panels with factory-applied air- and water-resistive barrier.
1. Insulation: Rigid polyurethane foam; 3.23 pcf nominal density.
    a. Surface Burning Characteristics: Class A when tested in accordance with ASTM E84 or UL 723.
    b. Closed-cell content equal to or greater than 90 percent.
    c. Fabrication: Fused to face of MgO sheathing panels.
2. Magnesium Oxide (MgO) Sheathing Panels:
    a. Thickness: 1/2 inch.
    b. Surface Burning Characteristics: Class A when tested in accordance with ASTM E84 or UL 723.
3. Air- and Water-Resistive Barrier (AWB): Factory-fluid-applied membrane.
    a. Air Leakage Rate: When tested in accordance with ASTM E283/E283M:

1) 0.01 cfm/sq ft with pressure difference of 1.6 psf.
2) 0.04 cfm/sq ft with pressure difference of 6.27 psf.

b. Water Vapor Permeance: 0.5 perm, when tested in accordance with ASTM E96/E96M using Procedure A.
c. Water Penetration: Tested in accordance with ASTM E331, with pressure difference of 6.27 psf for two hours without failure.
d. Products:
1) DuPont de Nemours, Inc; ArmorSeal Plus Coating: www.dupont.com/#sle.
2) Substitutions: Not permitted.

4. Structural Performance: Manufacturer's sheathing assemblies tested in accordance with ASTM E330/E330M; see ICC Listing Report ESL-1306.
5. Fire Resistance: Manufacturer's sheathing assemblies tested in accordance with ASTM E119 and UL 263; see ICC Listing Report ESL-1302.
6. Fire Propagation: Manufacturer's sheathing assemblies tested in accordance with NFPA 285; see ICC Listing Report ESL-1442.
7. Fungi Resistance: Tested in accordance with ASTM C1338; no observed growth.
8. Panel Size: 48 by 96 inches.
9. Composite Panels with One MgO Sheathing Layer:
a. Total Composite Panel Thickness and Thermal Resistance:
1) 2 inches; R-10.
b. Products:
1) DuPont de Nemours, Inc; ArmorWall Plus FR SIS: www.dupont.com/#sle.

2.03 SEALANTS AND OTHER JOINT MATERIALS

A. Gunnable Grade Sealant: Moisture-cured, polyether sealant; comply with ASTM C920 Type S, Grade NS, Class 50.
1. Products:
a. DuPont de Nemours, Inc; ArmorSeal Sealant, Gunnable Grade: www.dupont.com/#sle.

B. Trowel Grade Sealant: Moisture-cured, polyether sealant; comply with ASTM C920 Type S, Grade NS, Class 50.
1. Products:
a. DuPont de Nemours, Inc; ArmorSeal Sealant, Trowel Grade: www.dupont.com/#sle.

C. Backer Rod: Cylindrical, cellular foam rod with surface that sealant does not adhere to; compatible with sealant; type recommended by sheathing manufacturer; sized to fit gap or joint.

D. Foam Insulation: Field-applied, low-rise, closed-cell foam insulation; type recommended by sheathing manufacturer.

2.04 FASTENERS

A. Description: Corrosion-resistant, low-profile screws with oversized heads; approved by sheathing manufacturer.
1. Screws: Concealor Low Profile Fasteners with Tri-Seal Long Life Coating.

B. Fasteners for Concrete Substrates:
1. Fastener #14-13 DP1.
2. Embedment into Substrate: 1 inch minimum, 1-1/2 inch maximum.

C. Fasteners for Steel Substrates: Steel plate thicknesses between 0.045 inch and 1/4 inch.
1. Fastener 1/4-14 DP3.
2. Penetration beyond Opposite Face: Three exposed threads minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify penetrations and rough openings are correctly located.

B. Verify substrates are ready for work of this section.

C. Do not proceed with work until unsatisfactory existing conditions are corrected.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive sheathing.

B. Remove projections and protruding fasteners that might interfere with proper installation.

C. Clean substrate surfaces to receive sheathing.

D. Remove dirt and debris from substrates prior to sealant application.

3.03 INSTALLATION

A. See Section 054000 for installation of cold-formed steel stud framing assemblies providing structural base wall system substrates for sheathing.

B. Install sheathing system panels, components and accessories in accordance with sheathing manufacturer's published instructions.

C. Install sheathing panels vertically or horizontally.

D. Install sheathing panels within specified tolerances.

E. Trim insulation to make tight fits; do not compress insulation.

F. Fit insulation layer in panels tight to adjacent panel insulation and to exterior surfaces of utility services penetrating insulation layers.

G. Attach sheathing to structural base wall system with specified fasteners applicable for substrate type and substrate material thickness.

H. Install typical penetrations and punched opening penetrations in sheathing in accordance with manufacturer's published instructions. Refer to installation instructions for optional methods for penetrations and penetration returns.

I. Panel Gaps from Oversized Holes of Cylindrical Pipe Penetrations: Fill gaps 1/8 inch and wider with backer rod and sealant.

J. Panel Gaps from Typical Penetrations: Fill gaps with field-applied, closed-cell foam insulation.

K. Apply sealants at fastener heads, seams, cut edges, penetrations, inside corners and outside corners; install sealants and joint materials in accordance with and in locations indicated in manufacturer's published installation instructions.

L. Install backer rods and apply sealants at sheathing perimeter termination joints.

3.04 TOLERANCES

A. Maximum Variation of Sheathing Panels from Plumb: 1/4 inch in 10 feet.

B. Maximum Variation of Sheathing Panels from Level: 1/4 inch in 10 feet.

C. Maximum Variation of Sheathing Panel-to-Panel Joint Width: 3/4 inch.

3.05 PROTECTION

A. Protect installed sheathing from subsequent construction operations.

B. Cover top and edge of unfinished sheathing panels to protect them from weather and prevent water accumulation in panel cores.

C. Protect sheathing insulation layer from open flames.

D. Insulation Sunlight Exposure: Protect sheathing insulation layer from sunlight exposure for durations over 15 days. If extended exposure is anticipated, cover exposed insulation with waterproof tape recommended by sheathing manufacturer.

E. Air- and Water-Resistive Barrier Exposure Limits: Protect AWB surfaces from weather exposure for durations over 180 days without approval of sheathing manufacturer.

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Hardware (for casework).

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

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

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. BHMA A156.9 - Cabinet Hardware; 2020.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Product Data: Provide data for all materials.

D. Samples: Submit physical samples finishes.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical & moisture damage.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
   3. Adjustable Shelf Loading: 40 lbs. per sq. ft.
      a. Deflection: L/144.
   4. Cabinet Style: Flush overlay.
   5. Cabinet Doors and Drawer Fronts: Flush style.
   6. Drawer Construction Technique: As recommended by fabricator.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. Wilsonart LLC as indicated on drawings.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Provide specific types as indicated in construction documents.
   1. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, through color, _____ color, finish as indicated.

2.04 COUNTERTOPS

A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, as indicated on drawings.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.

C. Fasteners: Size and type to suit application.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as indicated for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

C. Fixed Specialty Workstation and Countertop Brackets:
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied powder coat.
   3. Color: As indicated on drawings..
   4. Manufacturers:
      a. Rakks/Rangine Corporation; EH Series Brackets (or approved equal).
      b. Substitutions: See Section 016000 - Product Requirements.

D. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.

E. Drawer Slides:
   1. Type: Standard extension.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Manufacturers:
      a. Accuride International, Inc.
      b. Grass America Inc.
      c. Knape & Vogt Manufacturing Company.

F. Hinges: European style concealed type, steel with satin finish.
   1. Manufacturers:
      a. Grass America Inc.
      b. Blum, Inc.
      c. Hafele.

2.07 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL (DIR) listed and approved identification on fire retardant treated material.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.08 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Seal cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use concealed joint fasteners to align and secure adjoining cabinet units.

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

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

3.03 ADJUSTING

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

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 066100
CAST POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid surfacing fabrications.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

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

B. Shop Drawings: For each type of cast polymer, indicate:
   1. Plans and Elevations: Include dimensions and field measurements; indicate location of fabricated units.

C. Samples: For each _____ type, two samples, 12 inches by 12 inches in size, indicating specified color.

1.04 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Surface Fabrications:
   1. Wilsonart, as indicated on drawings.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 SOLID SURFACING FABRICATIONS

A. Solid Surfacing: Densified, homogeneous, nonporous castings fabricated into sheets; composed of acrylic resins, fillers, color chips, and pigment and performance-enhancing additives.

B. Applications: As indicated on drawings..
   1. Style: As indicated on drawings.
   2. Color: As indicated on drawings.

2.03 FABRICATION

A. Fabricate units with embedded anchors, stiffening ribs, and sufficient strength for handling and placement stresses.

B. Fabricate cutouts where indicated.

C. Radius corners and edges with 1/4 inch minimum radius; polish exposed edges.

D. Provide consistent finish over exposed surfaces matching approved samples.

E. Fill seams and mold lines; grind smooth and finish to match adjacent cast polymer surfaces.

F. Fabricate units with internal drainage networks or other means to eliminate infiltrating water to exterior of unit.

G. Built-Up Edges: Laminate components where design requirements indicate built-up edges; follow manufacturer's recommended procedures for laminating.

2.04 ACCESSORIES

A. General: Accessories recommended by cast polymer manufacturer for complete installation.

B. Adhesives: Type recommended by cast polymer manufacturer for application; not containing formaldehyde or volatile organic compounds.

C. Joint Sealants: Type recommended by cast polymer manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements are as indicated on shop drawings.

B. Verify substrates are prepared to receive cast polymer fabrications.

3.02 INSTALLATION

A. Install cast polymer units in accordance with manufacturer's written instructions.

B. Align work plumb and level.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation from Plumb: 1/4 inch in 10 feet.

C. Maximum Variation from Level: 1/4 inch in 10 feet.

3.04 CLEANING

A. Clean exposed surfaces of installed units in accordance with manufacturer's instructions.

END OF SECTION

SECTION 068316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.03 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two sample illustrating material and surface design of panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels: Basic of Design: Koroguard, as indicated on drawings.

B. Or approved equal from one of the following
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.
   2. Marlite, Inc.: www.marlite.com/#sle.
   3. Nudo Products, Inc.: www.nudo.com/#sle.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.10 inch.
   3. Surface Design: Embossed.
   4. Color: As indicated on drawings

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

B. Trim: Vinyl; color coordinating with panel.

C. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
E. Install panels with manufacturer's recommended gap for panel field and corner joints.
F. Place trim on panel before fastening edges, as required.
G. Fill channels in trim with sealant before attaching to panel.
H. Install trim with adhesive and screws or nails, as required.
I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 071616
CRYSTALLINE WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Crystalline waterproofing.

B. Liquid waterproofing admixtures.

1.02 REFERENCE STANDARDS

A. ASTM C157/C157M - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete; 2017.

B. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method); 2021.

C. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.

D. NSF 61 - Drinking Water System Components - Health Effects; 2020.

E. UL (DIR) - Online Certifications Directory; Current Edition.

F. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Test data showing hydraulic permeability.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.
   5. Details for waterproofing at joints, intersections, and other special conditions.

C. Specimen warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Take necessary precautions to keep cementitious materials dry.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Installer Warranty: Provide 5-year warranty commencing on the Date of Substantial Completion for correcting leaking waterproofing, unless leakage is caused by structural failure, structural movement, or other causes beyond the installer's control. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Crystalline Waterproofing:
   1. Gemite Products Inc: www.gemite.com/#sle.
   2. W. R. Meadows, Inc; CEM-KOTE CW PLUS: www.wrmeadows.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Liquid Waterproofing Admixture:
   1. ISE Logik: www.iselogik.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 ASSEMBLIES

A. Crystalline Waterproofing for Concrete Building Surfaces:
   1. Surfaces as indicated on drawings.

B. Liquid Waterproofing Admixture for Water-Holding Structural Surfaces:
   1. Elevator pits.
   2. Retaining walls.
   3. Foundations, footings, and other below-grade structures.

2.03 MATERIALS

A. Crystalline Waterproofing: Portland cement, quartz or silica sand, and other active chemicals that when applied to surface of concrete forms insoluble crystals in capillary pores preventing passage of liquids, while having no adverse effect on normal properties of concrete.
   1. Water Permeability of Applied Concrete: No measurable leakage or water flow at pressure ranging from 175 psi to 200 psi when tested in accordance with COE CRD-C 48, using at least 2-inch thick sample, and with applied surface preparation and installation in accordance with NRCA (WM).
   2. Toxicity: Non-toxic.
      a. Potable Water and Drinking Water Safe: Provide UL (DIR) listed and labeled waterproofing; tested safe for use in potable drinking water applications in accordance with NSF 61.

B. Liquid Waterproofing Admixture: Nontoxic liquid admixture, free of Volatile Organic Compounds (VOCs), manufactured with deionized water, and formulated to react with hydroxide ion products by cement hydration process. Specifically formulated for use in normal and lightweight structural concrete mixes.
   1. Mitigating Effects: Alkali-Silica Reaction (ASR) mitigation in accordance with ASTM C1260, and mitigating effect on shrinkage in accordance with ASTM C157/C157M.
   2. Toxicity: Nontoxic.
   3. VOCs: None.
   4. Products:

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions, and consider use of sandblasting, water blasting, or acid etching as recommended.

C. Plug water leaks.

D. Patch holes, construction joints, and cracks; remove defective concrete.

E. Obtain approval of manufacturer's field representative before beginning installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written instructions, maintain environmental conditions required and recommended by manufacturer, and keep a copy of manufacturer's instructions on site.

B. Coordinate waterproofing installation with installation of products that must penetrate waterproofed surfaces.

C. Prevent excessive drying of surface.

1. Cure waterproofing for at least three days, or length of time required by manufacturer, with water spray and adequate air circulation.
2. Do not use chemical curing agents unless explicitly approved by waterproofing manufacturer.

D. Do not backfill, fill water or liquid holding structures, or apply finish coatings until time period recommended by manufacturer has passed.

3.04 PROTECTION

A. Protect from damage by weather; do not cover with vapor impermeable sheathing or films unless air circulation is provided.

B. Touch-up, repair or replace damaged waterproofing after Date of Substantial Completion.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall and underside of floor slabs.

B. Batt insulation in exterior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2022.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

G. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2024.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

I. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.03 SUBMITTALS

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

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.04 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.

5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
6. Board Edges: Square.
7. Thickness: As indicated on Architectural Drawings
8. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.
9. Products:
    a. DuPont de Nemours, Inc; Styrofoam Brand Square Edge: building.dupont.com/#sle.
    b. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
    c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
    d. Substitutions: See Section 016000 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
    1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
    2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
    3. Thermal Resistance: As indicated on Architectural Drawings
    4. Thickness: As indicated on Architectural Drawings
    5. Products:
        a. Johns Manville; Mineral Wool TempControl Batts: www.jm.com/#sle.
        b. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
        c. ROCKWOOL; AFB: www.rockwool.com/#sle.
        d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
    1. Application: Sealing of interior circular penetrations, such as pipes or cables.
    2. Width: Are required for application.

B. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
    1. Width: 3-1/2 inches.
    2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

C. Mineral Wool Insulation Attachment:
    1. Products:
        a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Grip-Lok MW Plate: www.trufastwalls.com/#sle.
        b. Substitutions: See Section 016000 - Product Requirements.

D. Rigid Insulation Pronged Attachment Washers: Solid plastic cap washer with prongs and flexible perimeter seal attached with screws to substrate for attachment of rigid insulation and to help seal against air and moisture penetration through weather barrier assembly.
    1. Products:
        a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Thermal-Grip ci Prong Washer: www.trufastwalls.com/#sle.
        b. Substitutions: See Section 016000 - Product Requirements.

E. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

F. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.

G. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.04 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 074213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.04 SUBMITTALS

A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, _____, and methods of anchorage.

C. Samples: Submit two samples of wall panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.

D. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

D. Prevent contact with materials that may cause discoloration or staining of products.

1.06 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Concealed Fasteners:
   1. ATAS International, Inc; Metafor: www.atas.com/#sle.

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels and Roof Screen Panels
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Design Pressure: In accordance with applicable codes.
   4. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
   5. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   6. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   7. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   8. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   9. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.

B. Exterior Wall Panels:
   1. Profile: Vertical; MFP120, Interlock smooth style.
   2. Side Seams: Double-interlocked, tight-fitting, The fasteners are concealed by the rib of the adjoining panel.
   3. Material: Precoated aluminum sheet, 16 gauge, 0.0508 inch minimum thickness.
   4. Panel Width: 12 inches.
   5. Color: As indicated on drawings.
   6. Finish: Smooth Texture

C. Roof Screen Panels
   1. Material: Precoated aluminum sheet, 16 gauge, 0.0508 inch minimum thickness.
   2. Color: As indicated on drawings.
   3. Finish: Smooth Texture

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

E. Expansion Joints: Same material, thickness and finish as exterior sheets; ___ gauge, ___ inch thick; manufacturer's standard brake formed type, of profile to suit system.

F. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

G. Anchors: Galvanized steel.

2.03 MATERIALS

A. Precoated Aluminum Sheet: ASTM B209/B209M, 3105 alloy, O temper, with smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.
   1. Products:
      a. PPG; Duranar: www.ppgmetalcoatings.com/#sle.

2.05 ACCESSORIES

A. 1" G90 Vented Horizontal Z-Girt by Monarch Metal Inc.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 079200

C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
   1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Use concealed fasteners unless otherwise indicated by Architect.

F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.02 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.03 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.04 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 074213.23
METAL COMPOSITE MATERIAL WALL PANELS – 3A COMPOSITES USA, INC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal composite material wall panel system.

1.02 REFERENCE STANDARDS

A. AAMA 508 - Voluntary Test Method and Specification for Pressure Equalized Rainscreen Wall Cladding Systems; 2021.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020.

C. 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.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

G. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

H. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2025b.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

J. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

K. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2021a.

L. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

M. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

N. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

O. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2021).

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

Q. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

R. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

S. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

T. ASTM E1233/E1233M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Cyclic Air Pressure Differential; 2014 (Reapproved 2021).

1.03 SUBMITTALS

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

B. Product Data:
   1. Wall System: Manufacturer's data sheets on each product.
   2. MCM Panels: Manufacturer's data sheets on each product.

C. Shop Drawings: Indicate layout, elevations, dimensions of panels, connections, details and location of joints, sealants, gaskets, method of anchorage, support clips, anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Indicate panel numbering system.
   2. Differentiate between shop and field fabrication.
   3. Indicate adjustments required to coordinate with adjacent work within wall system.
   4. Include large scale details of anchorages and connecting elements.
   5. Include details or schematic, exploded, or isometric diagrams to explain flashing at scale of minimum 1-1/2 inches equals 12 inches (1:10).

D. Samples:
   1. For Initial Selection: For each finish product, including sealants, provide three color chips representing manufacturer's standard range of available colors and patterns.

E. Test Reports: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.

1.04 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver products in manufacturer's original, unopened, and undamaged containers with identification labels intact.

C. Storage:
   1. Store products protected from exposure to harmful weather conditions and at temperatures recommended by manufacturer.
   2. Store in well-ventilated space out of direct sunlight.
   3. Protect from moisture and condensation with weathertight covering installed to provide ventilation.
   4. Store at slope, ensuring positive drainage of accumulated water.

1.05 FIELD CONDITIONS

A. Ambient Conditions:
   1. Fabricate and install system only when existing and forecasted weather conditions permit assembly in accordance with manufacturer's instructions and warranty requirements.
   2. Do not field fabricate or install panels when air temperature or relative humidity are outside manufacturer's limits.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ALUCOBOND by 3A Composites USA; ALUCOBOND PLUS - Dry Reveal: www.alucobondusa.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Comply with ASTM E330/E330M.

1. Size components to support assembly dead loads and withstand live loads caused by positive and negative wind pressure acting normally to wall plane.
2. Maximum Allowable Deflection:
   a. Panels: L/60 for length (L) of span.
   b. Perimeter Framing: L/175 normal to plane of wall.
   c. Anchors: 1/16 inch at connection points to framing members.

B. Thermal Movement: Provide system accomodating expansion and contraction from thermal movement at material temperature range of minus 20 degrees F to 180 degrees F without noise, buckling, or damage to system components.

C. Cyclic Air Pressure: Able to withstand maximum external gust pressure of 25.1 psf and maximum cavity pressure of 15.3 psf for 0.08 seconds when tested in accordance with ASTM E1233/E1233M.

D. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec/sq m) maximum leakage when tested at 6.24 psf (300 Pa) pressure difference in accordance with ASTM E283/E283M.

E. Water Penetration: No water penetration after 15 minutes of static pressure when tested in accordance with ASTM E331 and AAMA 508 at differential of 10 percent of inward acting design load, 6.27 psf minimum.

F. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

G. Building Envelope Performance: Comply with ASHRAE Std 90.1 I-P when tested as part of building envelope assembly.

H. Adhesive Peel Strength: 22.5 in-lb/inch when tested for bond integrity in accordance with ASTM D1781.

2.03 METAL COMPOSITE MATERIAL WALL PANEL SYSTEM

A. Description: Dry seal type; metal panels, fasteners, and anchors designed for use with supports provided by others.

B. Provide watertight and structurally sound wall panel system that prevents uncontrolled water penetration on inside face of system.

C. MCM Panels: Comprised of two 0.020-inch thick aluminum sheet facings bonded to extruded thermoplastic core.
1. Thickness: 0.157 inch.
2. Size: As indicated on drawings.
3. Core: Fire retardant.
4. Exterior Finish: PVDF fluoropolymer.
5. Provide concealed attachment to supporting structure with attachment members adhered to back of panel.

D. Steel Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
1. Provide material strength, dimensions, and configuration as required by structural engineer to meet applied loads and in accordance with applicable building code.

E. Drainage Holes: AAMA 508, 3/8-inch diameter, 16 inches on center.

2.04 MATERIALS

A. Aluminum Sheet: ASTM B209/B209M, 6061 alloy, T6 temper.

B. Aluminum Extrusions: ASTM B221 and ASTM B221M.

C. Steel Sheet: ASTM A653/A653M galvanized to G90 or zinc-iron alloy-coated to A60; or ASTM A792/A792M aluminum-zinc coated to AZ60.

2.05 FABRICATION

A. Fabricate panels as indicated on drawings and as recommended by MCM sheet manufacturer:

1. Rout and return panel edges.
2. Ensure panel lines, breaks, curves, and angles are sharp and true.
3. Keep plane surfaces free from warp or buckle.
4. Keep panel surfaces free of scratches or marks.

2.06 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multicoat superior performing organic coatings system complying with AAMA 2605, including minimum 70 percent PVDF resin, with minimum 80 percent of coil-coated metal surfaces having minimum total dry film thickness of 0.9 mil, 0.0009 inch; color and gloss as indicated on drawings.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.07 ACCESSORIES

A. Flashing: Sheet aluminum, minimum 18 gauge, 0.040 inch thick; finish matching MCM sheet.

B. Anchors, Clips, and Accessories: Provide one of the following:
   1. Stainless Steel: Comply with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666/A666M.
   2. Steel: Comply with ASTM A36/A36M; hot-dip zinc coated in accordance with ASTM A153/A153M.
   3. Steel: Comply with ASTM A36/A36M; hot-dip galvanized in accordance with ASTM A123/A123M, with coating thickness grade of 100.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not install defective products, including warped, bowed, dented, and broken members and members with damaged finishes.

B. Install panel system in accordance with fabricator's instructions, manufacturer's instructions, and approved shop drawings.

C. Secure attachment members to back face of panels in accordance with MCM sheet manufacturer's instructions.

D. Do not form panels in field unless required by wall system manufacturer and approved by Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

E. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape to prevent electrolytic action between metals.

F. Install flashing as indicated on shop drawings. At flashing butt joints, provide lap strap under flashing and seal lapped surfaces with full bed of nonhardening sealant.

3.02 TOLERANCES

A. Installation Tolerances:
   1. Shim and align MCM wall panel units on level and plumb within tolerance of 1/4 inch in 20 feet, noncumulative.
   2. Install panels within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.03 CLEANING

A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

B. Remove protective films, temporary coverings, and temporary protection.

C. Clean installed products in accordance with manufacturer's instructions.

3.04 PROTECTION

A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION

SECTION 075400.13
THERMOPLASTIC AND SBS MODIFIED BITUMINOUS HYBRID ROOFING – GAF

PART 1 GENERAL

1.01 SECTION INCLUDES

A. TPO and SBS modified bituminous hybrid roofing for new construction applications.

B. Cover boards.

C. Insulation.

D. Vapor retarder.

1.02 RELATED REQUIREMENTS

A. Section 053100 - Steel Decking.

B. Section 061000 - Rough Carpentry: Wood nailers, curbs, and blocking.

C. Section 072700 - Air Barriers.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C728 - Standard Specification for Perlite Thermal Insulation Board; 2017a.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2022.

D. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a.

E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

H. ASTM D6164/D6164M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements; 2021.

I. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2021.

K. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials; 2021.

L. FM (AG) - FM Approval Guide; current edition.

M. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).

N. FM 4470 - Examination Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1. Attendees: Owner, Contractor, Architect, installer, roofing manufacturer's technical representative, and installers whose work interfaces with or affects the work of this section.

1.05 SUBMITTALS

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

B. Product Data: Provide data for roofing system materials, components, and accessories.

C. Shop Drawings: Include roof plans and details showing terminations, flashings, penetrations, attachment methods, tie-ins, and interface with adjacent work.
   1. Indicate insulation thicknesses and slopes.
   2. Include project-specific tapered insulation layout prepared by roofing manufacturer.
   3. Roof plan indicating orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.

D. Samples for Verification: Submit two samples 6 by 6 inches in size of roof membrane.

E. Manufacturer's Letter: Certify products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 5 years of documented experience and listed in FM (AG) RoofNAV for specified roofing system.

B. Installer Qualifications: Company specializing in performing work of this section with minimum 3 years of documented experience and approved by manufacturer for specified warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver materials in manufacturer's original containers, dry and undamaged, with seals unbroken and labels intact, unless otherwise indicated.

C. Store materials in weather protected environment, clear of ground and moisture, and within temperature range required by manufacturer.

D. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

E. Protect liquids and foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Contact roofing manufacturer to confirm acceptable assemblies for special applications. Conform with manufacturer's instructions.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing materials when ambient temperature is below 45 degrees F unless otherwise permitted by manufacturer in writing.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be covered the same day.

F. Schedule applications so no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY OR GUARANTEE

A. See Section 017800 - Closeout Submittals for additional warranty or guarantee requirements.

B. System Guarantee: Provide manufacturer's system guarantee.
   1. Guarantee: GAF EverGuard® Diamond Pledge NDL Roof Guarantee.
   2. Term: 20 years .
   3. Liability Limit: No dollar limit on covered repairs.
   4. Scope of Coverage:
      a. Repair of covered leaks resulting from manufacturing defects, ordinary wear and tear, or workmanship in applying the covering materials, subject to certain exclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
   1. GAF; 1 Campus Drive; Parsippany, NJ 07054; Toll Free Tel: 877-423-7663; Email: {hl#20}: www.gaf.com/#sle.

2.02 ROOFING SYSTEM

A. Roofing System Description: Listed from top of roof down.
   1. Single Ply Membrane: TPO fleece-back membrane; adhered.
   2. Base Sheet: Smooth membrane; cold adhered.
   3. Cover Board: glass fiber-reinforced cellulosic facers (GRF) bonded to a core of high; mechanically fastened.
   4. Insulation: Minimum two layers, having maximum board thickness of 1-1/2 inches.
      a. Total System R-Value: Minimum R-value as indicated on drawings.
      b. Top Layers: Polyisocyanurate foam board; adhered.
      c. Bottom Layer: Polyisocyanurate foam board; mechanically fastened.
   5. Vapor Retarder: Self-adhering membrane.

2.03 MEMBRANE MATERIALS

A. TPO Membrane:
   1. Thermoplastic polyolefin sheet complying with ASTM D6878/D6878M with internally reinforced scrim.
      a. Fleece-Back Membrane: 60-mil, 0.060-inch nominal TPO thickness.
   2. Impact Resistance: Membrane to resist impact damage when tested in accordance with the Resistance to Foot Traffic Test in FM 4470.
   3. Accelerated Weathering: Roof to withstand 2000 hours of exposure when tested in accordance with ASTM G155.
   4. Color: Gray.
   5. Products:
      a. GAF EverGuard® TPO Fleece-Back Membrane: www.gaf.com/#sle.

2.04 BASE SHEETS

A. Base Sheet:
   1. SBS-Modified Bitumen, Smooth-Surfaced Membrane: Polyester-mat base sheet complying with ASTM D6164/D6164M, Type I, Grade S.
   2. Products:
      a. GAF RUBEROID® HW Smooth Membrane: www.gaf.com/#sle.

2.05 FLASHING MATERIALS

A. Membrane Flashing: Matching membrane materials and attachment methods as specified for base and cap sheets.

2.06 ASPHALT MATERIALS

A. Asphalt Adhesive: Manufacturer's standard asbestos-free, cold-applied adhesive, specially formulated for compatibility and use with roofing membrane sheets and base flashing sheets.
   1. Product:

B. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required by roofing membrane manufacturer.
   1. Product:

C. Roofing Asphalt: ASTM D312/D312M, Type III or Type IV as recommended by roofing system manufacturer.

2.07 COVER BOARDS

A. Cover Board: Glass Fiber-reinforced cellulosic facers (GRF) bonded to a core of high density polyisocyanurate foam complying with ASTM C1289, Type II Class 5 Grade 1

1. Thickness: 1/2 inch
2. Products
   a. GAF; ENERGYGUARD HD-MA POLYISO COVER BOARD

2.08 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, non-halogenated, TCCP-free, complying with ASTM C1289.
   1. Classification: Type II, Class 1 - Faced with glass-fiber-reinforced cellulosic facers on both major surfaces of core foam.
   2. Mold Growth Resistance: Passing ASTM D3273.
   3. Low Temperature Stability: Maintains R-value at 75 degrees F and 40 degrees F mean temperature when tested in accordance with ASTM C518.
   4. Compressive Strength: Grade 2, 20 psi minimum.
   5. Board Size: 48 by 96 inches.
   6. Tapered Board: Same type as primary roof insulation.
   7. Products:
      a. GAF; EnergyGuard™ Polyiso Insulation: www.gaf.com/#sle.

2.09 VAPOR RETARDER

A. Self-Adhering Vapor Retarder Membrane: Material approved by roof manufacturer complying with requirements of fire rating classification and compatible with adjacent materials.
   1. Water Vapor Permeance: 0.04 perm, maximum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method.
   2. Water Penetration Resistance around Nails: Pass, when tested in accordance with ASTM D1970/D1970M.
   3. Products:
      a. GAF; GAF SA Vapor Retarder XL: www.gaf.com/#sle.

2.10 ACCESSORIES

A. Miscellaneous Accessories: Provide pourable sealers, primers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

B. Prefabricated Flashing Accessories: Same material as membrane in manufacturer's standard thicknesses, including:
   1. Inside corners, outside corners, universal corners, and fluted corners.
   2. Square tube wraps.
   3. Conical pipe boots and split pipe boots.

C. Wood Nailers, Curbs, and Blocking: See Section 061000.

D. Cant Strips and Tapered Edge Strips: Nonflammable perlite, complying with ASTM C728.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
   1. DRILL-TEC FASTENERS & PLATES

F. Termination Bars: Manufacturer’s standard aluminum bars with integral caulk ledge.

G. Sealants: As recommended by membrane manufacturer.

H. Welded Flexible Walkways: Heavy-duty, slip-resistant, textured PVC walkway roll, suitable for maintenance traffic and visually distinctive from roof membrane.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of moisture, snow, or ice.

E. Verify roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.

3.02 PREPARATION - METAL DECK

A. Verify metal deck conforms with manufacturer's minimum requirements.
   1. Minimum Uncoated Thickness: 22-gauge, 0.03-inch, grade 33 (230) structural steel.
   2. Galvanized Coating: Minimum G90.
   3. Meeting the gauge and span requirements in the current FM (AG) and installed in accordance with FM DS 1-28 or specific FM approval.
   4. Re-roofing Over Existing Metal Decks: Remove surface corrosion and repair severely corroded areas. Fasten loose or inadequately secured decking and replace defective decking.

B. Verify surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION, GENERAL

A. Perform work in accordance with manufacturer's instructions and FM Approvals RoofNAV.

B. Do not apply roofing components during cold or wet weather conditions outside of manufacturer’s approved conditions.

C. Do not apply roofing membrane when ambient temperature is outside of manufacturer’s required temperature range.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be covered the same day.

F. Coordinate this work with installation of associated counterflashings installed by other sections as work of this section proceeds.

G. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty or guarantee for existing roofing system.

H. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 072700.

I. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

J. Install night seal at end of each workday or when rain is forecast. Provide temporary seals to prevent water from entering completed sections of roofing system. Ensure stagger and offset of underlying insulation to prevent thermal breaks. Remove and discard temporary seals before beginning work on adjoining roofing.

K. Install roof anchors at 1 every 15' min.

3.04 INSTALLATION - VAPOR RETARDER

A. Install vapor retarder to substrate in accordance with manufacturer's instructions.

B. Self-Adhering Vapor Retarder Membrane: Provide side and end lapping of each sheet. 3 inches minimum. Seal laps by rolling with a weighted roller.

C. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

D. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

3.05 INSTALLATION - INSULATION

A. Installation Over Metal Deck: Attach insulation in accordance with roofing manufacturer's instructions and FM (AG) requirements. Where insulation is installed directly over metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
   1. Base Layer: Mechanically fasten base layer of insulation using fasteners specifically designed and sized for fastening specified roof insulation to metal decks.
   2. Upper Layers: Adhere upper layers of insulation using insulation adhesive.

B. Lay subsequent layers of insulation with joints staggered from joints of preceding layer in accordance with manufacturer's instructions.

C. Place tapered insulation to required slope pattern in accordance with manufacturer's instructions.

D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

E. At roof drains, slope insulation down to roof drains with each side equal to the diameter of the drain bowl plus 36 inches.

F. Install cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degrees.

G. Do not install more insulation than can be covered with membrane in same day.

3.06 INSTALLATION - COVER BOARD

A. Install cover board over insulation with joints staggered from joints of insulation in accordance with manufacturer's instructions.

B. Trim cover board neatly to fit around penetrations and projections as directed by cover board manufacturer.

C. Mechanical Attachment: Fasten cover board in accordance with manufacturer's instructions and FM (AG) requirements.

3.07 INSTALLATION – BASE SHEET

A. Prime substrate in accordance with manufacturer's instructions.

B. Roll out base sheet and allow to relax.

C. Accurately align base sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Shingle joints on sloped substrates in direction of drainage.

D. Extend base sheet beyond top of cants to minimum dimension required by manufacturer.

E. Adhered Base Sheet Application:
   1. Cold Adhesive: Apply adhesive at prescribed rate and in conformance with manufacturer’s instructions. Bond and apply pressure by means required by manufacturer. Adhere one roll before proceeding to adjacent rolls.
   2. Apply pressure in accordance with manufacturer’s instructions to remove air pockets and achieve complete adhesion.

F. Repair tears and punctures and ensure laps are completely sealed.

3.08 INSTALLATION – CAP MEMBRANE

A. Roll out membrane, free from wrinkles or tears.

B. Accurately align membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Shingle joints on sloped substrates in direction of drainage.

C. Adhered Application:
   1. Adhesive: Apply adhesive at prescribed rate and in conformance with manufacturer’s instructions. Bond and apply pressure by means required by manufacturer. Adhere one roll before proceeding to adjacent rolls.

2. Apply pressure in accordance with manufacturer’s instructions to remove air pockets and achieve complete adhesion.

D. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings. Test lap edges with probe to verify seam weld continuity in accordance with manufacturer’s technical bulletins.

E. Extend membrane under copings and secure to outside face of wall.

3.09 INSTALLATION – FLASHING AND ACCESSORIES

A. Install flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations, and secure in accordance with manufacturer's instructions.
1. Install flashing with complete adhesion with no bridging, air pockets, or gaps.
2. Fasten top edge of flashing sheets with manufacturer’s recommended fasteners. Seal penetrations watertight using manufacturer’s sealant or mastic.

B. Asphaltic Base Flashing Sheet:
1. Install base flashing sheets on vertical surfaces, down over cants and onto horizontal roof surfaces the minimum dimension required by manufacturer.
2. Terminate base flashing sheets a minimum of 8 inches and a maximum of 24 inches above roofline.
3. Install corner membrane flashings and seal transitions, terminations, and penetrations according to manufacturer’s instructions.

C. Single-Ply Cap Flashing Sheet:
1. Install cap flashing sheets over base plies and lap onto roof surfaces the minimum dimension required by manufacturer.
2. Install cap sheet stripping where metal flanges and edgings are set on roof in accordance with manufacturer's instructions.

D. Install roofing expansion joints where indicated. Make joints watertight.

E. Coordinate installation of roof drains and related flashings. Terminate membranes according to manufacturer’s approved details. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.10 INSTALLATION – WALKWAYS

A. Walkways: Install walkways in accordance with roofing system manufacturer's instructions at the following locations. Provide manufacturer's minimum clearance between units.
1. Perimeter of each rooftop unit.
2. Between each rooftop unit location, creating continuous paths connecting rooftop unit locations.
3. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
4. Locations indicated on drawings.

3.11 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Properly dispose of all product wrappers, pallets, cardboard, scrap, waste and debris. Replace damaged material with new materials.

C. Clean adjacent construction where soiled by work of this section. Comply with manufacturer of adjacent construction's instructions and procedures.

3.12 PROTECTION

A. Protect installed roofing system from construction operations.

B. Correct deficiencies in work in accordance with warranty or guarantee requirements. Repair or replace defaced or damaged finishes caused by work of this section.

3.13 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Provide maintenance program agreement for specified GAF Well Roof Extension.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and exterior penetrations.

B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

E. CDA A4050 - Copper in Architecture - Handbook; Current Edition.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

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

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples, 6 by ___ inches in size, illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. 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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. ALUCOBOND by 3A Composites USA; ALUCOBOND AXCENT: www.alucobondusa.com/#sle.
   2. Petersen Aluminum Corporation; _____: www.pac-clad.com/#sle.
   3. Tamlyn: www.tamlyn.com/#sle.

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Underlayment: Polyethylene, 30 mil, ___ inch thick.

C. Slip Sheet: Rosin-sized sheathing paper.

D. Primer Type: Zinc chromate.

E. Concealed Sealants: Non-curing butyl sealant.

F. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

G. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 INSTALLATION

A. Comply with drawing details.

B. Comply with SMACNA Architectural Sheet Metal Manual

C. Comply with NRCA Roofing Menual

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

END OF SECTION

SECTION 077100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.

D. NRCA (RM) - The NRCA Roofing Manual; 2022.

1.03 SUBMITTALS

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

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two appropriately sized samples of coping.

E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Architectural Products Co; _____: www.archprod.com/#sle.
   2. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
   3. Metal Roofing Systems, Inc; Rapid Lock Coping: www.metalroofingsystems.biz/#sle.

2.02 COMPONENTS

A. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
   3. Wall Width: As indicated on drawings.
   4. Outside Face Height: As indicated on drawings.
   5. Inside Face Height: As indicated on drawings.
   6. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
   7. Color: As indicated on drawings.
   8. Products:
      a. ATAS International, Inc: www.atas.com/#sle.
      b. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
      c. Metal-Era Inc: www.metalera.com/#sle.

B. Pipe and Penetration Flashing: Base of rounded aluminum, compatible with sheet metal roof systems, and capable of accomodating pipes sized between 3/8 inch and 12 inches.
   1. Color: As indicated on drawings.

C. Roof Penetration Sealing Systems: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

2.03 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.04 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

C. Insulation Board Adhesive: Two-component, low-rise polyurethane foam adhesive used for adhering insulation to low slope roof deck materials.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

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

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Comply with NRCA (RM) drawing details as noted:

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Equipment rails.

C. Roof penetrations mounting curbs.

1.02 RELATED REQUIREMENTS

A. Section 077100 - Roof Specialties: Other manufactured roof specialty items.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. FM (AG) - FM Approval Guide; current edition.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
   1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store products under cover and elevated above grade.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for _____. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   2. Sheet Metal Material:
      a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
         1) Finish: Mill finish.
         2) Color: As selected by Architect from manufacturer's standard line of colors.
   3. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
      a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
      b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
      c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
      d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.

B. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
   1. Provide preservative treated wood nailers along top of rails.
   2. Height Above Finished Roof Surface: 8 inches, minimum.

C. Equipment Support: Straight curbs on each side of equipment, with top of curbs parallel with metal roofing system and each other for equipment mounting.

D. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.

2.02 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
   1. Design Loadings and Configurations: As required by applicable codes.
   2. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   4. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

SECTION 078413
PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.

B. Related Sections:
   1. Section 07 84 46 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.03 ACTION SUBMITTALS

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

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing penetration firestopping 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. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
   1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
      b. Classification markings on penetration firestopping correspond to designations listed by the following:
         1) UL in its "Fire Resistance Directory."

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.07 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

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. Hilti, Inc.
   2. 3M Fire Protection Products.
   3. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.02 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is 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.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg .
   1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-wool-fiber or rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
   2. Substrate primers.
   3. Collars.
   4. Steel sleeves.

PART 3 EXECUTION

3.01 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 the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with 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 penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.03 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. 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.

3.04 IDENTIFICATION

A. 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:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.05 CLEANING AND PROTECTION

A. 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.

B. 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.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

C. Section 092216 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

D. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

J. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

1.04 SUBMITTALS

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

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Sample product warranty.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

1.05 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver to manufacturer sufficient samples for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.06 WARRANTY

A. See Section 017000 - Execution and cl for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Joints between different exposed materials.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
      c. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      c. Joints where installation of sealant is specified in another section.
      d. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Type ___ - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Type ___ - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Non-Staining to Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Manufacturers:
      a. Dow; DOWSIL 795 Silicone Building Sealant: www.dow.com/#sle.
      b. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): www.pecora.com/#sle.
      c. Sika Corporation; Sikasil WS-290: www.usa.sika.com/#sle.
      d. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: Match adjacent finished surfaces.
   3. Manufacturers:
      a. Dow; DOWSIL 999-A Building and Glazing Sealant: www.dow.com/#sle.
      b. Pecora Corporation; Pecora 860: www.pecora.com/#sle.
      c. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.
   2. Manufacturers:
      a. Pecora Corporation; DynaTrol II: www.pecora.com/#sle.
      b. Sika Corporation: www.usa.sika.com/#sle.
      c. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
   2. Open Cell: 40 to 50 percent larger in diameter than joint width.

B. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.
   1. Size: 1 inch wide, in rolls 100 feet long.
   2. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
   3. Durometer Hardness, Type A: 26 to 32, minimum, when tested in accordance with ASTM D2240.
   4. Tensile Strength: 218 psi, in accordance with ASTM D412.

C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

SECTION 080671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Sliding Doors.
3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Integrated Door Opening Assemblies”.
2. Division 08 Section “Door Hardware”.
3. Division 08 Section “Automatic Door Operators”.
4. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 08 17 00 – Integrated Door Opening Assemblies.
2. Section 08 71 00 – Door Hardware.
3. Section 08 71 13 – Automatic Door Operators.
4. Section 28 15 00 – Access Control Hardware Devices.

C. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. RU - Corbin Russwin
6. RI - RITE Door
7. RF - Rixson
8. NO - Norton
9. SA - SARGENT
10. LU - Lund Equipment Co

Hardware Sets

Set: 1.0

Doors: 101A

2	Continuous Hinge	CFM__HD1 PT X LAR		PE	087100	
2	Electric Power Transfer	EL-CEPT	630	SU	087100	
1	Concealed Vert Rod Exit (thumbturn)	PED4850T MELR PED159 AD M92 (MELR, REX)	630	RU	087100	
1	Concealed Vert Rod Exit, Exit Only	PED4801 MELR EO AD M92 (MELR, REX)	630	RU	087100	
2	Door Pull	RM3311-Full Height (mounting as required)	US32D	RO	087100	
1	Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100	
1	Automatic Opener	6061 D	689	NO	087100	
1	Gasketing	By Door Manufacturer		00		
2	Sweep	307APK		PE	087100	
1	Threshold	273x3AFG MSES10SS		PE	087100	
2	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	
2	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	
2	Position Switch	DPS-M-BK		SU	087100	
1	Door Switch	502		NO	087100	
1	Switch Post	500	689	NO	087100	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	

Notes: OUTSIDE OPERATION: DURING NORMAL HOURS PUSHING OUTSIDE PUSH BUTTON UNLOCKS EXIT DEVICES AND ACTIVATES OPERATORS. AFTER HOURS OUTSIDE PUSH BUTTON IS NOT ACTIVE.
INSIDE OPERATION: PUSHING PUSH BUTTON WILL UNLOCK EXIT AND ACTIVATE OPERATOR. EGRESS IS BY EXIT DEVICE. EMERGENCY ACCESS IS BY KEY.

Set: 2.0

Doors: 102A

1	Continuous Hinge	CFM__HD1 X LAR		PE	087100	
1	Continuous Hinge	CFM__HD1 PT X LAR		PE	087100	
1	Concealed Vert Rod Exit, Exit Only	PED4801 M52 EO AD	630	RU	087100	

1	Concealed Vert Rod Exit, Exit Only	PED4801 MELR EO AD M92 (MELR, REX)	630	RU	087100	
1	Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100	
1	Automatic Opener	6061 D	689	NO	087100	
1	Gasketing	By Door Manufacturer		00		
2	Sweep	307APK		PE	087100	
1	Threshold	273x3AFG MSES10SS		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	
2	Position Switch	DPS-M-BK		SU	087100	
1	Door Switch	502		NO	087100	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	

Notes: PUSHING WALL SWITCH WILL UNLOCK EXIT DEVICE AND ACTIVATE OPERATOR.

Set: 3.0

Doors: 101B

2	Continuous Hinge	CFM__HD1 PT X LAR		PE	087100	
2	Electric Power Transfer	EL-CEPT	630	SU	087100	
1	Concealed Vert Rod Exit (thumbturn)	PED4850T MELR PED159 AD M92 (MELR, REX)	630	RU	087100	
1	Concealed Vert Rod Exit, Exit Only	PED4801 MELR EO AD M92 (MELR, REX)	630	RU	087100	
2	Door Pull	RM3311-Full Height (mounting as required)	US32D	RO	087100	
1	Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100	
1	Automatic Opener	6061 D	689	NO	087100	
1	Gasketing	By Door Manufacturer		00		
2	Sweep	307APK		PE	087100	
1	Threshold	273x3AFG MSES10SS		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	

1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	
1	Position Switch	DPS-M-BK		SU	087100	⚡
1	Door Switch	502		NO	087100	⚡
1	Switch Post	500	689	NO	087100	⚡
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: OUTSIDE OPERATION: DURING NORMAL HOURS PUSHING OUTSIDE PUSH BUTTON UNLOCKS EXIT DEVICES AND ACTIVATES OPERATORS. AFTER HOURS OUTSIDE PUSH BUTTON IS NOT ACTIVE UNLESS AUTHORIZED CREDENTIAL IS PRESENTED TO CARD READER (DIV 28) WHICH UNLOCKS EXIT DEVICE AND ACTIVATES EXTERIOR PUSH BUTTON.
INSIDE OPERATION: PUSHING PUSH BUTTON WILL UNLOCK EXIT AND ACTIVATE OPERATOR. EGRESS IS BY EXIT DEVICE. EMERGENCY ACCESS IS BY KEY.

Set: 4.0

Doors: 124A

1	Continuous Hinge	CFM__SLI-HD1 X LAR		PE	087100	
2	Rim Exit Device, Exit Only	PED4201 M52 EO	630	RU	087100	
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100	
1	Gasketing	By Door Manufacturer		00		
1	Sweep	307APK		PE	087100	
1	Threshold	273x3AFG MSES10SS		PE	087100	
1	Position Switch	DPS-M-BK		SU	087100	⚡

Set: 5.0

Doors: 139B

1	Continuous Hinge	CFM__HD1 PT X LAR		PE	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Electrified Rim Exit (fail secure)	PED52605-SN200 A N9605PT BIPS	630	RU	281500	⚡
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100	

1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	Rain Guard	346C		PE	087100	
1	Sweep	307APK		PE	087100	
1	Threshold	2009APK MSES10		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	
1	Position Switch	DPS-M-BK		SU	087100	⚡
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: PRESENTING AUTHORIZED CREDENTIAL TO INTEGRATED CARD READER UNLOCKS EXTERIOR TRIM ALLOWING ACCESS. EXIT DEVICE ALLOWS EGRESS AT ALL TIMES. PUSHING RAIL ACTIVATES REX SWITCH. EMERGENCY ACCESS BY KEY.

Set: 6.0

Doors: 144

1	Continuous Hinge	CFM__HD1 PT X LAR		PE	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Access Control Cyl Lock	CLX33605-SN200 NZD BIPS	626	RU	281500	⚡
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	Rain Guard	346C		PE	087100	
1	Threshold	1715A MSES25		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	
1	Position Switch	DPS-M-BK		SU	087100	⚡
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: PRESENTING AUTHORIZED CREDENTIAL TO INTEGRATED CARD READER UNLOCKS EXTERIOR TRIM ALLOWING ACCESS. LEVER WHICH ACTIVATES REX SWITCH ALLOWS EGRESS AT ALL TIMES .

Set: 7.0

Doors: 101C, 102B

2	Continuous Hinge	CFM__HD1 X LAR		PE	087100	
2	Door Pull	RM3311-Full Height (mounting as required)	US32D	RO	087100	
1	Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100	
1	Automatic Opener	6061 D	689	NO	087100	⚡
1	Gasketing	By Door Manufacturer		00		
2	Sweep	307APK		PE	087100	
2	Door Switch	502		NO	087100	⚡

Notes: PUSHING EITHER PUSH BUTTON WILL ACTIVATE OPERATOR.

Set: 8.0

Doors: S201A, S201B, S202

3	Hinge (heavy weight)	T4A3786 x NRP	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Electrified Rim Exit (fail safe)	PED52603-SN200 A N9603PT BIPS	630	RU	281500	⚡
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as required)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	⚡
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	

1	Position Switch	DPS-M-BK		SU	087100	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	

Notes: PRESENTING AUTHORIZED CREDENTIAL TO INTEGRATED CARD READER UNLOCKS EXTERIOR TRIM ALLOWING ACCESS. EXIT DEVICE ALLOWS EGRESS AT ALL TIMES. PUSHING RAIL ACTIVATES REX SWITCH. ACTIVATION OF FIRE ALARM UNLOCKS EXIT DEVICE TRIM ALLOWING FREE ACCESS.

Set: 9.0

Doors: 143

3	Hinge (heavy weight)	T4A3786 x NRP	US26D	MK	087100	
1	Rim Exit Device (classroom)	PED5245 A N945PT	630	RU	087100	
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as required)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Electromagnetic Holder	998 X voltage as required	689	RF	087100	
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	

Notes: MAGNETIC HOLD OPEN RELEASED WHEN FIRE ALARM IS ACTIVATED.

Set: 10.0

Doors: S101, S102, S301, S302A, S302B, S401A, S401B, S402

3	Hinge (heavy weight)	T4A3786	US26D	MK	087100
1	Rim Exit Device (passage)	PED5210 A N910PT	630	RU	087100
1	Surface Closer	7500 (brackets and drop plate as required)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 11.0

Doors: 124B, 124C

3	Hinge (heavy weight)	T4A3786 x NRP	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	
1	Rim Exit Device, Exit Only (Fire, delayed egress)	PED5201 A D EO	630	RU	087100	
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	CLP7500 (brackets and drop plate as required)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	

Notes: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL SHUNT DELAYED EGRESS EXIT DEVICE ALLOWING EXIT. EGRESS IS BY EXIT DEVICE. PUSHING TOUCHBAR WILL ACTIVATE DELAYED EGRESS AND LOCAL ALARM; DELAYED EGRESS WILL LOCK DOWN EXIT FOR 30 SECONDS AND THEN RELEASE EXIT. ACTIVATION OF FIRE ALARM WILL DROP POWER TO DELAYED EGRESS ALLOWING FREE EGRESS.

Set: 12.0

Doors: 139A

3	Hinge (heavy weight)	T4A3786 x NRP	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	
1	Electrified Rim Exit (Fire, delayed egress)	PED52905 A D N9905PT	630	RU	087100	
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	CLP7500 (brackets and drop plate as required)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	

Notes: CARD READERS BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK TRIM AND SHUNT DELAYED EGRESS. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL SHUNT DELAYED EGRESS EXIT DEVICE ALLOWING EGRESS. EGRESS IS BY EXIT DEVICE. PUSHING TOUCHBAR WILL ACTIVATE DELAYED EGRESS AND LOCAL ALARM; DELAYED EGRESS WILL LOCK DOWN EXIT DEVICE FOR 30 SECONDS AND THEN RELEASE EXIT DEVICE. ACTIVATION OF FIRE ALARM WILL DROP POWER TO DELAYED EGRESS ALLOWING FREE EGRESS.

Set: 13.0

Doors: 105, 201, 301, 401

1	Recessed Exit	D3677 (Supplied with Rite Door)	US32D	RI	081700
1	Trim (passage)	D3080-03 (Supplied with Rite Door)	US32D	RI	081700
1	Surface Closer (pocket door)	7706EPSTP (brackets and drop plate as required)	689	NO	087100
1	Electromagnetic Holder	998 X voltage as required	689	RF	087100

Notes: MAGNETIC HOLD OPEN RELEASED WHEN FIRE ALARM IS ACTIVATED. INTEGRATED DOOR SYSTEM WITH CONTINUOUS HINGES, EXIT DEVICE WITH TRIM SUPPLIED WITH DOOR AND FRAME.

Set: 14.0

Doors: 423

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Storeroom Lock	CLX3357 NZD	626	RU	087100
2	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 15.0

Doors: 331, 419, 425

3	Hinge, Full Mortise	TA2714xNRP	US26D	MK	087100
1	Storeroom Lock	CLX3357 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 16.0

Doors: 221

3	Hinge, Full Mortise	TA2714xNRP	US26D	MK	087100
1	Storeroom Lock	CLX3357 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Surface Overhead Holder/Stop	10-X46	630	RF	087100
3	Silencer	608		RO	087100

Set: 17.0

Doors: 431

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Storeroom Lock	CLX3357 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as required)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 18.0

Doors: 114, 205, 305, 405

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Storeroom Lock	CLX3357 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Surface Closer	7500 (brackets and drop plate as required)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 19.0

Doors: 212, 213, 214, 222, 223, 312, 314, 327, 328, 332, 417, 426, 427, 428, 429

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Entrance Lock	CLX3351 NZD	626	RU	087100

1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 20.0

Doors: 108, 109, 118, 119, 120, 128, 129, 130, 131, 132, 133, 134, 136, 209, 215, 220, 315, 316, 318, 322, 329, 412A, 413A, 416, 424, 432

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Passage Latch	CLX3310 NZD	626	RU	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 21.0

Doors: 219B

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Passage Latch	CLX3310 NZD	626	RU	087100
1	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as required)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 22.0

Doors: 313

6	Hinge, Full Mortise	TA2714	US26D	MK	087100
2	Flush Bolt (manual)	555 (metal) / 557 (wood)	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Classroom Lock	CLX3355 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
2	Surface Closer	CLP7500 (brackets and drop plate as required)	689	NO	087100
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
2	Silencer	608		RO	087100

Set: 23.0

Doors: 117A, 411

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Classroom Lock	CLX3355 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 24.0

Doors: 418A, 418B

3	Hinge, Full Mortise	TA2714xNRP	US26D	MK	087100
1	Classroom Lock	CLX3355 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1	Silencer	608		RO	087100

Set: 25.0

Doors: 106, 115A

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Classroom Lock	CLX3355 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as required)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 26.0

Doors: 326

3	Hinge, Full Mortise	TA2714xNRP	US26D	MK	087100
1	Classroom Lock	CLX3355 NZD	626	RU	087100
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100
1	Surface Closer	7500 (brackets and drop plate as required)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100

1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 27.0

Doors: 112, 113, 208

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Privacy Lock (with indicators both sides)	CLX3320 NVSL V33	626	RU	087100
1	Surface Closer	2800ST	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 28.0

Doors: 107, 203, 204, 206, 303, 304, 306, 319, 403, 404, 406

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Privacy Lock (with indicators both sides)	CLX3320 NVSL V33	626	RU	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 29.0

Doors: 121, 137

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Hospital Privacy Lock (with indicators both sides)	CLX3320H NVSL V33	626	RU	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 30.0

Doors: 110, 116A, 116B, 116C, 140, 142, 210, 218, 308, 309, 310, 323, 408, 409, 410, 412B, 413B

3	Hinge (heavy weight)	T4A3786	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Access Control Cyl Lock	CLX33605-SN200 NZD BIPS	626	RU	281500	⚡
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	

1	Surface Closer	7500 (brackets and drop plate as required)	689	NO	087100	
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	⚡
1	Position Switch	DPS-M-BK		SU	087100	⚡
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: PRESENTING AUTHORIZED CREDENTIAL TO INTERGAL LOCK CARD READER UNLOCKS EXTERIOR TRIM ALLOWING ACCESS. INSIDE LEVER ALLOWS EGRESS AT ALL TIMES. INSIDE LEVER HAS RX SWITCH. LATCHBOLT MONITORED.

Set: 31.0

Doors: 123, 135, 141, 207A, 207B, 211, 219A, 302, 307A, 307B, 311, 317, 320, 321, 325, 330, 407A, 407B, 414, 415, 421

3	Hinge (heavy weight)	T4A3786 x NRP	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Access Control Cyl Lock	CLX33605-SN200 NZD BIPS	626	RU	281500	⚡
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU	087100	
1	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as required)	689	NO	087100	
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100	⚡
1	Position Switch	DPS-M-BK		SU	087100	⚡
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: PRESENTING AUTHORIZED CREDENTIAL TO INTERGAL LOCK CARD READER UNLOCKS EXTERIOR TRIM ALLOWING ACCESS. INSIDE LEVER ALLOWS EGRESS AT ALL TIMES. INSIDE LEVER HAS RX SWITCH. LATCHBOLT MONITORED.

Set: 32.0

Doors: 115B, 117B

3	Hinge (heavy weight)	T4A3786	US26D	MK 087100	
1	Electric Power Transfer	EL-CEPT	630	SU 087100	⚡
1	Access Control Cyl Lock	CLX33605-SN200 NZD BIPS	626	RU 281500	⚡
1	Mortise, Rim or Cylindrical Cylinder	To match existing system	626	RU 087100	
1	Surface Closer	7500 (brackets and drop plate as required)	689	NO 087100	
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO 087100	
1	Gasketing	S88BL (Head & Jambs)		PE 087100	
1	Sweep	307APK		PE 087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK 087100	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK 087100	⚡
1	Pushbutton	PB		SU 087100	⚡
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU 087100	⚡

Notes: PRESENTING AUTHORIZED CREDENTIAL TO INTERGAL LOCK CARD READER OR PUSH BUTTON AT DESK UNLOCKS EXTERIOR TRIM ALLOWING ACCESS. INSIDE LEVER ALLOWS EGRESS AT ALL TIMES. INSIDE LEVER HAS RX SWITCH. LATCHBOLT MONITORED. POWER SUPPLY BY SECURITY INTEGRATOR.

Set: 33.0

Doors: 217, 324, 420A, 420B, 422

6	Hinge, Full Mortise	TA2714	US26D	MK 087100	
2	Magnetic Catch	901	ALM	RO 087100	
2	Half Dummy Trim	CLX3350 NZD	626	RU 087100	
2	Surf Overhead Stop	10-X36	630	RF 087100	
2	Silencer	608		RO 087100	

Set: 34.0

Doors: 126, 127

1	Hardware	By Door Manufacturer	00

Set: 35.0

Doors: MISC

1	Repair Kit	QC-R001	MK 087100	
1	Crimp Tool	QC-R003	MK 087100	
1	Key Cabinet	1205	LU	

END OF SECTION 080671

SECTION 081200
INTERIOR ALUMINUM DOOR AND GLAZING FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Pre-finished aluminum door frames for interior use.
   2. Pre-finished aluminum window frames for interior use.
   3. Pre-finished aluminum framing systems for interior use.
   4. Pre-finished aluminum and glass doors for interior use.

B. Related sections:
   1. Section 082110 – Flush wood doors.
   2. Section 087100 – Door hardware.
   3. Section 088000 – Glass and glazing.

1.02 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product data: Manufacturer's fabrication and installation instructions.
   1. Include information on factory finish, glazing gaskets, accessories, and other required components.

C. Shop drawings: Submit schedule indicating opening numbers, frame types, dimensions, swings and hardware requirements.

D. Include elevations and details indicating frame types, profiles, conditions at openings, methods and locations of anchoring, glazing requirements, hardware locations and reinforcements for hardware.

E. Instructions: Provide copies of manufacturer's data for fabrication and installation of aluminum door frames.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Provide aluminum frames, aluminum and glass doors and accessories produced by a single manufacturer for each type of product indicated.

B. Manufacturer's qualifications: Company specializing in the manufacturing of door frame systems with a minimum of 10 years of documented experience on a comparable sized project.

C. Fire and smoke rated assemblies:
   1. In locations where fire rated openings are scheduled or required by regulatory agencies, provide fire rated aluminum frames that have been tested and certified for specified exposure by an agency acceptable to governing authorities.
   2. Provide labels permanently fastened on each fire rated frame that are within size limits established by NFPA and the testing authority. Where scheduled:
      a. Provide 20 minute labels.
      b. Provide 90 minute labels.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver frames and doors cartoned to provide protection during transit and storage at project site.

B. Inspect frames and doors upon delivery for damage.
   1. Repair minor damage to pre-finished products by means as recommended by the manufacturer.
   2. Replace frames that cannot be satisfactorily repaired.

C. Store frames at the project site under cover and as near as possible to the final installation location. Do not use covering material that will cause discoloration of aluminum finish.

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Integrated Door Opening Assemblies”.
5. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
6. Division 08 Section "Door Hardware".
7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. 10. SDI-113 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door & Frame Assemblies.
10. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
11. ASTM C1199 - Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
12. ASTM E1423 - Practice for Determining Steady State Thermal Transmittance of Fenestration Systems.
13. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
14. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
15. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
16. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
17. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
18. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
19. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. 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 positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 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 non-vented 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. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Pioneer Industries (PI).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch 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 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. 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. Design: Flush panel.
2. Core Construction: Manufacturer’s thermally enhanced QMax core. Where indicated provide doors fabricated as thermal-rated assemblies with a minimum thermal rating of 0.35 BTU/hr-ft2-F.
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. 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. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.

5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - QMax Core - 707 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - Mercury 3 Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 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, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated

or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 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. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

9. 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 on-center and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template 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 non-template, 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.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

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; and compatible with substrate and field-applied coatings.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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 square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

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 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. 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 post-installed expansion anchors.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

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. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not begin installation of the frames or doors until the area of work has been completely enclosed and the interior is protected from the elements.

B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy. If necessary, provide temperature control and ventilation to maintain required environmental conditions.

1.06 WARRANTY

A. Warrant against defects in manufacturing of materials for a period of 2 years from date of substantial completion.

B. Warrant framing finish against defects, including cracking, flaking, blistering, peeling and excessive fading, chalking and non-uniformity in color for a periosd of 5 years.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Provide products manufactured by:

1. CR Laurence
   2200 E 55th Street
   Los Angeles, CA 90058-3438
   800-421-6144
   www.crlaurence.com
2. Frameworks Manufacturing
   1910 Cypress Station Drive, Suite 100
   Houston, Texas 77090
   713-692-5222
   www.frameworks.com
3. Wilson Partitions
   110 Viaduct Road
   Stamford, CT 06907
   203-316-8033
   www.wilsonpart.com

B. Substitutions: Comply with provisions of Section 01600 for substitution requests.

2.02 MATERIALS

A. Aluminum: Controlled alloy billets meeting requirements of ASTM B221, 6063 T5 alloy, to assure compliance with tight dimensional tolerances and maintain color uniformity.

2.03 INTERIOR ALUMINUM FRAMES

Snap-On Trim Profile: Provide frames with the following characteristics:

- Rectilinear design.

- Trim 2" typical, 4" high base.

- 4-7/8" throat typical, vif.

- Accepts 1/4”, 3/8” and 1/2” glass.

2.04 FABRICATION

A. Pre-machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within the frame.

B. Provide corner reinforcements and alignment clips for precise butt or mitered connections.

C. Fabricate all components to allow secure installation without exposed fasteners.

D. Manufacturer shall pre-cut and ship all frame materials knock-down.

2.05 FINISHES

A. Factory finish extruded frame components so that any part exposed to view upon completion of installation will be uniform in finish and color.

B. Clear Anodic Coating (AC-2): Comply with AAMA 611.Commercial, AAM12C22A21 anodized coating, less than .04 mil minimum thick.

C. TRADE PRACTICES ACT

D. Refer to Section 016000 Product Requirements.

2.06 TRADE PRACTICES ACT

REFER TO SECTION 016000 PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine project conditions and verify that the work of this section may properly commence. Do not proceed with the installation until unsatisfactory conditions have been corrected.

B. Verify that the wall thickness does not exceed manufacturer's recommended tolerances of specified frame throat size.

3.02 INSTALLATION

A. Comply with frame manufacturer's printed installation instructions and approved shop drawings. Strictly adhere to maintaining specified wall thickness to insure dimension does not exceed frame throat size specified. Installation not to be attempted in areas where the wall thickness exceeds the tolerance of the specified throat size.

B. Install frames plumb and square, securely anchored to substrates with fasteners recommended by frame manufacturer.

- Use concealed installation clips to assure that splices and connections are tightly butted and properly aligned.

- Secure clips to main structural extrusion components and not to snap-in or trim members.

- Do not use screws or other fasteners that will be exposed to view when installation is complete.

3.03 ADJUSTING AND CLEANING

A. Clean exposed frames promptly after installation, using cleaning methods recommended by frame manufacturer.

B. Touch up marred areas so that touch-up is not visible from a distance of 4 feet. Remove and replace frames that cannot be satisfactorily adjusted.

3.04 PROTECTION

A. Provide protection required to assure that frames will be without damage or deterioration upon substantial completion of the project.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

D. Section 092116 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.

E. Section 099123 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.04 SUBMITTALS

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

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of door veneer illustrating wood grain, stain color, and sheen.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty, executed in Owner's name.

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. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
   1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Masonite Architectural; Aspiro Select Wood Veneer Doors: www.architectural.masonite.com.
   2. Oregon Door, Architectural Series: www.oregondoor.com.
   3. Lyden Door, Architectural Series: www.lyndendoor.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Medium-Density Overlay (MDO) Faced Doors (Paint Grade):
   1. Masonite Architectural; Cendura Standard Painted Doors: www.architectural.masonite.com/#sle.
   2. VT Industries.
   3. Oregon Door.

C. Bullet Resistant Wood Doors:
   1. Overly Door Company: www.overly.com/product-types/bullet-resistant.
   2. Construction Specialties Acrovyn: www.c-sgroup.com/doors/bullet-resistant-doors.
   3. Total Security Solutions: www.tssbulletproof.com/product/doors.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Premium Grade, Standard Duty performance, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White oak, HPVA Grade A, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Stain to match existing (VIF).

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: Match existing doors - field verify.
      c. Sheen: Satin.

B. Factory finish doors in accordance with approved sample.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 081113.

B. Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048 (at any rated openings).
   2. Glazing: Single vision units, 1/4 inch thick glass.
   3. Tint: Clear.

C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

D. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.
   1. Adjust width of non-rated doors by cutting equally on both jamb edges.
   2. Trim maximum of 3/4 inch off bottom edges.
   3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 081700 – INTEGRATED DOOR OPENING ASSEMBLIES

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. Integrated door opening assemblies including metal frame, integrated door system with operating hardware, and associated door hardware as specified in this section.
2. Factory fitting and hardware preparation for doors and frames.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 08 Section "Hollow Metal Doors and Frames" for integrated assembly doors installed in standard hollow metal frames.
3. Division 08 Section "Glazing" for glass view panels in integrated assemblies.
4. Division 09 Section "Interior Painting" for field painting integrated assembly doors and frames.
5. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on integrated assembly doors and frames with factory installed electrical knock out boxes.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
3. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
4. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
5. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
6. ICC/IBC - International Building Code.
7. NFPA 70 - National Electrical Code.
8. NFPA 80 - Fire Doors and Windows.
9. NFPA 101 - Life Safety Code.
10. NFPA 105 - Installation of Smoke Door Assemblies.
11. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
12. CARB – California Air Resources Board.
13. State Building Codes, Local Amendments.

D. Standards: All hardware specified herein to comply with the current version year of the following industry standards:

1. ANSI/BHMA Certified Product Standards, A156 Series.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including integrated opening assembly construction and installation details, material descriptions, core descriptions, hardware reinforcements, profiles, anchorage, fire resistance rating, operational descriptions and finishes.

B. Door Hardware Schedule: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Include the following information:

1. Type, style, function, size, label, hand, and finish of each door hardware item.
2. Manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
5. Explanation of abbreviations, symbols, and codes contained in schedule.
6. Mounting locations for door hardware.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of door and frames types including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Details of conduit and preparations for power, signal, and control systems.
8. Provide all dimensions necessary required to complete recessed pockets.

D. Keying Schedule: Reference Division 08 Section "Door Hardware" for keying requirements.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete integrated assembly installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the installed assemblies and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project site under provisions Division 01 Section "Product Storage and Handling Requirements". Inspect doors, frames, and hardware with representatives of the supplier to verify shipment is complete and to rectify discrepancies promptly.

1. Integrated door assembly systems to be delivered to the job site complete with necessary screws, miscellaneous parts, instructions, and installation templates. Each package legibly and properly labeled to correspond to the approved Door Schedule.

B. Furnish integrated door opening assemblies with operating hardware flush to door skin, using protective wrappings and spacers between projecting hardware. Maintain and protect door assemblies using cardboard spacers and protective edge guards along the door edges, to reduce exposure to marring or damage during storage.

C. Store integrated door opening assemblies in dry and secure area. Do not store electronic access control software, credentials, or accessories at Project site without prior authorization.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

A. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

B. Electrical Connections: Coordinate the layout and installation of scheduled electrified hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. This warranty does not cover defects or damage arising from improper installation, lack of or improper maintenance, improper storage, improper handling, corrosion, erosion, ordinary wear and tear, misuse, abuse, accident, unauthorized service or use with unauthorized RITE Door® products or parts.
2. This warranty is void if any modifications are made to the product, regardless of whether the modification causes or contributes to the alleged defect. All modifications are made at the risk of the party making the modification.

B. Warranty Periods: Manufacturer's standard written form, with the exceptions noted below, warranting integrated door opening assemblies to be free of defect in material or workmanship under normal use for a period of five (5) years.

1. Hollow Metal Doors: Lifetime.
2. Hinges: Up to twenty-five (25) years based upon model and manufacturer.
3. Continuous Hinges: Ten (10) years.
4. Door Closers: Up to twenty-five (25) years based upon model and manufacturer.
5. Electrical Products (except MLR exit devices): Three (3) years.

C. Warranty includes the manufacturer, at their sole option, agreeing to repair or replace products or parts found to be defective in material or workmanship according to details contained in the warranty certificate.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of integrated door opening assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Adams Rite Manufacturing (RD) - The RITE Door.
2. Substitutions: Requests for substitutions and product approval for inclusive integrated door opening assembly systems in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 STEEL MATERIAL REQUIREMENTS

A. General:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

B. Hollow Metal Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. 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. Design: Flush panel.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    1). Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.

4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.

5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.

6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Steel Frames:

Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M. Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped corners.

2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.

3. Frames for openings up to 48 inches in width: Minimum 16 gauge thick steel sheet.

4. Frames for openings 48 inches and wider in width: Minimum 14 gauge thick steel sheet.

5. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

6. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

7. Provide suitable adjustable type anchors for wall condition, minimum 4 each per jamb.

2.3 LIGHT OPENINGS

A. Provide openings prepped for glazing with lite kits for glass thickness of 1/4" to 1” thick as specified.

B. Lite Kits: Provide primed kits of 18-gauge rust resistant galvanneal steel mitered with welded clean corner construction and beveled glass stops classified in accordance with UBC code stand 7-2 for positive pressure.

2.4 DOOR HARDWARE MATERIAL REQUIREMENTS:

A. Provide a complete integrated door opening assembly, including the installation and adjustment of the latching mechanism within the door construction.

B. Door hardware to include the following minimum products for each integrated door opening assembly as specified in the Door Hardware Sets under Part 3.

1. Hanging Device: Continuous Hinges (geared or pinned), Pocket Pivots, Offset/Intermediate Pivots, or Butt Hinges.
2. Integrated Locking/Latching Hardware: Exit Devices, Lever Handle Trim, or Flush Push/Pulls.

C. Integrated exit device hardware to be clean and unobtrusive in design with a minimal bar height of 2-7/16-inches. Push rails not to exceed a projection of 1-1/8-inches when in the latched position and be made of heavy-duty aluminum extrusion, available in anodized and architectural finishes using metal cladding. Exit device end caps to be of metal construction and should match the trim cover caps when available.

D. Push and pull hardware to be clean and unobtrusive in design with a maximum projection of 1/4-inches on pull side and 5/8-inches on the push side. To be used on hollow metal doors only.

E. Lever handles to be clean and unobtrusive in design with a maximum projection of 3-1/2-inches and match design of similar lever locking hardware furnished on project.

F. Door hardware may include the following optional products for each integrated door opening assembly as specified in the Door Hardware Sets under Part 3:

1. Door Closers: Surface Closer or Pocket Closer.
2. Accessory Items: Magnetic Holders, Protection Plates, Edge Guards, Astragals, Smoke Seals.

2.5 FINISH REQUIREMENTS

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

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; and compatible with substrate and field-applied coatings.

B. HPDL Wrapped: Color and pattern as selected by the architect.

C. Embossed Wood Grain Pattern: Color and pattern as selected by the architect from the manufacturer’s standard range.

D. Hardware Finishes: As specified in Hardware Sets.

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. Verify the accuracy of dimensions given to the integrated door opening assembly manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of the existing conditions.

D. Verify power supplies, as required, are available to power electrically operated devices.

3.2 INSTALLATION

A. General: Install integrated door opening assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; integrated locking/latching devices; closing devices; and seals.

C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically 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."
2. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
3. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

D. Coordinate installation and interface wiring with fire alarm and smoke detection systems.

E. Remove or protect furnished hardware accessories, prior to painting or finishing completed after the installation of the hardware accessories.

3.3 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.4 ADJUSTMENT

A. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Remove and 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. Protect all door opening assemblies and hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible time frame.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure integrated door and operating hardware is without damage or deterioration at time of owner occupancy.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer or finish paint.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain integrated door opening assemblies and hardware.

3.7 HARDWARE SETS

A. The integrated door opening hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

END OF SECTION 081700

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Hardware items other than specified in this section.

B. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

D. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

E. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

1.04 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 1' x 1' inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. YKK AP America, Inc; _____: www.ykkap.com/commercial/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Position: Centered (front to back).
   2. Finish: Superior performing organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.02 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.03 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

3.04 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 084418
GLAZED STEEL CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel-framed curtain wall, with vision glazing.

1.02 RELATED REQUIREMENTS

A. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

1.04 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, _____, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

E. Verification Samples: Submit two samples 12" x 12" inches in size illustrating finished exposed surfaces, glazing, and glazing materials.

F. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

G. Maintenance data.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing steel glazing systems with minimum three years of documented experience.

1.06 MOCK-UP

A. See Section 014000 - Quality Requirements for general requirements for mock-ups.

B. Provide 2' by 2' feet mock-up including each component being used on the project. Assemble to illustrate component assembly including glazing materials, weep drainage system, attachments, anchors, and perimeter sealant.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with recommendations of steel curtain wall manufacturer.

B. Protect finished metal surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to finishes when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glazed Steel Curtain Wall:
   1. BOD: YKK See drawings.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 CURTAIN WALL

A. Steel-Framed Curtain Wall: Factory fabricated, factory finished steel framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish of Exposed Steel: Superior performing organic coatings.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no exposed steel is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   2. Finish of Exposed Aluminum: Class I natural anodized.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   3. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2.03 PERFORMANCE REQUIREMENTS

A. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
   1. Design Wind Loads: Comply with the applicable code.
   2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
      a. Expansion and contraction caused by 180 degrees F surface temperature.

b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
c. Movement of curtain wall relative to perimeter framing.
d. Deflection of structural support framing, under permanent and dynamic loads.

B. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
1. Test Pressure Differential: 10 lbs per sq ft.

C. Air Leakage: 0.06 cfm/sq ft maximum leakage of wall area when tested at 6.27 psf pressure difference in accordance with ASTM E283/E283M.

2.04 COMPONENTS

A. Glazing: See Section 088000.

B. Sun Screens: Shop fabricated, shop finished, extruded aluminum outriggers, louvers, and fascia, free of defects impairing strength, durability or appearance.
1. BOD: YKK AP ThermaShade® Aluminum Sun Shade System
2. Configuration: Concealed Anchor,
3. Louver Type: Airfoil. 3-5/8 inch
4. Sun Screen Angle: ____ degrees from horizontal.
5. Outrigger Shape: Wedge.
6. Fascia Shape: Wedge
7. Design Criteria: Design and fabricate to resist the same loads as curtain wall system as well as the following loads without failure, damage, or permanent deflection:
a. Snow: ___ psf; minimum.
b. Live: ___ psf; minimum.
c. Thermal Movement: Plus/minus 1/8 inch, maximum.
8. Sizes: As indicated on drawings.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

C. Sundshade System: Thermally improved anchor: Sunshade anchor must provide a continuous thermal barrier by means of a poured and debridged pocket consisting of a two-part, chemically curing high density polyurethane which is bonded to the aluminum by YKK AP ThermaBond Plus™. Anchors employing non-structural thermal barriers are not acceptable.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

E. Glazing Accessories: See Section 088000.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick. See drawings.

C. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.

D. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that curtain wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings with turned up ends and edges; seal to adjacent work to form watertight barrier.

G. Install Sunshade system as per manufacturer’s system in accordance with shop drawings, and within specified tolerances
   1. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.
   2. Shim and brace aluminum system before anchoring to structure
   3. Verify curtain wall system allows water entering system to be collected in gutters and wept to the exterior. Verify weep holes are open, and metal joints are sealed in accordance with manufacturer’s installation instructions
   4. Seal metal to metal curtain wall system joints using sealant recommended by system manufacturer

H. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Wash down finished surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.04 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 085800
INTERIOR ALUMINUM BULLET RESISTANT SLIDING TRANSACTION WINDOW

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes:
   1. Interior aluminum bullet resistant sliding transaction windows as indicated in drawings and in sections.

B. The publication below forms a part of this specification:
   1. UNDERWRITERS LABORATORY UL 752 9th Edition Standard for Bullet Resisting Equipment dated Jan. 27, 1995.

SUBMITTALS

A. Product Data: Submit Manufacturer's technical product data substantiating that product complies.

B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.

C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage

B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.

C. Store windows at building site under cover in dry location.

PROJECT CONDITIONS

A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

WARRANTY

1. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

A. Basis of design: Design is based on interior aluminum bullet resistant sliding transaction windows, manufactured by C.R. Laurence Co., Inc. (800) 421-6144 Part #s SBRWA1 SBRWA3 SBRWDU1 SBRWDU3 SBRWP1 SBRWP3 SBRWK1 SBRWK3

B. Substitutions: See Section 016000-Product Requirements.

MATERIALS

A. Frames: 4" Aluminum bullet resistant frame modules shall be to the standards established by U.L. 752 Protection Level 3. Frames are to be constructed of 6063-T5 extruded aluminum lined with U.L. listed bullet resistant fiberglass. Shapes and sizes are to be in accordance with the contract drawings.

B. Finish: All aluminum to be clear anodized (A).
   1. Glazing: The glazing must be in accordance with U.L. 752 testing standards Level 3. 1-1/4" laminated polycarbonate with abrasion resistant coating.

C. Options: Keyed lock, half bottom track (no track under fixed panel), shelf/tray, and voice transmission.

1. Shelf: Provide 2” thick shelf. The shelf is to be the full width of the window and a minimum of 12” deep centered under the glazing. 16 ga. stainless steel #4 finish with integral ricochet resistant deal tray.
2. Voice Transmission Communication: Clear polished 10" disc of same glazing material, held in place in sliding panel over 6" hole with stainless steel standoffs (CRL CAD101).

PART 3 – EXECUTION

INSTALLATION

A. Install frames and glazing in accordance with manufacturer’s printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer’s instructions. Remove excess glazing sealant compounds, dirt or other substances.

PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration at the time of acceptance.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
4. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the

manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. 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.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

a. Ives (IV) - 5BB Series, 5-knuckle.
b. McKinney (MK) - TA/T4A Series, 5-knuckle.
c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum

overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
2. Manufacturers:.

    a. Ives (IV).
    b. Pemko (PE).
    c. dormakaba BEST (ST).

2.4 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Ives (IV) - Connect.
    b. McKinney (MK) - QC (# wires) Option.
    c. dormakaba BEST (ST) - C Option.

B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Pemko (PE) - EL-CEPT Series.
    b. Securitron (SU) - EL-CEPT Series.
    c. Von Duprin (VD) - EPT-10 Series.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.
b. Schlage (SC) - Connect.
c. dormakaba BEST (ST) - WH Series.
d. Von Duprin (VD) - Connect.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

a. Ives (IV).
b. Rockwood (RO).
c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

a. Ives (IV).
b. Rockwood (RO).
c. Trimco (TC).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

a. Corbin Russwin Hardware (RU).
b. No Substitution.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

    a. Lund Equipment (LU).
    b. MMF Industries (MM).
    c. Telkee (TK).

2.8 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

    a. Meets ANSI/BHMA A156.41 for single motion egress.
    b. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
    d. Exceeds ANSI/BHMA A156.2 requirements by 2.6 times for 3,100 in-lb. abusive locked lever torque with no entry while maintaining egress.
    e. Exceeds ANSI/BHMA A156.2 requirements by 8 times for 1,600 lbs. offset lever pull with no entry for protection against attacks.
    f. Exceeds ANSI/BHMA A156.3 requirements by 2 times for latch retraction with 100 lb. preload while maintaining operation in warped doors.
    g. Exceeds ANSI/BHMA A156.3 requirements by 20 times for no access with minimum 100 vertical impacts for protection against vandalism attempts.
    h. Independent return springs allow lock to exceed ANSI/BHMA A156.2 Grade 1 cycle requirements without lever sag.
    i. Status indicators inside, outside, or on both sides of doors as specified with high visibility red/green or red/white icons to display locked or unlocked state in the rose.
    j. Ten-year limited warranty for mechanical functions.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - CLX3300 Series.
    b. Sargent Manufacturing (SA) - 10X Line.
    c. Schlage (SC) - ND Series.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
c. No catch points: addition of applied deflectors or other added components are not allowed.
d. No visible plastic.
e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
f. Constructed of all stainless steel.
g. Stainless steel pullman type latch with deadlock feature.
h. Narrow or wide style exterior trim as specified in the hardware sets.
i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
j. Ten-year limited warranty for mechanical features.

2. Electromechanical exit devices shall have the following functions and features:

a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
b. Wire routing for all non-access control electromechanical functions and EcoFlex trim to be contained within the carrier of the device eliminating the need for cavities in doors to be drilled. Include a protective film so that wires don't get damaged if the rail needs to be removed.
c. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
d. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
e. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.

3. Manufacturers:

a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
b. Sargent Manufacturing (SA) - PE80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.

2.11 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. Norton Rixson (NO) - 7500 Series.
c. Sargent Manufacturing (SA) - 351 Series.

C. Door Closers, Surface Mounted (Cam Action): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, high efficiency door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be of the cam and roller design, one piece cast aluminum silicon alloy body with adjustable backcheck and independently controlled valves for closing sweep and latch speed.

1. Manufacturers:

a. Corbin Russwin (RU) - DC5000 Series.
b. Norton Rixson (NO) - 2800ST Series.
c. Sargent Manufacturing (SA) - 422 Series.

2.12 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4

requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48" wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48" wide. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide operators with features as follows:

    a. Non-handed with push and pull side mounting.
    b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.
    c. Activation by push button, hands-free or radio frequency devices.
    d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
    e. Two-year limited warranty.
    f. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
        1) Simple setup with no app required.
        2) View status and make adjustments without removing the cover.
        3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
    g. Mounting backplate to simplify and speed up installation.

2. Operators shall have the following functionality:

    a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
    b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
    c. Infinite Hold Open: Door will hold open at set position until power is turned off.
    d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
    e. Open Delay: Delays operator opening for locking hardware.
    f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.
    g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
    h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
    i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
    j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:

a. Norton Rixson (NO) - 6000 Series.

2.13 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15, Grade 1 electromagnetic door holder/releases with a minimum 25 to 40 pounds holding power and fail-safe operation; power failure releases door to close.

1. Manufacturers:

a. Norton Rixson (RF) - 900 Series.
b. Sargent Manufacturing (SA) - 1560 Series.

2.14 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Ives (IV).
b. Rockwood (RO).
c. Trimco (TC).

2.15 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where

they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

   a. Ives (IV).
   b. Rockwood (RO).
   c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

   a. Norton Rixson (RF).
   b. Rockwood (RO).
   c. Sargent Manufacturing (SA).

2.16 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

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 UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.17 ELECTRONIC ACCESSORIES

A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

1. Manufacturers:

a. Alarm Controls (AK) - TS Series.
b. Securitron (SU) - PB Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 3280 Series.
b. Securitron (SU) - DPS Series.

C. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
c. Enhanced surge immunity for input/output protection
d. Separate, dedicated battery charging circuit to keep locks cooler.
e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
f. Instant auto-switch to battery on AC loss.
g. Expandable up to 16 outputs in the standard enclosure
h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

a. Life Safety Power (LP).
b. Securitron (SU) - AQL Series.

2.18 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.19 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, 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. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically 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."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 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.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers.

B. Section 072600 - Vapor Retarders.

C. Section 072700 - Air Barriers.

D. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

E. Section 081416 - Flush Wood Doors: Glazed lites in doors.

F. Section 084313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

G. Section 084418 - Glazed Steel Curtain Walls: Glazing provided as part of wall assembly.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. AAMA 501.6 - Recommended Dynamic Test Method for Determining the Seismic Drift Causing Glass Fallout from Window Wall, Curtain Wall and Storefront Systems; 2018.

C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

E. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

G. ASTM C1036 - Standard Specification for Flat Glass; 2025.

H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.

I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

J. ASTM C1349 - Standard Specification for Architectural Flat Glass Clad Polycarbonate; 2017 (Reapproved 2024).

K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

L. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2023.

M. GANA (SM) - GANA Sealant Manual; 2008.

N. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.

O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of glass units.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.

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

1.07 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

1.08 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Guardian Glass, LLC: www.guardianglass.com/#sle.

B. Laminated Glass Manufacturers:

1. Guardian Glass, LLC: www.guardianglass.com/#sle.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:
      a. Water-Resistive Barriers: See Section 072500.
      b. Vapor Retarders: See Section 072600.
      c. Air Barriers: See Section 072700.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

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

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
   1. Applications: Exterior insulating glass glazing unless otherwise indicated.
   2. Space between lites filled with As indicated on Architectural Drawings.
   3. Total Thickness: As indicated on Architectural Drawings
   4. Thermal Transmittance (U-Value): _____, As indicated on Architectural Drawings.
   5. Visible Light Transmittance (VLT): As indicated on Architectural Drawings
   6. Solar Heat Gain Coefficient (SHGC): As indicated on Architectural Drawings
   7. Spacer Color: As indicated on Architectural Drawings.
   8. Edge Seal:
   9. Color: Black.
   10. Purge interpane space with dry air, hermetically sealed.

2.05 GLAZING COMPOUNDS

A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; _____ color.

B. Manufacturers:
   1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.Dow Corning Corporation: www.dowcorning.com/construction/#sle.
   2. Tremco Commercial Sealants & Waterproofing; Proglaze: www.tremcosealants.com/#sle.

2.06 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.
   3. Spacer Rod Diameter: As required for application.
   4. Manufacturers:
      a. Pecora Corporation; _____: www.pecora.com/#sle.
      b. Tremco Global Sealants; _____: www.tremcosealants.com/#sle.

D. Glazing Clips: Manufacturer's standard type.

2.07 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

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

END OF SECTION

SECTION 088813
FIRE-RATED GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 081213 - Hollow Metal Frames: Glazed borrowed lites.

B. Section 084313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1036 - Standard Specification for Flat Glass; 2025.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.

I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

J. ASTM C1349 - Standard Specification for Architectural Flat Glass Clad Polycarbonate; 2017 (Reapproved 2024).

K. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

L. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

M. ASTM E413 - Classification for Rating Sound Insulation; 2022.

N. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

O. GANA (GM) - GANA Glazing Manual; 2022.

P. GANA (SM) - GANA Sealant Manual; 2008.

Q. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.

R. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

T. ITS (DIR) - Directory of Listed Products; Current Edition.

U. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

V. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

W. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

X. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

Y. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

Z. UL (DIR) - Online Certifications Directory; Current Edition.

AA. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

BB. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

CC. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

DD. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Two samples 6"x 6" in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Specimen warranty.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
      a. North American Contractor Certification (NACC) for glazing contractors.
      b. Equivalent independent third-party ANSI accredited certification.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.07 FIELD CONDITIONS

A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty for Insulating Glass Units: Provide 5-year manufacturer warranty coverage for seal failure, interpane dusting or misting, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

C. Manufacturer Warranty for Laminated Glass: Provide 5-year manufacturer warranty coverage for delamination, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

D. Manufacturer Warranty for Heat Soaked Tempered Glass: Provide 5-year manufacturer warranty coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Guardian Glass www.guardianglass.com/#sle.
   2. Standard Bent Glass Corp. www.standardbent.com/#sle.
   3. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   4. Viracon, Inc: www.viracon.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Float Glass Manufacturers:
   1. Guardian Glass, LLC www.guardianglass.com/#sle.
   2. Pilkington North America Inc. www.pilkington.com/na/#sle.
   3. Vitro Architectural Glass (formerly PPG Glass) www.vitroglazings.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

C. Fire-Resistance-Rated Glass:
   1. Fabricators:
      a. GGI - General Glass International www.generalglass.com/#sle.
      b. McGrory Glass, Inc www.mcgrory.com/#sle.
   2. Manufacturers:
      a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.
      b. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.
      c. Vetrotech North America; Contraflam 60: www.vetrotechusa.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads and withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.

3. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain building enclosure vapor retarder and air barrier continuity.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated, in accordance with manufacturer's published data as determined with the following procedures or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW software.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW software.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 GLAZING UNITS

A. Type FPG-1 - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period of 90 minutes or less.
   1. Applications:
      a. Glazing in fire-resistance-rated door assembly.
      b. Glazing in fire-resistance-rated window assembly.
      c. Other locations as indicated on drawings.
   2. Glass Type: Specialty tempered float glass.
   3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   4. Safety Glazing Certification: 16 CFR 1201 Category II.
   5. Glazing Method: As required for fire rating.
   6. Fire-Rating Period: As indicated on drawings.
   7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
      a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
      b. "OH" - meets fire window assembly criteria, including hose stream test of NFPA 257 or UL 9 fire test standards.
      c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
      d. "XXX" - placeholder that represents fire-rating period, in minutes.
   8. Products:
      a. GGI - General Glass International www.generalglass.com/#sle.
      b. McGrory Glass, Inc www.mcgrory.com/#sle.
      c. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite I: www.safti.com/#sle.
      d. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite I-XL: www.safti.com/#sle.
      e. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite I-XL IGU: www.safti.com/#sle.
      f. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite X-45: www.safti.com/#sle.
      g. SAFTIFIRST, a division of O'Keeffe's Inc; SuperClear 45-HS: www.safti.com/#sle.
      h. SCHOTT North America Inc; PYRAN Platinum: www.us.schott.com/#sle.
      i. SCHOTT North America Inc; PYRAN Platinum F (Surface-Applied Safety Film): www.us.schott.com/#sle.
      j. SCHOTT North America Inc; PYRAN Platinum L (Laminated Safety Glass): www.us.schott.com/#sle.

k. Technical Glass Products; Fireglass20: www.fireglass.com/#sle.
l. Technical Glass Products; Firelite: www.fireglass.com/#sle.
m. Technical Glass Products; Firelite Plus: www.fireglass.com/#sle.
n. Technical Glass Products; Firelite NT: www.fireglass.com/#sle.
o. Technical Glass Products; Firelite IGU: www.fireglass.com/#sle.
p. Vetrotech North America; Keralite/Select: www.vetrotechusa.com/#sle.
q. Vetrotech North America; Keralite/Select Filmed: www.vetrotechusa.com/#sle.
r. Vetrotech North America; Keralite/Select Laminated: www.vetrotechusa.com/#sle.
s. Vetrotech North America; Pyroswiss 20: www.vetrotechusa.com/#sle.

2.05 ACCESSORIES

A. Setting Blocks: Aluminum silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Setting Blocks: Hardwood.

C. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.

D. Glazing Tape: Closed-cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to affect air barrier and vapor retarder seal; _____ by _____ size.
1. Manufacturers:
a. Pecora Corporation www.pecora.com/#sle.
b. Saint-Gobain Performance Plastics www.plastics.saint-gobain.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

E. Glazing Tape: Flexible tape made from spun calcium-magnesium-silica fibers in binder; designed to remain stable at temperatures up to 2,012 degrees F.
1. Thickness: As recommended by framing manufacturer for glazing application.

F. Glazing Gaskets: Flexible intumescent seals.
1. Material: Co-extruded intercalated graphite combined with thermoplastic lip.

G. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

2.06 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide shop inspection and testing for Type FRG or FPG glass.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that minimum required face and edge clearances are provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - WET/DRY GLAZING METHOD (TAPE AND SEALANT)

A. Application - Interior Glazed: Set glazing infills from interior of building.

B. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sightline.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

E. Install removable stops, spacer shims inserted between glazing and applied stops at 24-inch intervals, 1/4 inch below sight line.

F. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

G. Carefully trim protruding tape with knife.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Manufacturer Services: Provide services of glass and glazing manufacturer's field representative to observe installation of their products.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with 'X' by using removable plastic tape or paste; do not mark heat-absorbing or reflective glass units.

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

3.08 SCHEDULES

A. Hollow Metal Steel Frames, Interior Glazing:
   1. Fire-Resistance Rated Openings: Glass Type FRG 5/16 inch thick.
   2. Fire-Protected Rated Openings: Glass Type FPG 5/16 inch (8 mm) thick.

END OF SECTION

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Porcelain floor tile.

B. Removal of existing floor coverings.

C. Preparation of existing concrete floor slabs for installation of floor coverings.

D. Patching compound.

1.02 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2021.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.03 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Adhesive Bond and Compatibility Test Report.

D. Copy of RFCI (RWP).

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

3. Products:
    a. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch (or approved equal).

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
    1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
        a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
        b. Removal of existing floor covering.
    2. Preliminary cleaning.
    3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
    4. Specified remediation, if required.
    5. Patching, smoothing, and leveling, as required.
    6. Adhesive bond and compatibility test.
    7. Protection.

B. Remediations:
    1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
    2. Shot Blasting: Provide shot blasting to remove existing finish adhesives. Provide Dust Collection System.
        a. New exposed Concrete Floors with Sealer: Provide light shotblast CSP-3
        b. New LVL and Vinyl Tile Floors: Provide medium shotblast SCP-4

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.06 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Metal channel ceiling framing.

C. Acoustic insulation.

D. Gypsum wallboard.

E. Joint treatment and accessories.

F. Bullet resistant sheathing and wallboard.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 092216 - Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

D. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

F. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

G. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

I. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).

J. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

K. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

L. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#.
   2. Marino: www.marinoware.com.
   3. SCAFCO Corporation: www.scafco.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Non-structural Steel Framing for Application of Gypsum Board: See Section 092216.

C. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   3. National Gypsum Company: www.nationalgypsum.com.
   4. USG Corporation: www.usg.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and soffits (where indicated on reflected ceiling plan), unless otherwise indicated.
   2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 1/2 inch.
   4. Paper-Faced Products:
      a. CertainTeed Corporation; Type X Drywall: www.certainteed.com.
      b. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com.
      c. USG Corporation; USG Sheetrock Brand Firecode X Panels: www.usg.com.
      d. Substitutions: See Section 016000 - Product Requirements.
   5. Glass Mat Faced Products:
      a. CertainTeed Corporation; 5/8" GlasRoc Interior Type X: www.certainteed.com/.
      b. Georgia-Pacific Gypsum; DensArmor Plus: www.gpgypsum.com.
      c. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough.
      d. Substitutions: See Section 016000 - Product Requirements.

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including restrooms and janitor's closets.
   2. Application: Horizontal surfaces behind tile in wet areas including countertops and floors.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

4. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
    a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
    b. Products:
        1) CertainTeed Corporation; 5/8" GlasRoc Tile Backer Type X: www.certainteed.com.
        2) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com.
        3) National Gypsum Company; Gold Bond eXP Tile Backer: www.nationalgypsum.com.
        4) Substitutions: See Section 016000 - Product Requirements.

D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 1/2 inch.
3. Edges: Tapered.
4. Products:
    a. CertainTeed Corporation; Interior Ceiling Drywall: www.certainteed.com.
    b. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board: www.gpgypsum.com.
    c. USG Corporation; 1/2 Inch Sheetrock Brand UltraLight Panels: www.usg.com/.
    d. Substitutions: See Section 016000 - Product Requirements.

E. Bullet Resistant Sheathing and Wallboard: Woven roving, multi-ply, ballistic grade fiberglass cloth with thermoset polyester resin; comply with UL 752 Level 3.
1. Thickness: 7/16 inch.
2. Products:
    a. ArmorCore by Waco Composites; Bullet Resistant Fiberglass Panels: www.armorcore.com.
    b. Armortex; www.armortex.com.
    c. Total Security Solutions; www.tssbulletproof.com.
    d. Substitutions: See Section 016000 - Product Requirements.

F. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Paper-Faced Products:
    a. American Gypsum Company; M-Bloc Shaft Liner: www.americangypsum.com.
    b. CertainTeed Corporation; M2Tech Type X Shaftliner: www.certainteed.com.
    c. Georgia-Pacific Gypsum; ToughRock Shaftliner: www.gpgypsum.com.
    d. Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3".

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, unless noted otherwise.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Drying type, vinyl-based, ready-mixed.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
   2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

F. Blocking: Install fire-redardent treated wood blocking for support of:
   1. Wall-mounted cabinets.
   2. Toilet accessories.
   3. Wall-mounted digital displays.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

E. Installation on Metal Framing: Use screws for attachment of gypsum board.

F. Bullet Resistant Wallboard:
   1. Install bullet-resistant sheathing according to manufacturer's written recommendations and with manufacturer-approved fasteners.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.07 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking within stud framing.

B. Section 092116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

1.03 REFERENCE STANDARDS

A. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

1.04 SUBMITTALS

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

B. Product Data: Provide data describing framing member materials and finish, product criteria, and load charts.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com.
   2. Jaimes Industries: www.jaimesind.com.
   3. Marino: www.marinoware.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 FRAMING MATERIALS

A. Fire-Resistance-Rated Assemblies: Comply with applicable code and as follows:
   1. Fire-Resistance-Rated Partitions: Listed assembly by UL, No. U415, U419; 2 hour rating.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C shaped.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

D. Non-Loadbearing Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
   3. Fasteners: ASTM C1002 self-piercing tapping screws.

4. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch (76 mm).
5. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION OF STUD FRAMING

A. Extend partition framing to structure in all locations.

B. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

C. Align and secure top and bottom runners at 24 inches on center.

D. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

E. Align stud web openings horizontally.

F. Secure studs to tracks using crimping method. Do not weld.

G. Fabricate corners using a minimum of three studs.

H. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

I. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

J. Blocking: Use steel channels secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, and opening frames.

K. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.03 CEILING AND SOFFIT FRAMING

A. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated.

B. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

C. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Coated glass mat backer board as tile substrate.

E. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 071300 - Sheet Waterproofing.

B. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

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

D. Section 224000 - Plumbing Fixtures: Shower receptor.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.

C. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

G. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2024).

J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

M. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).

O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

P. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.

Q. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.

R. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.

S. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).

T. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

U. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).

V. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

W. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.06 QUALITY ASSURANCE

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

B. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Wall Tile, Type ceramic: ANSI A137.1 standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: As indicated on drawings
   3. Edges: Cushioned.
   4. Surface Finish: As indicated on drawings.
   5. Color(s): As indicated on drawings.
   6. Pattern: As indicated on drawings.
   7. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile and as indicated on drawings.
   8. Products:
      a. Refer to finish schedule for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Porcelain Tile: ANSI A137.1 standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: As indicated on drawings.
   3. Thickness: 3/8 inch.
   4. Surface Finish: Matte rectified.
   5. Color(s): As indicated on drawings.
   6. Pattern: As indicated on drawings.
   7. Products:
      a. Refer to finish schedule for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile and as indicated on drawings.
   1. Manufacturers: Same as for tile.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com.
   2. Custom Building Products: www.custombuildingproducts.com.
   3. LATICRETE International, Inc: www.laticrete.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.04 GROUTS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com.
   2. Custom Building Products: www.custombuildingproducts.com.
   3. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Standard Grout: ANSI A118.6 standard cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
   3. Color(s): As indicated on drawings.
   4. Products:
      a. Refer to finish schedule for basis of design.
      b. Substitutions: See Section 016000 - Product Requirements.

2.05 MAINTENANCE MATERIALS

A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.

2.06 ACCESSORY MATERIALS

A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
   2. Bonded Sheet Membrane Type:
      a. Material: Polyethylene sheet membrane with non-woven fabric laminated to both sides, 20 to 30 mils thick, nominal.

B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick or as indicated on drawings; 2 inch wide coated glass fiber tape for joints and corners.

C. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.

D. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor and wall joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Sound tile after setting. Replace hollow sounding units.

F. Keep control and expansion joints free of mortar, grout, and adhesive.

G. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

H. Grout tile joints unless otherwise indicated.

I. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Use uncoupling membrane under all tile unless other underlayment is indicated.

3.05 INSTALLATION - WALL TILE

A. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.

B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 095123
ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for interior ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Samples for Initial Selection: For components with factory-applied finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
   1. Acoustical Panels: Set of 6-inch-square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch long Samples of each type, finish, and color.

1.04 INFORMATIONAL SUBMITTALS

A. Manufacturer's product data.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E 1264.

2.03 ACOUSTICAL PANELS

A. Basis of Design Product: Armstrong Ultima 2'x2' ceiling tile as indicated on drawing.

1. CertainTeed Corporation.
2. Substitutions: See Section 016000-Product Requirements.

B. Color: White.

C. Edge/Joint Detail: Square Lay-in.

D. Modular Size: 24 by 24 inches.

2.04 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: 15/16" Armstrong Prelude.
1. Armstrong World Industries.
2. United States Gypsum Company.
3. CertainTeed Corporation.
4. Substitutions: See Section 016000-Product Requirements.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

2.05 SUSPENDED CEILING ALUMINUM PERIMETER TRIM

A. Basis-of-Design Product: Armstrong Axiom Classic Straight Perimeter Trim.
1. Size: As indicated on drawings.
2. Armstrong World Industries.
3. United States Gypsum Company.
4. CertainTeed Corporation.
5. Substitutions: See Section 016000-Product Requirements.

2.06 ACCESSORIES

A. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

2.07 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2.08 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.
c. Substitutions: See Section 016000-Product Requirements.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.

2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.03 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
   3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.
   2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   4. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.04 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.05 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095422
RECYCLED POLYESTER FELT CEILINGS - USG

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Linear baffles.

B. Direct suspension wire hanger system.

C. Suspended metal support system and perimeter trim.

1.02 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2022.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

F. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.03 DESIGN REQUIREMENTS

A. Design components to ensure installed accessories will not induce eccentric loads. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

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

1.05 SUBMITTALS

A. Product Data: Furnish for component profiles.

B. Shop Drawings: Indicate reflected ceiling plan.

C. Samples: Submit two samples 12 by 12 inch in size illustrating color and finish of exposed to view components.

1.06 MOCK-UPS

A. Construct _____ mock-up, 10 feet long by 10 feet wide; include suspension system, baffles in mock-up.

B. Locate mock-up where directed.

C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Accept factory-finished products on site in manufacturer's unopened factory packaging only; reject opened packages.

C. Protect factory-finished products from damage to appearance by storing products in manufacturer's unopened factory packaging in dry storage area.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for polyester felt components. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 POLYESTER FELT CEILING ASSEMBLIES

A. Basis of Design Product: Acoustic Ceiling Baffle by Turf Design, Inc.

B. Ceiling Assembly Type BF-1:
   1. Ceiling System: Include baffles; suspension members, trim, and accessories as required to provide a complete installation.
      a. Layout: As indicated on drawings.
   2. Baffles: Straight
      a. Profile: As indicated on drawings.
      b. Lengths: As indicated on drawings.
      c. Colors: As indicated on drawings.

2.02 CEILING SYSTEMS

A. Performance Requirements:
   1. Design to support imposed loads of indicated items without eccentric loading of supports.
   2. Design for maximum deflection of 1/360 of span.

2.03 COMPONENTS

A. Polyester Felt Elements: Manufacturer's standard.
   1. Baffles: Individual box-shaped linear elements mounted on factory-installed metal support framework.
      a. Baffle Profile: As indicated on drawings.
      b. Baffle Spacing: As indicated on drawings.
      c. Attachment Method: Baffles with embedded cable grippers snap into deck mounted aircraft cables
         1) 10’ aircraft cable supplied by Manf should be trimmed in the field as needed
      d. Plenum Accessibility: Exposed above grid.

B. Polyester Felt Material: Manufacturer's standard 100 percent integrally colored polyester with high recycled material content.
   1. Surface Burning Characteristics: Class A, with flame spread index of 0-25; smoke-developed Index of 0450; when tested in accordance with ASTM E84.

C. Suspension Systems:
   1. Direct Suspension Hanger Wire System: Wire hangers selected and spaced to comply with heavy-duty classification requirements of ASTM C635/C635M.

2.04 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Verify that field measurements are as indicated on shop drawings.

D. Start of installation constitutes acceptance of project conditions.

3.02 PREPARATION

A. Coordinate the location of hangers with other work.

B. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

C. Install after major above-ceiling work is complete.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented by this section.

B. Install hangers and inserts coordinated with overhead work. Provide additional hangers and supports as required.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts. facility services, or equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - DIRECTLY-SUSPENDED PANELS:

A. Locate hangers in coordination with panel locations and layout.

B. Attach deck mount hardware to structure above using appropriate fasteners or anchors appropriate for substrates encountered.

C. Install panels and other system supports and accessories in accordance with manufacturer's instructions.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

C. Maximum Variation From Dimensioned Position: 1/4 inch.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Replace damaged or abraded components.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Static control resilient tile flooring.

C. Resilient base.

D. Resilient stair accessories.

E. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

B. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2021a.

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

E. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).

F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 2 by 2 inch in size illustrating color and pattern for each resilient flooring product specified.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile: Surface pattern type. Provide two coats wax sealer, as recommended by manufacturer.
   1. Manufacturers:
      a. Refer to finish schedule for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Size: As specified on the drawings.
   4. Thickness: 0.125 inch.
   5. Pattern: As indicated on the Finish Schedule.
   6. Color: As Indicated on finish schedule.

B. Vinyl Tile - Type Luxury Vinyl Tile: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Manufacturers:
      a. Refer to finish schedule for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, Class III.
   3. VOC Content Limits: As specified in Section 016116.
   4. Plank Tile Size: As inditicated on drawings.
   5. Wear Layer Thickness: 0.020 inch.
   6. Total Thickness: 0.20 inch.
   7. Pattern: As indicated on the finish schedule.
   8. Style: As indicated on drawings.

C. Rubber Tile: Homogeneous, color and pattern throughout thickness.
   1. Manufacturers:
      a. Refer to finish schedule for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
   3. VOC Content Limits: As specified in Section 016116.
   4. Size: As indicated on drawings.
   5. Wear Layer Thickness: .080 inch.
   6. Total Thickness: 0.125 inch.
   7. Pattern: As indicated on drawings.
   8. Color: As indicated on drawings.

D. Static Control Tile: Homogeneous; color and pattern throughout thickness.
   1. Manufacturers:
      a. Refer to finish schedule for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Electrical Resistance:
      a. Dissipative Tile: Resistance between 1.0 megohms and 1000 megohms as tested in accordance with ASTM F150.
   3. Tile Size: As indicated on drawings
   4. Total Thickness: 0.125 inch.
   5. Color: As indicated on drawings.

2.02 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
   1. Manufacturers:
      a. Refer to finish schedule for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
   3. Nominal Thickness: 0.1875 inch.
   4. Nosing: Square.
   5. Striping: 2 inch wide contrasting color abrasive strips.
   6. Pattern: As indicated on drawings.
   7. Color: As indicated on drawings.

B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color.
   1. Manufacturers:
      a. Refer to finish schedule for basis of design product..
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Thickness: 0.080 inch.

2.03 RESILIENT BASE

A. Resilient Base - Type Rubber base: ASTM F1861, Type TV, vinyl, thermoplastic; straight base at carpet flooring and cove base at flooring types indicated on drawings.
   1. Manufacturers:
      a. As indicated on drawings..
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch.
   4. Finish: Satin.
   5. Color: As indicated on drawings.

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Adhesive for Vinyl Flooring:
   1. Manufacturers:
      a. As recommended by the Vinyl Tile, or resiliant base manufacturer

C. Moldings, Transition and Edge Strips: Same material as flooring.

D. Copper Grounding Strips: Type and size as recommended by static control flooring manufacturer.

E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is fully cured.

E. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install loose-laid tile, fit interlocking edges tightly.

E. Install loose-laid tile using interlocking pins to secure tiles to each other.

F. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.09 SCHEDULE

A. See Finish Schedule & Finish Floor Plans in the Construction Documents.

END OF SECTION

SECTION 096700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High-performance resinous flooring systems.

1.02 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available; and _____.

C. Samples: Submit two samples, 6" by 6" in size illustrating color and pattern for each floor material for each color specified.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.03 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Approved by manufacturer.

1.04 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One.
   2. Use same materials and methods for use in the work.
   3. Locate where directed.
   4. Minimum Size: 48 inches by 48 inches.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

1.06 FIELD CONDITIONS

A. Comply with manufacture's written instructions for substate temperature, ambient temperature, moisture, ventilation and other conditions affecting resinous flooring application.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fluid-Applied Flooring:
   1. Sherwin-Williams High-Performance Flooring; _____: www.sherwin-williams.com/resin-flooring/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 FLUID-APPLIED FLOORING SYSTEMS

A. Fluid-Applied Flooring _____: Epoxy, with aggregate.
   1. System Thickness: 20-30 mils, nominal.
   2. Texture: Slip resistant.
   3. Color and Pattern: As selected by Architect.
   4. Products:
      a. Sherwin-Williams High-Performance Flooring; As indicated on drawings.: www.sherwin-williams.com/resin-flooring/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring per manufacture's instructions.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH) per manufacture's instructions.
   1. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

3.02 INSTALLATION - FLOORING

A. Apply in strict accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

3.03 PROTECTION

A. Protect work in accordance with manufacture's directions..

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 017419 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap and removed carpet tile.

C. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

D. Section 096816 - Sheet Carpeting: Broadloom carpet.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. CRI 104 - Standard for Installation of Commercial Carpet; 2018.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors, and method of installation.

C. Shop Drawings: Indicate layout of joints and installation pattern.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Tile Carpeting: Tufted, manufactured in one color dye lot. Refer to finish schedule (on drawings) for basis of design spec.
   1. Substitutions: See Section 016000 - Product Requirements.
   2. Tile Size: As indicated on drawings.
   3. Color: As indicated on drawings.
   4. Pattern: As indicated on drawings.
   5. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").

2.02 ACCESSORIES

A. Edge Strips: Embossed aluminum, refer to drawings for flooring transition details.

B. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

3.02 PREPARATION

A. Remove existing carpet tile.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in pattern indicated on drawings, with pile direction parallel to next unit, set parallel to building lines.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 097200
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and prime painting.

B. Wall covering.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.04 SUBMITTALS

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

B. Product Data: Provide data on wall covering and adhesive.

C. Samples: Submit two samples of wall covering, illustrating color, finish, and texture.

D. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.05 QUALITY ASSURANCE

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

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling.

C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 WALL COVERINGS

A. General Requirements:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

B. Wall Covering: Fabric-backed vinyl roll stock.
   1. Manufacturers:
      a. Refer to finish schedule in drawings for basis of design product.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.

B. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

A. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

C. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

D. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

E. Butt edges tightly.

F. Do not seam within 6 inches of internal corners or within 6 inches of external corners.

G. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

H. Where wall covering terminates at wall base, apply with contact adhesive within 6 inches of wall covering termination and ensure full contact bond.

I. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing ceiling baffles.

1.02 SUBMITTALS

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

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.

D. Verification Samples: Fabricated samples of each type of panel specified, showing construction, edge details, and fabric covering.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

1.04 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional mock-up requirements.

B. Construct mock-up of acoustical units at location as indicated by Architect.
   1. Minimum mock-up dimensions; 96 by 96 inches.
   2. Mock-up may remain as part of work.

PART 2 PRODUCTS

2.01 FABRIC-COVERED SOUND-ABSORBING UNITS

A. Manufacturers:

B. General:

C. Fabric-Covered Acoustical Ceiling Baffles:
   1. Baffle Core: Manufacturer's standard _____ core.
   2. Baffle Size: As indicated on drawings.
   3. Color: As indicated.
   4. Mounting: Vertically suspended from ceiling or structure _____.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

D. Suspend ceiling baffles at locations and heights as indicated.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.03 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

2.02 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.

2.03 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:

F. Masonry:

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Apply each coat to uniform appearance.

C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel and anodized aluminum items.
6. Floors, unless specifically indicated.
7. Glass.
8. Acoustical materials, unless specifically indicated.
9. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

C. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.
5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals and wood doors, have been approved.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Paints:
   1. Base Manufacturer: Sherwin-Williams Company.
   2. Benjamin Moore & Co.
   3. PPG Paints.

C. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 016116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, and shop primed steel.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
   3. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen at ceilings and as indicated on drawings..
      b. Eggshell: MPI gloss level 3; use this sheen at walls and as indicated on drawings..
      c. Semi-Gloss: MPI gloss level 5; use this sheen at door frames and as indicated on drawings..
   4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.
   3. Top Coat Sheen:
      a. Semi-Gloss: MPI gloss level 5; use this sheen at locations indicated on drawings.

C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, galvanized piping, and as indicated on drawings.
   1. Shop primer by others.
   2. One top coat _____.
   3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
      a. Products:
         1) Sherwin-Williams Waterborne Acrylic Dryfall, Flat. (MPI #118)
         2) Substitutions: Section 016000 - Product Requirements.

2.04 PRIMERS

A. Primers: Provide as indicated on drawings or recommended by manufacturer of top coats.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 101419
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

B. Illumination system.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 879 - Electric Sign Components; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
   2. Show locations of electrical service connections.
   3. Include diagrams for power, signal, and control wiring.

D. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where materials, colors, and finishes are not specified, submit two sets of selection charts or chips.

F. Delegated-Design Submittal: For exterior building signs.
   1. Include structural analysis calculations for signs indicated to comply with design loads signed and sealed by the qualified professional engineer responsible for their preparation.
   2. For signage attached to aluminum curtain wall, structural calculations shall be part of the curtain wall delegated design submittal.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

C. Store tape adhesive at a normal room temperature of 68 to 72 degrees F.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering.
      b. Separation or delamination of sheet materials and components.
      c. Structural and signage connection failure.
      d. Water infiltration
   2. Warranty Period: Ten years from date of Substantial Completion

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dimensional Letter Signs:
   1. A.R.K. Ramos: www.arkramos.com/#sle.
   2. CityScapes Inc; _____: www.cityscapesinc.com/#sle.
   3. FASTSIGNS International, Inc; _____: www.fastsigns.com/#sle.
   4. Inpro Corporation; _____: www.inprocorp.com/#sle.
   5. Takeform: www.takeform.net/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, licensed in the state of Pennsylvania to design sign structure and anchorage of dimensional character sign type(s) to withstand design loads as indicated on Drawings. For signage attached to aluminum curtainwall, structural calculations shall be part of the curtain wall delegated design submittal.

B. Thermal Movements: For exterior fabricated dimensional characters, allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg , ambient; 180 deg F , material surfaces.

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.

2.03 FACE-LIT DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters, with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:
   1. Character Material: Sheet or plate acrylic, edge to edge, with laminated plate aluminum facing.
   2. Character Height: As indicated.
   3. Thickness: 0.25 inch aluminum plate laminated on each side of a 0.5 inch white translucent acrylic sheet.
   4. finishes: Overcoat: Manufacturer's standard baked-on clear coating.
   5. Mounting: The building signage must be attached using extruded aluminum structural signage rail bolted to the canopy with stainless steel hardware. Coordinate with canopy installation. Mounting must not void any roofing or other warranties.
   6. Illuminated Characters: Characters with concealed fiber-optic or LED lighting including transformers, insulators, and other accessories; with provision for servicing and concealing connections to building electrical system. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.
      a. Power: As indicated on electrical Drawings.
   7. Color: Manufacturer's standard integral color process, in color as selected by Architect from manufacturer's full range.
   8. Weeps: Provide Weeps at the bottom of all enclosed characters to drain out any incidental water intrusion.

2.04 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, stretcher-leveled standard of flatness.

D. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.05 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

B. Exposed Screws: Stainless steel.

C. Tape Adhesive: Double-sided tape, permanent adhesive.

D. Electrical Components and Devices: Listed and labeled as defined in NFPA 70 by a qualified testing agency.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that electrical service is correctly sized and located to accommodate dimensional letter signs.

C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

END OF SECTION

SECTION 101423
PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:
   1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
   2. FASTSIGNS International, Inc: www.fastsigns.com/#sle.
   3. Inpro Corporation: www.inprocorp.com/#sle.
   4. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
   5. Seton Identification Products: www.seton.com/aec/#sle.

2.02 REGULATORY REQUIREMENTS

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

2.03 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Room and door signs.
   2. Description: Flat signs with engraved panel media, tactile characters.
   3. Sign Size: 4 inches by 6 inches.
   4. Total Thickness: 1/8 inch.

5. Sign Edges: Squared.
6. Letter Edges: Squared.
7. Corners: Squared.
8. Color and Font, unless otherwise indicated:
   a. Character Font: Helvetica, Arial, or other sans serif font.
   b. Character Case: Upper and lower case (title case).
   c. Background Color: As scheduled.
   d. Character Color: Contrasting color.
9. Material: Laminated colored plastic engraved through face to expose core as background color.
10. Profile: Flat panel in matching plastic frame.
11. Tactile Letters: Raised 1/32 inch minimum.

2.04 SIGNAGE APPLICATIONS

A. Regulatory Signs:
   1. As indicated on drawings

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

END OF SECTION

SECTION 102226
OPERABLE PARTITIONS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

SUMMARY

A. This Section includes the following:
   1. Manually operated, individual panel operable partitions.

B. Related Sections include the following:
   1. Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
   2. Division 06 Sections for wood framing & supports, and all blocking at head and jambs as required.
   3. Division 09 Sections for wall and ceiling framing at head and jambs.

QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.

B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.

D. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.

REFERENCE STANDARDS

A. ASTM International
   1. ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
   2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   3. ASTM C1036 - Standard Specification for Flat Glass.
   4. ASTM C1048 - Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass.
   5. ASTM E84 - Surface Burning Characteristics of Building Materials.
   6. ASTM E413 - Classification for Rating Sound Insulation

B. Health Product Declaration Collaborative
   1. Health Product Declaration Open Standard v2.1

C. International Standards Organization
   1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labeling).
   2. ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
   3. ISO 14040:2009-11, Environmental Management - Life Cycle Assessment - Principles and Framework.
   4. ISO 14044:2006-10, Environmental Management - Life Cycle Assessment - Requirements and Guidelines.

5. ISO 21930 – Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services.

D. Other Standards
1. ADA – Americans with Disabilities Act.
2. ANSI Z97.1 - Safety Glazing Materials Used in Buildings.
3. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
4. NEMA LD3 - High Pressure Decorative Laminates.

SUBMITTALS

A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.

B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

E. Reports: Provide a complete and unedited written sound test report indicating test specimen matches product as submitted.

F. Create spaces that are healthy for occupants.
1. Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.

G. Furnish materials that generate the least amount of pollution.
1. Furnish products and materials that have third party verified environmental product declarations (EPD’s). Consider products and materials that have optimized environmental performance (reduced life cycle impacts). Products without an EPD or other disclosure documentation are not acceptable.

H. Buy American: Folding door to be manufactured in the United States in compliance with applicable U.S. Federal Trade Commission (FTC) and U.S. Customs Service and Border Protections regulations and be labeled "Made in America".

DELIVERY, STORAGE, AND HANDLING

A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.

B. Protect panels during delivery, storage, and handling to comply with manufacturer’s direction and as required to prevent damage.

WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Warranty period: Two (2) years.

C. Suspension System Warranty:
1. Five (5) years.

PART 2 – PRODUCTS

8.01 MANUFACTURERS, PRODUCTS, AND OPERATION

A. Manufacturers:

1. Modernfold, Inc.
2. Hufcor.
3. Moderco.

B. Basis of Design: Subject to compliance with the requirements, provide the following product:
1. Modernfold Acousti-Seal Premier Single Panel 600 Series, Model OP-01: Manually operated individual panel operable partition.

C. Substitutions: Comply with provisions of Section 01600 for substitution requests.

OPERATION

A. Acousti-Seal Premier - Single Panel: Series of individual flat panels, manually operated, top supported with operable floor seals.

B. Final Closure:
1. Horizontally expanding panel edge with removable crank.

PANEL CONSTRUCTION

A. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

B. Panel skin shall be:
1. 0.50-inch (13mm) tackable 100% recycled gypsum board, class "A" rated single material or composite layers continuously bonded to panel frame. Acoustical ratings of panels with this construction minimum:
a. 50 STC

C. Hinges for Closure Panels, Pass Doors, and Pocket Doors shall be:
1. Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.

D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.

E. Panel Weights:
1. 50 STC - 8 lbs./square foot

PANEL FINISH

A. Panel finish shall be:
1. Reinforced vinyl with woven backing weighing not less than 20 ounces (567 grams) per lineal yard.

B. Panel Trim: Exposed panel trim of one consistent color:
1. Architect to select from manufacturer’s standard line.

SOUND SEALS

A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.

B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

C. Horizontal bottom floor seals shall be:
1. Modernfold SM2 Bottom Seal. Manually activated seals providing nominal 2" (51mm) operating clearance with an operating range of + 0.50" (13mm) to -1.50" (38mm). Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds (54 kg) downward force to the floor throughout operating range.

SUSPENSION SYSTEM

A. #17 Suspension System - Right Angle Turn
   1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
      a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
   2. Carriers: Two carriers of low-friction polymer, reinforced with steel, that permit panels to traverse L, T, or X intersections without mechanical switching, on all panels except hinged closure panels.

PART 3 – EXECUTION

14.01 INSTALLATION

A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.

B. Install operable partitions and accessories after other finishing operations, including painting have been completed.

C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

CLEANING AND PROTECTION

A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer’s written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and Installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

ADJUSTING

A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

DEMONSTRATION

A. Demonstrate proper operation and maintenance procedures to Owner's representative.

B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 SUBMITTALS

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

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. As indicated on drawings.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Width of Wings: 2 inches.
   2. Corner: Square.
   3. Color: As indicated on drawings.
   4. Length: One piece.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 INSTALLATION

A. Position corner guard above wall base to height indicated on drawings..

END OF SECTION

SECTION 102800
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Diaper changing stations.

D. Utility room accessories.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM C1036 - Standard Specification for Flat Glass; 2025.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

G. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

I. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.04 SUBMITTALS

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

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.
   2. Bradley Corporation: www.bradleycorp.com/#sle.
   3. Kimberly-Clark Corporation; Kimberly-Clark Professional ICON Collection: www.kcprofessional.com/#sle.

B. Under-Lavatory Pipe Supply Covers:
   1. Basis of Design Plumberex Specialty Products, Inc: www.plumberex.com/#sle.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

C. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Provided by owner. Installed by GC.

B. Paper Towel Dispenser: Provided by owner. Installed by GC.

C. Soap Dispenser: Provided by owner. Installed by GC.

D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: As indicated on drawings.
   3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

E. Seat Cover Dispenser: Provided by owner. Installed by GC.

F. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.

G. Sanitary Napkin Disposal Unit: Provided by owner. Installed by GC.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
   2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
   3. Construction: 1/8 inch flexible PVC.
      a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
      b. Comply with ASTM C1822, type indicated.
      c. Comply with ASME A112.18.9.
      d. Comply with ICC A117.1.
      e. Microbial and Fungal Resistance: Comply with ASTM G21.
   4. Color: White.

5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.06 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Provided by owner. Installed by GC.

2.07 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch diameter.
   2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   4. Length: Manufacturer's standard length for number of holders/hooks.
   5. Location: Janitor's Closet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.
   2. Mirrors: As indicated on drawings.
   3. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.03 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size and classification as scheduled.
   3. Finish: Baked polyester powder coat, color as selected.
   4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Fire Rated Cabinet Construction: One-hour fire rated.

C. Cabinet Configuration: Recessed type.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Fabrication: Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

I. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: _____.

C. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 48 inches from finished floor to top of fire extinguisher cabinet.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 107500
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete base and foundation construction.

1.03 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2024.

B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

C. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

1.04 SUBMITTALS

A. Product Data: Provide data on pole, accessories, and configurations.

B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

C. Samples: Submit two _____, ____ by ____ inch in size, illustrating pole material, color, and finish.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Concord American Flagpole; Internal - Independence: www.concordamericanflagpole.com/#sle.
   2. Morgan-Francis Flagpoles & Accessories: www.morgan-francis.com/#sle.
   3. Pole-Tech Co, Inc: www.poletech.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001
   1. Material: Aluminum.
   2. Design: Cone tapered.
   3. Mounting: Ground mounted type.
   4. Nominal Height: 38 ft; measured from nominal ground elevation.
   5. Halyard: Internal type, manual winch operation.

2.03 POLE MATERIALS

A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

2.04 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth of ____ inches as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole , base assembly, and fittings in accordance with manufacturer's instructions.

B. Electrically ground flagpole installation.

C. Fill foundation tube sleeve with concrete specified in Section 033000.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 118129
FACILITY FALL PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof anchors.

1.02 RELATED REQUIREMENTS

A. Section 055133 - Metal Ladders.

1.03 DEFINITIONS

A. Anchorage: A secure connecting point or a terminating component of a fall protection system or rescue system capable of safely supporting the impact forces applied by a fall protection system or anchorage subsystem.

B. Anchorage Connector: A component or subsystem that functions as an interface between the anchorage and a fall protection, work positioning, rope access, or rescue system for the purpose of coupling the system to the anchorage.

C. Fall Arrest System: A system designed to stop you in the process of a fall, typically including an anchor point or series of anchor points, a safety lanyard or self-retracting lifeline, and a harness.

D. Fall Restraint System: A system designed to keep you from getting close enough to the fall hazard to fall, typically including an anchor point or series of anchor points, a safety lanyard or self-retracting lifeline, and a harness.

E. Fall Protection System: System can be either a fall arrest or a fall restraint system.

F. Lifeline: A component of a fall protection system consisting of a flexible line designed to hang vertically, a vertical lifeline, or connecting to anchorages or anchorage connectors at both ends to span horizontally, a horizontal lifeline.

1.04 REFERENCE STANDARDS

A. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.

B. 29 CFR 1910.140 - Personal fall protection systems; Current Edition.

C. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

D. 29 CFR 1926.502 - Fall protection systems criteria and practices; Current Edition.

E. 29 CFR 1926.1053 - Ladders; Current Edition.

F. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

G. ANSI/ASSP Z359.7 - Qualification And Verification Testing Of Fall Protection Products; 2019.

H. ANSI/ASSP Z359.18 - Safety Requirements for Anchorage Connectors for Active Fall Protection Systems; 2017, with Errata (2021).

I. ANSI/IWCA I-14 - Window Cleaning Safety Standard; 2001.

J. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2021.

K. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

L. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

M. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

N. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

O. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.

R. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).

T. CAL (OSHA) TITLE 8 SC 7 - California Code of Regulations, Title 8, Subchapter 7, General Industry Safety Orders; 2021.

U. ISO/IEC 17025 - General Requirements for the Competence of Testing and Calibration Laboratories; 2017.

V. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of roof anchors with architect to verify installation will result in a warrantable building envelope.

1.06 SUBMITTALS

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

B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.

C. Product Data: Material, equipment, and fixture lists. Manufacturer’s catalog data indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing in sufficient detail that product complies with contract requirements. Equipment and performance data including but not limited to lifeline anchors, safety tieback anchors, and lifeline cable.

D. Shop Drawings: Installation details: plan showing locations and types of anchorage points for personal fall protection systems and building maintenance equipment.
   1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
   2. Indicate anchorage details and quantity, diameter, and depth of penetration of anchors.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Delegated Design Documents: Drawings and calculations sealed by Designer for fall protection system, indicating compliance with performance requirements and design criteria.

G. Test Report: Indicating completion of proof load testing on installed systems.

H. Manufacturer's Installation Instructions: Instructions indicating recommended method and sequence of installation for lifeline anchors, safety tieback anchors, energy-absorbing devices, and lifeline cable.

I. Manufacturer's qualification statement.

J. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

K. Designer's qualification statement.

L. Installer's qualification statement.

M. Testing agency's qualification statement.

N. Operation Data: Provide operating instructions and identify unit limitations.

O. Maintenance Data: Include parts list and maintenance requirements for equipment.

1.07 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.

C. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

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

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF ANCHORS

A. Manufacturers:
   1. Guardian Fall Protection; _____: www.guardianfall.com/#sle.
   2. Pro-Bel Enterprises Ltd; _____: www.pro-bel.ca/#sle.
   3. Summit Anchor Company; _____: www.summitanchor.com/#sle.

B. Application:
   1. OSHA and ANSI one person PPE anchor.

C. Description:
   1. Roof anchorage points for personal fall protection systems; used exclusively for employee fall protection and independent of any anchorage used to suspend employees or platforms on which employees work.

D. Structural Performance: Provide safety tieback anchors capable of withstanding design loads as required by governing regulations and codes.

E. Design Criteria: Fall protection anchors.
   1. Comply with 29 CFR 1910.140 and 29 CFR 1926.502 for personal fall protection systems and anchorage.
   2. Comply with 29 CFR 1926, Subpart M-Fall Protection..
   3. Comply with ANSI/ASSP Z359.18 test requirements for static strength, dynamic strength, residual strength, serviceability, and corrosion of anchorage.
      a. Testing Labs: Meet requirements of ANSI/ASSP Z359.7 and ISO/IEC 17025.
   4. Comply with CAL (OSHA) TITLE 8 SC 7 requirements for anchors used in personal fall protection systems.

F. Design Criteria: Primary suspension lines.
   1. Comply with 29 CFR 1910.140 for fall protection.

G. Anchors:
   1. Type: Vertical foam-filled steel pier and baseplate with galvanized forged steel loop.
      a. Loop Diameter: 1-3/8 inch.
      b. Pier:
         1) Height: 12 inches.
         2) Diameter: 3-inch OD.
         3) Wall Thickness: Schedule 40.
         4) Material: Hot-dip galvanized steel pipe.
         5) Foam: Polyurethane. ASTM E84 Class I.
      c. Flat baseplate, factory-welded.

1) Size: 10 inches square.
2) Thickness: 3/8 inch.
3) Material: Hot-dip galvanized steel.
4) Bolt Holes: 52, 5/8-inch and 9/16-inch ID holes.
5) Drain Hole: 1-inch ID hole.

H. Anchor Installation:
1. Type: Cast-in-place.
2. Anchor Substrate: Existing concrete deck.
3. Roofing Material: As indicated on drawings.
4. Flashing Material: Premolded pipe flashing, membrane flashing, or sealant acceptable to roof manufacturer.

2.02 MATERIALS - STEEL

A. Structural Steel Sections: ASTM A36/A36M.

B. Steel Plates, Shapes, and Bars: ASTM A6/A6M or ASTM A283/A283M.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

D. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized in accordance with ASTM A153/A153M where connecting galvanized hardware components.

E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.

B. Grind off surplus welding material and ensure exposed internal corners have smooth lines.

C. Fabricate system components of the same material unless otherwise indicated.

D. Fabricate anchoring devices as recommended by the manufacturer to provide adequate support for intended use.

2.04 FINISHES

A. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install anchorage and fasteners in accordance with shop drawings and manufacturer's recommendations to obtain allowable working loads published in product literature and in accordance with this specification.

B. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous coating or by other permanent separation as recommended by fall protection system manufacturer.

C. Seal roof penetrations at anchors with pre-molded pipe flashing, membrane flashing, or sealant acceptable to roof manufacturer.

D. Install all roof safety anchors a minimum of 6 feet from the roof edge.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Load test anchors under the direct supervision of a licensed engineer in accordance with ANSI, OSHA, and IWCA requirements.

C. Inspect each anchor for conformance to manufacturer requirements, building envelope, looseness, and signs of permanent deflection during load testing.

3.03 ADJUSTING

A. Adjust fall protection components to function smoothly and safely.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.

C. Clean exposed surfaces in accordance with fall protection system manufacturer's written instructions.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

B. 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. Instructor: Manufacturer's training personnel.

3.06 MAINTENANCE

A. 29 CFR 1910 and ANSI/IWCA I-14 require that anchors first be certified and subsequently inspected on an annual basis. Coordinate with manufacturer and local inspectors as required to maintain compliance.

END OF SECTION

SECTION 122449
WINDOW ROLLER SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manual roller shades and accessories.

B. Shade fabric.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

B. Section 09260 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.

1.03 REFERENCES

A. ASTM International (ASTM):
   1. ASTM G21 and E 2180 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. National Fire Protection Association (NFPA):
   1. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

C. Window Covering Manufacturers Association (WCMA):
   1. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: One week prior to commencing work related to this section. Require attendance of all affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with finished conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

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

B. Shop Drawings: Include shade schedule indicating size, location and keys to details.

C. Bid Submittal: Information Required with Submittal of Bid: In order to evaluate proposals for window shade systems, the Architect requires the following information be submitted prior to the award of the system.
   1. Bid proposal shall be accompanied with a document that notes all deviations from these specifications on a line-by-line basis.

D. Product Data: Manufacturer's catalog pages and data sheets for products specified including materials, finishes, dimensions, profiles, mountings, and accessories.
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes , accessories, and operating instructions.
   3. Mounting details and installation methods.
   4. Manufacturer's Instructions: Include storage, handling, protection, examination, preparation, and installation.
   5. Operation and Maintenance Data: Component list with part numbers, and operation and maintenance instructions.

E. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements.
   1. Shadecloth Sample: Mark face of material to indicate interior faces.

a. Test reports indicating compliance with specified fabric properties.
b. Verification Samples: 6 inches (150 mm) square, representing actual materials, color and pattern.

F. Maintenance Data: Bill of materials for all components with part numbers. Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

G. Warranty: Provide manufacturer's warranty documents as specified in this Section.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of five years experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section.

B. Installer for Roller Shade System - Qualifications: Installer trained and certified by the manufacturer with a minimum of five years experience in installing products comparable to those specified in this section.
1. Requirements for Roller Shade Installer/Contractor:
a. Roller Shade Hardware, shade fabric and all related controls shall be furnished and installed as a complete assembly.

C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. ShadeCloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC9644 and ATCC9645, and E2180.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in Window Treatment Schedule.

B. Store and handle products per manufacturer's recommendations.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.09 WARRANTY

A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating, transferrable warranty for interior shading.
1. Shade Hardware – 10 years unless otherwise indicated:
a. Mecho/5 with ThermoVeil shade fabric: 25-years.
2. Standard Shadecloth: Manufacturer's standard 25-year warranty.
3. Roller Shade Installation: One year from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mecho, www.mechoshade.com.

B. Lutron, www.lutron.com.

C. Rollease Acmeda, www.rolleaseacmeda.com.

D. Requests for substitutions will be considered in accordance with provisions of Section 01600 .

2.02 APPLICATIONS/SCOPE

A. Roller Shade Schedule:
1. Shade Type 1: Manual operating, chain drive, sunscreen single roller shades and related mounting systems and accessories as indicated on drawings.

B. Shade System; General:
   1. Components capable of being removed or adjusted without removing mounted shade brackets, or cassette support channel.
   2. Smoothly operation raising or lowering shades.

C. Basis of Design: Mecho/5 System as manufactured by Mecho.
   1. Description: Manually operated fabric window shades.
      a. Shade Type: Single Roller.
      b. Universal drive capability to offset drive chain for reverse or regular roll shades.
      c. Drop Position: Regular roll.
      d. Mounting: Ceiling mounted.
      e. Size: As indicated on drawings.
      f. Fabric: As indicated on Finish Schedule.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Material: Steel, 1/8 inch (3 mm) thick.
   3. Roller Tubes:
      a. Material: Extruded aluminum.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
      d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
   4. Hembars: Designed to maintain bottom of shade straight and flat.
      a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
   5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
      a. Heavy-duty, 1/8” steel mounting bracket and integrated steel brake, clutch and sprocket assembly rigidly affix the shade support and user control to the building structure fully independent of the roller tube components.
      b. Permanently lubricated maintenance-free brake assembly employs an oil-impregnated steel hub with wrapped spring clutch.
      c. Brake must withstand minimum pull force of 50 pounds (22.7 kg) in the stopped position.
      d. Direct drive clutch requires no interstitial gear stages or plastic parts between the building structure and clutch ensuring reliable operation across the full range of shade sizes.
      e. Maximum shade hanging weight of 18 pounds (8.2 kg).
   6. Drive Chain: Continuous loop stainless steel beaded ball chain, 100 pound (45 kg) minimum breaking strength. Provide upper and lower limit stops.
      a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
      b. Limit stops: Bead stops affixed to the chain maintain consistent shadeband alignment at the top and bottom of shade travel across multiple shades, and help prevent shade damage resulting from unmanaged user control.
   7. Accessories:
      a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners.
         1) Finish: To be selected by Architect from manufacturer's standard color selection.
         2) Single Fascia: Accommodate regular roll shades.
         3) Profile: Square.
         4) Configuration: Captured, fascia stops at captured bracket end.

2.03 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill Opening from Head to Sill: 1/2 inch (13 mm) space between bottom bar and window sill.
   2. Horizontal Dimensions: Outside mounting.
      a. Cover window frames, trim, and casings completely.

2.04 SHADE FABRIC

A. Basis of Design: Shade fabric as manufactured by MechoShade Systems LLC.
   1. Solar Shadecloths:
      a. Fabric: As indicated on drawings.
         1) Color: as indicated on Finish Schedule.
   2. Performance Requirements:
      a. Flammability per NFPA 701: Pass. Large or small scale test.
      b. Fungal Resistance: No growth when tested per ASTM G21.
   3. Fabrication:
      a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.
      b. Battens: Manufacturer's standard material, full width of shade, and enclosed in welded shade fabric pocket; locate as indicated on drawings.
      c. Seams for Railroaded Fabric: Manufacturer's standard seam; locate as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

C. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Contractor Furnish and Install Responsibilities:
   1. Window Covering Contractor (WC) shall provide an on site, Project Manager, and shall be present for all related jobsite scheduling meetings.
   2. WC shall supervise the roller shade installation, and setting of intermediate stops of all shades.
   3. WC shall be responsible for field inspection on an area-by- area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.
   4. Verification of Conditions: examine the areas to receive the work and the conditions under which the work would be performed and notify General Contractor and Owner of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation shall constitute acceptance of substrate conditions by the installer.
   5. WC shall provide accurate to 0.0625” inch (1.5875mm); field measurements for custom shade fabrication on the Roller Shades manufacturers input forms.
   6. WC Installer shall install roller shades level, plumb, square, and true according to manufacturer’s written instructions, and as specified here in. Blocking for roller shades

installed under the contract of the interior General Contractor shall be installed plumb, level, and fitted to window mullion as per interior architect's design documents and in accordance with industry standard tolerances. The horizontal surface of the shade pocket shall not be out-of-level more than 0.625" (15.875mm) over 20 linear feet (6.096 meters)

7. Shades shall be located so the shade band is not closer than 2 inches (50 mm) to the interior face of the glass. Allow proper clearances for window operation hardware.
8. Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
9. Installer shall set Upper and Lower limits of all manual shade bands, and assure alignment in accordance with the above requirements.
10. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
11. WC shall train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.
    a. Use operation and maintenance manual as a reference, supplemented with additional training materials as required.

3.04 PROTECTION AND CLEANING

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.
   1. Clean soiled shades and exposed components as recommended by manufacturer.
   2. Replace shades that cannot be cleaned to "like new" condition.

END OF SECTION

SECTION 124813
ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet mat.

1.02 SUBMITTALS

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

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.

C. Shop Drawings: Indicate dimensions and details for recessed frame.

D. Samples: Submit two samples, ___ by ___ inch in size illustrating pattern, color, finish, and edging.

E. Maintenance Data: Include cleaning instructions, _____, and stain removal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Floor Mats:
   1. As indicated on drawings..
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATS

A. Carpet Mat: As indicated on drawings.
   1. Color and Pattern: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor is ready to receive work.

B. Prepare floor as indicated on drawings.

END OF SECTION

SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Pipe hangers and supports.

1.02 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

D. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.

E. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Welding Materials and Procedures: Comply with ASME BPVC-IX.

B. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.5 steel flanges and fittings.

2.03 ESCUTCHEONS

A. Material:
   1. Chrome-plated.
   2. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:

SECTION 142423 - HYDRAULIC PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modernizing the elevators, bringing everything to current code compliance. Elevator contractor shall perform all work necessary to achieve the intent of this project, including but not necessarily limited to the work specified herein.

1. Prior to removing the first elevator for modernization, the Elevator Contractor shall perform a thorough preventative maintenance routine on the remaining elevator(s) being used by the building. Replace any worn components, assemblies, or items that may fail or cause callbacks during the modernization of the first elevator due to the additional load placed on the elevator being used by the building. This preventative maintenance routine shall be in addition to the normal routine maintenance and included with the modernization price (not billed separately). All components, assemblies, or parts removed from the first elevator being modernized shall remain on-site for immediate and necessary repairs or call backs on the other elevator. A suggested list of maintenance items is:

    a. Clean, adjust, and lubricate all hoistway limit switches.
    b. Service governor and governor tension device.
    c. Clean, adjust, and lubricate the door operator, car door track, hangers, clutch, restrictor, and drive linkage.
    d. Secure the top emergency exit and verify it is easily opened in case of entrapment.
    e. Clean, adjust and lubricate all hall door tracks, hangers, interlocks, and closers; make all self-closing.
    f. Clean top of car, machine room and pit.
    g. Verify all signals work and replace parts as needed.
    h. Confirm communication works as per code.
    i. Clean and inspect safety apparatus.
    j. Replace any worn carbon contacts.
    k. Test overloads and replace any fuses that are not readily identifiable or legible.

B. Passenger Elevator Summary

1.	No. of Elevators:	Two (2)
2.	Classification:	Passenger
3.	Identification No.:	Car 1 & Car 2
4.	Rated Capacity:	2500 LBS
5.	Rated Speed:	100 FPM
6.	Operational Control:	Duplex / Selective-Collective
7.	Floors Served:	1,2,3,4
8.	No. of Openings:	Four (4)
9.	Car Door:	Single Speed Side Opening
10.	Hall Door:	Single Speed Side Opening
11.	Driving Machine:	Dual Roped Hydraulics

12. Control System: Microprocessor
13. Roping: 1:2

C. Fixture Design - Car and Hall

1. The owner or his representatives shall select and approve the buttons, cover plates, Braille tags, numerals, engravings, fixtures, and equipment. Failure to gain their approval prior to ordering fixtures may result in contractor having to reorder fixtures acceptable to the owner. Provide samples of finishes for owner's approval.
2. Contractor is responsible for all cutting and rough patching require for new hall stations. Owner shall perform final finishing.
3. Design:

   a. Manufacturer: Monitor Controls/Innovation Ind. EPCO.
   b. Series: Monitor, Brusier, SSL, or approved equal.
   c. Material: Stainless steel.
   d. Finish: Brushed (#4).
   e. Edge style: Panned.
   f. Button size: 1-1/8".
   g. Button profile: Flat.
   h. Button type: Tamper resistant with 3/16" jewel.
   i. Button halo: 1-3/8" diameter clear halo.
   j. Illumination: LED.

4. Type of Car Operating Panel/Car Station: Applied panel.

   a. See CAR OPERATING PANEL SECTION for further details.

5. Hall Riser Details:

   a. Quantity: One (1)

1.2 ALLOWANCES

A. The net allowance for the new cab enclosure(shell) and finishes is $40,000 per elevator.

1. The allowance shall include the design and materials for this enclosure including lighting, entrance columns, transoms, door panels, and all necessary cutouts. The allowance shall exclude any handling charge, sales or use taxes, car door hangers, interlocks, exit contacts and locks, or any operating equipment; the elevator contractor shall include all of these items cost in his base bid. Any unused Allowance will be credited to owner as a Deduct Change Order.
2. The owner or his authorized representative reserves the right to purchase the cab separately, in which case the elevator contractor shall deduct the full allowance amount from the contract price. The elevator contractor shall remain responsible for all coordination with the cab vendor in terms of scheduling delivery.

   a. If the cab allowance is deducted and removed from the Elevator Contractor's work, unless otherwise indicated, the Elevator Contractor shall continue to include the cost of labor for installation of the cab(s).

b. Elevator Contractor shall coordinate the scheduling of the cab delivery with the project work schedule to not delay the project.

3. The elevator contractor may hire a subcontractor to provide the design and build the new cab enclosure.

a. Owner shall pay elevator contractor out of each allowance the actual costs for the subcontractor's work without mark-up.
b. The elevator contractor shall coordinate and schedule the Subcontractor's work to fit into the elevator contractors schedule and meet all schedule obligations for this project.

1.3 DEFINITIONS

A. Approved or Accepted or Reviewed: As applied to materials, products and workmanship shall mean that acceptance or review by the CMA/Architect is required.

B. Best or First-Class or First-Grade or Similar: As applied to materials, products and workmanship shall mean that, in the CMA/Architect's opinion, there are no superior qualities of materials or products on the market, and there is no better class of workmanship.

C. Cab Company: Company that will furnish the cab interior.

D. Code: All applicable laws and codes, including but not limited to the electrical, fire, building, and elevator codes designated by any authority having jurisdiction.

E. Consultant: CBA Elevator Consultants, 190 Main Street, Suite 402, Hackensack, NJ 07601.

F. Contractor: Shall mean the person, firm, entity or corporation named in the Contract Documents who will execute the work. It shall include all his employees, subcontractors and suppliers.

G. 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.

H. Current Issues/Current Editions: As applied to reference standards and governing codes shall mean the latest published issue or edition available during the bidding period.

I. Defective: Shall include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected and unsatisfactory conditions.

J. Exposed: Shall mean not installed underground or "concealed" as defined above.

K. Furnish or Supply: Shall mean to purchase, procure, acquire, and deliver new, complete with related accessories and unload and inspect for damage.

L. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, and ready for use and connect complete with related accessories.

M. New: Furnish and install a newly manufactured, not a re-built, item.

N. Notice-To-Proceed: Shall mean a written document from the CMA/Architect or owner allowing the elevator contractor to commence only that portion of the work stated in the written document.

O. Provide: Shall mean to supply, install and connect up complete and ready for safe and regular operation particular work referred to unless specifically indicated otherwise by the CMA/Architect.

P. Refurbish: Make all repairs, replacements, and adjustment necessary to return item to "like new" condition and performance.

Q. Remove: Remove existing component and haul off-site.

R. Replace: Remove existing item or assembly and furnish install identical new, not re-built, item.

S. Reuse or Retain: Inspect, clean, modify, repair, adjust, or replace all parts, components, or materials, in order to return item to proper, code-compliant function.

T. Substantial Completion/Beneficial Use: Shall mean that the progress of the work, or on any portion of the work, is sufficiently complete in accordance with the Contract Documents, and as reviewed by the CMA/Architect, so that the owner can utilize the work for its intended purpose.

U. Upgrade: Remove existing technology and furnish and install new state of the art technology through replacement of critical operating parts, software, and assemblies.

V. Wiring: Shall mean conduit, fittings, wire, junction and outlet boxes, switches, cutouts, receptacles and related items.

W. Work: Shall mean the services, materials, labor, and all other equipment required for complete and proper installation by the elevator contractor.

1.4 SUBMITTALS

A. General Instructions

1. All submitted material shall be tendered complete, and at one time. PARTIAL SUBMITTALS WILL NOT BE CONSIDERED. Cutsheets or product data may be submitted prior to shop drawings as one package and at one time.
2. All cutsheets, product data and submittals must be emailed to the general contractor.
3. Variations - If drawings, schedules or other submitted matter show variations from the contract requirements because of standard shop practice or for other reasons, the elevator contractor shall describe such variations in his letter of transmittal. If acceptable, the CMA/Architect may accept in writing, any or all such variations. If the elevator contractor fails to describe such variations, and does not have the CMA/Architect's acceptance in writing, he shall not be relieved of the responsibility for executing the work in accordance with the contract, even though such drawings or schedules may have been accepted.

B. Cutsheets or Product Data: Include names and addresses of the manufacturers, together with catalog information or other identifying description for all items specified indicating model to be used.

1. Permit Application Forms.

C. Shop Drawings: Show material type and gauge, general dimensions, methods of attachment, location, and size of reinforcements and openings, and a general arrangement of components. Matter submitted for review shall be accompanied by complete information concerning the material, articles and/or design proposed for use in sufficient detail to show compliance with the Contract Documents, and shall be reviewed without exceptions before incorporation into the work.

1. Each drawing submitted shall provide a clear space approximately 4 inches x 4 inches for CMA/Architect's use and stamp.
2. Review thereof will not be construed as relieving the elevator contractor of compliance with the Contract Documents, even if such review is made in writing, unless the attention of the CMA/Architect is called to the noncomplying features by letter accompanying the submitted matter. Review of drawings, cuts and samples by the CMA/Architect shall not be construed as a complete check or approval of the detailed dimensions, weights, gauges and similar details of the proposed articles. The conformance of such details with the contract requirements, together with the necessary coordination of dimensions and details between the various elements of the work, and between the various subcontractors and suppliers, shall be solely the responsibility of the elevator contractor, approval of submitted matter notwithstanding.
3. In general, the items to be submitted shall include but shall not be necessarily limited to the following:

    a. Schedule of work showing commencement and completion dates and phasing, for each elevator.
    b. Elevator car and hall fixture drawings.
    c. Cab enclosurefinishes drawings.

4. Review of drawings, schedules and other submitted matter will be general and shall not be construed as:

    a. Permitting any departure from the contract requirements
    b. Relieving the elevator contractor of the responsibility for any errors, including details, dimensions, materials, etc.
    c. Approving departures from details furnished by the CMA/Architect.

D. Hoistway and Machine Room Plan and Section Drawings: Fully detailed elevator layout drawings are required on ALL elevator even if the Authority Having Jurisdiction (AHJ) does not require it. The drawing set shall include:

1. Machine Room Plans.
2. Shaft/Hoistway Plan.
3. Inside Cab Dimensions.
4. Pit Plan.
5. Hoistway Section.

6. Pump Unit and Valve Details.
7. All Reactions including structural loads, electrical loads, heating.

E. Samples: Where submissions are called for in the specifications, or when otherwise required by the CMA/Architect, the elevator contractor shall submit duplicate samples of materials, appliances, finish or other items included in the work. Such samples shall be in all respects equal to that to be provided for the work and shall be approved by the CMA/Architect before the work is executed. Samples shall be submitted in ample time before work is installed, to permit sufficient time for general contractor/architect's consideration. Samples shall be accompanied by a label, or shall be properly marked, indicating the type and brand of material, its place of origin, the name of the producer and address, serial numbers, the elevator contractor's name and the name of the project for which the material is intended.

1. Signage / braille plates.
2. Cab pads.
3. Materials and finishes.

F. Closeout Package

1. Instruction to owner's personnel: At the owner and/or elevator CMA/Architect's request, the elevator contractor shall provide a competent instructor who together with a representative from the elevator consultant's office, shall meet with the owner's personnel to fully and adequately instruct the owner's personnel in the proper operation of all equipment installed by the elevator contractor.
2. The following printed and electronic information shall be furnished during the shop drawing review for approval and submission upon completion of the elevator project.

    a. Operational Instructions - explaining all operating features, including all apparatus in the car control panels and elevator monitoring apparatus.

        1) One (1) hardcopy set of neatly bound instructions.
        2) One (1) electronic set in portable document format (PDF).

    b. Maintenance Instructions - instructions and recommendations for maintenance of all elevator equipment.

        1) One (1) hardcopy set of neatly bound instructions.
        2) One (1) electronic set in portable document format (PDF).

    c. Lubrication Charts - indicating all lubrication points and type of lubrication recommended for all equipment.

        1) One (1) hardcopy set of neatly bound instructions.
        2) One (1) electronic set in portable document format (PDF).

    d. Recommended Spare Parts - one complete parts list for all replaceable parts. It shall include a list of extra parts inventory (fuses, brushes, spare wires, and other typically consumed parts, etc.).
    e. Controller Prints - as-built controller prints updated to show all changes made during the project.

f. Wiring diagrams - complete set of all wiring diagrams for controller, door operator, and major assemblies.
g. Oil Log or Chart - for recording any time oil is added to the pump unit it shall be in a format that is acceptable to the AHJ.
h. Fire Service Test Log or Chart - for recording monthly testing of fire service in a format that is acceptable to the AHJ.
i. Diagnostic test device - complete with access codes, adjusters manuals and setup manuals for adjustment, diagnosis and troubleshooting of elevator system and performance of routine safety tests. Manufacturer of diagnostic test device shall update, reprogram, recharge, etc., device for as long as the controls remain in place. Further, elevator contractor warrants, by submitting their bid that any SIM card or related device shall remain with the control system, and that elevator contractor's personnel shall never remove such a device from the control system under any circumstances. This requirement shall remain in effect for the lifetime of the elevator control equipment.

G. Keys:

1. Three sets of keys to operate all keyed switches and locks shall be furnished upon completion of the work.

H. Spare Parts:

1. Elevator contractor shall provide a list of extra parts inventory (fuses, brushes, spare wires, and other typically consumed parts, etc.). Elevator contractor shall furnish all inventory listed to owner.

1.5 LICENSES AND PERMITS

A. Elevator contractor shall, at his own cost, secure any necessary municipal, state and federal permits and licenses required for all performance and the completion of all work to be done hereunder. The elevator contractor shall provide the general contractor with copies of all such permits, licenses and approvals upon their issuance. Some of the permits that elevator contractor must supply:

1. Elevator permit issued by the AHJ.
2. Separate electrical permit for electrical work associated with the elevator work and issued by the AHJ, if required.

1.6 STORAGE OF EQUIPMENT AND MATERIALS

A. Elevator contractor must specify at the beginning of the project the details of storage space required. Storage space requested shall be reasonable and in accordance with the projected schedule. In the event that it is necessary for elevator contractor to stockpile or to store quantities of material or equipment on the job site, elevator contractor shall inform owner of such necessity and owner shall offer available space, if any is available, for storage of such materials or equipment. Elevator contractor shall use said space only for such purpose. Any and all materials which may be stored in such space or which may be brought onto the job site at any time by elevator contractor shall be left at elevator contractor's sole risk. The owner shall not be responsible to elevator contractor for loss of or damage to said materials or equipment for any cause whatsoever. It is expressly understood and agreed that elevator contractor assumes all risk of loss or damage to such materials and equipment, except as heretofore provided, and that owner shall not be required to furnish or supply watchmen at any time.

1. Elevator contractor shall take necessary measures to protect any such storage area and shall be responsible for any and all damages.

B. The elevator contractor shall confine storage of materials to limits approved by the owner and he shall not necessarily encumber the premises or overload any portion of it with materials to a greater extent than it is calculated to bear. Elevator contractor shall not store hazardous materials such as solvents, paints, thinners, etc., unless in approved containers.

1.7 OWNER RESPONSIBILITIES

A. Open Violations

1. It is the owner's responsibility to confirm that the elevator is current with all mandated inspections and tests. The elevator contractor shall verify with the Authority Having Jurisdiction (AHJ) the status of all mandated inspections, tests, and any outstanding violations or fines incurred.

B. HAZARDOUS MATERIALS

1. If hazardous materials are encountered, owner will remove any hazardous materials under a separate contract. The elevator contractor shall notify the owner of any such materials as soon as observed.

1.8 WARRANTY AND GUARANTEE

A. Provide project warranty effective upon completion of the elevator project and continuing for one year after acceptance of the last elevator by the owner. Warranty shall be igned by elevator contractor, installer, and manufacturer, agreeing to replace/repair/restore defective materials and workmanship of the elevator work during warranty period.

B. The elevator contractor shall guarantee that the materials and workmanship installed, refurbished, and repaired, under this contract, shall be free of all faults, imperfections, flaws, and damage in every respect. The elevator contractor also assures and warrants that he will make good any defect, which may develop within one (1) year from the date of final acceptance of the completed installation. Such guarantee shall be delivered in writing, to the owner, before final payment will be made. Neither final payment nor any provision of the contract documents shall relieve the elevator contractor of his responsibility to remedy faulty materials or workmanship and to pay all expenses for damages to other work resulting therefrom.

1.9 WARRANTY AND GUARANTEE

A. Manufacturer's Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

B. Failures include but are not limited to: operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Warranty and maintenance coverage of all the elevators shall begin with the execution of the Contract (AIA or similar) and turn-over of the elevators for maintenance. It shall continue through substantial completion of the final elevator when the elevator maintenance contract commences.

D. Warranty Period: One year from the date of Substantial Completion of the final elevator in this modernization. Each elevator will be turned over separately (partial acceptance) and will be covered under the maintenance agreement after turn-over (Interim Service detailed in following section) and a one-year warranty and maintenance coverage at the Project Completion.

1.10 MAINTENANCE

A. Interim Service: The Contractor shall furnish interim service from the Notice to Proceed until the completion of the final elevator modernizationis completed. The terms of the included initial full-service maintenance service shall govern the component coverage provided by the Contractor. If there are any components scheduled for removal during the modernization, Contractor can elect to repair as necessary to provide elevator service prior to the commencement of the modernization. Upon the expiration of the interim service period, the term of the initial maintenance service shall commence.

1. Perform maintenance during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of 30 minutes or less.

B. One Year (Initial) Maintenance Service: Beginning at Substantial Completion of the last elevator, maintenance service shall include 12 months full maintenance by skilled employees of Elevator Contractor. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of 30 minutes or less.

C. Prior to starting maintenance and before the end of the One Year (Initial) Maintenance Service, jointly inspect all portions of the elevators, shafts, systems, machine rooms, and all other components with the existing/next elevator maintenance firm employed by the Owner.

PART 2 - PRODUCTS

2.1 CODE COMPLIANCE

A. All the work covered by these specifications is to be done in full accord with all federal, state and local codes, ordinances, and elevator safety orders as are in effect at the time of the execution of the contract. All of the requirements of the local Authority Having Jurisdiction (AHJ) are to form a part of these general conditions and are to be fulfilled by the elevator contractor and his subcontractors. The Contractor shall include and advise the Owner's Representative of pending code changes that could be applicable to this project and provide quotations for compliance with related costs. The entire elevator system, including all elevator equipment and work, shall be in accordance with the latest requirements adopted by the AHJ.

B. Code Compliance: Work is to comply with all applicable Local Laws. For any discrepancies, the code shall take precedent. Compliance is not limited to any changes or amendments imposed by the appropriate authorities to all laws specified.The elevator contractor shall immediately inform the owner of any work or materials which violate any of the above laws and regulations and any work done by the elevator contractor causing such violations shall be corrected by the elevator contractor at his own expense.The following codes shall be the applicable codes for this project and shall be identified, if required, on all required municipal permits:

1. ASME A17.1: Safety Code for Elevators.
2. ASME A17.2: Guide for Inspection of Elevators.
3. ASME A17.3: Safety Code for Existing Elevators.
4. ANSI A117.1: Accessible and Usable Buildings and Facilities.
5. ADA: The Americans with Disabilities Act, Civil Rights Law – Title III.
6. NFPA 70: National Electric Code (NEC).
7. OSHA: Occupational Safety and Health Administration.
8. ASME A17.1-2016 and PA modifications to IBC-2018, Chapter 405 as amended under Section 201 of Pennsylvania Construction Code.

2.2 PERFORMANCE REQUIREMENTS

A. Upon completion of the elevator[**s**] and prior to the acceptance test and subsequent turnover to use by the owner and the building adjust the elevator[**s**] to meet the following performance requirements.

1.	Contract Speed:	+/- 20 percent (Max).
2.	Leveling Accuracy:	+/- 1/4 inch.
3.	Floor-to-Floor Time:	13.0 - 15.0 Seconds.
4.	Door Opening Time:	2.5 Seconds.
5.	Door Closing Time:	3.5 Seconds.
6.	Dwell Time (Car Call):	3.0 Seconds (adjustable to 10 seconds).
7.	Dwell Time (Hall Call):	5.0 Seconds (adjustable to 20 seconds).
8.	Reduced Dwell Time:	1.0 Seconds (adjustable to 10 seconds).
9.	Lobby Dispatch Time:	5.0 Seconds (adjustable to 60 seconds).
10.	Nudging Time:	More than 20 Seconds.
11.	Door Closing Force:	Less than 30 Pounds.
12.	Acceleration/Deceleration:	2.5 milli-g.
13.	Horizontal Vibration:	30.0 milli-g.
14.	Vertical Vibration:	30.0 milli-g.
15.	Noise Level:	70 dBA (inside car).

2.3 SIGNAGE - NEW

A. Signage:

1. Machine Room: Provide a sign on the outside of the machine room on or adjacent to the machine room door. Elevator Machine Room sign with letters not less than 51 mm (2 in.) high.
2. Machine Room Temperature and Humidity: Provide a sign in the machine room stating the range of temperature and humidity as specified by the equipment manufacturer and as required by A17.1.
3. Medical Emergency Services: Identify the designated medical emergency services elevator with 3" high international symbol at each elevator entrance on both side of the jamb (if required).
4. Crosshead Data Plate: Provide a crosshead data plate that lists the rated capacity and rated speed of the elevator and complies with A17.1.
5. Safety Data Plate: Provide a safety data plate on or adjacent to the elevator safeties complying with A17.1.
6. Buffer Data Plate: Provide a permanent buffer marking plate indicating the manufacturer's name, identification number, rated impact speed and stroke on or adjacent to the buffers and complying with A17.1.
7. Car / Hoistway Door Bypass: Provide a warning sign adjacent to the car and hoistway door bypass switches "Jumpers shall not be used to bypass hoistway door or car-door electric contacts."

8. Elevator Identification: On both door jambs of every elevator entrance at the designated level, alternate level, level where means necessary for tests is provided and level where inspection and test panel is provided then 50 mm (2 in.) in height and shall be located immediately below the floor designation A17.1 – 2016 Section 2.29.1.2.(i)**.**
9. Floor Numbers: Provide new 4 inch floor numbering on the hoistway side of the hoistway doors and/or walls at intervals as require by Code.
10. Refuge Areas: Clearly mark using code complaint tape or paint indicating where the refuge areas are and where there are any striking hazards.
11. Emergency Signs - An approved pictorial sign of a standardized design shall be posted adjacent to each elevator call station on all floors instructing occupants to use the exit starways and not to use the elevators in case of fire. The sign shall read: "IN CASE OF FIRE, ELEVATORS ARE OUT OF SERVICE, USE EXIT STAIRS". Exceptions:

    a. The emergency sign shall not be required for elevators that are part of an accessible means of egress complying with Section 1009.4.
    b. The emergency sign shall not be required for elevators that are used for occupant self-evacuation in accordance with Section 3008. IBC Code Chapter 30 Section 3002.3.

B. Equipment Identification

1. In buildings with more than one elevator, each elevator in the building shall be assigned a unique alphabetical or numerical identification. Properly identify the following equipment with the car number assigned to it. Paint, engrave, or securely attach the number on:

a.	Driving Machine:	2 inches.
b.	Controller:	2 inches.
c.	Transformers:	2 inches.
d.	Governors:	2 inches.
e.	Buffers:	2 inches.
f.	Main Disconnect:	2 inches.
g.	Crosshead:	2 inches.
h.	Car Operating Panel:	½ inch.
i.	Main Egress:	3 inches.
j.	Hoistway Doors:	4 inches (shaft side).

C. ADA Accessibility Requirements: Confirm that the elevator**[s]** shall conform to the Elevator Code, Municipal Code, and ADA Accessibility requirements and include:

1. Braille plates, pins, or engraving: Provide markings on the car operating panel (COP) adjacent to the floor and control buttons on a contrasting color background to the left of the buttons. Letters and numbers shall be a minimum of 5/8 inch and raised 0.03-inch with Braille indications.
2. Jamb plates: Provide floor designations at each entrance on both sides of jamb at a height of 60 inches above the floor. Designations shall be 2 inches high, raised 0.03-inch with Braille indications and shall be as selected and approved by the owner. Provide samples for approval.
3. Hall station: Recommend the centerline of the new hall push button station shall be 42 inches above the floor line; however it can be adjusted (if acceptable by Ownership) as long as it is within the current reach range listed in A117.1.

4. Provide an audible signal to tell passengers that the car is stopping or passing a floor served by the elevator. See VOICE ENUNCIATION for further details.
5. Provide control non-interference door dwell timing features in accordance with ADA requirements. See PERFORMANCE REQUIREMENTS for further details.

2.4 CAB ENCLOSURE -NEW

A. Provide and install new cab enclosure(shell) and new finishes. The owner and/or his representatives shall select the finish and design of the cab enclosure. Construct elevator cab to accommodate the door operator, hangers, interlocks and all accessory equipment provided under other sections of these specifications, including firefighter phones, card readers and CCTV.

B. Steel shell with hanging panels design: EDI - ECI Design #3750

2.5 PROTECTIVE PADS - NEW

A. Provide one set of heavy duty pads with rubber coated eyelets to hang from pad buttons or pad retainers.

1. Color and type of cab pad shall be selected and approved by Owner. Sample shall be provided to owner prior to release for fabrication.

2.6 CCTV (SECURITY) CAMERA - PROVISIONS ONLY

A. Provide wiring provisions for a future installation of a CCTV (security) camera system. See WIRING AND CONDUIT and TRAVELING CABLE for specific details of the wiring provisions.

2.7 CAR SILL - NEW

A. Material:

1. Nickel-Silver.

2.8 CAB FLOORING - NEW

A. Color, finish and design selected by the owner or his representatives and installed by elevator contractor.

2.9 CAR OPERATING PANEL - NEW

A. Provide and install a new car operating push button panel in the front return of the car in an applied panel configuration. The car station shall contain a series of push buttons to correspond to the landings served. The push buttons shall illuminate individually when pressing a button for the desired floor. These lights shall extinguish after answering the call. The main panel shall include on the cover:

1. Key-operated stop switch, that when activated shall remove electric power from the driving-machine motor and brake. Activation of the key-operated stop switch shall not cancel registered car or corridor calls, and after releasing the switch, the car shall continue to answer its registered calls. Key shall be Group 1 Security.
2. An illuminated alarm button connected to a bell under or on top of the car.
3. Door open button.
4. Door close button.
5. Hairline fit flush cutout for card access reader, include all necessary shielded wiring. The hairline fit plate shall be of the same material and finish as the car operating panel(s).
6. Overload signals - both audible and visual indication when overload condition occurs. See OVERLOAD SECTION for further details.
7. In a separate locked service panel include the following:

    a. Car light key switch.
    b. Fan key switch.
    c. Inspection key switch for use with access operation and the top-of-car operating station.
    d. Independent key switch.
    e. One spare key switch reserved for future use.
    f. Attendant key switch with associated operating buttons and signal indicators.
    g. Emergency light test button.
    h. GFCI duplex receptacle.

8. Incorporate the emergency lighting, fire controls, auxiliary signals, and mandated engraving to comply with all applicable elevator and fire codes as well as ADA requirements.

2.10 VOICE ANNUNCIATION - NEW

A. Digitized floor annunciation to indicate the floor at which the car is about to stop. The verbal announcement indicating the floor shall complete prior to the initiation of the door opening. Shall comply with all current code requirements. Incorporate or locate this in either the car station or the car position indicator.

2.11 EMERGENCY TELEPHONE - NEW

A. Provide an automatic dialing, hands-free telephone in the car-operating panel. The system shall comply with ADA requirements. See the EMERGENCY COMMUNICATION SECTION for detailed requirements.

2.12 EMERGENCY LIGHTING - NEW

A. Provide an emergency light unit:

1. A minimum of two (2) bulbs or LED's of approximately equal wattage.
2. Illumination for a minimum of four (4) hours.
3. Not less than 0.2 fc when measured 48 inches above the car floor and 12 inches in front of car operating panel.
4. A permanent connection to the car light branch circuit.

B. Location:

1. Integral part of the car operating panel(s).

2.13 CAR POSITION INDICATOR - NEW

A. Location:

1. Incorporate/include in car operating panel (COP)/car station detailed above.

B. Provide LED type readout in the car station to show floor locations. The LED characters shall be 2" high with a screen flush with panel surface of the fixture cover. Install one transmitter per elevator to supply digital position indicator.

2.14 EMERGENCY COMMUNICATIONS - NEW

A. General Information:

1. Provide and install a new two-way communications system between the car and a location staffed by authorized personnel and that complies with Section 2.27 of the A17.1 Elevator Code and Section 407.4.10 of the A117.1 Accessibility Code.
2. Install interface unit and phone handset in the machine room to allow for communication between the machine room and the elevator.

B. Emergency Telephone (In-Car):

1. Provide an automatic dialing, hands-free telephone in the car, mounted as an integral part of the car operating panel.
2. Pressing the emergency alarm button or HELP push button in the car panel shall initial the telephone. It shall automatically dial a programmed number to alert the security personnel that there is a problem in the elevator. Calls shall terminate externally and not from within the car. Pressing any button that initiates the call twice shall NOT stop placing the call.
3. If the first number dialed does not answer, the auto dialer shall dial a second programmable number.
4. The system shall have a ring-back feature to allow placing calls to the elevator. It shall answer the incoming call automatically and shut off after an adjustable programmed time.

5. Provide an audible and visual signal once establishing the communication link.
6. Rechargeable batteries shall ensure operation under all conditions. The alternate power source shall be capable of providing power for the means of emergency communications for at least 4 hours.
7. Install the communication unit in the elevator and wiring within the hoistway, terminating the wiring in the elevator machine room. Install a suitable and identifiable junction box in the machine room.
8. The emergency telephone system shall require a maximum of one telephone line.
9. The system must provide line sharing capability to eliminate the need for a dedicated telephone line.
10. The line sharing function must ensure that the emergency telephones always receive dialing priority even if the line is in use and that the emergency telephones can be called into from an on-site location.

C. Line Verification/Monitoring:

1. The two-way communications means within the car shall include a means to verify operability of the telephone line where:

    a. Verification of the telephone line operability shall be automatically performed.
    b. Verification may be continuous or periodic.
    c. Periodic verification shall be at least daily.
    d. Verification shall not require activation of the two-way communications link(s).

2. If means other than a telephone line (VOIP, network, intercom, etc.) is used for the two-way communications, similar verification of this equivalent means shall be performed.

D. Designated Landing Signals:

1. If the verification means determines that the telephone line or equivalent means is not functional, an audible and illuminated visual signal shall be activated. A minimum of one visual and one audible signal shall be provided for each group of elevators controlled by a "FIRE RECALL" switch.
2. The visual signal shall:

    a. Be located at the designated landing in the vicinity of the "FIRE RECALL" switch and visible to elevator user(s).
    b. Be labeled "ELEVATOR COMMUNICATIONS FAILURE" in red letters a minimum of ¼ (0.25) inches high.
    c. Illuminate intermittently.
    d. Continue illuminating intermittently until the telephone line or equivalent means is functional.

3. The audible signal shall:

    a. Be 10 dBA minimum above ambient, but shall not exceed 80 dBA measured at the designated landing "FIRE RECALL" switch.
    b. Sound at least once every 30 seconds with a minimum duration of half a second.
    c. Continue to sound until silenced by authorized personnel or the telephone line or equivalent means is functional.

4. A means to silence the audible signal shall be provided and shall be accessible only to authorized personnel. The signal when silenced shall remain silent for a period of no less than 12 hours or until activated by the next failed periodic verification.
5. The verification means shall continue to monitor the operability of the telephone line or equivalent means while the telephone line or equivalent means is not functional on a continuous basis or periodically with intervals of not more than 5 minutes.
6. When the verification determines that the operability of the telephone line or equivalent means has been restored after being nonfunctional, the audible signal shall be silenced unless the signal has already been silenced and the illuminated visual signal shall be extinguished.

2.15 ACCESS CONTROL SYSTEM - NEW

A. Provide the necessary wiring, power, and mounting locations for installation of a new access control system with card readers being installed in the car operating panels and interfacing this system into the new elevator system. The elevator contractor shall be responsible for the elevator related work and coordinate work with the Security Company.

1. Assist installing pass card readers in the new car operating panels, card readers shall be integral to new car operating panels and shall not be surface mounted.
2. New interface wiring and connections between the access control system in machine room and all necessary car and hall calls.

2.16 MACHINE ROOM ENCLOSURE - NEW

A. Equipment:

1. All elevator machinery and control equipment shall be located in the machine room.
2. Any work required facilitating removal of existing equipment and installation of new equipment in the machine room governor access and repair thereof shall be the responsibility of the elevator contractor.
3. The placement of any new equipment shall meet all current and applicable codes including, but not limited to, ASME A17.1 and all local codes and ordinances.

B. Electrical System:

1. Provide new electric wiring from the main disconnect switch to the terminals of the new elevator controller in its location as shown on the approved layout drawing, inclusive of a normal/standby 120 VAC, 15 Amp supply at each controller for car lighting.

    a. Confirm if emergency lowering/battery backup is present and that main disconnect has necessary auxiliary contact present.

2. If necessary for code compliance, provide auxiliary main line disconnect switch to maintain line of sight of any controller and moving equipment.

2.17 EQUIPMENT ISOLATION - REFURBISH

A. Refurbish equipment isolation.

2.18 OPERATIONAL CONTROL SYSTEM - NEW

A. Approved Manufacturers:

1. GAL.
2. MCE.
3. [Elevator Controls - Pixel]
4. Approved Equal (must be non-proprietary).
5. A "Non-proprietary" controller product is one that is regularly sold by the manufacturer to other installers and one for which the manufacturer will provide technical support to other elevator contractors maintaining the product.
6. The CMA/Architect shall retain the right to change or assign a controller manufacturer or product to the elevator contractor.

B. General Information:

1. Provide new solid-state microprocessor controller designed to the applicable ASME code as adopted and/or modified by local and state law or the local authority having jurisdiction.
2. Paint all machine room enclosures provided by the control manufacturer (control cabinet, isolation transformers, ripple filters, resistor boxes, etc.) the same color.
3. Provide rubber floor mats at the front of the controller[and at the rear (if serviceable parts are located in the rear)].

C. Remote Monitoring:

1. Provide one (1) remote monitoring panel in a location to be designated later by the owner. Include the following controls and monitoring features:

    a. Manufacturer's standard elevator monitoring and reporting system including all optional features.

        1) MCE iMonitor and iReport.
        2) Approved Equal.

2. The desktop computer-based elevator monitoring and reporting system shall have:

    a. A windows based computer with necessary communication and data storage to meet the performance requirements of these specifications.
    b. Keyboard: Full size with 104 keys.
    c. USB ports for transferring data.
    d. LCD monitor (19" minimum size).

3. The monitoring system shall be capable of displaying the information in the following formats:

   a. Graphic Status Display - Display of an elevation (hoistway) view with a representation of every car in the group and shall show at least one group at a time. It shall include the following information:

      1) Floor status.
      2) Group operational mode.
      3) Car status.
      4) Hall calls.
      5) Date and time, building and group identification.

   b. Car Snapshot - For each car, the snapshot provides car ID, hoistway position, real-time motion indication, real-time front and rear door animation, operating mode, next travel direction, floor, connection information, dispatch status (independent/group), and visible/audible alarm indication.
   c. Per Car Detail - For each car, the detail provides operating mode, group status, real-time door animation, current floor (at or passing), real-time motion indication, next destination, preferred direction, ETA to next hall call, hall calls for front and rear doors, non-directional calls (i.e., Code Blue), emergency power status, seismic status, load weigher status, swing indicator, sabbath indicator, flood operation status, and auto-stop status.
   d. Tabular Status Display: Display the same information as indicated above except that registered hall and car calls and floor security status shall be displayed on screen simultaneously for all groups connected to the remote monitoring system.
   e. Elevator Alarm and Event Data Display: Monitoring and reporting system shall monitor various discrete signals from the elevator system and retain a log of up to the last 200 alarms/events.
   f. Security Display and Operation: The system shall display one group at a time and from the keyboard shall allow modification of the security status of each car in the group, including floors the car is allowed to serve, floors that the car is secured from serving and floors that are cut out from having hall calls registered from them.
   g. Interactive Elevator Operations Display and Control: The ability to use the keyboard to initiate and display interactive elevator operations, including the following:

      1) Display faults and events.
      2) Alarm messages.
      3) Car and hall calls.
      4) Modifications of certain elevator parameters.
      5) Any other special operations.

   h. Performance Monitoring Display: The ability to view and print performance data for each group connected to the elevator monitoring and reporting system shall be provided. The following screens shall be provided:

      1) The car operation's screen showing the number of door operators, door reversals and car runs.

2) The car timing averages screen, showing averages for flight time, door opening and closing.
3) The hall calls screen shall show per group basis the number of hall calls in each direction broken down into the number answered in specified intervals.
4) The landing summary screen.
5) Any additional screens required.

4. The reporting system shall have the following capabilites, as a minimum: The server shall reside on the Local Area Network (LAN) with the elevator equipment. It shall permit logging in to the Server using any Windows PC running the proper client application. The PC can be on the Local Area Network or in a remote location communicating with the Server through the Internet.

a. Once connected, all information in the current log is immediately available. Select from pre-configured reports, pick start and end times, and the Server instantly pulls the desired information from the database and presents it in an easily understood, graphically simple format.
b. Shall have the ability to save collected data to a file on your PC hard drive or export it to USB drive. Shall permit simple exporting and saving all the data as an .csv file for use with spreadsheet software.
c. Preconfigured Reports:

1) Hall call performance.
2) Hall call analysis.
3) Traffic analysis.
4) Hall call log.
5) Car call log.
6) Event log.
7) Emergency log.
8) Maintenance log.
9) Percent in service.

d. Automatically alert maintenance and other selected personnel when required.
e. Reporting system shall retain records of building elevator traffic.

5. Lobby Display - Software shall have the ability to drive and display a lobby display of the elevator group or groups within the building connected to the lobby display. It shall be a hoistway view designed exclusively for lobby use for waiting passengers or for building personnel. The screen format shall permit customization and some items to be enabled or disabled.

D. Automatic Group Operation œœ Conventional ETA Dispatching:

1. A microprocessor based group supervisory control system with the following features shall control the operation of the elevators:

a. Redundant (distributed) dispatching.
b. Artificial Intelligence.
c. Neural network system with high speed data transmission via serial communications.
d. Advanced software diagnostics.

2. Elevators shall be arranged to operate with or without attendants as an automatic group.

    a. The group shall remain capable of sustaining balanced service and continuing operation with one or more cars removed from the system.
    b. Elevators shall operate from pushbutton panels located inside each car and from a riser of hall pushbutton fixtures located on each landing served.

3. Elevators shall automatically travel to landings for which a call demand exists.

    a. Stops in response to calls that are registered at either the car or hall push button stations shall occur in the natural order of progression in which the floors are encountered, depending on the direction of car travel, and irrespective of the order in which calls are registered.

4. Call acknowledgment lights provided in both the car and hall push button fixtures shall become extinguished as the car responding to a particular call begins its slowdown approach to the corresponding landing.
5. Parking - In the event no demand for elevator service exists, the first car to satisfy its assigned calls shall be dispatched to park at the main landing.

    a. In the event additional cars should also complete their call assignments, those cars shall be individually dispatched to previously designated parking floors.
    b. Parking assignments shall be accomplished without door operation.
    c. Should the elevator parked at the main landing receive a call assignment, another free car in the group shall immediately assume that parking assignment.
    d. The number of elevators assigned to park at any particular landing shall be programmable.

6. The group supervisory controller shall, through a dispatching algorithm along with artificial intelligence parameters, continuously scan the system in order to determine the load each car is transporting and to monitor the number of hall calls registered, the duration of each call, and the intended direction of travel, the number of loaded lifts, etc.

    a. Based upon that data, the supervisory system shall automatically devise a strategy for call assignment with preference given to calls registered in the following order:

        1) Lobby demand.
        2) Long waiting times - down.
        3) Long waiting times - up.
        4) Up calls.
        5) Long wait calls shall be considered those which have remained unanswered for at least forty (40) seconds. The long wait call threshold time shall be programmable.

    b. If a car with no car calls arrives at a landing where both up and down hall calls are registered, it will answer the call in the direction of travel. If no car call is registered, the car shall be assigned to respond to the call registered for opposite direction. The doors shall close and immediately re-open when responding to this call. Hall lantern operation shall always correspond to direction of service.

c. In the event that any car is delayed for more than a predetermined time interval after it received a start signal, the system shall automatically permit the remaining cars in the group to respond to signals and be dispatched in the specified manner.

7. Group dispatching system failures:

   a. In the event the group dispatching or supervisory system should malfunction so that elevators are not assigned to calls within a predetermined interval and in accordance with the conditions of the operating strategy in effect, the system shall automatically assume a back-up mode of operation whereby the elevators shall be arranged to provide continuous service to each landing in a predetermined pattern without regard to actual hall demand.
   b. Failure of the automatic dispatching system will be indicated by an illuminated signal in the Lobby Elevator Control Panel where applicable.

8. Hall call failures:

   a. In the event of failure of the landing call button circuit, provide a means to enable the elevators to service each floor without registration of a call within the elevators.
   b. Provide an illuminated signal in the lobby Elevator Control Panel to indicate that this emergency operation is in effect.

9. Last stop and direction reversal:

   a. When a car arrives at its last stop and reverses direction of travel, all previously registered car calls shall be automatically cancelled. When a car has responded to the highest or lowest call, and hall calls are registered for the opposite direction, the car shall reverse direction automatically and respond to those registered calls. When an empty car reverses direction at a landing with no hall calls, doors shall not open and the hall lantern shall not operate.

10. Main Lobby Operation:

    a. Only the "Next" designated car shall have its hall lantern illuminated and its doors open.
    b. When a "down" traveling car which is not designated "Next" arrives at the main lobby with a lobby car call registered, it will open its door to discharge the passengers but shall not illuminate its lantern.
    c. The doors shall close one (1) second after the door protection is re-established.
    d. When a "down" traveling car with no car calls arrives at the main lobby and is not designated "Next", it shall park without opening its doors.

11. Coincident Calls:

    a. The dispatching system shall be designed with a 20 second parameter whereby an elevator with a car call will receive priority to answer a corresponding hall call if it can do so within 20 seconds.
    b. If the elevator cannot answer the call within the prescribed time, the first available car shall be assigned.
    c. A continuous reassessment of calls shall be made.

E. Machine Display:

1. Provide an LCD display on the controller or in the machine room that allows troubleshooting and can display the status of the elevators. The monitor display shall display car position, registered hall and car calls, and status of the car, etc. The troubleshooting functions should include the ability to register car calls and hall calls. Controller shall include security features in order to allow any elevator contractor to lockout car calls or hall calls on an individual basis without software changes. Fire service shall override all lockouts, as required by Code.
2. Elevator contractor shall provide any passwords or passcodes set on either the LCD display or the control system in writing to the building owner and CMA/Architect. Anytime making changes to passwords or passcodes, elevator contractor shall give in writing all new updates to building owner and CMA/Architect.

F. Car Controller:

1. Design:

   a. Electromechanical relays shall be used on safety circuits as required by the Code.
   b. Relays shall be designed to ensure long life and quiet reliable operation without overheating or excessive wear. Provide contacts supplying highly inductive loads with arc deflectors or suppressers.
   c. Mount large resistors so that heat generated is dissipated from the enclosure without heating other components or wiring.
   d. All controller wiring shall be copper and done in a neat workmanlike manner. Make all connections to studs or terminals by means of solder-less connections lugs or similar connections. Label all studs and terminals for connections of board and external wiring.
   e. Symbols or letters shall identify all devices on the controller, either permanently marked on or adjacent to each device. All fuse holders shall be permanently marked with ampere rating.

2. Programming:

   a. Provide equipment to protect the pump motor and solid-state starter as applicable against overload, phase reversal, low voltage, and single phase in all three phases.
   b. Controller shall regulate car speed to +/- 5% of contract velocity in either direction with any load up to full load.
   c. Calls shall register after establishing the direction of travel and only register in that direction.
   d. Parking shall be adjustable to allow each car to park at any floor.
   e. All date-sensitive functions of the elevator control system shall use a 4-digit year-tracking system.
   f. Controller shall provide efficient, smooth operation with step-less acceleration and deceleration of the elevator-driving machine independent of the load in the car.
   g. All memory chips shall be of the non-volatile type to provide for an automatic restart on power-up conditions.

2.19 MOTION CONTROL SYSTEM - NEW

A. Solid-State Motor Starter:

1. For use with hydraulic elevator pump motors, the system shall include:

   a. Prevent high inrush current and eliminate voltage dips when pump motors start.
   b. Adjustable current limit (10% - 450% of starter rating).
   c. Shall include dynamic stall protection.
   d. Shall include motor wiring detection (reverse phase protection).
   e. Shall include LCD display and keypad with full starter diagnostic information.

2. Approved Manufacturers:

   a. Siemens.
   b. Approved Equal.

2.20 DRIVING MACHINE - NEW

A. Hydraulic Power Unit:

1. Pump Motor and Tank: Provide a fully enclosed self-contained pump unit with structural steel base to support the storage tank and with an integral oil-tight drip pan with drain. Mount the assembly on vibration sound dampeners designed to isolate the unit from the building structure. Construct the storage tank of welded sheet steel complete with a tight fitting cover, a protected vent, an oil level gauge, a drain and a filtering screen over the suction inlet. Provide for storage capacity equal to the volume needed to lift the elevator to the top landing, plus more than 12 gallons (US) reserve.

   a. Design the system for 500-psi maximum working pressure with cold oil, or indicate the maximum working pressure. Design the system such that the pump delivers oil directly into the cylinder at the necessary pressure and in sufficient quantity to force the plunger to lift the fully loaded car at the contract speed.
   b. Arrange equipment in the machine room to allow their removal, by dolly or other conventional means, without having to dismantle or remove any other major components.
   c. Provide any additional structural members required for the installation of the equipment, such as shelf angles or plunger support steel.
   d. Provide all required anchor bolts and beams, templates, inserts, signal boxes and sleeves in the walls or floors.

      1) V-belt or direct drive assembly (dry pump and motor).
      2) Submersible pump drive assembly (under oil).

   e. Starts per hour: 120 elevator starts per hour.

2. Oil: Shall be the proper grade and weight as specified by power unit manufacturer with an ISO 4406:99 cleanliness level of 14/13/11.

3. Muffler/silencer:

    a. The muffler shall reduce pulsation and deliver quiet operation, which may be present in the flow of the hydraulic fluid.
    b. A silencer that contains an internal bladder and pressurized by air is not acceptable.
    c. Limit the increase of ambient noise in the cab to under 4dB (A-scale) when the elevator travels UP or DOWN anywhere in the hoistway.

4. Tank Heater: Furnish and install a thermostatically controlled tank heater, isolated heating element and flexible sealed connecting conduit and wiring.
5. Control Valve: The control valve shall control flow for up and down directions hydraulically and shall include an integral check valve. A control section including control solenoids shall direct the main valve and control: up and down starting, acceleration, transition from full speed to leveling speed, up and down stops, pressure relief and manual lowering. Shall be a load compensated valve. All of these functions shall be fully adjustable to provide maximum smoothness and to meet contract conditions. It shall include:

    a. Relief valve: Externally adjustable, capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that needed to barely open the valve.
    b. Check valve: Designed to support the fully loaded elevator at rest on a column of oil, and to close quietly without allowing any perceptible reverse flow.
    c. Up-start valve: Externally adjustable to bypass oil flow during initial start to relieve load on the motor; to close slowly and to provide for smooth UP starts.
    d. Up-level valve: Externally adjustable, and designed to assure smooth UP stops.
    e. Down valves: Externally adjustable, and designed to control drop-away speed, lowering speed, Down-leveling speed as well as stopping, to provide for smooth starts and stops in the down direction.
    f. Manual valve: Designed to permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes. Manual lowering valve shall be tagged and labeled.
    g. Shut-off valve: Designed to isolate oil in the storage tank and permit adjusting the elevator without having to remove oil from the tank.
    h. Strainer: Designed to prevent fouling the control valve system of the self-cleaning type. Strainer must use a filter that is designed for bi-direction oil flow.
    i. Low pressure switch: Designed to activate by loss of positive pressure at the top of the cylinder, and prevent the operation of the lowering valve or valves.
    j. High pressure switch: Designed to activate by increased positive pressure at the top of the cylinder, and prevent the operation of the valves.

2.21 PIPING / OIL LINE - REUSE

A. Provide new shut-off valves as follows:

1. Type: ball valves.
2. Quantity: Two (2).
3. Locations: One (1) in the machine room, one (1) in the elevator pit.

B. Reuse the existing piping, fittings and shut-off valves however all of the following conditions shall be met and if not replace all components that are not compliant:

1. The existing pipe shall be seamless schedule 80 and compliant with all code requirements. The pipe and fittings must not show any indication of leaking.
2. The pipe run must use the least number of bends required, replace and re-run sections of pipe with excess or unnecessary bends.
3. Must have proper quantity of pipe supports along the entire run of the piping.
4. The piping must be properly labeled: "Elevator Hydraulic Line" with 3/4" high letters in a contrasting color and applied at intervals less than 120 inches.
5. The pipe fittings must not have any indication of leaking, have proper pressure rating for new system pressures and be properly mounted and installed.

    a. The fittings for grooved piping systems must have the proper gasket installed on all couplings. All coupling with improper gaskets shall be removed and the proper gasket installed.

6. The shut-off valves must be installed in easy to access locations in the pit and machine room, any difficult to access or missing shall be installed. The valves must have proper pressure rating for the new system pressures and the proper safety factor.

2.22 AUXILIARY POWER / BATTERY BACKUP UNIT - NEW

A. Provide a new auxiliary power / battery back-up unit that complies with the following requirements:

1. Shall automatically activate during power loss.
2. Shall keep doors closed until proper floor level is reached.
3. Automatically opens doors at Main landing.
4. The elevator shall remain parked with its door closed and door open button operative until normal power is restored.
5. Provide necessary circuitry within the controller to determine the difference between actual power failure and manual operation of elevator disconnect switch in order to prevent unsafe operation of the unit.
6. The control panel shall be located in the machine room or be an integral part of the control system.
7. It shall include necessary batteries, solid-state controls, charger, and monitor lights. Provide a test button in the control panel to simulate this operation.
8. When normal power is restored, the elevator shall return to normal service only after the completion of the automatic lowering operation.
9. Provide necessary terminals for connection to auxiliary switch in main line disconnect provided by others. Coordinate with Electrical Engineer for provision of auxiliary switch in main line disconnect.

2.23 ANCILLARY SHEAVES - REFURBISH

A. Applicable Equipment:

1. Traveling/rams head.

B. The elevator contractor shall refurbish and reuse the existing sheaves:

1. Clean exterior of all grease and oil.
2. Check all bearings for wear and replace all deficient bearings.
3. Check all sheave grooves for proper and equal depth; regroove or replace as necessary.
4. Check all fastenings for proper structural integrity.

2.24 GOVERNOR - NEW

A. Install a new governor.

1. Elevator contractor shall clean, confirm calibration, and install governor level and plumb.
2. Provide an electrical overspeed protective device that when operated, shall disconnect power from the pump unit before or at the application of the safety. This switch shall operate in both directions of travel. The setting for the overspeed switches shall be as prescribed in the ASME Code.
3. The governor shall be located in the hoistway overhead and require a governor access door.
4. The governor shall meet all applicable code requirements including, but not limited to, ASME 17.1 and all applicable local codes and ordinances.

2.25 GOVERNOR ROPE - NEW

A. Provide necessary new pre-formed steel wire rope specifically constructed for elevator governor rope applications.

1. Governor rope shall pass over top of the governor sheave in the overhead and underneath the tension sheave located in the pit.
2. Both ends of the governor rope shall attach to the safety release carrier.
3. Governor rope diameter and method of fastening shall be in accordance with ASME A17.1 elevator safety code and codes and standards accepted by the authority having jurisdiction.

2.26 CAR TOP GUARD RAILINGS - NEW

A. Provide top of car guard rails on the outside perimeter of the car top on all sides where the perpendicular distance between the edges of the car top and the adjacent hoistway enclosure exceeds 12 inches horizontal clearance. The top of car railings shall include a top and midrail and a kick plate.

1. These shall meet all local and state code requirements.

2.27 ALARM BELLS - NEW

A. Provide one (1) new alarm bell per elevator. Locate the bell either underneath the platform or on top of the car.

1. Minimum bell diameter shall be six inches (6").
2. All required bells shall ring when operating the Alarm Button inside the elevator.
3. The activation of the alarm shall activate the emergency communication system as specified in the EMERGENCY COMMUNICATION SECTION.

2.28 LANDING DEVICE - NEW

A. Provide and install a new solid-state landing device and incorporate it into the new microprocessor based operational controls. The device shall:

1. Determine the position in the hoistway through either a fixed tape or by an encoder.
2. Provide accurate control, rapid acceleration, and retardation without discomfort to the rider.
3. Include absolute floor encoding; that during the elevator power up sequence causes the elevator to move to the closest floor to identify its position.
4. Automatically bring the car to a stop within 1/4 of an inch of the floor for which a stop has been initiated under all conditions of load for both UP and DOWN travel. This system shall correct for overtravel or undertravel.
5. Confirm tape is plumb and centered between guides.

2.29 DOOR REOPENING DEVICE - NEW

A. Provide a new infrared matrix door reopening device system with an independent power supply.

1. Approved manufacturers: Janus, Tri-tronics, or equal.
2. Provide protection in line with doors and in front of door path; 3D type with visual indicators when doors are in motion.
3. Protective field not less than 71" above the car sill
4. A minimum of 47 light beams and positioned correctly to conform to applicable codes, A17.1 and A117.1
5. The door protection system shall have a modular design to permit on board test operation and replacement of all circuit boards without removing the complete unit.
6. If the power to the unit fails, the doors shall remain open.
7. The reopening device shall be designed to detect a rectangular prisms positioned anywhere within the opening width of the entrance vertically between two horizontal planes located 1 inch and 60 inches respectively above the floor.

    a. The device(s) shall be designed to detect prisms positioned anywhere within the opening width of the entrance on the floor.

b. The device(s) shall be designed to detect prisms wholly located between the vertical planes established by the landing-side face of the hoistway door and the car-side face of the car door.
c. The device(s) shall be designed to detect prisms centered between the two planes if the distance between the two planes is less than 6 inches.

8. The system shall be designed to be self-monitoring. After the door has reached its fully opened position and before door closing is initiated, the detection means shall be self-checked to verify the detection means is operational. If the self-check outcome is unsuccessful, power closing of the door(s) shall be at reduced kinetic energy conforming to 2.5 ft-lbf.
9. Nudging Action: In the event continually obstructing a detector edge for a predetermined time interval (not less than 20 seconds) after initiating automatic door closing, a buzzer shall sound and the doors shall close at a gentle reduced speed. Timers shall be individually adjustable. This feature must be adjustable for reduced car door closing force. This feature shall also have the capability of being turned off on demand. See DOOR OPERATOR SECTION for additional details.

2.30 TOP OF CAR STATION - NEW

A. Provide and install a new top of car run box shall have an inspection switch that overrides all other inspection switches, with UP, DOWN, and ENABLE push buttons and a stop switch. The inspection station shall comply with all current code requirements, including operational and labeling requirements.

1. The top of car run box may contain a guarded lighting fixture for the top of the car and an approved 120 Volt grounded GFCI duplex receptacle.

2.31 LOAD WEIGHING - NEW

A. Provide a means to detect if the load exceeds the rated capacity of the elevator. If an overload is detected, the elevator doors must reopen, elevator is to be taken out of service and the doors must remain open. A voice notification and visual signal must indicate that the car is overloaded. Once the overload condition is removed the elevator should automatically be returned to normal service.

1. System accuracy of plus or minus 4% of the elevator capacity.
2. Types of devices allowed:

a. A high-pressure switch to monitor hydraulic pressure to the piston.
b. A device consisting of four strain gauge load cells located at each corner of the car platform and supporting a free-floating car platform and cab with summing circuits to calculate the actual load under varying conditions of eccentric loading.

2.32 CAR GUIDE RAILS -REUSE

A. Reuse guide rails.

2.33 CAR GUIDES - NEW

A. Furnish and install new roller guides that shall have an adjustable metal base, rigidly bolted to the top and bottom of each side of the car.

1. Roller guide design shall provide continuous contact of all rollers with the guide rail surfaces under all conditions of load and operation.
2. The roller guides shall consist of a set of sound reducing wheels in precision bearings held in contact with the three finished rail surfaces by adjustable stabilizing springs.

    a. Proper wheel material must be specified by the OEM for the capacity, speed and the usage of the elevator.

3. Provide grease fittings for lubrication of the bearings.
4. Equip roller guides with adjustable stops to control float.
5. Equip roller guides with 16-gauge steel guards.
6. Prior to the installation of the roller guides, wash down the rails, check and repair rail joints for proper mesh.
7. Manufacturers: ELSCO, Hollister-Whitney, or approved equal.

2.34 DOOR OPERATOR - NEW

A. Approved Manufacturers:

1. GAL.
2. Approved equal.

B. Model:

1. MOVFE2500-HL - heavy-duty, closed-loop linear door operator.
2. MOVFR2 - heavy-duty closed-loop door operator.

2.35 CAR DOOR CONTACT - NEW

A. A new electrical contact shall be provided and arranged to operate with the car doors so that the elevator cannot operate unless the doors are closed or within the tolerance allowed by ASME Code. The car door contact/switch shall not be accessible by passengers inside the car.

2.36 CAR DOOR HANGERS - NEW

A. New car door hangers shall be compatible with the new door operator.

2.37 CAR DOOR TRACK - NEW

A. New car door tracks shall be compatible with the new door operator.

2.38 CAR DOOR CLUTCH - NEW

A. Provide and install a new car door clutch assembly that is compatible with new release roller assembly and includes a door restrictor compatible with applicable code.

2.39 HOISTWAY DOOR FRAMES - REUSE

A. Applicable floors:

1. All floors.

B. Reuse the existing door frames.

2.40 HOISTWAY DOOR PANELS - REFURBISH

A. Applicable floors:

1. All floors.

B. Refurbish the existing hoistway door panels:

1. Replace any missing or damaged sight guards.
2. Replace any damaged or torn door astragals.
3. Provide escutcheons with metal ferrules at each opening. Sample requires approval by owner or owner's representative.
4. Replace any missing door bumpers with permanently mounted type bumper, adhesive type door bumpers/stops are not acceptable.

2.41 HOISTWAY SILL - REUSE

A. If any entrance sill shows excessive wear, damage, or is no longer code compliant inform general contractort and owner immediately.

2.42 HOISTWAY DOOR HANGER - NEW

A. Provide and install new hangers for hoistway doors of the heavy-duty sheave type, consisting of two (2) ball bearing sheaves not less than 3-1/2 inches in diameter enclosed in steel housings.

1. All sheave wheels shall rotate in grease packed precision ball bearing.
2. Each hanger shall be equipped with two (2) ball bearing upthrust rollers not less than 1 inch in diameter with eccentric adjustment.

B. Mechanical interlocking device.

1. Panels of multipanel doors shall be mechanically interconnected to assure simultaneous movement of all panels. The factor of safety of the interconnecting means shall not be less than 10 for cast iron or 5 for other materials. Multiple-speed panels shall be provided with secondary mechanical interconnecting means to ensure that individual panels of multiple panel doors moving in the same direction cannot become separated from the panel that is locked by the interlock in the event that the normal interconnecting means fails.
2. Where cable and pulleys are used to connect panels of multisection doors each pulley shall be equipped with a guard to prevent the cable from leaving the pulley.

2.43 HOISTWAY DOOR TRACK - NEW

A. Provide and install new tracks not less than 3-1/2 inches in height, and shall be of high carbon cold rolled or drawn steel, shaped, and finished to permit free movement of sheaves.

2.44 HOISTWAY DOOR ROLLER - NEW

A. Provide new rollers for the hoistway doors of the heavy-duty sheave type, consisting of ball bearing sheaves enclosed in steel housings.

1. All sheave wheels shall rotate on sealed precision ball bearing.

2.45 HOISTWAY DOOR INTERLOCK - NEW

A. Approved manufacturers:

1. GAL.
2. Approved equal.

B. Provide and install new, positive electro-mechanical interlock. Interlock release roller assembly will include one fixed roller attached to the door mounting plate and one moveable roller that activate the interlock release assembly.

1. Interlock shall prevent operation of elevator by normal operating devices, unless all hoistway doors are locked in the closed position. Interlock shall also prevent opening of hoistway doors from landing side, unless car is within that landing zone and is either stopping or stopped. Interlocks shall be unlockable from elevator car in case of power failure, only within the landing zone. Entrances with center-parting doors shall be provided with interlock keeper mounted to both fast door panels.

2.46 HOISTWAY DOOR CLOSER - NEW

A. Provide and install new mechanical closers to assure self-closing of all hoistway doors, independently and irrespective of the position of the car.

1. Closers shall have a similar mounting as at present - spirator. Each hall door panel shall be equipped with a mechanical closer.

2.47 HOISTWAY DOOR GIB - NEW

A. Provide and install on each hoistway door panel two new removable plastic composition guides, arranged to run in sill grooves with a minimum clearance. The guide mounting shall permit their replacement without removing the door from the hangers.

2.48 HOISTWAY DOOR SAFETY RETAINER - NEW

A. Provide and install one new steel safety retainer (aka: "Z bar" or "fire gib") guide on the underside of each door panel and securely fasten to the underside of the door with steel countersunk machine screws. Mount the safety retainer adjacent to and in between the removable guides. The safety retainer shall meet all local code requirements for size and location. Provide new safety retainer as described in ASME A17.1 on all openings.

2.49 ROPES - NEW

A. Provide and install new pre-formed steel wire rope specifically constructed for hydraulic elevator applications for suspension of the elevator car. Ropes shall be fastened to the top of the cylinder jack-stands, travel over the plunger/traveling sheave and attach to the bottom of the elevator car frame.

1. A metal tag shall identify the type, strength, number of strands and date of installation of the hoist ropes.
2. Properly tension all ropes after installation and adjust sockets as needed as the ropes stretch.
3. Hoist rope sockets shall be wedge type not the Babbit type.

2.50 WIRING AND CONDUIT - NEW

A. Provide new wiring in the hoistway, pit, and machine room adequate for the proper operation of the elevator. All material used and method of installation shall conform to the National Electrical Code (NFPA 70) and/or local Building Code.

1. Conductors shall be copper. The minimum size of conductors, exclusive of those that form an integral part of control devices and/or cabinets, shall be a minimum no. 14 for lighting or power circuits and no. 18 for operating, control and signal circuits.
2. Provide ten percent (10%) spare wires and not less than two (2) spare wires between the controller, selector, hoistway junction box, and pump unit.

    a. Properly tag or clearly and indelibly mark all spares.

3. All wiring shall be labeled and identified at the terminal in the machine room, shaft box, elevator cab junction box, and push-button stations within the cab and shall agree with the submitted wiring diagrams.
4. Install strain boxes no more than 80 feet apart.
5. Flexible metal conduit may be used for short connections if it is not subject to moisture, oil, or embedment in concrete.
6. Connections to the controller, soft starter, or pump unit shall be made in a manner that minimizes transmission of vibration or noise to the building.
7. Do not use threadless (compression) fittings with rigid galvanized steel conduit. Electrical connections to machinery shall allow for one foot of lateral motion.
8. Remove all abandoned or unused electrical conduit from the hoistway, pit, and machine room.
9. Existing wire raceway may be reused.
10. New wire raceway shall be zinc-coated rigid steel conduit, intermediate electrical conduit, electrical metallic tubing (EMT), or metal wireways and outlet boxes.

2.51 TRAVELING CABLES - NEW

A. Provide and install new traveling cables designed for elevator service compliant with current elevator and electrical codes and shall be sufficiently flexible to readily adapt to all changes in the position of the elevator cab and hang straight without twist. The cables shall be capable of bending 360 degrees with an inside radius of one (1) foot without any permanent set and without cracking of the outer covering. The open loop shall show no tendency to twist upon itself. Traveling cables shall contain shielded wires for the intercommunication system and sufficient coaxial cable for a CCTV system.

1. Conductors shall be copper. The minimum size of conductors shall be a minimum no. 14 for lighting or power circuits and no. 18 for operating, control and signal circuits.
2. Traveling cable(s) shall contain at least:

    a. Six (6) shielded pairs for a total of 12 wires.
    b. Two (2) coaxial cables.
    c. Ten percent (10%) spare wires for each wire size and not less than two (2) spare wires for each wire size in each traveling cable. Properly tag or clearly and indelibly mark all spares.

3. Terminating Coaxial Cable

    a. Terminate one end on one of the top corners of the elevator cab along with a duplex GFCI outlet dedicated for camera power only.
    b. Terminate one end of the coaxial cable in the machine room, in a separately identified box.

4. Directly suspend traveling cables exceeding 100 feet in length from the steel supporting core cables to relieve the conductors from strain.
5. Install beam pads as necessary to prevent chafing of traveling cables.

2.52 CONVENTIONAL DISPATCHING HALL STATIONS - NEW

A. Applicable Floors

1. All floors.

B. Provide and install new flush-mounted hall button stations.

1. Stations shall include new up and down pushbuttons at all intermediate landings and single button at terminal landings. All buttons shall have acknowledge lights.
2. Hall button stations shall be ADA compliant.
3. Elevator contractor shall not use surface mounted hall button stations.
4. Elevator contractor may use extended plates, but must remove old covers and boxes completely.

C. New lobby (main egress) floor hall pushbutton station[**s**] shall include:

1. Pushbuttons.
2. Fire service signals and key switches.
3. Emergency communication signals and key switches.
4. Lock-out switches.

D. Provide and install a new lobby security panel located next to the fire alarm panellocation to be designated later and approved by Owner on the main egress landing that shall include:

1. Digital Position Indicators.
2. Independent Service key switch.
3. Car to Lobby key switch.
4. Firemen Service key switch and indicator light.

2.53 HALL POSITION INDICATOR - NEW

A. Applicable Floors:

1. Main lobby only.

B. Location:

1. Incorporate in the hall station.

C. Provide and install new 1/2 inch LED digital position indicator to show floor landings.

1. LED characters shall have a screen flush with fixture cover.

2.54 CONVENTIONAL DISPATCHING HALL LANTERNS AND GONGS - NEW

A. Applicable Floors:

1. All floors.

B. Provide and install new hall lanterns and gongs that shall indicate which car will stop in response to the corridor call and indicate the direction that the car is traveling five (5) seconds before arrival. The lantern shall remain illuminated until the doors start to close.

1. Incorporate a new multi-stroke gong in the new lantern fixture to sound when illuminating the lantern to call the attention to the waiting passengers and to meet handicapped requirements.
2. Intermediate floor fixtures shall have both "up" and "down" indications. The terminal floors shall have only one (1) indication.
3. New hall lanterns and gongs shall meet all A.D.A. compliance requirements.
4. Lantern shape:

    a. Equilateral triangles with 2-1/2" minimum dimension.

5. Lantern colors:

    a. Up: white.
    b. Down: white.

6. The lantern and gong fixture shall be centered a minimum of 72 inches above the floor. The location of the hall lanterns and gongs shall be:

    a. Adjacent to the hoistway entrance door in a separate fixture, new location.

2.55 HALL ACCESS STATION - NEW

A. Fixture shall be installed a minimum of 48 inches and a maximum of 72 inches above the floor measured to the centerline of the switch and in one of the following locations:

1. One the wall outside the hoistway within 12 inches of the entrance frame.
2. On the hoistway entrance frame or jamb.
3. On the sight guard.

B. Furnish and install a new access fixture at the location**[s]** indicated above to permit moving the elevator with the hoistway doors open at that particular landing only. The car will only travel a distance necessary for authorized persons to obtain access to the top of car or pit area.

2.56 PIT LADDER - REFURBISH

A. Refurbish and reuse the existing pit ladder unless it does not meet the following: (Rule 2.2.4.2):

1. Extend not less than 48 inches above the lowest landing sill height.
2. Ladder rungs, cleats, or steps shall be a minimum of 16 inches wide; if there are obstructions, the reduced width shall be not less than 9 inches.
3. Rungs, cleats, or steps shall be spaced 12 inches on center.

4. With not less than 4.5 inches distance between the rungs and the wall (from the centerline of rung to the wall).
5. Side rails shall have a clear distance of not less than 4.5 inches from their centerline to the nearest permanent object.
6. The pit ladder shall be located so that the means to unlock the access door from inside the pit can be accessed from the ladder. The means to unlock the access door shall be located:

    a. Not more than 72 inches vertically above a rung, cleat or step.
    b. With the door in the closed position, in a plane not more that 39 inches horizontally from a rung, cleat, or step of the pit ladder.

7. Clean and paint the pit ladder.
8. Contractor may add handhold if the pit ladder is less than 48 inches above lowest landing sill height; however it shall be compliant with all the other requirements listed above.

2.57 CYLINDER AND JACK - REFURBISH

A. Refurbish the existing cylinders:

1. Clean the cylinder jack.
2. Replace the packing head seals.
3. Polish pitted areas on the cylinder jack and apply pit filler to reduce leakage, as required.
4. Install a bleed line to return the oil from the cylinder head back to the tank.

2.58 SPRING BUFFERS - NEW

A. Furnish and install new spring buffers as manufactured by Hollister Whitney or approved equal.

1. Clean and paint all supporting steel.
2. Attach the buffers to the pit channel or pit plate with removable helical coil springs with internal stop pipes.
3. Install all necessary buffer support steel, hardware, and inspection platforms as required by code.

2.59 PIT STOP SWITCHES - NEW

A. Provide and install new pit stop switch(es) as per code requirements.

2.60 CAR FRAME - REFURBISH

A. Refurbish and reuse the existing car frame, completely clean, and secure loose sections. Repaint and areas not properly protected to prevent oxidation.

2.61 PLATFORM - REFURBISH

A. Refurbish and reuse the existing platform.

1. Clean existing components completely and properly secure all loose sections.
2. All platform materials exposed to the hoistway shall be lined with sheet steel for proper fire protection as required by code. Replace any portions that are damaged, missing, or rusted.
3. Properly align and square the existing car platform to the existing hall sills to provide equal running clearance at all floors.
4. Provide a NEW code-compliant platform/toe guard at the car entrance opening to extend below the car opening for safety.

2.62 SAFETY - REFURBISH

A. Type:

1. A - Instantaneous.

B. Refurbish and overhaul the existing governor actuated car safety device for current code compliance.

1. Readjust safety for proper operation in accordance with current ASME A17.1 design standards.
2. Readjust the existing safety operated switch (plank-switch) for proper adjustment and operation.
3. Provide a new plank-switch where none currently exists.
4. Replace existing tiller rope[**s**] with new code-compliant tiller rope[**s**] of correct type and size for proper and safe operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Measurements and Inspection: Complete responsibility for detailed dimensions lies with the elevator contractor. In the execution of the work, the elevator contractor must verify all dimensions with the actual conditions.

1. Prepare written report, endorsed by elevator contractor, listing conditions detrimental to performance of the work.
2. Proceed with work only after unsatisfactory conditions have been corrected.
3. The elevator contractor shall verify with the Authority Having Jurisdiction the status of all mandated inspections, tests, and any outstanding violations or fines incurred.

3.2 INSTALLATION

A. Complete the work with skilled workers in strict accordance with the accepted shop drawings and other submittals.

B. Comply with the code, manufacturer's instructions and recommendations.

C. Coordinate work with the work of other trades for proper time and sequence to avoid construction delays and to insure right-of-way system. Use lines and levels to insure dimensional coordination of the work.

D. Accurately and rigidly secure supporting elements within the hoistway to within the tolerance established.

E. Provide and install motors, switches, controls, safety and all operating devices in strict accordance with the submitted wiring diagrams and applicable codes and regulations having jurisdiction.

F. After installation, touch up in the field surfaces of shop primed elements, which have become scratched or damaged.

G. Lubricate operating parts of system, as recommended by the manufacturer.

H. Bevel any ledges, setback, recess, or projection in the hoistway that measures 4 inches or more in width shall be beveled at an angle of not less than 75 degrees from horizontal. Each bevel plate shall be constructed to conform to ASME A17.1 elevator safety code. Provide patching of hoistway walls.

I. Elevator contractor is responsible for cutting and patching of walls and floors in the hoistway and machine room.

3.3 PAINTING OF COMPONENTS / EQUIPMENT

A. Before shipment, all parts made of structural steel section and plates shall be thoroughly cleaned to remove all loose mill scale, rust and foreign matter. Except where encased in concrete, all these parts shall be given one coat of rustproof paint, applied thoroughly and evenly, and well worked into the joints and other spaces. Parts that will be inaccessible after assembly shall be given two shop coats.

B. Machine finished surfaces shall be protected against corrosion by effective means approved by the owner as soon as the machining is completed. All new machinery and equipment shall be given a shop finish of the best quality paint normally used by the manufacturer of the machinery or equipment. After final adjustment of all machinery, work, metal fittings, etc., exposed in the hoistways or elsewhere, all shall be painted one coat in the field. All machinery, cabinets, etc., shall be painted the same color and numbered as required by code. All surface holes and imperfections shall be filled with iron filler thoroughly rubbed in and smoothed off. Upon completion of the installation, all equipment, new and existing, shall be thoroughly cleaned and touched-up as required, and given two additional coats of machine enamel and a coat of high-grade waterproof varnish.

C. Completely clean and paint the following areas:

1. The top of the elevator.
2. The machine room and pit area shall be painted by the elevator contractor at the completion of the project, using an appropriate paint approved by the owner.

3.4 FINAL CLEAN-UP

A. Upon completion of the work covered by the contract, the elevator contractor shall leave the completed project ready for use without the need of further cleaning of any kind and with all work in perfect order. In addition, upon completion of all work the elevator contractor shall remove from the vicinity of the work and from the building's rubbish, unused materials, and other materials belonging to him or used under his direction during construction and legally dispose of same.

B. If during this period, the elevator contractor impairs the use or appearance of the property, then elevator contractor shall restore such areas, affected by the work, to their condition prior to the start of the work. Failure to do so, the same shall be removed by the owner at the expense of the elevator contractor and shall be liable therefore.

C. Upon completion of the modernization for eachelevator thoroughly clean the elevator machine room**[s]** and hoistway enclosure**[s]** including setbacks, sills, pits, car tops and all related elevator equipment.

3.5 ACCEPTANCE AND TURNOVER

A. Testing and Inspection:

1. The elevator contractor shall secure and pay for all inspections and tests required for the work. Provide proper facilities, at all times, for inspections and tests of work by general contractor and authorities having jurisdiction. Furnish labor, equipment, materials and services necessary to conduct all tests and inspections.

2. Upon completion of installation of all equipment and when same is in full operating condition, coordinate with the owner to completely test all equipment, both for the governing authorities and for compliance with the requirements of the Contract Documents. All necessary equipment for testing and the cost of same shall be included as part of this contract. All tests shall be performed in accordance with the requirements of the governing code.
3. If tests show that the equipment is in any way defective, of poor workmanship, at variance with the requirements of the Contract Documents, or dangerous or objectionable in operation, the elevator contractor shall make all necessary changes and remedy all defects at his expense, to the satisfaction of the general contractor, and also pay, as hereinbefore noted, for all subsequent tests until all equipment is acceptable.
4. Upon completion of satisfactory tests, secure and furnish to the general contractor certificates from all authorities having jurisdiction, that the conveying systems and related equipment have been inspected and approved.
5. Review and acceptance of equipment by the general contractor is contingent upon prior approval of the above referenced authorities and compliance by the elevator contractor with all requirements of such authorities and the Contract Documents.
6. Elevator contractor shall provide at least TEN (10) DAYS prior written notice to the general contractor regarding the exact date on which work will be tested by the authority having jurisdiction.

3.6 GENERAL REQUIREMENTS

A. The modernization including equipment, material, workmanship, design and tests shall be in accordance with standards, rules and regulations referenced. All material and equipment shall be new unless otherwise specified and indicated. Equipment shall be the product of a manufacturer regularly engaged in the manufacture and installation of this type of equipment. Design and construction of the equipment and parts subject to wear shall be such that similar machines and devices provided will be completely interchangeable. Working parts shall be accessible for inspection, servicing and repair. Adequate means shall be provided for lubrication of all wearing parts that require lubrication.

1. Work to be performed under this section shall include furnishing and installation of all labor, materials and equipment as herein specified. Elevator contractor shall do all work to furnish a complete modernization.
2. In all cases where a device or part of the equipment is referred to herein in the singular, it is intended that such reference shall apply to as many devices as are required to complete the modernization.
3. All work called for in the specifications applicable to each separate section but not shown on the contract drawings in their present form, or vice versa, is required and shall be performed by the elevator contractor as though it were specifically delineated or described.
4. Work not particularly detailed in the specification nor shown on the contract drawings but involved in carrying out their intent, or in the complete and proper execution of the work, is required and shall be performed by the elevator contractor.
5. The apparent silence of the specifications as to any detail, or the apparent omission from item of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail, and that only the best material and workmanship is to be used; interpretation of these specifications shall be made upon that basis.

6. No material (equipment) shall be delivered until elevator contractor has obtained general contractor's written approval of shop drawings and other data stated herein. Should materials or equipment be delivered before required approval, elevator contractor shall be liable for its removal and/or replacement at no charge to owner, if, in opinion of CMA/Architect, material or equipment does not meet intent of documents.

PART 4 - ADDITIONAL REQUIREMENTS

4.1 SAFETY

A. The elevator contractor shall comply with all the health and safety regulations of governing codes, laws, and ordinances. Elevator contractor shall provide a written safety plan before starting work.

4.2 ACCIDENT PREVENTION

A. Elevator contractor shall take all reasonable steps and precautions to protect health, and minimize danger from all hazards to life and property. The elevator contractor is responsible for conducting all work activity associated with this project in strict conformance with all applicable OSHA standards and/or local and state regulations. The elevator contractor is solely liable for enforcement of those safe practices in their operation.

4.3 ACCIDENT REPORTS

A. In the event of accidents of any kind, the elevator contractor shall furnish the owner, general contractor and CMA/Architect with copies of all reports of the same. The reports shall be sent without delay and at the same time that they are forwarded to any other parties concerned.

4.4 ELECTRICAL REQUIREMENTS

A. Electrical Wiring:

1. Elevator contractor shall assist owner as needed in determining requirements for electrical upgrades. If necessary, elevator contractor shall be involved in discussions with owner's electrical contractor and/or owner's engineering group to insure the electrical work is completed with respect to the new equipment being installed and compliant with building, electrical, and elevator codes.
2. All new wiring to be installed in conjunction with the work shall comply with all applicable regulations, Codes and Ordinances and carry approval of Underwriters Laboratory. This wiring shall be enclosed in rigid standard weight or thin-wall conduit with steel splice boxes or metal wiring troughs, except that flexible conduit may be used in short runs, between terminals not exceeding 24 inches. Flexible conduit shall not be used where subject to moisture or embedded in concrete.

3. Wiring shall be insulated with a flame retarding and moisture-resisting jacket. Stranded conductors are to be used in field connections, which shall be color-coded. A minimum of ten (10) percent spare wires must be provided throughout each and every major elevator component. Separate junction boxes are to be utilized for the different functions of the elevator installation. This will include but not be limited to communications or audio, operational modules, or signal segments.
4. Run all wire between terminal blocks including spares, and shielded cable. Check for continuity and ground. Ensure that connectors or terminal strips used maintain the proper grounding continuity and minimize signal deterioration. Make no splices. Use color codes in multiconductor cable. Identify each wire and mark each group as to destination using waterproof markers. Correspondingly, identify all connections at terminal blocks with waterproof labels. Provide legible waterproof lists of color codes and identities for all field wiring. Make entries in a bound consecutively numbered journal and attach to each controller.
5. Approved strain boxes shall be installed in all vertical runs in accordance with the Code. New raceways shall be neatly and systematically run. All exposed conduit boxes shall be supported by approved straps, hangers or clamps fastened to structural steel, walls or other substantial supports. All electrical boxes exceeding 150 cubic inches shall be supported independently of the connecting conduit.
6. Traveling cables, which shall be added in conjunction with this specification, shall be designed for elevator service. The cables shall be sufficiently flexible to readily adapt to all changes in the position of the elevator car and hang straight without twist. The open loop shall show no tendency to twist upon itself.
7. Traveling cables shall be suitably supported and protected from physical damage. The traveling cable shall not exceed 6 feet in length without being installed inside a raceway or conduit if it properly taped, corded, or in the original sheath.
8. Traveling cables shall be suspended by looping cable around hanger supports. They shall terminate in junction boxes located on the bottom of the car platform or inside the car operating panel. The traveling cable shall not go to the top of the elevator without proper protection. These terminal boxes shall have connection strips for connecting conductors and, in addition to said devices for connecting conductors, strain devices for connecting the supporting strands and relieving the conductors of all strain.
9. The cables shall be capable of bending 360 degrees with an inside radius of one foot without any permanent set and without cracking of the outer covering.
10. The swing of the traveling cables shall be checked when the elevator is operating and all shields and pads necessary to prevent chafing of the cables in the hoistway shall be secured. The loop in the traveling cables shall be not less than two (2) feet in diameter.
11. The traveling cables and the corresponding groups of conductors connecting these cables shall each contain ten (10) percent spare conductors, but not less than two (2) spare conductors of the same size and type. Each traveling cable conductor will have a distinctive color-coded outer covering for identification. Terminal blocks shall have indelible identification numbers for each terminal connection.
12. Shielded wires will be provided for communication circuits.
13. The outer covering of all traveling cables shall be flame retarding and moisture resisting which will meet the National Board of Fire Underwriters Standards.
14. Entire elevator system shall have new terminal blocks including but not limited to under car junction box, halfway box and all appropriate connecting points.

B. Existing Feeder Wiring

1. Feeder wiring to the fused disconnect switch or circuit breakers, or each existing elevator unit, must be checked and verified. The elevator contractor will provide the necessary "Power Supply Confirmation Data Form" based upon the voltage application being supplied, for the capacity and speed of the Elevators.
2. If the maximum amperage demands, reveal size and design of the existing feeder wiring, to be below minimum safety standards, as described by the National Electric Code or other codes having jurisdiction, the changes and modifications must be initiated, supplied and developed to the new or altered elevator equipment, under this section. The final results of these, conversions, modifications and transformations, shall be satisfactory to the power as displayed and verified. Failure to confirm and establish the power supply shall not, relieve responsibility for the sufficient, adequate, and acceptable operation of the equipment.

4.5 SITE SURVEY

A. The elevator contractor shall perform the following:

1. Study the Contract Documents with regard to the work as shown and required to insure its completeness.
2. Examine surface and conditions to which this work is to be attached or applied and notify the general contractor, in writing, if conditions or surfaces are detrimental to the expeditious installation of the work. Starting the work shall imply acceptance of the surfaces and conditions to perform the work as specified.
3. Verify, by measurements at the job site, dimensions affecting the work.
4. Bring field dimensions, which are at variance with those on the accepted shop drawings, to the attention of the general contractor.
5. Obtain the decision regarding corrective measures before the start of fabrication of the items affected.
6. 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.
7. Submit heat emission data and electrical load of new and/or existing equipment to be utilized in final system configuration.
8. Provide suggested or mandated atmospheric conditions for new equipment.
9. Perform mandated motor room configuration changes required for approval of authorities and/or proper servicing of new or existing component systems.
10. Inspect mechanical and electrical systems available at the property including all wiring to ensure that mechanical and electrical requirements of proposed new equipment are met. In the event that the requirements cannot be met, the elevator contractor shall bring this to the attention of the owner and the general contractor no later than the due date of the bid submittal. The elevator contractor will be responsible for any required modifications after the submission of their bid.
11. At the time of Bid Submittal, identify all potentially hazardous materials (including asbestos) at the job site that may affect the procedures used to complete the work. Moreover, the elevator contractor is specifically expected to point out the location of any and all asbestos or other hazardous material potentially located within or around elevator equipment, such as doors, brakes, etc. After the submission of bids, the elevator contractor will not be entitled to ANY additional charges for the proper and legal completion of the work.

12. Elevator contractor must identify with their bid any jobsite related safety issues. Any safety issues not identified by the elevator contractor in their bid will be the responsibility of the elevator contractor to correct without additional cost to the owner.

B. Existing Conditions:

1. It is intended that the specifications include all labor and material to accomplish a complete job in every respect, except those items specifically indicated as being done by other trades. Bidders are cautioned, however, to familiarize themselves with existing conditions on the premises and to include all incidental Work that might occur during the job. After signing the contract, there will be no extra charges allowed for any labor or material necessary to complete the work whether exactly described in these specifications herein or not, as long as such work, labor, and material are required in order to obtain the desired effect and results.
2. Any discrepancies or ambiguities found in the specification shall be promptly reported to the general contractor. Elevator contractor is expected to field verify all existing conditions in relation to the specification, and should in no case design, engineer or order equipment based solely on the specification.

4.6 CONFLICTS

A. Should it appear that there is a real or apparent discrepancy between different sections of specifications concerning nature, quality or extent of work to be furnished, it shall be assumed that elevator contractor has based his bid on more expensive manner. Final decision will rest with the owner.

4.7 ADVERTISING / TRADEMARK

A. The advertising privileges will be retained by the owner and it shall be the duty of the Contractor to keep the premises free from poster, signs, decorations, etc. No logos or trademarks visible to the general public shall appear on any piece of equipment will be permitted.

4.8 OCCUPIED BUILDING

A. Elevator contractor understands that the project location will be occupied during the time period this project will be performed. Elevator contractor will conduct itself accordingly, and will give appropriate consideration to the occupants while performing the work, especially regarding noise, dust, and debris.

4.9 WORKMANSHIP

A. Refurbishment:

1. Elevator contractor shall ensure the proper, code-compliant operation of all components of the elevator system, including those components being retained or reused, whether specifically stated in these specifications or not. Elevator contractor must perform all work required, including repair, adjustment, modification, or replacement, to meet this requirement.

B. Materials:

1. All materials and equipment furnished shall be new and the best of their respective kinds. They shall be installed in a neat, accurate, workmanlike manner and be subject to the approval of the CMA/Architect. All materials and equipment furnished shall conform to the regulations of the bodies having jurisdiction over such installation. The elevator contractor shall furnish the CMA/Architect with all samples as directed, and materials shall be in accordance with approved samples.
2. Elevator contractor will perform all work with skilled, competent, trained mechanics and elevator technicians under the direct control and supervision of the elevator contractor.
3. All equipment shall be installed in strict accordance with the manufacturer's written instructions, applicable codes and standards to provide a smooth and quiet product, free from all defects, flaws, imperfections, oscillations and vibrations.
4. Install equipment such that access for maintenance is safe and readily available, and that major components may be removed using conventional means.
5. Keep the premises orderly and clean during the progress of work. Remove all debris as fast as it accumulates. Maintain the cab, entrances, hoistway and machine room free from dirt, oil and grease.
6. If the work falls behind schedule, provide extra personnel as required to meet the schedule.

C. Protection of Work and Property:

1. Elevator contractor shall continuously maintain adequate protection of all work from damage and shall protect the owner's property from injury or loss arising out of work. Elevator contractor shall make good any such damage, injury or loss, except such as may be directly caused by owner.
2. Screening: Elevator contractor shall supply and install screening to protect the adjacent elevators from falling debris. The screening shall be installed the entire length and width of the shaft adjacent to any other car.

4.10 SUBCONTRACTORS

A. All Subcontractors used for this project must be approved by owner or owner's representative prior to entering into an agreement with the Subcontractor.

B. All submittals generated by subcontractors or vendors shall be reviewed and approved by the primary elevator contractor prior to submission to the general contractor for approval.

4.11 ELEVATOR CONTRACTOR'S SUPERINTENDENT

A. The elevator contractor shall keep a competent superintendent at the work site during its progress and any necessary assistants, all satisfactory to the general contractor. The superintendent shall respect the general contractor and all instructions given by general contractor shall be as binding as if given to the elevator contractor.

4.12 CHANGES IN WORK

A. The owner, without invalidating the contract, may order extra work or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly. All such work shall be executed under the condition of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

4.13 PROGRESS OF WORK

A. Upon signing of the contract, the elevator contractor shall submit a schedule indicating starting date for each phase of work and completion of each phase, as well as a completion date for work, including equipment delivery dates and testing dates based on the information submitted on the bid form.

B. The elevator contractor shall be required to submit the following information to the general contractor throughout the construction period:

C. A detailed completion schedule, including equipment delivery times and anticipated completion date of individual stages of work, the final completion date of the work and any other details requested by the general contractor.

D. Progress reports with submissions of payment requests or upon request of the owner showing the progress being made and the percentage of the job completed.

4.14 COORDINATION

A. The elevator contractor shall be held responsible for the proper coordination of all phases of the work under this contract. Elevator contractor shall be held responsible for the resolution of all conflicts between the work of his subcontractor's and his own work.

B. Before proceeding with any work, the elevator contractor shall carefully check and verify all pertinent dimensions and sizes, and assume full responsibility for fitting the equipment and materials to the structure. Where the apparatus and equipment have been indicated on the drawings, the dimensions have been taken from typical equipment of the type specified in these specifications. The elevator contractor shall carefully check the drawings to verify that the equipment that will be actually provided will fit into the spaces available. Should the equipment not fit the specific structure shown on the drawings, all additional sub-framing members required to accommodate the elevators shall be provided and paid for by elevator contractor as part of the work of this section. The elevator contractor shall submit all structural shop drawings and engineering calculations for the general contractor's review and written approval.

C. Elevator contractor shall familiarize himself with the specifications, drawings, installation procedures and construction schedules for those phases of work performed by his subcontractors. The elevator contractor shall also familiarize himself with the owner's security requirements and shall abide by and conform to such established regulations at all times. If the elevator contractor's work or the work of any of his subcontractor's depends upon the execution of the work of another subcontractor or upon his own work, he shall so coordinate all phases of work so as to avoid conflicts in installation procedures and construction schedules.

D. As work progresses, elevator contractor shall consult with his subcontractors, examine the work installed by them, and resolved all conflicts without expense to owner and/or general contractor.

E. Meetings: Progress meetings shall be held at the job site, as and when requested by owner or general contractor. The elevator contractor shall be represented at these meetings by persons familiar with the details of the scope of work and authorized to conclude matters relative to work progress, as may be necessary to expedite completion of work.

4.15 SCHEDULE

A. The Contractor's proposal shall state, and detail, the length of time, in terms of weeks, a schedule covering:

B. Preparation and submission of drawings, details and layouts, including contract ordering after authorization, and award of contract.

C. Manufacture or purchase of the major components necessary to begin the work after receipt of approved drawings.

D. Complete installation of all material, timing and testing of each elevator.

E. Before work commences, a meeting shall be convened with all interested parties. This meeting shall include:

1. Representative of the Owner.
2. Managing Agents.
3. Consultant.
4. Elevator Contractor.
5. General Contractor.

6. CMA/Architect.
7. Vendors.
8. Any other persons required for a successful completion of this project.

4.16 REMOVAL OF EQUIPMENT AND RUBBISH

A. On a regular basis the elevator contractor shall remove all rubbish as it accumulates, keep the building and premise clean during the progress of the work, and leave the premises at completion in perfect condition as far as the work is concerned. The equipment designated to be removed in good working order and retained for future reuse by the building shall be decided on at the inception of all work. Elevator equipment that has been replaced shall be the property of the elevator contractor and shall be removed by it from the premises. The owner may require clean up and removal of such accumulation at any time. Elevator contractor shall comply with all applicable laws in the removal and disposal of rubbish.

B. The elevator contractor shall be responsible to properly uninstall and remove any equipment, materials or components that needs to be removed in order to install the new or modified equipment being installed as part of this project.

4.17 FINAL PUNCH LIST

A. Elevator contractor shall complete all punch list items within fifteen (15) working days of the date of elevator being returned to service.

B. Prior to returning the elevator to service, the elevator contractor shall perform certain other tests and submit evidence of compliance with the specifications to consultant. These tests MUST include the following:

1. Sustained high-speed velocity of the elevator in either direction of travel;
2. Floor leveling accuracy;
3. Ride quality measured with a tri-axial accelerometer;
4. Performance tests for door opening times, closing times, and floor-to-floor performance as required by specifications;
5. Load settings at which anti-nuisance, load dispatch, and load nonstop features are activated.

C. Upon completion of work on the last car in any group of elevators, and in conjunction with the aforementioned testing procedures, the elevator contractor shall carry out additional testing of group dispatch / supervisory control features in the presence of the general contractor. To that end, the elevator contractor shall provide qualified field labor as required to successfully demonstrate:

1. The back-up operating mode for group dispatch failure.
2. Simulated and actual emergency power operation.
3. Restricted access security features.
4. Zoning operations and floor parking assignments.
5. Up / down peak operation.
6. Response to corridor calls that fall into the "long-wait" category.
7. Lobby dispatch operations.

8. All of this work shall be performed on overtime.

END OF SECTION

1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.04 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

J. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 210523
GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Iron butterfly valves with indicators.

B. Check valves.

C. Trim and drain valves.

1.02 RELATED REQUIREMENTS

A. Section 210553 - Identification for Fire Suppression Piping and Equipment.

1.03 REFERENCE STANDARDS

A. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 13R - Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies; 2022, with Errata.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

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

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:

B. Comply with NFPA 13 and NFPA 13R for valves.

C. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

D. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.02 TRIM AND DRAIN VALVES

A. Ball Valves:
   1. Description:
      a. Pressure Rating: 175 psig.
      b. Body Design: Two piece.
      c. Body Material: Forged brass or bronze.
      d. Port Size: Full or standard.
      e. Seat: PTFE.
      f. Stem: Bronze or stainless steel.
      g. Ball: Chrome-plated brass.
      h. Actuator: Hand-lever.

PART 3 EXECUTION

3.01 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

3.02 INSTALLATION

A. Comply with specific valve installation requirements and application in the following Sections:

B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.

C. Valves in horizontal piping installed with stem at or above the pipe center.

D. Position valves to allow full stem movement.

E. Install valve tags. Comply with Section 210553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 211100
FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water pipe.

1.02 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.

B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

E. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe; 2020.

F. AWWA M11 - Steel Pipe - A Guide for Design and Installation; 2017, with Addendum (2019).

G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

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

B. Product Data:

C. Project Record Documents:

1. Record actual locations of piping mains, valves, connections, fire hydrants, free-standing fire department connections, underground manholes and vaults, valve boxes, thrust restraints, and invert elevations.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Steel Pipe: ASTM A53/A53M, Grade B, Type F. Provide standard weight, zinc-coated, and listed piping.

1. Fittings: Comply with ASME B16.3 Class 150, zinc-coated, threaded or ASME B16.4 Class 125, zinc-coated.
2. Mechanically Factory Applied Protective Materials:
   a. Clean by wire brushing and solvent cleaning.
   b. Apply one coat of coal-tar primer and two coats of coal-tar enamel complying with AWWA C203.
   c. Protect threaded pipe ends and fittings prior to coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 INSTALLATION

A. General Requirements:

1. Location of Water Lines:
2. Sleeving:
   a. Sleeve water piping where piping is required to be installed within 3 feet of existing structures.
   b. Provide ductile iron or Schedule 40 steel sleeves.
   c. Fill annular space between pipe and sleeves with mastic.

d. Install water pipe and sleeve without damaging structures or causing settlement or movement of foundations or footings.

3. Pipe Laying and Jointing:
   a. Remove fins and burrs from pipe and fittings.
   b. Prior to placing in position, clean pipe, fittings, valves, and accessories, and maintain in clean condition.
   c. Provide proper facilities for lowering pipe sections into trenches.
   d. Dropping or dumping of piping, fittings, valves, or any other water line material into trenches is not permitted.
   e. Cut pipe in a neat, workmanlike manner accurately to length established at the site and work into place without forcing or springing.
   f. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
   g. Wedging or blocking between bells and spigots will not be permitted.
   h. Install bell-and-spigot pipe with the bell end pointing in the direction of laying.
   i. Grade the pipeline in straight lines avoiding the formation of dips and low points.
   j. Support piping at proper elevation and grade.
   k. Secure firm, uniform support.
   l. Wood support blocking will not be permitted.
   m. Install pipe so that the full length of each pipe section and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
   n. Provide anchors and supports where indicated and necessary for fastening work into place.
   o. Provide proper provisions for expansion and contraction of pipelines.
   p. Keep trenches free of water until joints have been properly made.
   q. Close open ends of piping temporarily with wood blocks or bulkheads at the end of each workday.
   r. Do not install pipe during unacceptable trench conditions or inclement weather.
   s. Minimum Depth of Pipe Cover: Not less than 2-1/2 feet.
4. Connections to Existing Water Lines:
   a. Ensure minimal interruption of service on the existing line.
   b. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.
5. Penetrations:
   a. Provide ductile-iron or Schedule 40 steel for pipes passing through walls of valve pits and structures.
   b. Fill annular space between sleeves and walls with rich cement mortar.
   c. Fill annular space between pipe and sleeves with mastic.

B. Special Requirements:
1. Steel Piping:
   a. Jointing:
   b. Allowable Offsets:
   c. Pipe Anchorage:
      1) Provide concrete thrust blocks (reaction backing) for pipe anchorage, except where metal harness is indicated.
      2) Thrust blocks to be in accordance with the recommendations for thrust restraint in AWWA M11, except that size and positioning of thrust blocks are to be as indicated.
      3) Use ASTM C94/C94M concrete having a minimum compressive strength of 2500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
      4) Metal Harness:

(a) Provide in accordance with the recommendations for joint harnesses in AWWA M11, except as otherwise indicated.
(b) Fabricated by the pipe manufacturer and furnished with the pipe.

C. Valves:
1. Set valves on solid bearing.
2. Center and plumb valve box over valve.
3. Set box cover flush with finished grade.

3.03 SERVICE CONNECTIONS

3.04 FIELD QUALITY CONTROL

A. Field Tests and Inspections:
1. See Section 014000 - Quality Requirements for additional requirements.
2. Provide all labor, equipment, and incidentals required for field testing, except that water and electric power needed for field tests will be furnished as set forth in Section 015100 - Temporary Utilities.
3. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently and at least 5 days after placing of concrete.
4. Fill pipeline 24 hours before testing and apply test pressure to stabilize system, using only potable water.
5. Pressure test piping to ____ psi.
6. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
7. Prepare reports of testing activities.

3.05 CLOSEOUT ACTIVITIES

END OF SECTION

SECTION 211200
FIRE-SUPPRESSION STANDPIPES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Valves.

B. Fire department connections.

1.02 RELATED REQUIREMENTS

A. Section 210500 - Common Work Results for Fire Suppression: Fire protection piping.

B. Section 210523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

1.03 REFERENCE STANDARDS

A. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2019, with Amendment.

B. NFPA 1963 - Standard for Fire Hose Connections; 2019.

C. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 VALVES

A. General Duty Valves: See Section 210523.

B. Specialty Valves:
   1. Hose Connection Valve:
      a. Angle type; brass finish; 2-1/2 inch NPS, thread to match fire department hardware, 300 psi working pressure, with threaded cap and chain of same material and finish.

2.02 FIRE DEPARTMENT CONNECTIONS

A. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
   1. Inlets: Two-way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
   2. Configuration: Horizontal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 14.

C. Connect standpipe system to water source ahead of domestic water connection.

D. Flush entire system of foreign matter.

END OF SECTION

SECTION 211300
FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.02 REFERENCE STANDARDS

A. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.02 SPRINKLERS

A. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Upright type.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

2.03 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.

3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Test Connections:
1. Backflow Preventer Test Connection:
a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.
b. Furnish one valve for each 250 gpm of system demand or fraction thereof.
c. Provide permanent sign reading "Test Valve" in accordance with Section 210553.

D. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

E. Fire Department Connections:
1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
a. Configuration: Horizontal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Locate outside alarm gong on building wall as indicated.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

G. Flush entire piping system of foreign matter.

H. Hydrostatically test entire system.

I. Require test be witnessed by Fire Marshal.

END OF SECTION

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.

B. Check valves.

C. Flow limiting valves.

D. Gate valves.

1.02 REFERENCE STANDARDS

A. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

B. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

C. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.03 SUBMITTALS

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

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, butterfly, gate or plug.

C. Domestic, Hot and Cold Water Valves:
   1. 2 inch and Smaller:
      a. Bronze and Brass: Provide with solder-joint ends.
      b. Ball: One piece, full port, brass with brass trim.
      c. Bronze Swing Check: Class 125, bronze disc.
      d. Bronze Gate: Class 125, NRS.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Hand Lever: Quarter-turn valves 6 inch and smaller except plug valves.

D. Valve-End Connections:

E. General ASME Compliance:

2.03 BRASS, BALL VALVES

A. One Piece, Full Port with Brass Trim and Push-to-fit or Threaded Connections:
   1. Comply with MSS SP-110.
   2. CWP Rating: 200 psi.
   3. Body: Forged brass.
   4. Seats: PTFE.
   5. Stem: Brass.

6. Ball: Chrome-plated brass.
7. Operator: Handle.

2.04 BRASS, INLINE CHECK VALVES

A. Class 150:
1. Maximum Service Temperature: 250 degrees F.
2. Body: Forged brass.
3. Disc: Forged brass.
4. Seal: PTFE, bubble-tight.
5. End Connections: Press.

2.05 BRONZE, SWING CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WOG Rating: 200 psi.
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded.
6. Disc: Bronze.

2.06 BRONZE, GATE VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

END OF SECTION

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe hangers.

B. Pipe supports, guides, shields, and saddles.

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; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014 (Reapproved 2020).

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2018).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

I. 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; 2018a.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2021.

M. FM (AG) - FM Approval Guide; current edition.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

O. UL (DIR) - Online Certifications Directory; Current Edition.

P. 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 manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

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 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. Swivel Ring Hangers, Adjustable:
   1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
   2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

C. Clevis Hangers, Adjustable:

2.03 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Pipe Supports:
   1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   2. Liquid Temperatures Up to 122 degrees F:
      a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
      b. Support From Below: MSS SP-58 types 35 through 38.

C. Pipe Supports, Thermal Insulated:
   1. General Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      c. Provide pipe supports for 1/2 to 30 inch iron pipes.
      d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
      b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
      c. Minimum Thickness: 60 mil, 0.06 inch.

END OF SECTION

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tags.

B. Stencils.

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; 2020.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Tags:
   1. Piping: 3/4 inch diameter and smaller.

B. Stencil:

C. Pipe Markers: 3/4 inch diameter and higher.

2.02 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 in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

C. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

D. Piping: 3/4 inch diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

2.03 STENCILS

A. Pipe: Stencil size required per external insulated or uninsulated pipe diameter.
   1. 3/4 to 1-1/4 inch Range: 1/2 inch text over 8 inch long background.
   2. 1-1/2 to 2 inch Range: 3/4 inch text over 8 inch long background.

2.04 PIPE MARKERS

A. 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.

B. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

C. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
      a. 3/4 to 1-1/4 inches: Use 8 inch field-length with 1/2 inch text height.
      b. 1-1/2 to 2 inches: Use 8 inch field-length with 3/4 inch text height.
   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 flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Apply stencil painted identification in compliance with Section 099123 requirements. Identify unit with assigned id-number and area being served using pipe marking rules.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

END OF SECTION

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Glass fiber insulation.

C. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020a.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 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.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

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 INSULATION

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.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETING AND ACCESSORIES

A. PVC Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before 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. Exposed Piping: Locate insulation and cover seams in least visible locations.

END OF SECTION

SECTION 220800
– GENERAL COMMISSIONING REQUIREMENTS

PART I – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes the administrative requirements related to commissioning and includes the following:
   1. Definitions

B. The Owner, Architect/Engineer, and Commissioning Agent are not responsible for construction means, methods, job safety, or management function related to commissioning on the job site.
   1. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

1.03 DEFINITONS

A. Commissioning Agent (CxA): The commissioning agent develops the functional test procedures in a sequential written form, coordinates, oversees, and documents the actual testing, which is usually performed by the installing contractor or vendor. Functional Performance Tests are performed after pre-functional checklists and startup is complete.

B. Commissioning Plan: The commissioning plan is an overall plan that provides the structure, schedule, and coordination planning for the commissioning process.

C. Deficiency: A deficiency is a condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the Contract Documents, does not perform properly, or is not complying with the Owner's Project Requirements.

D. Owner's Project Requirements (OPR): The OPR is a specific Commissioning document that is updated throughout the project that provides the explanation of the ideas, concepts, and criteria that are considered to be very important to the Owner. It is initially the outcome of the programming and conceptual design process.

E. Functional Performance Test (FPT): The FPT is a test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g. the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failure, unoccupied, varying outside air temperatures, fire alarm power failure, and any other operational sequence included in the system design. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The CxA develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. Functional Performance Tests are performed after prefunctional checklists and startup is complete.

1.04 COORDINATION

A. Perform commissioning services to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.

B. Commissioning Agent (CxA) shall provide overall coordination and management of the commissioning program as specified herein.

1.05 SUBMITTALS

A. Basis of Design and Owner's Project Requirements:
   1. CxA shall review BOD and OPR updates made necessary during the work to reflect the progress on the components and systems.

B. Cx Meeting Minutes:
   1. CxA shall prepare meeting minutes and provide to Owner's PM for distribution.

C. Commissioning Plan:
   1. Update as necessary during the work to reflect the progress on the components and systems.

D. Functional Performance Test Forms:
   1. Submit no later than thirty (30) calendar days prior to testing, or two (2) weeks after acceptance of ATC submittal.

E. Issues Log: Issue logs document items of non-compliance in materials, installation or operation. Document the results from start-up/pre-functional checklists, functional performance testing, and on-site observations. Include details of the components or systems found to be non-compliant with the drawings, specifications, and approved submittals. Team member responsibilities related to issues identified during commissioning are covered in Part 3 of this specification.

F. Final Commissioning Report: Compile a final commissioning report summarizing all the tasks, findings, conclusions, and recommendations of the commissioning process. Indicate the actual performance of the building systems in reference to the OPR and contract documents. Include completed pre-functional inspection checklists, functional performance testing records, Issues Log, and a summary of commissioning activities.

1.06 DESIGN REVIEW AND DOCUMENTATION

A. Document Basis of Design and Project Requirements as they relate to project functional performance and environmentally responsive characteristics, including:
   1. Functionality
   2. Energy Performance
   3. Maintainability

B. Review design documents to verify that each commissioned system meets the Project Requirements.

C. Review construction documents to verify that commissioning is adequately specified, that each commissioned system can be commissioned and is likely to meet the Project Requirements.

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. The contractor will make available standard testing equipment required to perform startup, initial checkout and functional performance testing as well as any special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents.

B. Data Logging equipment and software required to test equipment shall be provided by the CxA, but shall not become property of the Owner.

C. Test Equipment Calibration Requirements: Contractors shall comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired after being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

PART 3 – EXECUTION

3.01 COMMISSIONING PROCESS

A. The following activities outline the commissioning tasks and the general order in which they occur. The CxA shall coordinate all activities.

1. Design Review and Documentation:
    a. Basis of Design and Owner's Project Requirements Review
    b. Design Document Review
    c. Controls Coordination Review Meeting
    d. Construction Document Review
2. Commissioning Scoping Meetings
3. Commissioning Plan
4. Submittal Review:
    a. General systems to be Commissioned
    b. Controls Submittal Review

3.02 DESIGN REVIEW AND DOCUMENTATION

A. Design Document Review: Review design documents at two phases of design to verify that each commissioned system meets the Owner's requirements with special attention on integrated systems, building automation controls, and functional performance. Design review comments shall be submitted in writing to A/E and Owner. A/E will respond in writing to all comments prior to next document submission.

3.03 COMMISSIONING SCOPE MEETINGS

A. Commissioning Scope Meeting – Construction Phase:
    1. Schedule, coordinate, and facilitate a scoping meeting at the start of construction after the subcontractors have been selected.
    2. Review the Cx process with special attention on the construction phase requirements.

3.04 COMMISSIONING PLAN

A. Develop a Commissioning (Cx) Plan to identify how commissioning activities will be integrated into general construction and trade activities. The Cx Plan shall identify how commissioning responsibilities are distributed. The intent of this plan is to raise questions and issues and resolve them with input from the entire Cx Team early in construction.

3.05 SUBMITTAL REVIEW

A. Identify Submittals for Commissioning Review:
    1. At start of Construction Phase, CM shall provide a complete submittal register to the CxA. The CxA shall identify which submittal packages should be reviewed for coordination with the commissioning scope. During submittal phase, submittals identified as Cx submittals shall be sent to the CxA and the Engineer of Record concurrently for review.

B. General Systems to be Commissioned:
    1. Concurrently with the Engineer of Record, review the equipment and system submittals for the equipment to be commissioned to verify that the submitted equipment meets the requirements of the contract documents and the OPR. Focus on integration of equipment within the building systems.

C. Controls Submittal Review
    1. Concurrently with the Engineer of Record, review the Automatic Temperature Control submittal to verify that the submitted design meets the requirements of the contract documents, the OPR, and the design intent for the operation of the building systems. After submittal review is complete, schedule the Commissioning Controls Coordination Meeting prior to manufacturer's resubmittal of ATC package. Only if the submittal is accepted with no comments noted by the A/E team, the Commissioning Controls Coordination Meeting may be skipped.

3.06 COMMISSIONING CONTROLS COORDINATION MEETING

A. After the first controls submittal review is complete, schedule, coordinate and facilitate the Commissioning Controls Coordination Meeting.

B. Review all submittal review comments with the group and, as a group, determine the required resolution for each comment. Controls resubmittal shall be submitted within two (2) weeks of this meeting.

3.07 START-UP / PRE-FUNCTIONAL CHECKLISTS

A. Start-up/Pre-Functional Checklists: Coordinate start-up plans and documentation formats, including providing contractor with pre-functional checklists to be completed during the start-up process.

B. Start-up/Pre-Functional Checklists are used to verify that the systems are complete and operational before functional testing is scheduled.

3.08 FUNCTIONAL PERFORMANCE TESTING

A. Functional Performance Tests (FPT): Test procedures shall fully describe system configuration and steps required for each test; appropriately documented so that the test can be repeated with virtually identical results.
   1. Test Methods: Functional performance testing and verification may be achieved using a combination of the following methods to test the complete sequence of operation. The CxA shall determine which method, or combination, is most appropriate:
      a. Direct manipulation of system inputs (i.e. applying heat or cold to sensors).
   2. Setup: Setup each test procedure to be performed under conditions that simulate normal operating conditions as closely as possible. Where equipment requires integral safety devices to stop/prevent equipment operation unless minimum safety standards or conditions are met, functional performance test procedures shall demonstrate the actual performance of safety shutoffs in a real or closely-simulated condition of failure.

B. Develop FPT procedures for equipment and systems identify specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Coordinate test procedures with the contractor for feasibility, safety, equipment, and warranty protection. Functional performance test forms shall include the following information at a minimum:
   1. System and equipment or component name(s)
   2. Equipment location and ID number
   3. Date
   4. Project name
   5. Participants
   6. Test Set-up instructions including special requirements and alarm limits.
   7. Step-by-step test procedure
   8. Acceptance criteria
   9. Comments

3.09 ISSUES LOG

A. Issues are items of non-compliance in materials, installation, or operation observed by the CxA.

B. The CxA shall notify responsible parties upon observation of deficiencies or issues of non-compliance. CxA shall recommend corrective actions as appropriate. Issues that are not immediately resolved shall be placed on the Issues Log.

3.10 FINAL COMMISSIONING REPORT

A. Final Commissioning Report: Compile final commissioning report. Summarize all the tasks, findings, conclusions and recommendations from the Commissioning process. Include a “Lessons Learned” section.

END OF SECTION

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.
B. Sanitary waste piping, above grade.
C. Domestic water piping, above grade.
D. Storm drainage piping, above grade.
E. Pipe hangers and supports.
F. Ball valves.

1.02 RELATED REQUIREMENTS

A. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2016.
D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV; 2017.
E. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.
F. ASTM B32 - Standard Specification for Solder Metal; 2020.
G. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
H. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
I. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.
J. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
K. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
L. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
N. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2018.
O. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2018.
P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
Q. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
R. NSF 61 - Drinking Water System Components - Health Effects; 2020.
S. NSF 372 - Drinking Water System Components - Lead Content; 2020.
T. 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 data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Joints: Grooved mechanical couplings.
   4. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.05 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, alloy Sn50 solder.

2.06 PIPE HANGERS AND SUPPORTS

A. See Section 220529 for additional requirements.

B. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.

C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.

2.07 BALL VALVES

A. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

C. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

3.02 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

END OF SECTION

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Hydrants.

E. Backwater valves.

F. Backflow preventers.

G. Water hammer arrestors.

H. Mixing valves.

1.02 REFERENCE STANDARDS

A. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2003 (Reaffirmed 2012).

B. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2017.

C. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

D. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011 (Reaffirmed 2016).

E. NSF 61 - Drinking Water System Components - Health Effects; 2020.

F. NSF 372 - Drinking Water System Components - Lead Content; 2020.

1.03 SUBMITTALS

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

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Roof Drains:
   1. Assembly: ASME A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Removable polyethylene dome with vandal proof screws.
   4. Accessories: Coordinate with roofing type, see Section _____:
      a. Membrane flange and membrane clamp with integral gravel stop.
      b. Adjustable under deck clamp.
      c. Waterproofing flange.

2.03 HOSE BIBBS

A. Interior Hose Bibbs:
   1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome-plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

2.04 HYDRANTS

A. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with chrome-plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

2.05 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventer Assembly:
   1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
   2. Size: _____ inch assembly with threaded gate valves.

2.06 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:

2.07 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 221429
SUMP PUMPS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 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. Shop Drawings: Include dimensions and performance data.

PART 2 PRODUCTS

2.01 SUMP BASINS AND PITS

A. Sump Basin:
   1. Basin Volume Holding Capacity: 20 gal.
   2. Below Ground Pipe Inlet: Molded or predrilled with seal, 4 inch.
   3. Basin Dimensions: 18 inch diameter, 22 inch deep.
   4. Basin Material: Polyethylene structural foam, heavy duty injection molded.
   5. Molded-Finish Requirements: Hard bottom, watertight, gas-tight and radon-tight molding.
   6. Maximum Effluent Temperature: Match or exceed maximum pump service temperature.
   7. Basin Riser Extension: Diameter matched, 6 inch with hardware.
   8. Basin Cover:
      a. Material: One-piece flat lid made of polyethylene with seal gasket.

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).

END OF SECTION

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets.

B. Lavatories.

C. Sinks.

D. Under-lavatory pipe supply covers.

E. Bi-level, electric water coolers.

F. Mop sinks.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).

C. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

D. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.

H. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. NSF 61 - Drinking Water System Components - Health Effects; 2020.

K. NSF 372 - Drinking Water System Components - Lead Content; 2020.

1.03 SUBMITTALS

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

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

E. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets:
   1. Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
   2. Flush Valve: Exposed (top spud).
   3. Flush Operation: Sensor operated.
   4. Handle Height: 44 inches or less.
   5. Trapway Outlet: 4 inch.

B. Flush Valves:

C. Toilet Seats:
   1. Plastic: Solid, white finish, enlongated shape, open front, slow-closing hinged seat cover, extended back complete with self-sustaining hinges, and brass bolts with covers.
   2. Plastic: White finish, open front, extended back, self-sustaining hinge, brass bolts, with cover.

2.03 LAVATORIES

A. Wall-Hung Basin:
   1. Vitreous China, Grade A: ASME A112.19.2; white, rectangular commercial-grade sink with predrilled holes, rear-center drain, front overflow, and hanger. Size as indicated on drawings with 4-inch centerset spacing.
   2. Carrier:
      a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

B. Supply Faucet:
   1. ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gpm, indexed handles.
   2. Two-Handle, Supply Faucet: ASME A112.18.1; deck-mount, ceramic cartridge disc valve, and maximum flow of 1.2 gpm. Brushed nickel finish.

C. Thermostatic Mixing Valve:
   1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.
   2. Braided hot and cold water supply lines.

2.04 SINKS

A. Undermount-Installed Single Compartment Bowl:
   1. ASME A112.19.3, stainless steel with ledge back drilled for trim.
   2. Undercoated with side and bottom sound deadening pads.
   3. Drain: 1-1/2 inch, stainless steel with strainer, crumb cup, and tailpiece.

B. Kitchen Faucets:
   1. Single Handle Faucet with Three-Function Pulldown Spray Head:
      a. Minimum Spout Height: 8 inch.
      b. Minimum Spout Reach: 8-1/4 inch.
      c. Type: Deck-mount, swivel faucet with mounting plate.
      d. Spray Functions: Stream, full spray and pause at 1.8 gpm, maximum.
      e. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
      f. Materials: Ceramic disc-cartridge valve on brass body with polished chrome finish.

2.05 UNDER-LAVATORY PIPE SUPPLY COVERS

A. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
      a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
      b. Comply with ICC A117.1.

2.06 BI-LEVEL, ELECTRIC WATER COOLERS

A. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gph of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

B. Bottle Filler: Materials to match fountain.

2.07 MOP SINKS

A. Material: Precast terrazzo composed of marble chips cast in Portland cement.

B. Type: Rectilinear, standard height.

C. Tiling Flange Construction: Galvanized steel.

D. Grid strainer: Stainless steel; integral; removable.

E. Dimensions: As indicated on drawings.

F. Accessories:
   1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.
   3. Mop hanger.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install components level and plumb.

END OF SECTION

SECTION 230130.51
HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning of HVAC duct system, equipment, and related components.

1.02 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements: Additional requirements for testing and inspection agencies.

1.03 DEFINITIONS

A. HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, coils, and condensate drain pans; see NADCA ACR for more details.

1.04 REFERENCE STANDARDS

A. NADCA ACR - The NADCA Standard for Assessment, Cleaning, and Restoration of HVAC System; 2021.

1.05 QUALITY ASSURANCE

A. Cleaning Contractor Qualifications: Company specializing in the cleaning and restoration of HVAC systems as specified in this section.
   1. Certified by one of the following:
      a. NADCA, National Air Duct Cleaners Association: www.nadca.com
      b. Nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.
   2. Having minimum of three years documented experience.
   3. Employing for this project a supervisor certified by same organization that certified the cleaning contractor.

PART 2 PRODUCTS

2.01 TOOLS AND EQUIPMENT

A. Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.

B. Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.

C. Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

END OF SECTION

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Three phase electric motors.

1.02 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators; 2024.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

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

B. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F environment.
   3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

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.

2.02 APPLICATIONS

END OF SECTION

SECTION 230519
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

C. Static pressure gauges.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).

C. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

2.02 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

2.03 STEM TYPE THERMOMETERS

A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.

2.04 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

END OF SECTION

SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.

B. Check valves.

C. Gate valves.

1.02 REFERENCE STANDARDS

A. ASME B31.9 - Building Services Piping; 2020.

B. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2019).

C. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

D. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

E. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

1.03 SUBMITTALS

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

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Butterfly, Ball, Globe, and Angle.
   2. Swing Check (Pump Outlet):
      a. Size 2 inch and Smaller: Bronze with bronze disc.
      b. Size 2-1/2 inch and Larger: Iron with lever and weight, lever and spring, center-guided metal, or center-guided with resilient seat.

C. Condenser Water Valves:
   1. Size 2 inch and Smaller, Brass and Bronze Valves:
      a. Threaded ends.
   2. Size 2-1/2 inch and Larger, Iron Valves:
      a. 2-1/2 inch to 4 inch: Threaded ends.

D. Heating Hot Water Valves:
   1. Size 2 inch and Smaller, Brass and Bronze Valves:
      a. Threaded ends.
   2. Size 2-1/2 inch and Larger, Iron Valves:
      a. 2-1/2 inch to 4 inch: Threaded ends.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Handwheel: Valves other than quarter-turn types.

2. Hand Lever: Quarter-turn valves 6 inch and smaller.

D. Valves in Insulated Piping: Provide 2 inch stem extensions and the following features:
1. Gate Valves: Rising stem.
2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

F. General ASME Compliance:
1. Building Services Piping Valves: ASME B31.9.

2.03 BRONZE, SWING CHECK VALVES

A. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WSP Rating: 200 psi.
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded or soldered.
6. Disc: Bronze.

2.04 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125:
1. Comply with MSS SP-71, Type I.
2. Body Design: Clear or full waterway.
3. Body Material: ASTM A126, gray iron with bolted bonnet.
4. Ends: Flanged.
5. Trim: Bronze.
6. Gasket: Asbestos free.
7. Closer Control: Factory installed, exterior lever, and spring or weight.

2.05 IRON, CENTER-GUIDED CHECK VALVES

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. Strut Channel or Bracket Material:
   2. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.

D. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 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. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. 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.

G. Secure fasteners according to manufacturer's recommended torque settings.

H. Remove temporary supports.

END OF SECTION

SECTION 230548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

1.02 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

1.03 SUBMITTALS

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

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Piping Isolation:
   1. Provide vibration isolators for piping supports:
      a. Located in equipment rooms.

2.02 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Structural Steel Bases:
   1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

2.03 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.

e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.
B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
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. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
C. Secure fasteners according to manufacturer's recommended torque settings.
D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
E. Vibration Isolation Systems:
    1. Vibration-Isolated Equipment Support Bases:
        a. Provide specified minimum clearance beneath base.
    2. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
    3. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
    4. Adjust isolators to be free of isolation short circuits during normal operation.
    5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Commissioning activities.

1.02 RELATED REQUIREMENTS

A. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

B. Section 230800 - Commissioning of HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

B. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.04 SUBMITTALS

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

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect.
   2. Submit to the Commissioning Authority.
   3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   4. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least twice a week to the Commissioning Authority.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

J. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

K. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.03 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.04 COMMISSIONING

A. See Sections 019113 - General Commissioning Requirements and 230800 for additional requirements.

B. Perform prerequisites prior to starting commissioning activities.

C. Fill out Prefunctional Checklists for:
   1. Air side systems.
   2. Water side systems.

D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

E. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for ___ percent of the air handlers plus a random sample equivalent to ____ percent of the final TAB report data as directed by Commissioning Authority.
   1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
   2. Use the same test instruments as used in the original TAB work.
   3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
   4. For purposes of re-check, failure is defined as follows:
      a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
      b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
      c. Temperatures: Deviation of more than one degree F.
      d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
      e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
   5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

F. In the presence of the Commissioning Authority, verify that:
   1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
   2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

END OF SECTION

SECTION 230713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020a.

B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

C. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019.

D. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2021.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 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.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

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 C612; rigid, noncombustible blanket.

B. Vapor Barrier Jacket:

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETING AND ACCESSORIES

A. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.
   1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
   2. Thickness: 34 mil, 0.034 inch.

3. Finish: Embossed.
4. Color: Silver.
5. Water Vapor Transmission: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
6. Mold Resistance: Pass when tested in accordance with ASTM C1338.
7. Emissivity: 0.30 when tested in accordance with ASTM C1371.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.

C. Slope exterior ductwork to shed water.

D. External Duct Insulation Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

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.

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.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020a.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2021.

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.

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 Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. K Value: ASTM C177, 0.23 at 75 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. Maximum Service Temperature: 650 degrees F.
   2. Maximum Moisture Absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
1. Aeroflex USA, Inc; Aerocel Stay-Seal with Protape (SSPT): www.aeroflexusa.com/#sle.
2. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.

B. 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.
2. Maximum Service Temperature: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

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.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil, 0.010 inch.
e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

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.

3.02 SCHEDULE

A. Cooling Systems:

1. Condensate Drains from Cooling Coils:
   Glass Fiber Insulation:
   Pipe Size Range: All sizes.
   Thickness: 1 inch (25 mm).
2. Refrigerant Suction:
   Flexible elastomeric cellular insulation:
   Pipe Size Range: 1/2 inch (15 mm) and up.
   Thickness: 1 inch (25 mm).
3. Refrigerant Hot Gas:
   Flexible elastomeric cellular insulation:
   Pipe Size Range: 1/2 inch (15 mm) and up.
   Thickness: 1 inch (25 mm).

END OF SECTION

SECTION 230800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.

B. This section covers the **Mechanical**Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
   1. Control system.
   2. Major and minor equipment items.
   3. Piping systems and equipment.
   4. Ductwork and accessories.
   5. Variable frequency drives.
   6. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

A. Section 250800 - Commissioning of Integrated Automation.

1.03 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - HVAC&R Technical Requirements for the Commissioning Process; 2007, with Errata (2012).

1.04 SUBMITTALS 23 00 00

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. Request integrated automation (controls) checklists and test procedures from Section 250800.

C. **Commissioning Authority (CA) will** Draft Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
   1. System name.
   2. List of devices.
   3. Step-by-step procedures for testing each controller after installation, including:
      a. Process of verifying proper hardware and wiring installation.
      b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
      c. Process of performing operational checks of each controlled component.
      d. Plan and process for calibrating valve and damper actuators and all sensors.
      e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
   4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to

specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.
5. Description of the instrumentation required for testing.
6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.

D. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for **review** of Commissioning Authority.

E. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
2. Full as-built set of control drawings.
3. Full as-built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
    a. Floor.
    b. Room number.
    c. Room name.
    d. Air handler unit ID.
    e. Reference drawing number.
    f. Air terminal unit tag ID.
    g. Heating and/or cooling valve tag ID.
    h. Minimum air flow rate.
    i. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller and/or module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Valves and valve actuators.
    h. Dampers and damper actuators.
    i. Program setups (software program printouts).

F. Project Record Documents: See Section 017800 for additional requirements.
1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.

2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

G. Draft Training Plan: In addition to requirements specified in Section 017900, include:
1. Follow the recommendations of ASHRAE Guideline 1.1.
2. Control system manufacturer's recommended training.
3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

H. Training Manuals: See Section 017900 for additional requirements.
1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

C. **Test Equipment Calibration Requirements: Contractor will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments imediately after instruemtnshave been repaired resulting from being dropped or damaged. Affix calibration tages to test instruments. Furnish calibration records to Commissoning Authority upon request.**

PART 3 EXECUTION

3.01 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Valve/Damper Stroke Setup and Check:
   1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
   2. Set pump/fan to normal operating mode.
   3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
   4. Command valve/damper open; verify position is full open and adjust output signal as required.
   5. Command valve/damper to a few intermediate positions.
   6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
   7. Closure for Heating Coil Valves - Normally Open:
      a. Set heating setpoint 20 degrees F above room temperature.
      b. Observe valve open.
      c. Remove control air or power from the valve and verify that the valve stem and actuator position do not change.
      d. Restore to normal.
      e. Set heating setpoint to 20 degrees F below room temperature.
      f. Observe the valve close.
      g. Restore to normal.

D. Isolation Valve or System Valve Leak Check: For valves not by coils.
   1. With full pressure in the system, command valve closed.
   2. Use an ultra-sonic flow meter to detect flow or leakage.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. **Notify the Commissioning Authority at least 10 days in advance of testing and balancing work, and provide access for the Commissioning Authority to witness test and balancing work.**

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents **and the graphics complete.**

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
   1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
   2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
   1. Setpoint changing features and functions.
   2. Sensor calibrations.

G. Demonstrate to the Commissioning Authority:
   1. That all specified functions and features are set up, debugged and fully operable.
   2. That scheduling features are fully functional and setup, including holidays.
   3. That all graphic screens and value readouts are completed.
   4. Correct date and time setting in central computer.
   5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
   6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
   7. Power failure and battery backup and power-up restart functions.
   8. Global commands features.
   9. Security and access codes.
   10. Occupant over-rides (manual, telephone, key, keypad, etc.).
   11. O&M schedules and alarms.
   12. Occupancy sensors and controls.
   13. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

A. See Section 017800 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner

E. **Provide an updated as-built version of the control drawings and sequences of operation in the final controls O&M manual submittal.**

3.06 DEMONSTRATION AND TRAINING

A. See Section 017900 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:

E. TAB Review: Instruct Owner's personnel for minimum ____ hours, after completion of TAB, on the following:
   1. Review final TAB report, explaining the layout and meanings of each data type.
   2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
   3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
   4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
   5. Other salient information that may be useful for facility operations, relative to TAB.
   6. **During any demonstration, should the system fail to perform in accorance with the requirements of the O&M manual or sequences of opertios, the system will be repaired or adjusted as necessary and the demostation repeated.**

F. HVAC Control System Training: Perform training in at least three phases:
   1. Phase 1 - Basic Control System: Provide minimum of ____ hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
      a. This training will be held on-site.
   2. Phase 2 - Integrating with HVAC Systems: Provide minimum of ____ hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
      a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
      b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
      c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
      d. Every display screen, allowing time for questions.
      e. Point database entry and modifications.
   3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of ____ hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 230913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air Supply System:

B. Control panels.

C. Control Valves:
   1. Ball valves and actuators.

D. Dampers.

E. Damper Operators:
   1. Electric operators.

F. Sensors with transmitters:
   1. Building static pressure transmitters.
   2. Pressure transmitters.
   3. Air pressure transmitters.
   4. Temperature transmitters.

1.02 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.

1.03 SUBMITTALS

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

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 AIR SUPPLY SYSTEM

2.03 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

2.04 CONTROL VALVES

A. Ball Valves and Actuators:
   1. Service: Use for brine (30 percent glycol), chilled water, hot water, or steam at 15 to 25 psig (104.4 to 172.4).
   2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail normally closed (NC).
   3. Replacements in Kind: Provide pressure-independent type.

4. Rangeability: 500 to 1.
5. ANSI Rating: Class 150.
6. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
7. Body Size:
    a. Service Temperature:
        1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
        2) Ambient Side: From minus 4 to 122 degrees F.
8. Actuator Requirements:
    a. Assembly: Factory-mounted.
    b. Input: 0 to 5 VDC configured for proportional control.
    c. Accessories: Provide with valve position indicator and manual override.

2.05 DAMPERS

A. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gauge, 0.1046 inch.

B. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gauge, 0.0299 inch, attached to minimum 1/2 inch shafts with set screws.

C. Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.

D. Jamb Seals: Spring stainless steel.

E. Linkage Bearings: Oil impregnated sintered bronze.

F. Leakage: Less than one percent based on approach velocity of 2000 fpm and 4 in-wc.

G. Maximum Pressure Differential: 6 in-wc.

2.06 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

B. Electric Operators:
1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.07 SENSORS WITH TRANSMITTERS

A. Building Static Pressure Transmitters:

B. Air Pressure Transmitters:
1. General: Provide dry media differential pressure transducers to monitor duct and room pressure.

C. Temperature Transmitters:
1. One pipe, directly proportional output signal to measured variable, linearity within plus or minus 1/2 percent of range for 200 degrees F span and plus or minus 1 percent for 50 degrees F span, with 50 degrees F. temperature range, compensated bulb, averaging capillary, or rod and tube operation on 20 psig input pressure and 3 to 15 psig output.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats; see Section 262726.

C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 230923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. System description.

B. Operator interface.

C. Controllers.

D. Power supplies and line filtering.

E. System software.

F. Controller software.

G. HVAC control programs.

1.02 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC.

B. Section 230993 - Sequence of Operations for HVAC Controls.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2021).

B. ASHRAE Std 147 - Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems; 2019, with Addendum (2020).

C. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2019h.

1.04 SUBMITTALS

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

B. Product Data: Provide data for each system component and software module.

C. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
   3. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   4. Indicate description and sequence of operation of operating, user, and application software.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Delta Controls: www.deltacontrols.com/#sle.

B. Honeywell International, Inc: www.honeywell.com/#sle.

C. Johnson Controls, Inc: www.johnsoncontrols.com/#sle.

D. Schneider Electric: www.schneider-electric.us/#sle.

2.02 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 230913.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

A. PC Based Work Station:
   1. Resides on high speed network with building controllers.

B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

C. BACnet protocol to comply with ASHRAE Std 135.

D. Hardware:
   1. Laptop:
      a. Laptop(s) to be provided by DDC controls manufacturer.
      b. Quantity: As indicated on the drawings.
      c. Minimum RAM: 8.
      d. Minimum Processing Speed: 2.3.
      e. Minimum Hard Drive Memory: 1T.
      f. Drives: 2.
      g. Ports: 3.
      h. Display: 17".
      i. Network Connection:
         1) Ethernet interface card.
         2) Minimum Speed: _____.

2.04 CONTROLLERS

A. Building Controllers:
   1. General:
      a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
      b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
      c. Share data between networked controllers.
      d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
      e. Utilize real-time clock for scheduling.
      f. Continuously check processor status and memory circuits for abnormal operation.
      g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.

h. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
   b. Perform routing when connected to a network of custom application and application specific controllers.
   c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
2. All Input/Output Points:
   a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
   b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
3. Binary Inputs:
   a. Allow monitoring of On/Off signals from remote devices.
   b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
   c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
   a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
   b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
   a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   b. Outputs provided with three position (On/Off/Auto) override switches.
   c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
7. Analog Outputs:

a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
c. Drift to not exceed 0.4 percent of range per year.

8. Tri State Outputs:
   a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
   b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
   c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
9. System Object Capacity:
   a. System size to be expandable to twice the **anticipated 700 input output objects** required by providing additional controllers, including associated devices and wiring.
   b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.05 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
2. Limit connected loads to 80 percent of rated capacity.
3. Match DC power supply to current output and voltage requirements.
4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
7. Operational Ambient Conditions: 32 to 120 degrees F.
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
2. Minimum surge protection attributes:
   a. Dielectric strength of 1000 volts minimum.
   b. Response time of 10 nanoseconds or less.
   c. Transverse mode noise attenuation of 65 dB or greater.
   d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.06 SYSTEM SOFTWARE

A. Operating System:
1. Concurrent, multi-tasking capability.
   a. Common Software Applications Supported: Microsoft Excel.
   b. Acceptable Operating Systems: _____.
2. System Graphics:
   a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
   b. Animation displayed by shifting image files based on object status.
   c. Provide method for operator with password to perform the following:

1) Move between, change size, and change location of graphic displays.
2) Modify on-line.
3) Add, delete, or change dynamic objects consisting of:
(a) Analog and binary values.
(b) Dynamic text.
(c) Static text.
(d) Animation files.

3. Custom Graphics Generation Package:
a. Create, modify, and save graphic files and visio format graphics in PCX formats.
b. HTML graphics to support web browser compatible formats.
c. Capture or convert graphics from AutoCAD.
4. Standard HVAC Graphics Library:
a. HVAC Equipment:
1) Chillers.
2) Boilers.
3) Air Handlers.
4) Terminal HVAC Units.
5) Fan Coil Units.
6) Unit Ventilators.
b. Ancillary Equipment:
1) Valves.
2) Piping.
3) Dampers.
4) Ductwork.

B. Workstation System Applications:
1. Automatic System Database Save and Restore Functions:
a. Current database copy of each Building Controller is automatically stored on hard disk.
b. Automatic update occurs upon change in any system panel.
c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
a. Save database from any system panel.
b. Clear a panel database.
c. Initiate a download of a specified database to any system panel.
3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
a. Context-sensitive system assists operator in operation and editing.
b. Available for all applications.
c. Relevant screen data provided for particular screen display.
d. Additional help available via hypertext.
5. Security:
a. Operator log-on requires user name and password to view, edit, add, or delete data.
b. System security selectable for each operator.
c. System supervisor sets passwords and security levels for all other operators.
d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
f. All system security data stored in encrypted format.

6. System Diagnostics:
    a. Operations Automatically Monitored:
        1) Workstations.
        2) Printers.
        3) Modems.
        4) Network connections.
        5) Building management panels.
        6) Controllers.
    b. Device failure is annunciated to the operator.
7. Alarm Processing:
    a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
    b. Configurable Objects:
        1) Alarm limits.
        2) Alarm limit differentials.
        3) States.
        4) Reactions for each object.
8. Alarm Messages:
    a. Descriptor: English language.
    b. Recognizable Features:
        1) Source.
        2) Location.
        3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
    a. Logging.
    b. Printing.
    c. Starting programs.
    d. Displaying messages.
    e. Dialing out to remote locations.
    f. Paging.
    g. Providing audible annunciation.
    h. Displaying specific system graphics.
10. Custom Trend Logs:
    a. Definable for any data object in the system including interval, start time, and stop time.
    b. Trend Data:
        1) Sampled and stored on the building controller panel.
        2) Archivable on hard disk.
        3) Retrievable for use in reports, spreadsheets and standard database programs.
        4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
        5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
11. Alarm and Event Log:
    a. View all system alarms and change of states from any system location.
    b. Events listed chronologically.
    c. Operator with proper security acknowledges and clears alarms.
    d. Alarms not cleared by operator are archived to the workstation hard disk.
12. Object, Property Status and Control:
    a. Provide a method to view, edit if applicable, the status of any object and property in the system.
    b. Status Available by the Following Methods:
        1) Menu.
        2) Graphics.

3) Custom Programs.

13. Reports and Logs:
    a. Reporting Package:
        1) Allows operator to select, modify, or create reports.
        2) Definable as to data content, format, interval, and date.
        3) Archivable to hard disk.
    b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
    c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
    d. Set to be printed on operator command or specific time(s).
14. Reports:
    a. Standard:
        1) Objects with current values.
        2) Current alarms not locked out.
        3) Disabled and overridden objects, points and SNVTs.
        4) Objects in manual or automatic alarm lockout.
        5) Objects in alarm lockout currently in alarm.
        6) Logs:
            (a) Alarm History.
            (b) System messages.
            (c) System events.
            (d) Trends.
    b. Custom:
        1) Daily.
        2) Weekly.
        3) Monthly.
        4) Annual.
        5) Time and date stamped.
        6) Title.
        7) Facility name.
    c. Tenant Override:
        1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
        2) Annual report showing override usage on a monthly basis.
    d. Electrical, Fuel, and Weather:
        1) Electrical Meter(s):
            (a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
            (b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
        2) Fuel Meter(s):
            (a) Monthly showing daily natural gas consumption for each meter.
            (b) Annual summary showing monthly consumption for each meter.
        3) Weather:
            (a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.
    e. Daily Operating Condition of Chiller(s) Based on ASHRAE Std 147:
        1) Chilled water inlet and outlet temperature.
        2) Chilled water flow.
        3) Chilled water inlet and outlet pressure.
        4) Evaporator refrigerant pressure and temperature.
        5) Condenser refrigerant pressure and temperature.
        6) Condenser refrigerant pressure and liquid temperature.

7) Refrigerant levels.
8) Oil pressure and temperature.
9) Oil level.
10) Compressor refrigerant discharge temperature.
11) Refrigerant suction temperature.
12) Addition of refrigerant.
13) Addition of oil.
14) Motor amperes per phase.
15) Motor volts per phase.
16) Ambient temperature (dry-bulb and wet-bulb).
17) Date and time logged.

C. Workstation Applications Editors:
1. Provide editing software for each system application at PC workstation.
2. Downloaded application is executed at controller panel.
3. Full screen editor for each application allows operator to view and change:
a. Configuration.
b. Name.
c. Control parameters.
d. Set-points.
4. Scheduling:
a. Monthly calendar indicates schedules, holidays, and exceptions.
b. Allows several related objects to be scheduled and copied to other objects or dates.
c. Start and stop times adjustable from master schedule.
5. Custom Application Programming:
a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
b. Programming Features:
1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values cab be used in IF/THEN comparisons, calculations, programming statement logic, etc.
9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.07 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
   1. User access secured via user passwords and user names.
   2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
   3. User Log On/Log Off attempts are recorded.
   4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
   1. Weekly Schedules Based on Separate, Daily Schedules:
      a. Include start, stop, optimal stop, and night economizer.
      b. 10 events maximum per schedule.
      c. Start/stop times adjustable for each group object.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
   1. Binary object is set to alarm based on the operator specified state.
   2. Analog object to have high/low alarm limits.
   3. All alarming is capable of being automatically and manually disabled.
   4. Alarm Reporting:
      a. Operator determines action to be taken for alarm event.
      b. Alarms to be routed to appropriate workstation.
      c. Reporting Options:
         1) Logged.
         2) Custom messaging.
         3) Graphical displays.

F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

G. Sequencing: Application software based upon specified sequences of operation in Section 230993.

H. PID Control Characteristics:
   1. Direct or reverse action.
   2. Anti-windup.
   3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
   4. User selectable controlled variable, set-point, and PED gains.

I. Staggered Start Application:
   1. Prevents all controlled equipment from simultaneously restarting after power outage.
   2. Order of equipment startup is user selectable.

J. Energy Calculations:
   1. Accumulated instantaneous power or flow rates are converted to energy use data.
   2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
   3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

K. Anti-Short Cycling:
   1. All binary output objects protected from short-cycling.
   2. Allows minimum on-time and off-time to be selected.

L. On-Off Control with Differential:
   1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
   2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

M. Run-Time Totalization:

1. Totalize run-times for all binary input objects.
2. Provides operator with capability to assign high run-time alarm.

2.08 HVAC CONTROL PROGRAMS

A. General:
   1. Support Inch-pounds and SI (metric) units of measurement.
   2. Identify each HVAC Control system.

B. Optimal Run Time:
   1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
   2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.

2.09 CHILLER CONTROL PROGRAMS

A. Chiller Sequencing: Determine which combination of chillers will most efficiently satisfy chilled water load, by cycling chillers, based on comparing load to switchover limits defined for each chiller.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.

C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.02 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide basic operator training for 3 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 40 hours dedicated instructor time. Provide training on site.

C. **CONTRACTOR SHALL PROVIDE INTEGRATION OF EXISTING CONTROLS SYSTEMS INTO NEW SYSTEM, THIS SHALL INCLUDE THE 6TH FLOOR , 9TH FLOOR, 10TH FLOOR AND ANY OTHER SYSTEMS CURRENTLY IN THE OLD BAS SYSTEM.**

END OF SECTION

SECTION 232300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Strainers.
F. Filter-driers.
G. Expansion valves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. AHRI 710 (I-P) - Performance Rating of Liquid-Line Driers; 2009.
B. AHRI 711 (SI) - Performance Rating of Liquid-Line Driers; 2009.
C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
D. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
E. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2020.
F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
G. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
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; 2020.
J. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
K. ICC (IMC)-2018 - International Mechanical Code; 2018.
L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
M. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.
C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
D. Design Data: Submit design data indicating pipe sizing. Indicate load-carrying capacity of trapeze, multiple pipe, and riser support hangers.
E. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

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. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.
   2. If receiver is provided, install in liquid line leaving receiver.

D. Valves:
   1. Use service valves on suction and discharge of compressors.
   2. Use gauge taps at compressor inlet and outlet.

E. 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

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.
   3. Mechanical Press Fittings: Double-pressed type complying with UL 207 and ICC (IMC)-2018.

B. Copper Tube to 7/8-inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.

C. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply 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. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   5. Vertical Support: Steel riser clamp.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   8. 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.
   9. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
      c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
      d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.04 REFRIGERANT

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 and maximum working pressure of 500 psi.

2.06 VALVES

A. Diaphragm Packless Valves:
   1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, soldered or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

B. Packed Angle Valves:
   1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, soldered or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

2.07 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.

2.08 FILTER-DRIERS

A. Performance:
   1. Flow Capacity - Liquid Line: ____ ton, minimum, rated in accordance with AHRI 710 (I-P) (AHRI 711 (SI)).
   2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
   3. Design Working Pressure: 350 psi, minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Connections: As specified for applicable pipe type.

2.09 ELECTRONIC EXPANSION VALVES

A. Valve:

B. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

PART 3 EXECUTION

3.01 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. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

END OF SECTION

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

1.02 RELATED REQUIREMENTS

A. Section 230130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.

B. Section 233319 - Duct Silencers.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.

1.04 SUBMITTALS

A. Product Data: Provide data for duct materials.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
   1. Rectangular: Plus or minus 1/2 in-wc of galvanized steel.

E. Duct Sealing and Leakage in accordance with Static Pressure Class:
   1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
      a. Supply Air: 1/2 in-wc pressure class, galvanized steel.
      b. Return and Relief Air: 1/2 in-wc pressure class, galvanized steel.
      c. General Exhaust Air: 1/2 in-wc pressure class, galvanized steel.

F. Duct Fabrication Requirements:
   1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
   2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
   3. Construct tee's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
   4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
   5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
   6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.

7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

A. Material Requirements:
   1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Duct sizes indicated are inside precise dimensions. For lined ducts, maintain sizes inside lining.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

3.02 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. Clean thoroughly each duct system as indicated within Section 230130.51.

C. Clean the duct system and force air at high velocity through the duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

D. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access to the ductwork for cleaning purposes.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.
B. Backdraft dampers - metal.
C. Backdraft dampers - fabric.
D. Combination fire and smoke dampers.
E. Duct access doors.
F. Duct test holes.
G. Fire dampers.
H. Flexible duct connectors.
I. Smoke dampers.
J. Volume control dampers.
K. Low leakage (Class 1A) control dampers.
L. Miscellaneous products:
    1. Damper operators.
    2. Damper position switch.
    3. Internal strut end plugs.

1.02 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings.
B. Section 253513 - Integrated Automation Actuators and Operators: Damper operators.
C. Section 253516 - Integrated Automation Sensors and Transmitters: Damper position switch.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
B. NFPA 92 - Standard for Smoke Control Systems; 2021.
C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.
D. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.
B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.02 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 BACKDRAFT DAMPERS - FABRIC

A. Fabric Backdraft Dampers: Factory-fabricated.
   1. Blades: Neoprene coated fabric material.
   2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
   3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.04 COMBINATION FIRE AND SMOKE DAMPERS

2.05 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
   1. Less Than 12 inches Square: Secure with sash locks.
   2. Up to 18 inches Square: Provide two hinges and two sash locks.

2.06 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.07 FIRE DAMPERS

2.08 SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

B. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by pneumatic actuator.

C. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.09 VOLUME CONTROL DAMPERS

A. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

2.10 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

A. Maximum Leakage Allowed: 3 cfm/sq ft at 1 in-wc.

B. Frame:
   1. Material: 12 gauge galvanized steel.

C. Blade:
   1. Operation: Opposed type.

2.11 MISCELLANEOUS PRODUCTS

A. Damper Operators: Provide electric operators; see Section 253513.

B. Damper position switch; see Section 253516.

C. Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct test holes where indicated and required for testing and balancing purposes.

D. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

E. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

F. Demonstrate re-setting of fire dampers to Owner's representative.

G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

END OF SECTION

SECTION 236213
PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Condensing unit package.
B. Charge of refrigerant and oil.
C. Controls and control connections.
D. Refrigerant piping connections.
E. Motor starters.
F. Electrical power connections.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

END OF SECTION

SECTION 237200
AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Energy recovery ventilators.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 230923 - Direct-Digital Control System for HVAC.

C. Section 251500 - Integrated Automation Software: BAS, BMS, or SCADA.

D. Section 260583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. AHRI 1060 (I-P) - Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment; 2018.

B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum (2022).

C. 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.

D. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2021).

E. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019.

F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

I. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's installation instructions, product data, and engineering calculations.

C. Shop Drawings: Show design and assembly of energy recovery unit and installation and connection details.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 1-year manufacturer warranty for equipment including parts, materials, workmanship, and operation commencing on date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

C. Motor Warranty: Provide 36-month manufacturer warranty against breakdowns, malfunctions, or defects in material and workmanship under expected service conditions.

D. Energy Wheel Warranty: Provide 5-year manufacturer warranty against desiccant coating or wheel material and workmanship defects including issues arising from reduced performance under circumstances of normal use from listed design figures.

PART 2 PRODUCTS

2.01 ENERGY RECOVERY VENTILATOR

A. ERV Equipment Construction Requirements:
   1. Energy Recovery Exchanger Type: Energy wheel.
   2. ERV Equipment Location: As indicated on drawings.
   3. Supply and Return Duct Connection Orientation: As indicated on drawings.
   4. Casing and Frame:
      a. Frame: Galvanized steel body or welded extruded aluminum tubular frame capable of supporting components and casings including integral base lifting holes.
      b. Double Wall Panels: Minimum of 18 gauge, 0.040 inch galvanized steel.
      c. Doors: Construct doors of same construction and thickness as wall panels. Include p-shaped extruded neoprene gasket, prop rod, chain with spring, exterior handle, and interior 3-point latching device. Label each door to identify equipment located within.
      d. Insulation Requirements:
         1) Mold Resistance: "Pass" when tested in accordance with ASTM C1338.
         2) Fungal Resistance: No growth when tested in accordance with ASTM G21.
         3) Bacteria Resistance: No growth when tested in accordance with UL 181.
         4) Flame spread index of 25 or less and maximum smoke developed index of 50.
      e. Isolation and Sealing: Form continuous, thermally isolated, weathertight seal between inner wall of panels and structural framing with closed cell PVC foam gasketing and seal seams to prevent job site caulking.
      f. Access Panels: Provide access to components through a large, tightly sealed and easily removable hinged or screwed access panel.
      g. Finish: Polyurethane enamel over weather-protected, corrosion-resistant assembly.
      h. Nameplate: Permanent name plate listing manufacturer, model number, serial number, voltage with tolerance, and amp ratings mounted inside door near electrical panel.
   5. Supply and Exhaust Fans:
      a. Provide separate non-overloading, statically and dynamically balanced, draw-through, forward curved centrifugal fan or fan-array for each air stream.
      b. Fan Motor: Constant Speed, high efficiency, load matched, belt-driven, open drip proof, thermal overload protected TEFC motor with variable-sheave belt drive, and adjustable-removable motor-slide base. Size drives to 150 percent of load, minimum.
      c. Belt Guards: Full sized, hinged, painted with high-visibility safety color, and accessible with standard tools.
      d. Motor Bearings: Permanently lubricated sealed ball bearings rated for not less than 200,000 hours of operation with accessible greased fittings.
   6. Dampers and Louvers:
      a. Service Ratings: Up to 6 in-wc closed and 3,000 fpm when open.
      b. Frame: Minimum of 20 gauge, 0.0359 inch galvanized steel channel with rear flange, prepunched mounting holes, and welded corner clips for maximum rigidity.
      c. Exhaust Damper: Parallel blade, barometric damper for exhaust air stream isolation.
      d. Outdoor-Intake Louver: Parallel blade, for exhaust air stream isolation. Provide weatherhood with intake insect screen and mist eliminator.
      e. Bypass Damper: Opposed blade, modulating damper linked to out-of-stream electronic actuator with position feedback indicator for regulating airflow, based on load control.
   7. Filter Sections:
      a. Outdoor-Intake and Exhaust Sides: 2 inch thick, pleated, MERV 13 filters, ASHRAE Std 52.2.
      b. Filter Racks: Bolt-on rack constructed of aluminum with minimum size of 1/12 inch thick. Include hinged side access door and snap fasteners.
   8. Roof Curbs:

a. Curbs: Provide full perimeter, watertight, sloped, weight-supporting roof curb fabricated from minimum of 10 gauge, 0.1345 inch aluminized steel.
b. Isolation Rails: Provide factory-installed, 12 gauge, 0.1046 inch aluminized steel angles top and bottom, connected with flexible, outdoor rated membrane and factory-installed vibration isolation springs.
c. Gaskets: Provide closed cell PVC foam, field installed top of curb.

9. Vibration Isolation: Provide corrosion-resistant vibration isolation products for internal motors and other revolving parts. See Section 230548.
10. Electrical:
    a. 220 VAC, 3-phase with single-point power connection to nonfused main disconnect interlocked with control panel and other components.
    b. Install internal wiring in accordance with NFPA 70 within flexible, liquid tight steel conduit.
11. Controls and Local Control Panel:
    a. Unit Controls: Factory supplied DDC with sensors, limit switches, and frost control.
    b. Provide fused disconnect within local control panel with power supplies, transformers, terminal strip or terminal blocks for interface of field installed components.
    c. Service Status: Provide both local and remote indication of sensor readings and status of safeties and other status items including power on, wheel-rotation alarm, outside-air loaded filter and exhaust-air loaded filter.
    d. Provide temperature, humidity, dewpoint temperature, CO2, and wheel rotation sensors.
    e. Freeze Protection Thermostat: Provide and configure to stop unit when outdoor air intake temperature drops below 38 degrees F, adjustable.
12. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
13. Configuration: Adjust listed requirements in conformance with ASHRAE Std 90.1 I-P.
14. Certification: AHRI 1060 (I-P) labeled, include copy of published ratings for operating conditions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's written installation instructions.

B. Do not obstruct maintenance access to equipment piping, electrical conduit, or any other utility.

C. Vibration Isolation: Provide corrosion-resistant equipment isolation products; see Section 230548.

D. Electrical: Provide equipment raceway, wiring, and cables; see Section 260583.

E. Coordinate installation and fire alarm system interface of system compatible duct-mounted smoke detectors and other appurtenances following NFPA 90A guidelines.

F. Start system and adjust controls and equipment for satisfactory operation.

G. Coordinate hardwired or software interfacing links to enable coordinate as minimum start-stop, occupied, unoccupied functions as well as specific schedules and setpoints functions with other DDC controls onboard airside systems serving common spaces; see Section 230923.

H. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 251500.

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. Refrigerant branch units.

D. Indoor units.

1.02 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; 2019, with All Amendments and Errata.

E. ITS (DIR) - Directory of Listed Products; Current Edition.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. 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:

1. Outdoor Units:
    a. Refrigerant Type and Size of Charge.
    b. Output and Input Cooling Capacity: Btu/h.
    c. Output and Input Heating Capacity: Btu/h.
    d. Operating Temperature Range, Cooling and Heating.
    e. Fan Capacity: Flow in cfm with respective fan curves.
    f. External Static Pressure (ESP): In-wc.
    g. Sound Pressure Level: dB(A).
    h. Electrical Data: Complete including motor size.
    i. Maximum number of indoor units that can be served.
    j. Maximum refrigerant piping run from outdoor unit to indoor unit(s).
    k. Maximum height difference between outdoor unit to Indoor unit(s), both above and below.
2. Indoor Units:
    a. Output and Input Cooling Capacity: Btu/h.
    b. Output and Input Heating Capacity: Btu/h.
    c. Fan Capacity: Flow in cfm with respective fan curves.
    d. External Static Pressure (ESP): In-wc.
    e. Electrical Data: Complete including motor size.
    f. Maximum Lift of Built-in Condensate Pump.

3. Control Panels: Complete data of controllers, input-output points, and zones.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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.
      b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h.
   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.
   4. Cooling Mode Interior Performance:
      a. Daytime Setpoint: 68 degrees F, plus or minus 2 degrees F.
      b. Setpoint Range: 57 degrees F to 77 degrees F.
      c. Night Setback: 78 degrees F.
      d. Interior Relative Humidity: 20 percent, maximum.

2.03 AIR-SOURCE OUTDOOR UNITS

A. 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.

B. 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.
   4. Sound Pressure Level: 55 dB measured at 3 feet from front of unit.

C. 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.
      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.

D. 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-410a 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.

E. Local Controls:

F. 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. Three-Pipe Run: Provide low-pressure vapor, high-pressure vapor gas, and liquid pipes for each indoor unit selected for off-season heating and cooling changeover service.

C. 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 REFRIGERANT BRANCH UNITS

A. Outdoor unit interface to handle two or more indoor units required to do automatic off-season heating and cooling changeover.

B. Concealed box consisting internally-piped refrigeration loops, subcooling heat exchanger, and other devices coordinated by electronic valves to facilitate off-season load management between outdoor and indoor units.

C. Minimum Requirements:
1. Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise; use of multi-port branch selector boxes is not permitted unless spare ports are provided for redundancy.
2. Provide one electronic expansion valve for each downstream indoor unit served except when multiple indoor units are connected, provide balancing joints in downstream piping to keep total capacity within branch unit capacity.
3. Energize subcooling heat exchanger during simultaneous heating and cooling service.
4. Casing: Galvanized steel sheet with flame and heat resistant foamed polyethylene sound and thermal insulation.
5. Refrigerant Connections: Braze type.
6. Condensate Drainage: Provide unit that does not require condensate drainage.

2.06 INDOOR UNITS

A. Manufacturers:

B. 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; 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.

C. Ceiling-Recessed Cassette, Indoor Units:
1. Ceiling mount, 4-way, 2-way, or 1-way supply air flow units with central return air grill, DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
2. Cabinet Height: Maximum of 10 inches above face of ceiling.
3. Exposed Housing: White, impact resistant, with washable decoration panel.
4. Supply Airflow Adjustment:
   a. Horizontally and vertically adjustable dampers with electronic actuators.
   b. Four-way distribution field-modifiable to 3-way and 2-way airflow.
   c. Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.
5. Return Air Filter: Manufacturer's standard.
6. Sound Pressure Range: Between 28 to 33 dB(A) at low speed measured at 5 feet below the unit.
7. Fan: Direct-drive turbo type, with motor output range of 1/16 to 1/8 hp.
8. Condensate Pump: Built-in with minimum lift of 21 inches.
9. Fresh Air Intake: Provide side-mounted outdoor air intake duct connection.

PART 3 EXECUTION

3.01 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.

3.02 SYSTEM STARTUP

A. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

B. Adjust equipment for proper operation within manufacturer's published tolerances.

END OF SECTION

SECTION 250800
COMMISSIONING OF INTEGRATED AUTOMATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. **Integrated automation commissioning requirements.**

1.02 RELATED REQUIREMENTS

A. **Section 230593 - Testing, Adjusting, and Balancing for HVAC.**

B. **Section 230800 - Commissioning of HVAC.**

1.03 DEFINITIONS

A. **BoD: Basis of design.**

B. **CD: Construction documents.**

C. **CFR: Current facility requirements.**

D. **Cx: Commissioning.**

E. **CxA: Commissioning agent or authority.**

F. **CxP: Commissioning plan.**

G. **Cx Process: Quality-focused documented OPR compliance verification.**

H. **Cx Team: Commissioning group consisting of CxA, Owner, Architect, Design-Builder, and Contractor as applicable.**

I. **EBCx: Existing building commissioning process or retrocommissioning.**

J. **FG: Facility guide or construction standard.**

K. **FPT: Functional performance test within Cx Process.**

L. **IAQ: Indoor Air Quality.**

M. **M&V: Measurement and verification within FPT.**

N. **OPR: Owner project requirements for BoD. May include CFR and FG.**

O. **O&M: Operation and maintenance.**

P. **PFC: Prefunctional checks or installation (verification) checks within Cx Process.**

Q. **PPE: Personal protection equipment or safety gear.**

R. **QA: Quality assurance or manufacturer installation instructions.**

S. **QC: Quality control or manufacturer reviewed installation.**

T. **TAB: Testing, adjusting and balancing of mechanical systems.**

1.04 REFERENCE STANDARDS

A. ACG Cx Guideline - ACG Commissioning Guideline for Building Owners, Design Professionals, and Commissioning Service Providers; 2005.

B. ASHRAE Guideline 4 - Preparation of Operations and Maintenance Documentation for HVAC&R Systems; 2019.

C. ASHRAE Std 202 - Commissioning Process for Buildings and Systems; 2018.

1.05 ADMINISTRATIVE REQUIREMENTS

A. **Cx Process activities will be executed by each respective subcontractor, installer or manufacturer representative unless indicated otherwise.**

B. **Cx Phase Participation:**

1. **Construction: Assist CxA to execute the Cx Process in full coordination with the Cx Team.**
2. **Post-construction: Complete CxA deferred seasonal tasks as directed.**

C. **Meetings:**
   1. **Include a two hour time allowance for weekly Cx progress meetings during the entire construction schedule.**
   2. **Post-construction: Include a one month time allowance to execute pending activities and attend related meetings.**

D. **Record Drawings: Keep CxA informed of approved changes, change orders, substitutions, compromises, or variances as products are installed. Revise and resubmit record drawings with associated product data and related documents to update approved submittal package.**

E. **Substantial Completion Review: Verify that systems, subsystems, assemblies, equipment, and components were installed according to record drawings, specifications, codes, manufacturer's recommendations, industry accepted standards, and other contract requirements. Provide a report listing Cx Team applied resolutions for conflicting requirements or references.**

F. **Field Safety: Restrict equipment access to any Cx Team participant without PPE.**

G. **Standard Acceptance Tests: Specified operational checkouts, detailed testing procedures, calibrations, and adjustments are to be coordinated and executed as directed by CxA.**

H. **Coordinate with Divisions 23 and 26 to execute FPT's for Utility monitored systems through the integrated automation system (BAS).**

1.06 SUBMITTALS

A. **Provide CxA with a verified copy of approved submittals with O&M Manuals.**

B. **Provide CxA with a copy of signed-off, timestamped Cx field reports as they are completed.**

C. **Documentation: Provide printed copies of graphic panels, M&V (trend) logs, product data, system screen captures, calibration certificates, other division-specific items, and applicable nonconformity reports as requested for inclusion into the Cx manual in compliance with ASHRAE Guideline 4.**

PART 3 EXECUTION

2.01 EXAMINATION

A. **Provide a QA report listing alignment or discrepancies between listed documents applicable to:**
   1. **Commissioning:**
      a. **OPR and BoD.**
      b. **Plans and specifications.**

B. **Review drawings, logic diagrams, protective device settings, engineering studies, and other pertinent information to confirm alignment with work scope.**

C. **Approved Submittal Review: Underline and apply bold font on the following key information:**
   1. **Schedules: List specific days and hours when the system is set to its assigned modes such as occupied, unoccupied, custom, holiday, and OFF.**
   2. **Setpoints with respective setbacks, tolerances, and deadband ranges.**
   3. **Modes of Operation: Normal, backup, emergency, seasonal, holiday, and others with specific descriptions related to energy management, fire alarm, and smoke control.**
   4. **Content Review: Complies with Appendix B of ACG Cx Guideline requirements.**
   5. **Submittal First Page: Include a signed-off letter confirming that selected products and components were chosen and sized according to design criteria to meet or exceed listed functional requirements.**

D. **Coordinate internal activities to align quality control readiness with construction schedule.**

2.02 COMMISSIONING

A. **Test and Measurement Equipment.**
   1. **Bring per Cx Team resource:**
   2. **Accuracy: Each test and measurement equipment is to be of sufficient quality and accuracy to verify system specified performance with minimum tolerance levels.**
   3. **Calibration:**
   4. **Data Logging: Use integrated automation (BAS) and portable data loggers for M&V of CxA requested points (objects) over a time period of two weeks. Then download and provide a copy using CSV file format. As a minimum include timestamped:**

B. **Prefunctional Checklists:**
   1. **Development: Assist CxA to develop checklists by modifying submitted point (object) schedules with the addition of the following "check in the box" marking column fields:**
      a. **Point-to-point Verification: End to end components including hardware, wiring, tubing, tags, and related appurtenances are installed properly.**
      b. **Graphic Panel Verification: Point (object) shown on assigned graphic panel(s) displaying the same process value as on the field side.**
      c. **Point Signal Verification: After specific point (object) testing.**
         1) **Binary (Digital) Dry/Wet Input:**
            (a) **Force or shunt monitored device to open or close to verify actual change of state.**
            (b) **Include electromechanical or pneumatic relay interface(s).**
            (c) **For wet points use the services of a qualified electrician.**
         2) **Analog Input: Apply on the field end a 25, 50, 75, and 100 percent of the signal range using a calibrated active/passive signal generator.**
         3) **Binary (Digital) Dry/Wet Output: Command point to On/Off or Open/Close and observe actual change of state on the field.**
         4) **Analog Output: Command point to 25, 50, 75, and 100 percent signal range and measure field end received signal end with a calibrated multimeter.**
      d. **Point Alarm Verification: Applicable alarm configuration is verified and tested.**
      e. **Setpoint Verification: Assigned setpoints and setbacks are verified and tested.**
      f. **M&V Data Verification: Applicable point (object) trend data captures are verified as enabled and recording.**
      g. **Safety-interlock Status: System or equipment hardwired circuit is verified and tested.**
      h. **Write-in Fields: Add three lines at the lower end of the schedule sheet where the first line gets assigned for technician signature and date, the second line for its printed name, and the third line to indicate any comments or concerns.**
   2. **Pre-functional Cx Process:**
      a. **Assign two field technicians familiar with the installation to execute CxA generated installation and start-up checklists.**
      b. **Return timestamped, signed-off forms no later than two days after execution.**
   3. **Nonconformity: The CxA reserves the right to stop the process if more than three discrepancies are found. Contractor to finish incomplete work, correct deficiencies, and address potential schedule delays.**

C. **Functional Performance Test:**
   1. **Functional Performance Cx Process:**
      a. **Assign two field technicians familiar with the installation to execute CxA witnessed sequence tests and performance verifications.**
      b. **Integrated Automation Verification:**

c. **Setpoint Verification: Ensure point (object) setpoint, setback, maximum, and minimum settings were applied per contract documents for the following items.**
   1) **Flow and pressure, with values within five percent of TAB report figures.**
   2) **Temperature, humidity, CO2, and other monitored setpoints.**
d. **Sequences of Operation (FPT's): Execute in compliance with ASHRAE Std 202.**

2. **Nonconformity: The CxA reserves the right to stop the process if more than three discrepancies are found. Contractor to finish incomplete work, correct deficiencies, and address potential schedule delays.**

2.03 CLOSEOUT ACTIVITIES

A. **Training:**
1. **Organize division-related training to include specific subjects about installed system, equipment, and components.**
2. **Red mark with a diagonal line non-applicable articles included on the O&M Manual and training related handouts prior to formal CxA turnover.**
3. **Record training sessions using professional recording service provider. Provide an electronic copy of each recorded session.**

END OF SECTION

SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Additional requirements for alterations work.

B. Section 028400 - Polychlorinate Biphenyl (PCB) Remediation: Removal of equipment and materials containing substances regulated under the Federal Toxic Substances Control Act (TSCA), including but not limited to those containing PCBs and mercury.

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies to Owner before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

2.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

E. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

2.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
   1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
   2. PCB- and DEHP-containing lighting ballasts.
   3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

2.04 CLEANING AND REPAIR

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.
B. Underground feeder and branch-circuit cable.
C. Metal-clad cable.
D. Wiring connectors.
E. Electrical tape.
F. Heat shrink tubing.
G. Oxide inhibiting compound.
H. Wire pulling lubricant.
I. Cable ties.
J. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.
B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
C. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 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. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).
F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).
G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.
H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
J. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.
K. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
L. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

M. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

Q. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

R. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

S. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

T. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

U. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

V. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Armored cable is not permitted.

F. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet.
      b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

G. Manufactured wiring systems are permitted only as follows:

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 260526.

H. Conductor Material:
   1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
      a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
         1) Services: Copper conductors size 1/0 AWG and larger.
         2) Feeders: Copper conductors size 1/0 AWG and larger.
      b. Where aluminum conductors are substituted for copper, comply with the following:
         1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
         2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
         3) Provide aluminum equipment grounding conductor sized according to NFPA 70.
         4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.
   4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.
      c. Travelers for 3-Way and 4-Way Switching: Pink.
      d. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Alcan Products Corporation: Alcon Cable Division.
      b. Alpha Wire.
      c. Encore Wire Corporation: www.encorewire.com/#sle.
      d. General Cable Technologies Corporation: www.generalcable.com/#sle.
      e. Southwire Company: www.southwire.com/#sle.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):
      a. Encore Wire Corporation: www.encorewire.com/#sle.
      b. Southwire Company: www.southwire.com/#sle.
      c. Stabiloy, a brand of General Cable Technologies Corporation: www.stabiloy.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.
      b. Installed Underground: Type XHHW-2.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.04 METAL-CLAD CABLE

A. Manufacturers:
   1. Encore Wire Corporation: www.encorewire.com/#sle.
   2. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide dedicated neutral conductor for each phase conductor.

G. Grounding: Full-size integral equipment grounding conductor.

H. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
3. Connectors for Aluminum Conductors: Use compression connectors.

D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Aluminum Conductors: Use compression connectors for all connections.
7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
8. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.06 ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
   a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
   b. Increase size of conductors as required to account for ampacity derating.
   c. Size raceways, boxes, etc. to accommodate conductors.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install metal-clad cable (Type MC) in accordance with NECA 120.

F. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

I. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
a. Use listed fittings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

J. Install conductors with a minimum of 12 inches of slack at each outlet.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

Q. Identify conductors and cables in accordance with Section 260553.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 99 - Health Care Facilities Code; 2024, with Errata.

E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
   b. Metal gas piping.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame.
10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
11. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

F. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
   a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
   b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
   c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
   d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

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. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 QUALITY ASSURANCE

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Components for Vibration Isolation and/or Seismic Controls: See Section 260548.

C. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

G. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
   1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
   2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

H. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.
   6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    b. Comply with MFMA-4.
    c. Channel Material: Use galvanized steel.

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. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. 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.

H. Conduit Support and Attachment: See Section 260533.13 for additional requirements.

I. Box Support and Attachment: See Section 260533.16 for additional requirements.

J. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.

K. Exterior Luminaire Support and Attachment: See Section 265600 for additional requirements.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners in accordance with manufacturer's recommended torque settings.

N. Remove temporary supports.

O. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

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 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Stainless steel rigid metal conduit (RMC).
C. Galvanized steel intermediate metal conduit (IMC).
D. Stainless steel intermediate metal conduit (IMC).
E. PVC-coated galvanized steel rigid metal conduit (RMC).
F. Flexible metal conduit (FMC).
G. Liquidtight flexible metal conduit (LFMC).
H. Galvanized steel electrical metallic tubing (EMT).
I. Stainless steel electrical metallic tubing (EMT).
J. Rigid polyvinyl chloride (PVC) conduit.
K. Liquidtight flexible nonmetallic conduit (LFNC).
L. Reinforced thermosetting resin conduit (RTRC).

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.
B. Section 078400 - Firestopping.
C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
D. Section 260526 - Grounding and Bonding for Electrical Systems.
    1. Includes additional requirements for fittings for grounding and bonding.
E. Section 260529 - Hangers and Supports for Electrical Systems.
F. Section 260533.16 - Boxes for Electrical Systems.
G. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
H. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
I. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
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; 2018.
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 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

K. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

O. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

P. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

Q. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

R. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

S. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

T. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

U. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

V. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

W. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 QUALITY ASSURANCE

A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
2. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
3. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
4. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
5. Where galvanized steel electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D. Embedded Within Concrete:
1. Within Slab on Grade: Not permitted.
2. Within Slab Above Ground: Not permitted.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

L. Corrosive Locations Above Ground: Use stainless steel rigid metal conduit (RMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), stainless steel electrical metallic tubing (EMT), or reinforced thermosetting resin conduit (RTRC).

M. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Electrical Service Conduits: See Section 262100 for additional requirements.

D. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.

E. Provide conduit, fittings, supports, and accessories required for complete raceway system.

F. Provide products listed, classified, and labeled as suitable for purpose intended.

G. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4-inch trade size.
   2. Branch Circuit Homeruns: 3/4-inch trade size.
   3. Flexible Connections to Luminaires: 3/8-inch trade size.
   4. Underground, Interior: 1-inch trade size.

H. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
   2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

C. PVC-Coated Boxes and Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.08 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.09 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.10 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.
a. Do not use indenter type connectors and couplings.
4. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

2.11 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Connectors and Couplings: Use compression/gland or set-screw type.

2.12 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.13 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.14 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

F. Foam Conduit Sealant:
   1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Rated to hold minimum of 10 ft water head pressure.

G. Conduit Mechanical Seals:
   1. Listed as complying with UL 514B.
   2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   3. Suitable for sealing around conductors/cables to be installed.

H. Sealing Systems for Concrete Penetrations:
   1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
   2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

I. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits

and roofing system to be installed; designed to accommodate existing penetrations where applicable.

J. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

K. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

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. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.

E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

F. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

G. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conduits in the following areas may be exposed, unless otherwise indicated:
   a. Electrical rooms.
   b. Mechanical equipment rooms.
4. Arrange conduit to maintain adequate headroom, clearances, and access.
5. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
6. Arrange conduit to provide no more than 150 feet between pull points.
7. Route conduits above water and drain piping where possible.
8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
9. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
10. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
11. Group parallel conduits in same area on common rack.

H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
2. Provide required vibration isolation and/or seismic controls; see Section 260548.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

I. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 033000.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
4. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

O. Provide grounding and bonding; see Section 260526.

P. Identify conduits; see Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Floor boxes.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

E. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 262726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:

3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Manufacturer: Same as manufacturer of floor box service fittings.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

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. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes so that wall plates do not span different building finishes.
4. Locate boxes so that wall plates do not cross masonry joints.
5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
7. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

H. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
   4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K. Install boxes as required to preserve insulation integrity.

L. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

M. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 260526.

S. Identify boxes in accordance with Section 260553.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260548
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

1.02 RELATED REQUIREMENTS

A. Section 014533 - Code-Required Special Inspections and Procedures.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

1.04 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment 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. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:

1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
3. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation:
1. Engine Generators:
a. Specified vibration isolators are in addition to any factory-installed internal vibration isolators between generator set and integral base unless otherwise indicated; obtain generator set manufacturer approval of applied vibration isolation.
b. Nonseismic Applications, Isolators Not Located Below Sub-Base Fuel Tank: Use housed spring isolators or restrained spring isolators.

E. Conduit Isolation:
1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
a. Minimum Length: 3 feet unless otherwise indicated.
2. Vibration Isolators:
a. Provide vibration isolators for conduit supports:
1) Located within 50 feet of connected vibration-isolated equipment where flexible connection to equipment is not possible.
2) For conduits over 2 inch trade size located below or within 50 feet of noise-sensitive areas indicated.
b. Minimum Static Deflection:
1) First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
2) Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
c. Suspended Conduits, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.

2.02 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Structural Steel Bases:
1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

2.03 VIBRATION ISOLATORS

A. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
a. Color code or otherwise identify springs to indicate load capacity.
b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

B. Vibration Isolators for Nonseismic Applications:

1. Resilient Material Isolator Pads:
   a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
   b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
   c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
2. Resilient Material Isolator Mounts, Nonseismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
3. Open (Unhoused) Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
   b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
4. Housed Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
   b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
   c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
   d. Furnished with integral leveling device for positioning and securing supported equipment.
5. Restrained Spring Isolators, Nonseismic:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
   b. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
   d. Provides constant free and operating height.
6. Resilient Material Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
7. Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
8. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.

b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 014533 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

D. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   3. Isolator Hangers:
      a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
      b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
   4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
6. Adjust isolators to be free of isolation short circuits during normal operation.
7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Vibration Isolation Systems:
   1. Verify isolator static deflections.
   2. Verify required clearance beneath vibration-isolated equipment support bases.
   3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Floor marking tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 099123 - Interior Painting.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D. Section 260573 - Power System Studies: Arc flash hazard warning labels.

E. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Panelboards:
         1) Identify power source and circuit number. Include location when not within sight of equipment.
         2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

3) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Enclosed switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
2) Identify power source and circuit number. Include location when not within sight of equipment.
3) Identify load(s) served. Include location when not within sight of equipment.

c. Time Switches:
1) Identify load(s) served and associated circuits controlled. Include location.

d. Enclosed Contactors:
1) Identify ampere rating.
2) Identify voltage and phase.
3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
4) Identify load(s) and associated circuits controlled. Include location.

e. Transfer Switches:
1) Identify voltage and phase.
2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
3) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Emergency System Equipment:
a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.

4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

5. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

6. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 099123 and 099113.

7. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
a. Service equipment.
b. Elevator control panels.

8. Arc Flash Hazard Warning Labels: Comply with Section 260573.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
a. At each source and load connection.
b. Within boxes when more than one circuit is present.

C. Identification for Boxes:
   1. Use voltage markers to identify highest voltage present.
   2. Use voltage markers or color coded boxes to identify systems other than normal power system.
      a. Color-Coded Boxes: Field-painted in accordance with Section 099123 and 099113 per the same color code used for raceways.
         1) Emergency Power System: Red.
         2) Fire Alarm System: Red.
      b. For exposed boxes in public areas, do not color code.
   3. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

D. Identification for Devices:
   1. Wiring Device and Wallplate Finishes: Comply with Section 262726.
   2. Use identification label to identify fire alarm system devices.
   3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

E. Identification for Luminaires:
   1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
   3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
   4. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend:
      a. Equipment designation or other approved description.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. Equipment Designation: 1/2 inch.
   5. Color:
      a. Normal Power System: White text on black background.

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

G. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

H. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

B. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

C. Legend:
1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
a. Emergency Power System: Text "EMERGENCY".

D. Color: Black text on orange background unless otherwise indicated.

2.05 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Secure rigid signs using stainless steel screws.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260573
POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.
   1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.02 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 262416 - Panelboards.

C. Section 262813 - Fuses.

D. Section 262816.13 - Enclosed Circuit Breakers.

E. Section 262816.16 - Enclosed Switches.

F. Section 262913 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 00001 - Motors and Generators; 2024.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
   2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Submit study reports prior to or concurrent with product submittals.

2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

1.05 SUBMITTALS

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

B. Study reports, stamped or sealed and signed by study preparer.

1.06 POWER SYSTEM STUDIES

A. Scope of Studies:
1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:
1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
1) Obtain up-to-date information from Utility Company.
b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.
d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
e. Protective Devices:
1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.
2. Existing Installations:
a. Collect data on existing electrical distribution system necessary for completion of studies, including field verification of available existing data (e.g. construction documents, previous studies). Include actual settings for field-adjustable devices.

D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
a. Maximum utility fault currents.
b. Maximum motor contribution.

c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.

F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
a. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
a. Maximum and minimum utility fault currents.
b. Maximum and minimum motor contribution.
c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:
1. General Requirements:
a. Identify date of study and study preparer.
b. Identify study methodology and software product(s) used.
c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
d. Identify base used for per unit values.
e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
f. Include conclusions and recommendations.
2. Short-Circuit Study:
a. For each scenario, identify at each bus location:
1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
2) Fault point X/R ratio.
3) Associated equipment short circuit current ratings.
b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Protective Device Coordination Study:
a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
b. For each graph include (where applicable):
1) Partial single-line diagram identifying the portion of the system illustrated.
2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
3) Conductors: Damage curves.
4) Transformers: Inrush points and damage curves.

5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
6) Motors: Full load current, starting curves, and damage curves.
7) Capacitors: Full load current and damage curves.

c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
2) Include ground fault pickup and delay.
3) Include fuse ratings.
4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.

d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.

4. Arc Flash and Shock Risk Assessment:
a. For the worst case for each scenario, identify at each bus location:
1) Calculated incident energy and associated working distance.
2) Calculated arc flash boundary.
3) Bolted fault current.
4) Arcing fault current.
5) Clearing time.
6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.07 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
1. Products:
a. EasyPower LLC: www.easypower.com/#sle.
b. ETAP/Operation Technology, Inc: www.etap.com/#sle.
c. Power Analytics Corporation: www.poweranalytics.com/#sle.
d. SKM Systems Analysis, Inc: www.skm.com/#sle.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
1. Materials: Comply with Section 260553.
2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
a. Include the following information:
1) Arc flash boundary.
2) Available incident energy and corresponding working distance.
3) Site-specific PPE (personnel protective equipment) requirements.
4) Nominal system voltage.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install arc flash warning labels in accordance with Section 260553.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

3.03 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.

1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 260583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

F. Section 262913 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 262726.

D. Flexible Conduit: As specified in Section 260533.13.

E. Boxes: As specified in Section 260533.16.

2.02 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 260923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.
B. Outdoor motion sensors.
C. Time switches.
D. Outdoor photo controls.
E. Lighting contactors.
F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
B. Section 260526 - Grounding and Bonding for Electrical Systems.
C. Section 260529 - Hangers and Supports for Electrical Systems
D. Section 260533.16 - Boxes for Electrical Systems.
E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
F. Section 260573 - Power System Studies.
G. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
    1. Includes finish requirements for wall controls specified in this section.
H. Section 262813 - Fuses.
I. Section 262913 - Enclosed Controllers : General purpose contactors.
J. Section 265100 - Interior Lighting.
K. Section 265600 - Exterior Lighting.
L. Section 284600 - Fire Detection and Alarm.

1.03 REFERENCE STANDARDS

A. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2020.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
F. NEMA IA 10039 - Control Circuit and Pilot Devices; 2025.
G. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
J. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
K. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

M. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

N. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
   2. Coordinate placement of wall switch occupancy sensors with installed door swings.
   3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
   4. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.
   5. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

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

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

C. Field quality control reports.

D. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.07 FIELD CONDITIONS

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for occupancy sensors.

C. Provide five year manufacturer warranty for digital load controllers.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Hubbell Incorporated: www.hubbell.com/#sle.
   3. Intermatic, Inc: www.intermatic.com/#sle.
   4. Legrand North America, Inc: www.legrand.us/#sle.
   5. Leviton Mfg Company Inc
   6. Lightolier Controls

7. Lutron Electronics Company, Inc: www.lutron.com/#sle.
8. RAB Lighting, Inc: www.rablighting.com/#sle.
9. Sensor Switch Inc
10. Square D
11. Watt Stopper
12. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. General Requirements:
1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
   d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
8. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
9. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
10. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect.

C. Wall Switch Occupancy Sensors:
1. General Requirements:
   a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
   b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
   c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
   d. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.
3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within area of 400 square feet.
4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:
1. General Requirements:
a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
c. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
d. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.
2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

E. Ceiling Mounted Occupancy Sensors:
1. General Requirements:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
d. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet, with field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within area of 500 square feet at mounting height of 9 feet, with field of view of 360 degrees.
b. Medium Range Sensors: Capable of detecting motion within area of 1,000 square feet at mounting height of 9 feet, with field of view of 360 degrees.
c. Extended Range Sensors: Capable of detecting motion within area of 2,000 square feet at mounting height of 9 feet.
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet, with field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet.

F. Directional Occupancy Sensors:
1. General Requirements:

a. Description: Occupancy sensors designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.

2. Passive Infrared (PIR) Directional Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within distance of 40 feet at mounting height of 10 feet.
   b. Long Range Sensors: Capable of detecting motion within distance of 80 feet at mounting height of 10 feet.
3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within distance of 40 feet at mounting height of 10 feet.

G. Power Packs for Low-Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.

2.03 OUTDOOR MOTION SENSORS

A. Manufacturers:
1. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.

C. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.

D. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during adjustable turn-off delay time interval.

E. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.

F. Integral Photocell: For dusk to dawn operation.

G. Manual Override: Activated by switching power off to unit and then back on.

H. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.

I. Coverage: Capable of detecting motion within distance of 50 feet at mounting height of 8 feet, with field of view of 270 degrees.

2.04 TIME SWITCHES

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com/#sle.
2. NSI Industries LLC: www.nsiindustries.com/#sle.
3. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
   a. 24-Hour Time Switches: Single channel, with same schedule for each day of week and skip-a-day feature to omit selected days.
   b. 7-Day Time Switches: Single channel, capable of different schedule for each day of week with additional holiday schedule available to override normal schedule for selected days.
   c. Astronomic Time Switches: Single channel, capable of different schedule for each day of week with additional holiday schedule available to override normal schedule

for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.

3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Input Supply Voltage: As indicated on the drawings.
8. Provide lockable enclosure; environmental type per NEMA EN 10250 as specified for the following installation locations:

2.05 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
   1. Intermatic, Inc: www.intermatic.com/#sle.
   2. NSI Industries LLC: www.nsiindustries.com/#sle.
   3. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. Stem-Mounted Outdoor Photo Controls:
   1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
   2. Housing: Weatherproof, impact resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Provide external sliding shield for field adjustment of light level activation.
   5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
   6. Voltage: As required to control load indicated on drawings.
   7. Failure Mode: Fails to the on position.
   8. Load Rating: As required to control load indicated on drawings.

C. Button Type Outdoor Photo Controls
   1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
   2. Housing: Weather resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
   5. Voltage: As required to control load indicated on drawings.
   6. Failure Mode: Fails to the on position.
   7. Load Rating: As required to control load indicated on drawings.

2.06 LIGHTING CONTACTORS

A. Manufacturers:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Eaton Corporation: www.eaton.com/#sle.
   3. Rockwell Automation Inc; _____: www.rockwellautomation.com/#sle.
   4. Schneider Electric: www.se.com/#sle.
   5. Siemens Industry, Inc; : www.new.siemens.com/#sle.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on drawings.

C. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactors and externally operable disconnect.
   1. Disconnects: Circuit breaker type.

a. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening cover with disconnect in the ON position with capability of overriding interlock for testing purposes.
b. Provide auxiliary interlock for disconnection of external control power sources where applicable.

D. Short Circuit Current Rating:
1. Provide contactors with listed short circuit current rating not less than available fault current at installed location as indicated on the drawings.

E. Enclosures:
1. Comply with NEMA IA 10030.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1 or Type 12.
3. Finish: Manufacturer's standard unless otherwise indicated.

2.07 ACCESSORIES

A. Auxiliary Contacts:
1. Comply with NEMA IA 10039.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

B. Pilot Devices:
1. Comply with NEMA IA 10039; heavy-duty type.
2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
4. Indicating Lights: Push-to-test type unless otherwise indicated.
5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
1. Comply with NEMA IA 10039.
2. Provide number and type of relays indicated or required to perform necessary functions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.

C. Maintain separation of remote-control, signaling, and power-limited circuits.
   1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.

H. Provide required supports; see Section 260529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

J. Occupancy Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.

M. Daylighting Control Photo Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
   2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
   3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.

N. Combination Enclosed Lighting Contactors:

1. Except where indicated to be mounted adjacent to equipment they supply, mount lighting contactors such that highest position of operating handle does not exceed 79 inches above floor or working platform.
2. Provide fuses for fusible switches as indicated; see Section 262813.

O. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

P. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near sensor location.

Q. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

R. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lighting and appliance panelboards.

B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F. Section 264300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

N. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature:
a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
      c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.

K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
      a. Use zero sequence ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

L. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

M. Provide the following features and accessories where indicated or where required to complete installation:
   1. Feed-through lugs.
   2. Sub-feed lugs.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
11. Provide the following features and accessories where indicated or where required to complete installation:
a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.05 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 260526.

K. Install all field-installed branch devices, components, and accessories.

L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

N. Provide filler plates to cover unused spaces in panelboards.

O. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Fire detection and alarm circuits.

P. Identify panelboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

F. Poke-through assemblies.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260583 - Wiring Connections: Cords and plugs for equipment.

F. Section 260923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

G. Section 262913 - Enclosed Controllers: Manual motor starters and horsepower rated motor-starting switches without overload protection.

1.03 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. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
4. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide GFCI protection for receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

H. For flush floor service fittings, use tile rings for installations in tile floors.

I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

C. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.

2.03 WALL SWITCHES

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

2.04 WALL DIMMERS

A. Manufacturers:
   1. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.
   3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

2.05 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

E. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

2.06 WALL PLATES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; _____.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.07 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

2.08 POKE-THROUGH ASSEMBLIES

A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that openings in access floor are in proper locations.

H. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches above finished floor.
      b. Wall Dimmers: 48 inches above finished floor.
      c. Receptacles: 18 inches above finished floor or 6 inches above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Identify wiring devices in accordance with Section 260553.

Q. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262813
FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

B. Section 260573 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.

C. Section 262416 - Panelboards: Fusible switches.

D. Section 262816.16 - Enclosed Switches: Fusible switches.

E. Section 262913 - Enclosed Controllers: Fusible switches.

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

F. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com/#sle.

B. Littelfuse, Inc: www.littelfuse.com/#sle.

C. Mersen: ep-us.mersen.com/#sle.

2.02 APPLICATIONS

A. Feeders:
   1. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. General Purpose Branch Circuits: Class RK1, time-delay.

C. Individual Motor Branch Circuits: Class RK1, time-delay.

D. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

E. Primary Protection for Control Transformers: Class CC, time-delay.

2.03 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class L Fuses: Comply with UL 248-10.

I. Class CC Fuses: Comply with UL 248-4.

J. Provide the following accessories where indicated or where required to complete installation:
   1. Fuseholders: Compatible with indicated fuses.
   2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 262816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

J. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide enclosed circuit breakers and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:
   1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide thermal magnetic circuit breakers unless otherwise indicated.

G. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

I. Provide externally operable handle with means for locking in the OFF position.

J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:

1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

F. Provide the following circuit breaker types where indicated:
1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
2. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

G. Provide the following features and accessories where indicated or where required to complete installation:
1. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

F. Section 262813 - Fuses.

G. Section 262913 - Enclosed Controllers: Manual motor controllers.

H. Section 263600 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:
   1. Comply with NEMA BS 31047.
   2. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262913
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
   1. Magnetic motor starters.
   2. General purpose contactors.
   3. Manual motor starters.
   4. Motor-starting switches without overload protection.

B. Overcurrent protective devices for motor controllers, including overload relays.

C. Control accessories:
   1. Auxiliary contacts.
   2. Pilot devices.
   3. Control and timing relays.
   4. Control power transformers.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F. Section 262813 - Fuses: Fuses for fusible switches.

1.03 REFERENCE STANDARDS

A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

E. NEMA IA 10039 - Control Circuit and Pilot Devices; 2025.

F. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

J. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

K. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Rockwell Automation, Inc: www.rockwellautomation.com/#sle.

D. Schneider Electric: www.se.com/#sle.

E. Siemens Industry, Inc: www.new.siemens.com/#sle.

2.02 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Service Conditions:
1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
   a. Altitude:
      1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
      2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.

b. Ambient Temperature: Between 32 degrees F and 104 degrees F.

2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E. Short Circuit Current Rating:
1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Enclosures:
1. Comply with NEMA IA 10030.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1 or Type 12.
b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.

H. Instrument Transformers:
1. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

I. Magnetic Motor Starters: Combination type unless otherwise indicated.
1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Disconnects: Circuit breaker type.
a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
4. Overload Relays: Bimetallic thermal type unless otherwise indicated.
5. Pilot Devices Required:
a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
b. Single-Speed, Non-Reversing Starters:
1) Pushbuttons: START-STOP.
2) Selector Switches: HAND/OFF/AUTO.
3) Indicating Lights: Red ON, Green OFF.

J. General Purpose Contactors: Combination type unless otherwise indicated.
1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Disconnects: Circuit breaker type.
a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.
b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

4. Pilot Devices Required:
    a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.

K. Manual Motor Starters:
1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
2. Configuration: Non-reversing unless otherwise indicated.
3. Fractional-Horsepower Manual Motor Starters:
    a. Furnish with toggle operator.
    b. Overload Relays: Bimetallic or melting alloy thermal type.

L. Motor-Starting Switches: Horsepower-rated switches without overload protection; toggle operator.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:
1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
3. Trip-free operation.
4. Visible trip indication.
5. Resettable.
    a. Employ manual reset unless otherwise indicated.
    b. Do not employ automatic reset with two-wire control.
6. Bimetallic Thermal Overload Relays:
    a. Interchangeable current elements/heaters.
    b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
    c. Trip test function.
7. Melting Alloy Thermal Overload Relays:
    a. Interchangeable current elements/heaters.

B. Circuit Breakers:
1. Interrupting Capacity (not applicable to motor circuit protectors):
    a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
    b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
2. Motor Circuit Protectors:
    a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
    b. Provide field-adjustable magnetic instantaneous trip setting.
    c. Provide the following features and accessories where indicated or where required to complete installation:
        1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
        2) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
3. Molded Case Circuit Breakers:

a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
   1) Provide thermal magnetic circuit breakers unless otherwise indicated.
b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
c. Provide the following features and accessories where indicated or where required to complete installation:
   1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
   2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
   3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

2.04 CONTROL ACCESSORIES

A. Auxiliary Contacts:
   1. Comply with NEMA IA 10039.
   2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B. Pilot Devices:
   1. Comply with NEMA IA 10039; heavy-duty type.
   2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
   3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
   4. Indicating Lights: Push-to-test type unless otherwise indicated.
   5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
   1. Comply with NEMA IA 10039.
   2. Provide number and type of relays indicated or required to perform necessary functions.

D. Control Power Transformers:
   1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus _____ VA spare capacity.
   2. Include primary and secondary fuses.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 260526.

G. Install all field-installed devices, components, and accessories.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

J. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 260573.

K. Identify enclosed controllers in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers larger than _____ amperes. Tests listed as optional are not required.

E. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of controllers to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of enclosed controllers and associated devices.

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 enclosed controllers from subsequent construction operations.

END OF SECTION

SECTION 263213
ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set enclosure.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 231123 - Facility Natural-Gas Piping.

C. Section 235100 - Breechings, Chimneys, and Stacks: Engine exhaust piping.
   1. Includes installation of exhaust silencer specified in this section.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

I. Section 263600 - Transfer Switches.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

C. NEMA MG 00001 - Motors and Generators; 2024.

D. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2024, with Errata.

G. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

H. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

I. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 263600.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Manufacturer's factory emissions certification.

E. Source quality control test reports.

F. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Furnish engine generator sets and associated components and accessories produced by single manufacturer and obtained from single supplier.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Emergency/standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:

1. Type: Gaseous (spark ignition).
2. Power Rating: As indicated on drawings, standby.
3. Voltage: As indicated on drawings.
4. Main Line Circuit Breaker:
    a. Type: Thermal magnetic.
    b. Trip Rating: Select according to generator set rating.

E. Generator Set General Requirements:
1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
2. Factory-assembled, with components mounted on suitable base.
3. List and label engine generator assembly as complying with UL 2200.
4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:
1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Gaseous (Spark Ignition):
1. Fuel Source: Natural gas.
2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
    a. Carburetor.
    b. Gas pressure regulators.
    c. Fuel shutoff control valves.
    d. Low gas pressure switches.

C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
    a. Battery Type: Lead-acid.

b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.

3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:
   a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
   b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
   c. Listed as complying with UL 1236.
   d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
   e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
   f. Provide alarm output contacts as necessary for alarm indications.
5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.

F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 00001; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
   1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
   2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
   3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 00001, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 00001, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
      d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
      e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
      f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
      g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
   3. Generator Set Status Indications:
      a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
      b. Current (Amps): For each phase.
      c. Frequency (Hz).
      d. Real power (W/kW).
      e. Reactive power (VAR/kVAR).
      f. Apparent power (VA/kVA).
      g. Power factor.
      h. Duty Level: Actual load as percentage of rated power.
      i. Engine speed (RPM).
      j. Battery voltage (Volts DC).
      k. Engine oil pressure.
      l. Engine coolant temperature.
      m. Engine run time.
      n. Generator powering load (position signal from transfer switch).
   4. Generator Set Protection and Warning/Shutdown Indications:
      a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:

1) Overcrank (shutdown).
2) Low coolant temperature (warning).
3) High coolant temperature (warning).
4) High coolant temperature (shutdown).
5) Low oil pressure (shutdown).
6) Overspeed (shutdown).
7) Low fuel level (warning).
8) Low coolant level (warning/shutdown).
9) Generator control not in automatic mode (warning).
10) High battery voltage (warning).
11) Low cranking voltage (warning).
12) Low battery voltage (warning).
13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:
1) High AC voltage (shutdown).
2) Low AC voltage (shutdown).
3) High frequency (shutdown).
4) Low frequency (shutdown).
5) Overcurrent (shutdown).

c. Provide contacts for local and remote common alarm.
d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
a. Event log.

C. Remote Annunciator:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Generator Set Status Indications:
a. Generator powering load (via position signal from transfer switch).
b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
1) Overcrank (shutdown).
2) Low coolant temperature (warning).
3) High coolant temperature (warning).
4) High coolant temperature (shutdown).
5) Low oil pressure (shutdown).
6) Overspeed (shutdown).
7) Low fuel level (warning).
8) Low coolant level (warning/shutdown).
9) Generator control not in automatic mode (warning).
10) High battery voltage (warning).
11) Low cranking voltage (warning).
12) Low battery voltage (warning).
13) Battery charger failure (warning).
b. Provide audible alarm with silence function.
c. Provide lamp test function that illuminates all indicator lamps.

2.06 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

J. Enclosure Space Heater: Provide thermostatically controlled enclosure space heater to prevent condensation and improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

2.07 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed in accordance with Section 033000.

F. Provide required support and attachment in accordance with Section 260529.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide natural gas piping in accordance with Section 231123.

I. Provide engine exhaust piping in accordance with Section 235100, where not factory installed.
   1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
   2. Do not exceed manufacturer's maximum back pressure requirements.

J. Do not insulate piping for engine components restricted by manufacturer.

K. Install exhaust silencer in accordance with Section 235100, where not factory installed.

L. Provide grounding and bonding in accordance with Section 260526.

M. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

E. Preliminary inspection and testing to include, at a minimum:
   1. Inspect each system component for damage and defects.
   2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
   3. Check for proper oil and coolant levels.

F. Prepare and start system in accordance with manufacturer's instructions.

G. Perform acceptance test in accordance with NFPA 110.

H. Inspection and testing to include, at a minimum:
   1. Verify compliance with starting and load acceptance requirements.
   2. Verify voltage and frequency; make required adjustments as necessary.
   3. Verify phase sequence.
   4. Verify control system operation, including safety shutdowns.
   5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).

I. Provide field emissions testing where necessary for certification.

J. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.

3.06 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.07 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

END OF SECTION

SECTION 263600
TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 260573 - Power System Studies: Additional criteria for the selection of equipment specified in this section.

G. Section 262816.16 - Enclosed Switches: Safety switches not listed for use as transfer switch equipment.

H. Section 263213 - Engine Generators: For interface with transfer switches.

I. Section 263633 - Connection Cabinets for Portable Generators and Load Banks.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA IA 10042-1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2025.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

G. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
      a. Engine Generators: See Section 263213.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Source quality control test reports.

E. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Comply with the following:
1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 2 system.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Transfer Switches:
1. ABB: www.electrification.us.abb.com/#sle.
2. Eaton Corporation: www.eaton.com/#sle.
3. Generac Power Systems: www.generac.com/industrial/#sle.
4. Rehlko: www.powersystems.rehlko.com/#sle.
5. Schneider Electric; ASCO Power Technologies: www.ascopower.com/#sle.
6. Thomson Power Systems: www.thomsonps.com/#sle.
7. Source Limitations: Provide transfer switches and accessories produced by single manufacturer and obtained from single supplier.

2.02 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Integrated Transfer Switch/Connection Cabinet Units:

1. Where separate transfer switces and connection cabinets/docking stations are specified, integrated combination units also complying with Section 263633 are permitted where approved by authorities having jurisdiction.

D. Applications:
   1. Utilize open transition transfer unless otherwise indicated or required.
   2. For transfer of highly inductive loads (e.g. large motors and transformers), utilize open transition transfer with in-phase monitor or delayed transition transfer.
   3. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):
      a. Unless otherwise indicated or required, provide solid (unswitched) neutral.

E. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

F. Automatic Transfer Switch:
   1. Transfer Switch Type: As indicated on the drawings.
   2. Transition Configuration: As indicated on the drawings.
   3. Voltage: As indicated on the drawings.
   4. Ampere Rating: As indicated on the drawings.
   5. Neutral Configuration: Solid neutral (unswitched), except as indicated.
   6. Load Served: As indicated on the drawings.
   7. Primary Source: As indicated on the drawings.
   8. Alternate Source: As indicated on the drawings.

G. Comply with NEMA IA 10042-1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

H. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

I. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

J. Switching Methods:
   1. Open Transition:
      a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
      b. Where in-phase transfer is indicated, utilize in-phase monitor to initiate transfer when phase angle difference between sources is near zero to limit in-rush currents.
   2. Delayed Transition:
      a. Provide break-before-make transfer with programmable time delay in a neutral position not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
   3. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

K. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

L. Enclosures:
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
      b. Outdoor Locations: Type 3R or Type 4.
   2. Finish: Manufacturer's standard unless otherwise indicated.

M. Short Circuit Current Rating:
   1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating

not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

N. Automatic Transfer Switches:
   1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
   2. Control Functions:
      a. Automatic mode.
      b. Test Mode: Simulates failure of primary/normal source.
      c. Voltage and Frequency Sensing:
         1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
         2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
         3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
      d. Outputs:
         1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
         2) Auxiliary contacts; one set(s) for each switch position.
      e. Adjustable Time Delays:
         1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
         2) Transfer to alternate/emergency source time delay.
         3) Retransfer to primary/normal source time delay.
         4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
      f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
      g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
   3. Status Indications:
      a. Connected to alternate/emergency source.
      b. Connected to primary/normal source.
      c. Alternate/emergency source available.
   4. Automatic Sequence of Operations:
      a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
      b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
      c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
      d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 260529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Automatic Transfer Switches:
   1. Inspect and test in accordance with NETA ATS, except Section 4.
   2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.06 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Emergency power supply units.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260923 - Lighting Control Devices.

F. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

G. Section 265600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.

D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

E. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

J. UL 1598 - Luminaires; Current Edition, Including All Revisions.

K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

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

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

I. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
   1. LED Tape - General Requirements:
      a. Listed.
      b. Designed for field cutting in accordance with listing.

J. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.
      a. Wall Dimmers: See Section 262726.

b. Daylighting Controls: See Section 260923.

2.06 EMERGENCY POWER SUPPLY UNITS

A. Description: Self-contained emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

B. Compatibility:

C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamps to emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.

E. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status and field selectable audible alert.

2.07 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
4. Secure pendant-mounted luminaires to building structure.
5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.

H. Suspended Luminaires:
1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

N. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260650.16 - Lighting Fixture Schedule.

E. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

F. Section 260923 - Lighting Control Devices.

G. Section 262726 - Wiring Devices: Receptacles for installation in poles.

H. Section 262813 - Fuses.

I. Section 265100 - Interior Lighting.

1.03 UNIT PRICES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

B. Exterior Lighting Unit:

1.04 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.06 SUBMITTALS

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

B. Shop Drawings:

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.04 POLES

A. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Finish: Match luminaire finish, unless otherwise indicated.
   3. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

B. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Pole-Mounted Luminaires:
   1. Maintain the following minimum clearances:
      a. Comply with IEEE C2.
      b. Comply with utility company requirements.
   2. Foundation-Mounted Poles:
      a. Install foundations plumb.
      b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      c. Tighten anchor bolt nuts to manufacturer's recommended torque.
      d. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
      e. Install anchor base covers or anchor bolt covers as indicated.
   3. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 271000
STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products.

D. Section 262726 - Wiring Devices.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.

D. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).

G. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; 2000 (Reaffirmed 2005).

H. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).

I. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.

J. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

K. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.

L. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

M. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).

N. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

O. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

P. UL 444 - Communications Cables; Current Edition, Including All Revisions.

Q. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

R. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

S. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Field Test Reports.

1.06 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.

C. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

A. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:

2.03 COPPER CABLE AND TERMINATIONS

A. Manufacturers:
   1. CommScope: www.commscope.com/#sle.
   2. General Cable Technologies Corporation: www.generalcable.com/#sle.
   3. Siemon Company: www.siemon.com/#sle.

B. Copper Backbone Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
   2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.
   3. Cable Capacity: Quantity of pairs as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

C. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568.2 Category 6E UTP (unshielded twisted pair); 23 AWG.
   3. Cable Capacity: 4-pair.
   4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
   5. Cable Jacket Color -VOIP communications/phones: Black.
   6. Cable Jacket Color - TV's: White (shielded)
   7. Cable Jacket Color - Public and General Use: Blue.
   8. Cable Jacket Color - ISS Camer's, Access Control, Keypads: Green.
   9. Cable Jacket Color - WAPs: Orange.
   10. Cable Jacket Color - ILO/DRAC remote connectivity: Purple.
   11. Cable Jacket Color - Clustering Heartbeat, Cross over cabling: Red.
   12. Cable Jacket Color - Backchannel/private connectivity: Yellow.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

E. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

F. Copper Patch Cords:
   1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.

2. Patch Cords for Patch Panels:
    a. Quantity: One for each pair of patch panel ports.
3. Patch Cords for Work Areas:
    a. Quantity: One for each work area outlet port.

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:
1. CommScope: www.commscope.com/#sle.
2. General Cable Technologies Corporation: www.generalcable.com/#sle.
3. Siemon Company: www.siemon.com/#sle.

B. Fiber Optic Backbone Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Single-mode, 8.3/125 um (OS2) complying with TIA-492CAAB.
3. Cable Capacity: Quantity of fibers as indicated on drawings.
4. Cable Applications:
5. Cable Jacket Color:
    a. Single-Mode Fiber (OS1/OS2): Yellow.
6. Product(s):
    a. CommScope Fiber Optic Cables; TeraSpeed Zero Water Peak Single-Mode Fiber: www.commscope.com/#sle.

C. Fiber Optic Interconnecting Devices:
1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.

D. Fiber Optic Patch Cords:
1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
2. Patch Cords for Patch Panels:
    a. Quantity: One for each pair of patch panel ports.
    b. Length: _____ feet.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Fiber Optic Cross-Connection Equipment:
1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
    a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
    b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    c. Provide incoming cable strain relief and routing guides on back of panel.
    d. Provide rear cable management tray at least 8 inches deep with removable cover.
    e. Provide dust covers for unused adapters.

2.06 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 260533.16.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
    a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

B. Wall Plates:

1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 262726.

2.07 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

2.08 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

2.09 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches from power conduits and cables and panelboards.
   3. 5 inches from fluorescent and high frequency lighting fixtures.
   4. 6 inches from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches.
   2. At Outlets - Copper: 12 inches.
   3. At Outlets - Optical Fiber: 39 inches.

C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
   3. Use T568B wiring configuration.

D. Fiber Optic Cabling:
   1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
   2. Support vertical cable at intervals as recommended by manufacturer.

E. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Test backbone cables after termination but before cross-connection.
   2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
   3. Category 3 Backbone: Perform attenuation test.
   4. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.
   5. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Testing - Fiber Optic Cabling:
   1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
   2. Single Mode Backbone: Perform tests in accordance with TIA-526-7.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 271100
COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications entrance protection.

B. Communications cabinets, racks, frames, and enclosures.

C. Communications termination blocks and patch panels.

D. Communications cable management.

E. Communications rack-mounted power protection and distribution.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260553 - Identification for Electrical Systems.

C. Section 270529 - Hangers and Supports for Communications Systems.

1.03 ABBREVIATIONS AND ACRONYMS

A. PDU: Power distribution unit.

B. RCDD: Registered communications distribution designer.

C. UPS: Uninterruptible power supply.

1.04 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. BICSI TDMM - Telecommunications Distribution Methods Manual, 15th Edition; 2024.

C. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

F. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.

G. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

H. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

I. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

J. UL 497B - Standard for Protectors for Data Communications and Fire-Alarm Circuits; Current Edition, Including All Revisions.

K. UL 497C - Protectors for Coaxial Communications Circuits; Current Edition, Including All Revisions.

L. UL 1363 - Relocatable Power Taps; Current Edition, Including All Revisions.

M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

N. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate arrangement of equipment with dimensions and clearance requirements.

2. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

C. Field Test Reports.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.

B. Installer Qualifications: Company having minimum 3 years of experience in installation and testing of type of system specified.
   1. Employing BICSI RCDD.
   2. Supervisors and installers factory certified by manufacturers of products to be installed.

C. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL), and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for duration below. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 COMMUNICATIONS ENTRANCE PROTECTION

A. Comply with:
   1. BICSI TDMM.
   2. NFPA 70.
   3. TIA-607.

B. Building Entrance Termination:
   1. Provide for each circuit entrance from serving communications distribution.
   2. Listed and labeled as compatible with communications cable used.
   3. Include cable termination and grounding points.

C. Surge Protection:
   1. Line-Voltage Surge Protection:
      a. Provide for each line voltage circuit serving communications entrance and related equipment.
      b. Listed and labeled as complying with UL 1449.

2. Low-Voltage Surge Protection:
    a. Provide for each communications circuit that enters or exits building.
    b. Listed as complying with UL 497B or UL 497C.
    c. Provide voltage and current ratings suitable for circuit to be protected.

2.02 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

A. Manufacturers:
1. Belden: www.belden.com/#sle.
2. CommScope: www.commscope.com/#sle.
3. Schneider Electric; APC: www.se.com/#sle.
4. Siemon Company: www.siemon.com/#sle.

B. General Requirements:
1. Component Racks: EIA/ECA-310 standard 19 inches wide, unless otherwise indicated.
2. Cabinets: Steel construction with corrosion resistant finish.
3. Locks: Keyed alike.

C. Floor-Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

2.03 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

A. Copper Cross-Connection Equipment:
1. Manufacturers:
    a. Belden: www.belden.com/#sle.
    b. CommScope: www.commscope.com/#sle.
    c. Siemon Company: www.siemon.com/#sle.
2. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
3. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19-inch wide equipment racks; 0.09-inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
    a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
    b. Comply with TIA-568.2.
    c. Include provisions for both T568A and T568B wiring configurations.
    d. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
    e. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    f. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:
1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19-inch wide equipment racks; 0.09-inch thick aluminum.
    a. Comply with TIA-568.3; match cable.
    b. Adapters:
        1) Maximum of 24 duplex adaptors per standard panel width.
    c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    d. Provide incoming cable strain relief and routing guides on back of panel.
    e. Provide rear cable management tray at least 8-inches deep with removable cover.
    f. Provide dust covers for unused adapters.

2.04 COMMUNICATIONS CABLE MANAGEMENT

A. Comply with BICSI TDMM for cable organization, minimizing strain relief, and cable bending limitations.

B. Comply with TIA-607 and NFPA 70 for bonding of metal parts with dedicated wiring or by using listed connections.

C. Fiber Raceways:
   1. Description: Raceway system specifically designed for routing and protecting optical fiber cables; suitable for overhead, underfloor, and above-ceiling applications.
   2. Provide complete fiber raceway system consisting of required components, fittings, supports, and accessories.
   3. Material: Thermoplastic; nylon and PVC not acceptable.
   4. Color: Yellow.
   5. Joining Method: Mechanical; glue and solvents not acceptable.
   6. Plenum rated; listed as complying with UL 2024.
   7. Flammability: Comply with UL 94.
   8. Minimum Cable Bend Radius: 2 inches throughout system.

D. Horizontal/Vertical Cable Managers: Compatible with equipment racks.

2.05 COMMUNICATIONS RACK-MOUNTED POWER PROTECTION AND DISTRIBUTION

A. Rack Power Strips:
   1. Description: UL 1363 listed and labeled, industrial grade power strip.
   2. Provide AC rack-mounted power taps for equipment loads.
   3. Mounting Orientation: Vertical.
   4. Ratings: 120 V, 20 A.
   5. Provide integral surge protection.

2.06 ACCESSORIES

A. Backboards: Interior grade plywood without voids, 3/4-inch thick; listed and labeled as fire-retardant.
   1. Do not paint over listing label.

2.07 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements.

B. Verify ratings and configurations of system components.

C. Verify mounting surfaces are ready to receive system components.

D. Verify branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.

E. Verify conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Comply with BICSI N1.

C. Floor-Mounted Racks and Cabinets: Permanently anchor to floor in accordance with manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish; including repair of scratched or marred surfaces.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

END OF SECTION

SECTION 281500 - INTEGRATED ACCESS CONTROL HARDWARE DEVICES

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 access control door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:

1. Electrified and Integrated Access Control Card Key Door Hardware

C. Related Sections include the following:

1. Division 01 Section “Cash Allowances”.
2. Division 01 Section “Product Allowances”.
3. Division 08 Section “Door Schedule”.
4. Division 08 Section “Door Hardware Schedule”.
5. Division 08 Section "Hollow Metal Doors and Frames."
6. Division 08 Section "Flush Wood Doors".
7. Division 08 Section "Clad Wood Doors".
8. Division 08 Section "Stile and Rail Wood Doors".
9. Division 08 Section “Fiberglass Doors”,
10. Division 08 Section "Integrated Door Opening Assemblies".
11. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
12. Division 08 Section "All-Glass Entrances".
13. Division 08 Section "Automatic Entrances".
14. Division 08 Section "Door Hardware".
15. Division 08 Section "Automatic Door Operators".
16. Division 14 Section "Elevators" for security access to elevator floor selection controls.
17. Division 26 Section "Electrical" for connections to electrical power system and for low voltage wiring work.
18. Division 27 Section "Communications" for connections to the LAN.
19. Division 28 Section "Access Control" for access control devices and equipment installed at door openings and provided as part of a security and site management system.

20. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
21. Division 28 Section "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.
22. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

D. References:

1. ANSI A117.1 (1998) - Accessible and Usable Buildings and Facilities.
2. IBC - International Building Code
3. NFPA 70 (2002) - National Electrical Code.
4. NFPA 80 (1999) - Fire Doors and Windows.
5. NFPA 101 (2006) - Life Safety Code.
6. UL 294 - Access Control Systems.
7. UL 1076 - Proprietary Burglar Alarm Units and Systems.

E. Products installed, but not provided under this Section include the following. Coordination to remain a requirement of this Section.

1. Security or High Security keyed cylinders, including provisions for temporary construction keying, for mechanical override at access control locking hardware to be furnished under Division 8 Section "Door Hardware".

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. System Operational Descriptions: Complete system operational narratives for the integrated access-controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access-controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.

2. Electrical Coordination: Coordinate with related Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum of five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.

1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.
3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.

4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

C. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.

1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers."

D. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.
3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
5. The installed access control system shall conform to all local jurisdiction requirements.

F. Keying Conference: Reference Division 8 Section "Door Hardware".

G. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.

1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
2. Review and verify sequence of operation descriptions for each unique access controlled opening.
3. Review and finalize construction schedule and verify availability of materials.
4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.

1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the “Pre-Submittal Conference".

1.6 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of

the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods (Electrified Access Control Door Hardware):

1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.

E. Maintenance Support and Extended Service Agreement: Submit for Owner’s consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer’s version or for up to (2) years after a new version release.

1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner’s site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.

3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of the installed access control system hardware and components.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

A. Integrated Wired Output Multi-Class Cylindrical Locks: Wiegand or Open Supervised Device Protocol (OSDP)output ANSI A156.2, Grade 1, Cylindrical Lockset with integrated card reader with or without keypad option, and request-to-exit signaling in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim with 1/2" deadlocking stainless steel latch. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Inside lever handle (request-to-exit) signaling standard with door position (open/closed status) monitoring (via separately connected DPS).
2. Integrated reader supports the following credentials:
   a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
   b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
   c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
   d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant
   e. NFC-enabled mobile phones
   f. PIN code only or PIN + credential with keypad option
3. 12VDC external power supply required for reader and lock, with optional 24VDC lock solenoid. Fail safe or fail secure options.
4. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.

6. Manufacturers:

   a. Corbin Russwin (RU) - CL3300 SN Series.

b. Sargent Manufacturing (SA) - SN200/SN210 10 Line.

B. Integrated Wired Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated card reader with or without keypad option, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
2. Integrated reader supports the following credentials:

   a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
   b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
   c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
   d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant
   e. NFC-enabled mobile phones
   f. PIN code only or PIN + credential with keypad option

3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Competitor Alternates Allowed Option: Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.

6. Manufacturers:

   a. Corbin Russwin (RU) - ED5000 SN Series.
   b. Sargent Manufacturing (SA) - SN200/SN210 80 Series.

2.2 CABLES AND WIRING

A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."

B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and

distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.3 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.

C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

D. BHMA Designations: Comply with base material and finish as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

A. Install each item of electronic integrated door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount electronic integrated door hardware units at heights indicated in following applicable publications, unless specifically 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."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

E. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and 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 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.

1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
4. Provide “as designed” drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.5 ADJUSTING

A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by access control system installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.8 ACCESS CONTROL HARDWARE SETS

A. The access control system hardware sets listed below represent the design intent and direction of the owner, architect, and security consultant (as applicable). They are intended as a guideline only and should not be considered a detailed opening schedule. Discrepancies, conflicting, and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 281500

SECTION 284600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

D. Maintenance of fire alarm system under contract for specified warranty period.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping: Materials and methods for work to be performed by this installer.

B. Section 087100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.

C. Section 211300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

D. Section 233300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

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

B. Evidence of designer qualifications.

C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:

1. Copy (if any) of list of data required by authority having jurisdiction.
2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
4. System zone boundaries and interfaces to fire safety systems.
5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
7. List of all devices on each signaling line circuit, with spare capacity indicated.
8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
12. Certification by Contractor that the system design complies with Contract Documents.

D. Evidence of installer qualifications.

E. Evidence of instructor qualifications; training lesson plan outline.

F. Evidence of maintenance contractor qualifications, if different from installer.

G. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

H. Operating and Maintenance Data: See Section 017800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

I. Project Record Documents: See Section 017800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

J. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories:
1. Honeywell Security & Fire Solutions/Gamewell-FCI: www.gamewell-fci.com/#sle.
2. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com/#sle.
3. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.
4. Honeywell Security & Fire Solutions/Silent Knight: www.silentknight.com/#sle.
5. Honeywell Security & Fire Solutions/Vista: www.security.honeywell.com/#sle.
6. Simplex, a brand of Johnson Controls: www.simplex-fire.com/#sle.
7. Provide control units made by the same manufacturer.

B. Initiating Devices and Notification Appliances:
1. Simplex, a brand of Johnson Controls: www.simplex-fire.com/#sle.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
2. Protected Premises: Entire building shown on drawings.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
   a. ADA Standards.
   b. The requirements of the local authority having jurisdiction .
   c. Applicable local codes.
   d. Contract Documents (drawings and specifications).
   e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
7. Program notification zones and voice messages as directed by Owner.

8. Fire Alarm Control Unit: New, located at fire command center.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at _____.
3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.

C. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
2. Dry-pipe sprinkler system pressure.
3. Dry-pipe sprinkler valve room low temperature.
4. Elevator shut-down control circuits.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
2. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
3. Duct smoke detectors.

C. Elevators:
1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

D. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

E. Doors:
1. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 087100.

2.04 COMPONENTS

A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit.

D. Remote Annunciators:

E. Addressable Modules:
   1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
   2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
   3. Monitor Modules: Unless devices are explicitly permitted to be connected together as zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable fire alarm control unit.
   4. Control Modules: Provide as indicated or as required for selective control of notification appliances.
   5. Releasing Control Modules: Provide as indicated or as required for control of listed solenoids in releasing applications.
   6. Relay Modules: Provide as indicated or as required to perform necessary functions via dry-contact interface. Where load exceeds module contact rating, provide accessory power isolation relays suitable for load as required.

F. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
   2. Manual Pull Stations:
   3. Key Operated Pull Stations:
   4. Smoke Detectors:
   5. Duct Smoke Detectors:
   6. Heat Detectors:

G. Notification Appliances:
   1. Speakers:
   2. Strobes:

H. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

I. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

J. Locks and Keys: Deliver keys to Owner.
   1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

K. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
   1. Record all system operations and malfunctions.
   2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
   3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
   4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.
   2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
   1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

3.05 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

F. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 320190
OPERATION AND MAINTENANCE OF PLANTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Maintain plants in manner that promotes health, growth, color and appearance, to quality levels specified; replace dead, dying, and damaged plants at no extra cost to Owner.
   1. It is Contractor's responsibility to determine type and quantity of soil amendments and fertilizer required.
   2. Perform soil analysis to determine type and quantity of soil amendments; test enough soil samples to obtain a comprehensive analysis; submit reports.

B. Maintain newly planted landscape plants, including shrubs, hedges, ground cover, and perennials.

C. Operate permanent irrigation system.

D. Clean up landscaped areas.

E. Maintenance Period: The time frame covered by these requirements is 90 days:
   1. Start Date: Project Date of Substantial Completion.

1.02 REFERENCE STANDARDS

A. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

B. ANSI Z133.1 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

C. ASTM C602 - Standard Specification for Agricultural Liming Materials; 2023.

D. ASTM D4972 - Standard Test Methods for pH of Soils; 2019.

E. ASTM D5883 - Standard Guide for Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes; 2018.

1.03 PROPOSAL SUBMITTALS

A. Submit complete maintenance plan, showing:
   1. Irrigation volume and frequency.
   2. Fertilizer type, quantity, and schedule of application.
   3. Soil amendment type, quantity, and schedule of application.
   4. Personnel assigned, including supervisor.
   5. Inspection procedures, diagnostics, and remedies.

1.04 SUBMITTALS

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

B. Soil Tests and Analysis: Submit report showing number of samples, test results, and recommendations for soil amendments and fertilizer.

C. Product Data: Manufacturer's data sheets on each fertilizer, herbicide, pesticide, and other chemical material to be used, showing trade name, chemical composition, mixing instructions, recommended application rate, storage and handling instructions, and application instructions.
   1. Pesticides and Herbicides: Also include U.S. EPA registration number and Material Safety Data Sheets.

D. Shop Drawings:
   1. Maintenance plan.
   2. Recommendations of the local Cooperative Extension Service office for maintenance and care of turf.

E. Certificates: Certification of composition of the following as delivered:

1. Fertilizer.
2. Mulch.

F. Installer Qualifications: As specified.

G. Site Reports: Include date, time, personnel, condition of plants, activities, temperature, precipitation, irrigation applied; record:
1. Each visit for maintenance purposes.
2. Volume of water applied and area applied to.
3. Diagnosis for treatment of unhealthy plants.
4. Pesticide application; provide all additional reports and recordkeeping required by law.
5. Herbicide application; provide all additional reports and recordkeeping required by law.
6. Removal of dead plants, with quantity and diagnosis.
7. Replanting.
8. Volume of bio-degradable debris composted.
9. Volume of wood chips produced.
10. Volume of debris removed from site.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
1. Maintenance Contractor: The contractual entity that performed the planting installation.
2. Pruners: Certified member, or supervised by certified member, of International Society of Arboriculture.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver U.S. EPA-controlled materials to site in original containers with legible labels indicating registration number and registered uses.

B. Deliver fertilizer and manufactured soil amendments to site in original containers bearing manufacturer's chemical analysis, name, trade name or trademark, and indication of compliance with applicable state and federal laws and regulations ; alternatively, bulk delivery with equivalent certificate is acceptable.

C. Store fertilizer, soil amendments, and mulch in dry locations away from contaminants.

D. Do not store pesticides, herbicides, or other chemical treatment materials in locations where they could damage seeds or plants.

PART 2 PRODUCTS

2.01 FERTILIZERS AND SOIL AMENDMENTS

A. Fertilizers: Free flowing granular organic type containing nitrogen, phosphorus, and potassium, plus trace minerals and micro-nutrients; controlled release type is preferred.
1. Determine type and quantity based on soil analysis.

B. Soil Amendments: Type and quantity as required to achieve specified results, based on soil analysis.

C. pH Adjuster: ASTM C602 Class O limestone.

D. Gypsum: Commercially packaged, free flowing, minimum 95 percent calcium sulfate by volume.

E. Sand: Clean and free of materials harmful to plants; 95 percent by weight, minimum, passing No.10 (sieve and 10 percent by weight, minimum, passing No.16 (sieve.

F. Calcined Clay: Granular particles produced from montmorillonite clay calcined to minimum temperature of 1200 degrees F.
1. Gradation:
a. 90 percent, minimum, passing No.8 (sieve.
b. 99 percent, minimum, retained on No.60 (sieve.
2. Density: 40 pounds per cubic foot.

G. Expanded Shale, Clay, or Slate: ASTM D5883, rotary kiln produced.

2.02 APPLIED MATERIALS

A. Organic Mulch: Maintain general appearance of existing mulched areas; use one of the following types:
   1. Wood chips ranging in size from 1/2 inch to one inch.
   2. Ground or shredded bark.
   3. Shredded hardwood ranging in size from 1/2 inch to one inch.
   4. Pine straw.
   5. Marsh hay.
   6. Pine needles.
   7. Peanut, pecan, or cocoa bean shells.
   8. Recovered 100 percent wood-based materials ranging in size from 1/2 inch to one inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. If soil analysis has not already been performed, take sufficient samples to obtain a comprehensive analysis; perform analysis in accordance with ASTM D4972.

3.02 LANDSCAPE MAINTENANCE - GENERAL

A. Obtain and follow the maintenance instructions provided by the installer of new plant materials.

B. Protect existing vegetation, pavements, and facilities from damage due to maintenance activities; restore damaged items to original condition or replace, at no extra cost to Owner.

C. General Cleanup: Remove debris from all landscape areas at least once a week and from turf areas before each mowing.
   1. Debris consists of trash, rubbish, dropped leaves, downed branches and limbs of all sizes, dead vegetation, rocks, and other material not belonging in landscaped areas.
   2. Remove debris from site and dispose of properly.

D. Watering, Soil Erosion, and Sedimentation Control: Comply with federal, state, local, and other regulations in force; prevent over-watering, run-off, erosion, puddling, and ponding.
   1. Site grading and planting have been designed to resist erosion once fully grown, with temporary measures in place during establishment period.
   2. Repair temporary erosion control mechanisms provided by others.
   3. Repair eroded areas and replant, when caused by inadequate maintenance.
   4. Prevent sediment from entering storm drains.

E. Trees: Exercise care to avoid girdling trees; provide protective collars if necessary; remove protective collars at end of maintenance period.

F. Fertilizing: Apply fertilizer only when necessary.

G. Earth Mound Watering Basins: Maintain in good condition and as required to permit efficient application of water without waste; reapply mulch if soil surface shows.

H. Drainage Channels: Remove obstructions in gutters, catch basins, storm drain inlets, yard drains, swales, ditches, and overflows.
   1. Remove grates from catch basins to clean.
   2. Prevent encroachment of other vegetation on turfed surface drainage channels.

I. Health Maintenance: Inspect all plants regularly for health:
   1. Eradicate diseases and damaging pests, regardless of severity or speed of effect.
   2. Treat accidental injuries and abrasions.
   3. If a plant is unhealthy but not yet dead, according to specified definitions, determine reason(s) and take remedial action immediately.
   4. Remove dead plants immediately upon determining that they are dead.

J. Pesticide and Herbicide Application: Comply with manufacturer's instructions and recommendations and applicable regulations.

1. Obtain Owner's approval prior to each application.
2. Apply in manner to prevent injury to personnel and damage to property due to either direct spray or drifting, both on and off Owner's property.
3. Use backflow preventers on hose bibbs used for mixing water; prevent spills.
4. Inspect equipment daily before application; repair leaks, clogs, wear, and damage.
5. Do not dispose of excess mixed material, unmixed material, containers, residue, rinse water, or contaminated articles on site; dispose of off site in legal manner.
6. Rinse water may be used as mix water for next batch of same formulation.
7. Contractor is responsible for all recordkeeping, submissions, and reports required by laws and regulations.

K. Replanting: Perform replacement and replanting immediately upon removal of dead plant.

3.03 IRRIGATION

A. Irrigation: Do not allow plants to wilt; apply water as required to supplement rainfall; do not waste water; do not water plants or areas not needing water; do not water during rainfall; shut off water flow when finished; repair leaks.
   1. New automatic irrigation system is to be installed with controls provided at owner designed basement location.
      a. BOD. Rainbird ESPTM2 Irrigation Controller with Link Wifi and all other accesorries needed to operate planter irrigation system from basement located controller.
      b. Substitions Allowed.
   2. Provide backflow preventers on hose bibbs used for irrigation hoses.

B. Automatic Irrigation System: Obtain and follow manufacturer's operating and maintenance instructions.
   1. Adjust to water landscape areas only.
   2. Adjust sprinkler heads, drippers, valves, pumps, and controllers as required for optimum operation.
   3. Drain and prepare for freezing weather; prepare and start up in spring.
   4. During system warranty period notify Architect and system installer promptly of defects and leaks that adversely affect irrigation performance.
   5. After end of system warranty period, service and repair all defects and leaks.

3.04 PLANTING BED MAINTENANCE

A. Planting beds include all planted areas except turf.

B. Begin maintenance immediately after plants have been installed; inspect at least once a week and perform needed maintenance promptly.

C. Keep planting beds free of pests; remove weeds and grass by hand before reaching 1 inch height.

D. Do not allow climbing, twining, or creeping plants to encroach into other species.

E. Replace mulch as required and remove debris.

3.05 TREE AND SHRUB MAINTENANCE

A. Trees will be considered dead when main leader has died back or when 25 percent or more of crown has died ; except as otherwise indicated for palm trees.

B. Shrubs will be considered dead when 25 percent or more of plant has died.

C. Inspect woody plants for health by scraping up to 1/16 inch square area of bark; no green cambium layer below bark shall be evidence of death.

D. Adjust stakes, guys and turnbuckles, ties, and trunk wrap as required to promote growth and avoid girdling.

E. Pruning: Unless otherwise indicated, prune only to maintain balanced natural shape; follow recommendations of ANSI A300 and ANSI Z133.1 and best local practices for species involved.

F. Shrubs: Prune at least once during maintenance period at best time to influence ultimate shape and size for the particular species.
   1. Prune to balance the plant's form and according to its natural growth characteristics.
   2. Remove water shoots, suckers, and branches not complying with desired shape and size.

G. Hedges: Trim to encourage growth into voids and gaps.

3.06 CLEANING

A. Remove fallen deciduous leaves in Fall; removal may wait until all leaves have fallen.

B. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.

C. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner; Owner's trash collection facilities may be used.

D. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner.
   1. Biodegradable Debris: Owner will designate a compost pile on site where biodegradable debris may be deposited; branches and bark are not considered biodegradable.
   2. Branches and Bark: Owner will designate a wood chip storage area; machine-chip all branch and bark debris.
   3. Non-Biodegradable Debris: Owner's trash collection facilities may be used.

3.07 CLOSEOUT ACTIVITIES

A. 10 days prior to end of maintenance period, submit request for final inspection.

B. Final inspection will be conducted by Owner.

END OF SECTION