



ARCHITECTURE
INTERIOR DESIGN
ENGINEERING
PLANNING

Specifications

For:

Johnson-Betts Meadows

**SE 31st Street & SE Fremont Street
Topeka, Kansas 66605**

Owner:

**Johnson-Betts Meadows, LP
2010 SE California Ave
Topeka, Kansas 66607**

**Project No: 25144
December 18, 2025**

**SECTION 000001
PROJECT TITLE PAGE**

PROJECT: JOHNSON-BETTS MEADOWS

OWNER: JOHNSON-BETTS MEADOWS, LP

BY: _____ DATE: _____

ARCHITECT: ROSEMAN & ASSOCIATES, P.C.

BY: _____ DATE: _____

CONTRACTOR:

BY: _____ DATE: _____

KANSAS HOUSING RESOURCES CORPORATION:

BY: _____ DATE: _____

END OF SECTION

SECTION 000006
CIVIL ENGINEER CERTIFICATION PAGE

CIVIL ENGINEER CERTIFICATION

I, BRIAN T. AUSTIN, HEREBY SPECIFY, PURSUANT TO THE STATE OF KANSAS, THAT THE DOCUMENTS INTENDED TO BE AUTHORIZED BY MY SEAL ARE LIMITED TO:

SPECIFICATION SECTIONS

11 6813	Playground Equipment
31 1000	Site Clearing
31 2000	Earthwork
32 1216	Asphalt Paving
32 1313	Concrete Paving
32 9200	Turf and Grasses
33 0561	Concrete Manholes
33 1416	Site Utility and Distribution Piping
33 3113	Sanitary Sewer
33 4211	Stormwater Gravity Piping
33 4231	Stormwater Area Drains and Inlets

DRAWINGS

C-001	Title Sheet
C-002	General Notes and Quantities
C-003	Project Control
C-004	Project Control – Road A & C
C-005	Project Control – Road B & D
C-006	Typical Sections
C-007	Overall Site Plan
C-008	Existing Drainage Areas
C-009	Proposed Drainage Areas
C-010	Detention Pond Plan
C-011	BMP Plan
C-012	Water Line A
C-013	Water Line A Profile
C-014	Water Line B
C-015	Water Line B Profile
C-016	Water Line C
C-017	Water Line C Profile
C-018	Water Line D (Existing 8" PVC)
C-019	Water Line D (Existing 8" PVC)
C-020	Sanitary Sewer A
C-021	Sanitary Sewer A
C-022	Sanitary Sewer A Profile
C-023	Sanitary Sewer B & C

C-024	Sanitary Sewer B Profile
C-025	Sanitary Sewer C Profile
C-026	Retaining Wall A
C-027	Retaining Wall B
C-028	Retaining Wall B Profile
C-029	Retaining Wall C
C-030	Retaining Wall C Profile
C-031	Storm Sewer A
C-032	Sanitary Sewer A
C-033	Storm Sewer A Profile
C-034	Storm Sewer A1 & A2
C-035	Storm Sewer B
C-036	Storm Sewer B Profile
C-037	Storm Sewer C & D
C-038	Storm Sewer C & D Profile
C-039	Road A
C-040	Road A Profile
C-041	Road B
C-042	Road B Profile
C-043	Road C
C-044	Road C Profile
C-045	Road D
C-046	Road D
C-047	Road D Profile
C-048	Paving Plan – Road A
C-049	Paving Plan – Road A
C-050	Paving Plan – Road B
C-051	Paving Plan – Road B
C-052	Paving Plan – Road C
C-053	Paving Plan – Road C
C-054	Paving Plan – Playground Area
C-055	Paving Plan – Road D
C-056	Paving Plan – Road D
C-057	Paving Plan – South Entrance
C-058	Paving Plan – Trail Connection
C-060	Miscellaneous Site Details
C-064	Trash Enclosure Details
C-081	Erosion Control – Phase 1
C-082	Erosion Control – Phase 2
C-083	Erosion Control – Phase 3
C-084	Erosion Control – Detention and Siltation Pond

**AND DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS,
REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE
USED FOR ANY PART OR PARTS FOR JOHNSON BETTS MEADOWS IN TOPEKA, KS.**

SEAL:

BY: BRIAN T. AUSTIN DATE: _____

END OF SECTION

SECTION 000110
TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

000001	Project Title Page
000005	Architect Certification Page
000006	Civil Engineer Certification Page
000007	Structural Engineer Certification Page
000008	MEP Engineer's Certification Page
000110	Table of Contents
003100	Available Project Information
003100A	
005000	Conditions of the Contract
007000	General Conditions
007000A	A201-2017 for Johnson-Betts Meadows
007300	Supplementary Conditions
007300A	Form HUD-2254

SPECIFICATIONS

DIVISION 01 -- GENERAL REQUIREMENTS

011000	Summary
012300	Alternates
012600	Contract Modification Procedures
012900	Payment Procedures
013000	Administrative Requirements
013100	Project Management and Coordination
013300	Submittal Procedures
014000	Quality Requirements
015000	Temporary Facilities and Controls
015850	Project Signs
016000	Product Requirements
017300	Execution
017700	Closeout Procedures
017823	Operation and Maintenance Data
017839	Project Record Documents
017900	Demonstration and Training

DIVISION 02 -- EXISTING CONDITIONS (Not Used)

DIVISION 03 -- CONCRETE

033000	Cast-in-Place Concrete
035400	Cast Underlayment

DIVISION 04 -- MASONRY

042000	Unit Masonry
047300	Manufactured Stone Masonry

DIVISION 05 -- METALS

055213 Pipe and Tube Railings

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

061000 Rough Carpentry
061605 Sheathing – Zip Sheathing (Alternate No. 01)
061753 Shop-Fabricated Wood Trusses
062000 Finish Carpentry
064700 Plastic Shutters and Accessories
066100 Cast Polymer Fabrications
067300 Composite Decking

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

070523 Building Envelope Testing
072100 Thermal Insulation
072126 Blown Insulation
072700 Air Barriers
073113 Asphalt Shingles
074646 Fiber-Cement Siding
076200 Sheet Metal Flashing and Trim
077123 Manufactured Gutters and Downspouts
078400 Firestopping
079200 Joint Sealants

DIVISION 08 -- OPENINGS

081113 Hollow Metal Doors and Frames
081416 Flush Wood Doors
081433 Stile and Rail Wood Doors
083100 Access Doors and Panels
085313 Vinyl Windows
087100 Door Hardware
088000 Glazing
088300 Mirrors

DIVISION 09 -- FINISHES

092116 Gypsum Board Assemblies
093000 Tiling
096500 Resilient Flooring
096816 Sheet Carpeting
099113 Exterior Painting
099123 Interior Painting

DIVISION 10 -- SPECIALTIES

101400 Signage
102800 Toilet, Bath, and Laundry Accessories
103090 Manufactured Electric Fireplaces
104400 Fire Protection Specialties
105500 Postal Specialties
105723 Closet and Utility Shelving

DIVISION 11 -- EQUIPMENT

113013 Residential Appliances
116813 Playground Equipment

DIVISION 12 -- FURNISHINGS

122113	Horizontal Louver Blinds
123530	Residential Casework
123600	Countertops

DIVISION 13 -- SPECIAL CONSTRUCTION (Not Used)

DIVISION 14 -- CONVEYING EQUIPMENT (Not Used)

DIVISION 21 -- FIRE SUPPRESSION

210010	Fire Suppression Provisions
210011	Basic Fire Suppression Materials and Methods
210013	Project Coordination
211314	Wet Pipe Fire Protection System (NFPA 13R)

DIVISION 22 -- PLUMBING

220010	Plumbing Provisions
220011	Basic Plumbing Materials and Methods
220013	Project Coordination
220523	Valves
220700	Plumbing Insulation
221000	Plumbing Piping
221119	Domestic Water Piping Specialties
221319	Sanitary Waste Piping Specialties
221429	Sump Pumps
223300	Electric Water Heaters
224000	Plumbing Fixtures

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

230010	Mechanical Provisions
230011	Basic Mechanical Materials and Methods
230013	Project Coordination
230713	Duct Insulation
230913	Programmable Thermostats
232000	HVAC Piping
233113	Metal Ducts
233300	Air Duct Accessories
233400	HVAC Fans
233713	Diffusers, Registers, and Grilles
238116	Mini-Split Systems
238128	Split System Heat Pumps
238240	Electric Heaters

DIVISION 25 -- INTEGRATED AUTOMATION (Not Used)

DIVISION 26 -- ELECTRICAL

260010	Electrical Provisions
260511	Basic Electrical Materials and Methods
260519	Wire and Cable
260526	Grounding
260533	Raceways and Boxes
260553	Electrical Identification
260923	Lighting Control Devices

262416	Panelboards
262726	Wiring Devices
262813	Fuses
262816	Enclosed Switches and Circuit Breakers
262913	Enclosed Controllers
264313	Surge Protective Devices
265000	Lighting
265100	Interior Lighting
265600	Exterior Lighting

DIVISION 27 -- COMMUNICATIONS

270500	Common Work for Communications
271100	Communications Equipment Room Fittings
271300	Communications Cabling and Equipment
271500	Telephone/Door Entry System

DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY

280500	Common Work for Electronic Safety & Security
284605	Conductors/Cables for Electronic Safety & Security
284611	Fire Sensors and Detectors
284612	Other Initiating Devices
284613	Other Fire Alarm Devices
264621	Digital, Addressable Fire-Alarm System
284623	Fire Alarm Notification Appliances
284624	Fire Alarm Interfaces to Remote Monitoring
285300	Area of Rescue/Refuge Assistance Systems
285500	Emergency Radio Communication Enhancement System

DIVISION 31 -- EARTHWORK

311000	Site Clearing
312000	Earth Moving
312113	Radon Mitigation.
313116	Termite Control

DIVISION 32 -- EXTERIOR IMPROVEMENTS

321216	Asphalt Paving
321313	Concrete Paving
329200	Turf and Grasses

DIVISION 33 -- UTILITIES

330561	Site Utility and Distribution Piping
333113	Sanitary Sewer
334211	Stormwater Gravity Piping
334231	Stormwater Area Drains and Inlets

DIVISION 46 -- WATER AND WASTEWATER EQUIPMENT (Not Used)

END OF SECTION 000110

**SECTION 004000
AGREEMENT**

PART 1 GENERAL

1.01 FORM OF AGREEMENT

- A. Capital Advance Construction Contract/Cost Plus - MHDC Form 92442-CA (Attached).

PART 2 - PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 005000
CONDITIONS OF THE CONTRACT**

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work included under these Specifications consists of furnishing all items, materials, operations, or methods listed, mentioned, indicated, or scheduled on the Drawings and/or in these Specifications, including all labor, materials, equipment transportation temporary facilities, services, and incidentals necessary and required for construction completion of the project named in title page in accordance with Contract Documents.

1.02 FORM OF SPECIFICATIONS

- A. Conditions of the Contract, Supplementary General Conditions, and Division 1 apply to every Division of these Specifications.
- B. These Specifications are of abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "shall be", "as noted on the Drawings", "according to the Drawings", "a", "the", and "all" are intentional. Omitted words and phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.
- C. All Specification instructions are directed to the Contractor, and inclusion of any work by mention, note, or itemization, however brief, implies Contractor shall provide same unless specifically directed otherwise.
- D. In specifying an item by manufacturer's name and/or catalog number, unless specifically stated otherwise, such item shall be provided with all standard devices and accessories indicated in latest edition of manufacture's catalog or brochure published at date of Invitation to Bid: furnished such item complete with component parts necessary for obviously intended use and installation, whether or not description or catalog number contains all supplemental information and/or numbers of such components.

1.03 UNIFORM FEDERAL ACCESSIBILITY STANDARDS

- A. General Contractor shall complete all work in accordance with latest printed edition of the Fair Housing Act Guidelines, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act and/or the Uniform Federal Accessibility Standards as applicable. Where work is required to comply with the standards and conflict exist with the architectural plans and/or specifications, notify Architect immediately of such conflict and request written clarification prior to proceeding with the work.

1.04 AIA GENERAL CONDITIONS

- A. AIA Document A201, "General Conditions of the Contract for Construction", 2017 Edition, 14 Articles, hereinafter referred to as "AIA General Conditions", is hereby made a part of this Specification. Contractor shall consult this Document and become intimately familiar with it content.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SUPPLEMENTS AND AMENDMENTS TO THE AIA GENERAL CONDITIONS

- A. The AIA General Conditions are hereinafter supplemented and/or amended. All supplementary provisions shall be considered as added thereto. Where any Article is amended, deleted or superseded hereby, unaltered provisions of such. Article shall remain in effect.

3.02 GENERAL PROVISIONS

- A. Supplement Subparagraph 1.2.1 as follows:
 - 1. Drawings, Specifications and Other Contract Documents are not intended as "Shop Drawings" or extensively detailed documents; they are intended to indicate general design

concept of Project in sufficient detail that all work required is reasonable inferable there from and Contractor shall provide all work thus indicated or reasonably inferred as necessary to produce intended results of complete, structurally sound, aesthetically desirable, durable, properly performing work of quality. Should conflict occur between Drawings and Specifications, Contractor shall obtain written decision of same from Architect prior to submitting Bid, Signing Agreement or proceeding with the work.

- B. Supplement Subparagraph 1.4,1 Interpretation, as follows:
1. When a word, "approval", "approved", "proper", "satisfactory", "equal", and "as directed", is used, it implies such reference as to the Architect's approval or direction.
 2. "Approve", "approval", or "approved" means the Architect will observe or review items or construction referred to him for such approval and that his review represents his opinion that such item or construction is acceptable for the circumstances and conditions of the project, based on his observations and/or information made available to him by Contractor. However, such review shall not represent that Architect checked item or construction in detail, nor that he thereby waives original requirements or assumes any responsibility for its correctness or performance.
 3. "Equal", "equivalent", means the item or construction possesses similar physical size and characteristics, similar performance qualities and characteristics and fulfills utilitarian functions required by Contract Documents without any decrease in quality, appearance or durability, responsibility for "equal" or "equivalent" item of construction fulfill the Architect's intent of Contract Documents (expressed or implied) rests with the Contractor.
 4. "Extent" means general checklist or outline of work included: not constructed as all inclusive nor limiting and not relieving Contractor from providing all similar or related work elsewhere indicated or inferable in Contract Documents.
 5. "Indicated" means as indicated on Contract Documents.
 6. "Provide" means furnish and install.

3.03 ARTICLE 2 OWNER

- A. Delete Subparagraph 2.2.5 and insert: The successful Contractor awarded the contract shall purchase Drawings and Project Manuals as needed for the execution of the work.

3.04 ARTICLE 3 CONTRACTOR

- A. Supplement Subparagraph 3.7.1 as follows:
1. Contractor shall give notice to public or private utility companies and others required to make installations, in ample time for them to complete such installations and not delay the project, whether such installations are under contract or reasonable inferable necessary for completion of project. Contractor is responsible for staking or surveying as may be required to complete the installation of utilities either on or off site by any Utility Companies or by private contract.
- B. Supplement Subparagraph 3.12.5 as follows:
1. By submitting Shop Drawings and samples, Contractor thereby represents he has approved them (whether they bear his approval stamp or not) and he has determined and verified all field measurements, quantities, field construction criteria, materials, catalog numbers, and similar data, or will do so, and he has checked and coordinated Shop Drawings and sample with requirements of work and Contract Documents and with work of all other trades and Contractors on project.
- C. Supplement Subparagraph 3.12.8 as follows:
1. When material or equipment is specified by manufacturer's name or names, the intent is to establish quality required. Materials other than those specified will be considered after Contract has been executed provided they are submitted in writing by successful bidder with sufficient data to establish that their quality for the use intended is equivalent to the quality of materials specified.
 2. By making request for substitution, the Contractor represents that he has personally investigated the substitute product and determined that it is equal or superior to that

specified, that he will provide the same warranty as for that specified, that he waives all claims for any additional cost related to the substitution, and that he will coordinate the installation of any accepted substitution making changes as may be required such that the work shall be complete in all respects.

3. Requests for substitutions shall be submitted in sufficient time to allow for proper consideration and so as to cause no delay in the work. All materials and equipment shall be applied, installed, connected, cleaned and placed in operation in accordance with manufacturer's directions.
4. When material or equipment is required to be installed by manufacturer's approved applicator, it shall be the contractor's responsibility to insure such approval.

3.05 ARTICLE 4 ADMINISTRATION OF THE CONTRACT

- A. Insert after first sentence in Subparagraph 4.1.1: The term Architect means Architect or his authorized representative (including his Consulting Engineer). The term Architect/Engineer means Architect and/or his Consulting Engineer.

3.06 ARTICLE 8 TIME

- A. Add the following Subparagraph 8.1.5: As between the Owner and the Contractor: as to all acts or failures to act occurring prior to the relevant Date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such Date of Substantial Completion; as to all acts or failures to act occurring subsequent to the relevant Date of Substantial Completion, any applicable statute of limitation shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of final Certificate of Payment.

3.07 ARTICLE 11 INSURANCE AND BONDS

- A. Supplement Paragraph 11.1 Contractor's Insurance and bonds, add the following: 11.1.4 Certificates of Insurance: General Contractor shall, before commencing work under this Contract, submit duplicate copies to Architect and Owner showing evidence that all Certificates of Insurance are in effect, covering Contractor and owner as their interests may appear, and that these minimum insurance coverage will not be canceled or changed until 30 days after written notice is given to Owner and Architect. Coverage are as follows:
 1. Workmen's Compensation: Statutory for applicable states, except provide \$100,000.00 minimum coverage.
 2. Comprehensive General Liability including Contractor's Liability; Contingent Liability; Contractual Liability, Completed Operations and Products Liability all on occurrences with Bodily Injury Coverage and broad from Property Damage. Remove XCU exclusion relating to Explosion, Collapse and Underground Property Damage. Completed Operations Liability shall be kept in force for at least 2 years after date of final completion. Provide \$500,000.00 minimum coverage.
 3. Comprehensive Automobile Liability including nonowner or hired care coverage as well as owned vehicles. Provide \$500,000.00 minimum coverage.
 4. Employer's Liability: Provide \$100,000.00 minimum coverage.
 5. Builder's Risk Insurance: Contractor will effect and maintain, Fire Insurance with extended coverage and vandalism and malicious mischief insurance upon the entire structure on which the work to be performed under this Contract is to be done to the extent of 100% of the insurable value thereof. Contractor will be responsible for any and all deductibles.
 6. In addition to the above minimum coverage, Contractor shall provide \$1,000,000.00 umbrella coverage.
- B. Add Paragraph 11.4 Performance Bond and Payment Bond as follows:
 1. Performance Bond and Labor and Materials Payment Bonds shall be furnished to the Owner, by General Contractor, in an amount equal to 100% of the contract sum as security for the faithful performance of the contract and the payment of all persons performing labor and furnishing materials in connection with the contract.

2. Surety: Bonds furnished shall be written by a Surety approved by the U.S. Treasury Department and licensed to do business in the State where project is to be constructed. No work shall be commenced until bonds are in force. Power of Attorney for the Surety Company Agent must accompany each bond issued, and must be certified to include the date of the bonds.
3. Bid Proposal: Contractor shall include cost of bonds in contract price.

END OF SECTION

SECTION 005436
BUILDING INFORMATION MODELING EXHIBIT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work included under these Specifications consists of furnishing all operations, or methods listed, mentioned, indicated or scheduled on the Drawings and/or in these Specifications concerning the preparation of electronic drawings by Architect and/or Architect's Consultants for the Project. This information is being made available to the Contractor, sub-contractor and material suppliers to set forth the basis of design.
- B. This Section establishes the terms and protocols governing the reliance upon, and the ownership, development, uses, transmission and sharing of Building Information Models (BIM) and other Digital Data for the Project.

1.02 DEFINITIONS

- A. Building Information Model or Model: A BIM or Model is a digital representation of the Project or a subset of the Project. A Model is a collection of one or more Model Portions, each of which is an assemblage of Model Elements.
- B. Model Portion: A model Portion, or Portion, is a subset of a Model. The parties may designate a Model Portion by discipline, trade, area, location, phase, or other mutually agreeable distinction.
- C. Model Element: A Model Element is a digital representation of a component, system, object, or assembly within a Model.
- D. Model Version: A Model Version, is a specific edition of a Model or Model Portion that is sufficiently identifiable as unique and unchanged as of the time it is saved by its Author or the Architect
- E. Confidential Digital Data: Unless otherwise stated, Confidential Digital Data is Digital Data containing confidential or business proprietary information that the transmitting party designates as "confidential". For purposes of this Project – all information transmitted by Architect and Architect's Consultants shall be treated as confidential.
- F. Contract Document: The term Contract Document shall have the same meaning as in the Agreement between the Owner and Architect and subsequently to the preparation of Drawings between the Owner and Contractor for the construction of the Project. The Model will not be enumerated as part of the Contract Document and should be considered as such.
- G. Level of Development: The Level of Development (LOD) establishes the minimum dimensional, spatial, quantitative, and qualitative aspects of a Model Element, and the degree to which Project Participants may rely upon the Model Element when developed to that level in the Model. The Levels of Development is described further below in this Section.

1.03 MODEL USES AND RELIANCE

- A. Model Uses, Sharing and Reliance: Project Participants may share, use and rely upon a Model or Model Portion only to the extent set forth in Items in this Section. Model sharing includes sharing within Design Team, with Contractor, and within the Construction Team
- B. Model Uses: The Project Participants shall develop Models on the Project for the following uses:
 - 1. Planning: Examples include programming, site analysis, scheduling, and documentation of existing conditions
 - 2. Design: Examples include design authoring, design review, 3D coordination, structural analysis, lighting analysis, and engineering analysis.
 - 3. Any other uses or preparation of supplemental information or drawings utilizing the BIM model may be developed by the Contractor and/or subcontractors at their own discretion, expense, and risk.

- C. Model Reliance: A Project Participant may only rely on Models, Model Portions, and Model Elements as indicated in Paragraph A. The Parties agree that the extent of their reliance on any Model Version shall be limited to the uses identified in Paragraph B above. Any reliance on a Model Version not in accordance with this Section shall be at the Project Participant's sole risk.
- D. Liability: To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Architect and Architect's Consultants from and against all claims arising from or related to the Receiving Party's modification to, or unlicensed use of, the Digital Data.
- E. Model Coordination: If Project Participants discover or become aware of any discrepancies, inconsistencies, errors, or omissions in any Model Version, consistent with the LOD scope described below, they shall promptly report the discrepancy, inconsistency, error, or omission in writing to the Architect; prior to commencing any work.

1.04 LEVEL OF DEVELOPMENT

- A. Level of Development Descriptions: The LOD descriptions below shall be used to identify the minimum required characteristics for each Model Element for the Project. Other Project Participants may only rely on a Model Element consistent with the minimum required characteristics for the designated LOD.
- B. LOD 100. The Model Element designated for the Project by the Architect and Architect's Consultants for the Project is established to be LOD 100. The Model Element may be graphically represented in the Model with a symbol or other generic representation. Information related to the Model Element (e.g., cost per square foot, quantity, etc). Model Elements are not required to be an actual representation of a specific product as enumerated in the Construction Documents.

1.05 DIGITAL DATA LICENSING AGREEMENT

- A. The purpose of this Agreement will be to grant a license from the Architect or Architect's Consultants (the Transmitting Party) to the Receiving Party for the Receiving Party's use of Digital Data and to set forth the license terms. This Exhibit is anticipated to utilize AIA Document C106-2022 Digital Data Licensing Agreement, and will be required to be executed prior to any data transfer.
- B. Transmission of Digital Data: The Transmitting Party grants to the Receiving Party a nonexclusive limited license to use the Digital Data solely and exclusively for the uses, and in accordance with the terms, set forth in this Section, and in the Digital Data Licensing Agreement.
- C. Access: Only the Receiving Party is permitted to access and use the Digital Data. Unlicensed and unauthorized access or use by third parties is strictly prohibited.
- D. License Conditions: The Receiving Party may use and rely upon the Digital Data to the extent set forth below:
 - 1. The Digital Data is transmitted solely for the Receiving Party's information. Receiving Party acknowledges that any use of the Digital Data shall be at Receiving Party's sole risk. The Receiving Party accepts the Digital Data "as is" without any warranty or representations from the Transmitting Party as to whether the Digital Data is accurate, complete, or fit for use as intended by the Receiving Party. The Receiving Party is solely responsible for verifying whether the Digital Data is accurate, complete, or fit for the Receiving Party's intended use.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 005500
MHDC CONDITIONS OF THE CONTRACT**

PART 1 - GENERAL

1.01 MHDC REQUIREMENTS

- A. The work included under these specifications consists of requirements stipulated by Missouri Housing Development Commission (The "MHDC") pursuant to the current MHDC Design Constraints Compliance Guidelines.

1.02 MHDC WORKFORCE ELIGIBILITY POLICY

- A. MHDC has adopted and enacted the enforcement of its policy to support workforce eligibility requirements pursuant to its Commission, effective and made a part of these Specifications. The MHDC, effective the date of this Project, Workforce Eligibility Policy is made a part of this Project and shall be made a part of each General Contractor and each Subcontractors contract for the work to be performed for this Project. A copy of the MHDC Workforce Compliance Handbook is made a part of Work of this Section and available on the MHDC website.
- B. As stipulated by the MHDC Workforce Compliance Handbook, submission of various Forms and Lists are required to be submitted to MHDC offices and/or retained on-site for periodic review and inspection to ensure compliance with the Policy. A partial listing of those forms and lists is listed below. MHDC may add to or delete from this list as may be determined to be appropriate for the specific Project or as may be amended from time to time by the Commission.
 - 1. Designated Workforce Eligibility Contacts, MHDC Form - 2510
 - 2. Use of E-verify. Each General Contractor and subcontractors who have employees perform labor on site must utilize E-Verify and submit proof of registration to use E-verify.
 - 3. I-9 Forms and E-Verify for Employees
 - 4. Labor List, MHDC Form -2509
 - 5. Master Subcontractor List, MHDC Form -2502
 - 6. Certified Payroll, MHDC Form - 2504
 - 7. Daily Sign In Sheet, MHDC Form -2505
 - 8. Contractor Labor List, MHDC Form - 2503
 - 9. Subcontractor Bids: Must be submitted to MHDC at the time of Firm Submission and updated as new bids are collected.
 - 10. Documentation of Good Standing: Each incorporated General Contractor and Subcontractors must submit a certificate of good standing issued by the Missouri Secretary of State that is dated no earlier than six months prior to execution of their contract in connection with the Project.

1.03 CONSTRUCTION DISBURSEMENT

- A. General Contractor and all subcontractors shall comply with requirements set forth and made a part of the Specifications as set forth in the current MHDC Construction Disbursement Handbook, MHDC Form 2400..
- B. Applicable Forms:
 - 1. MHDC Form FIN 115, Mortgagor's and/or Contractors Schedule of Values shall be utilized to complete the AIA form of payment request. NO adjustments in the schedule of values may be made without MHDC approval.
 - 2. American Institute of Architects, AIA Document G702/G703 -1992, Application for Certificate of Payment must be completed and submitted with each application for payment.
 - 3. AIA Document G701 - 2017, Change Orders
 - 4. Contractor's Prevailing Wage Certificate, MHDC Form -2450 (if applicable)
 - 5. MBE/WBE monthly reporting to MHDC, form together with sub-contractor list, Form 2502.
- C. Monthly Disbursements:

1. All amounts requested must be approved by an MHDC designated inspector.
2. The Project must be in good standing with submission of the I-9 Compliance documentation.
3. The monthly amount requested for General Contractor's overhead and profit must not exceed the percentage of completion of the Project.
4. The monthly amount requested for General Contractor's profit must not exceed the percentage of completion of the Project.
5. MHDC shall maintain ten percent (10%) retainage on all work performed on the Project during the construction. No reduction of retainage will be considered nor approved by MHDC until the Project has achieved 90% completion and may be reduced to five percent (5%), subject to MHDC approval.
6. Any adjustments requested by the Contractor to the approved FIN 115 MUST be submitted and processed by MHDC on an AIA Change Order form.
7. Change Orders: Change Orders must be submitted in advance of or concurrent with a monthly application for payment and require signature of Owner, Contractor and Architect. MHDC may require the receipt of appropriate Consent of Surety to any increase/decrease to be submitted with the Change Order to MHDC.

1.04 FIRM SUBMISSION REQUIRED DOCUMENTATION

- A. At the time of submission of the Owner's application to MHDC, the following minimum items are required of the General Contractor.
 1. Contractor's Qualification Statement, AIA Document A305, current edition
 2. Financial Income/Balance Statement if required by MHDC
 3. Certificate of Insurance
 4. Certificate or evidence of Bonding
 5. Executed Mortgage's and Contractors Cost Breakdown, MHDC Form -FIN 115
 6. Master Subcontractor List, MHDC Form -2502
 7. Subcontractor Bids
- B. Should MHDC determine that additional documentation is required, the General Contractor shall provide in a timely manner.

1.05 OTHER MHDC REQUIRED DOCUMENTATION

- A. During the performance of the work on the Project, General Contractor and all subcontractors shall maintain all required documentation and required Federal and State Notices at the Project Site as required. General Contractor shall post and maintain required MHDC Labor Lists, Master Lists, Sign-In sheets, I-9 documentation, Prevailing Wage notices (if applicable) at the Project site.
- B. General Contractor shall ensure all site field personnel are familiar with MHDC requirements, rules/regulations, and procedures to maintain effective communication with Owner, Architect and MHDC designated representative regarding the implementation of MHDC policies.
- C. General Contractor shall provide As-built survey and Surveyor's Report of the subject Project indicating all improvements at the site by a licensed land surveyor conforming to all requirements as stipulated and required by MHDC.
- D. General Contractor shall provide a Cost Certification performed by independent CPA pursuant to MHDC requirements, guidelines and requirements.

1.06 FIRM COMMITMENT REQUIRED DOCUMENTATION

- A. Executed Mortgage's and Contractors Cost Breakdown, with the Schedule of Values shall be submitted in duplicate (2) copies with original signatures, MHDC Form FIN-115.
- B. When subcontractors work and material suppliers exceed \$10,000.00, their actual bids must be submitted.
- C. A list of all major subcontractors by work category.
- D. Contractors' Qualification Statement, AIA Form A305, current edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

Supplementary Conditions of the Contract for Construction

U.S. Department of Housing
and Urban Development
Office of Housing
Federal Housing Commissioner

OMB Approval No. 2502-0470
(Expires 12/31/2016)

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. This information is required to obtain benefits and voluntary. HUD may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB control number.

This information collection is necessary to ensure that viable projects are developed. It is important to obtain information from applicants to assist HUD in determining if nonprofit organizations initially funded continue to have the financial and administrative capacity needed to develop a project and that the project design meets the needs of the residents. The Department will use this information to set forth the obligations of the contractor or subcontractor performing under the covered contract. This information is required in order to obtain benefits. This information is considered non-sensitive and no assurance of confidentiality is provided.

Article 1 – Labor Standards

Instructions

Whenever only FHA mortgage insurance is involved, use paragraph (A) and (C) of Article 1 – Labor Standards. Whenever any direct form of assistance (Section 8, Section 202/811 Capital Advance, grants etc.) is involved, use paragraphs (A) and (B) and (C) of Article 1 – Labor Standards.

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted or insured by the United States of America and the following Federal Labor Standards Provisions are included in this Contract or related instrument pursuant to the provisions applicable to such Federal assistance or insurance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR Part 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification

requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs A.1.(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the

same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR Part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- (1)** That the payroll for the payroll period contains the information required to be maintained under 29 CFR Part 5.5(a)(3)(i) and that such information is correct and complete;
- (2)** That each laborer or mechanic (including each

helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph A.3.(ii)(b) of this section.

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph A.3.(i) of this section available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR Part 5.12.

4. (i) Apprentices and Trainees. Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau

of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as HUD or its designee may be appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm

ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration . . . makes, utters or publishes any statement, knowing the same to be false . . . shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

B. Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages, liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

3. Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. The Contractor will be required to execute FHA Form No. 2403-A, Contractor's Prevailing Wage Certificate, as a condition precedent to insurance by the Federal Housing Administration of that certain mortgage loan, or an advance thereof, made or to be made by the mortgagee in connection with the construction of the project.

Article 2 – Equal Employment Opportunity

The applicant hereby agrees that it will incorporate or cause to be

incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:

During the performance of this contract, the Contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

C. The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

D. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

E. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

F. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulations or order of the Secretary of Labor, or as otherwise provided by law.

G. The Contractor will include the portion of the sentence immediately preceding paragraph A and the provisions of paragraphs A through G in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. *Provided, however,* that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Secretary of Housing and Urban Development or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

H. The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work:

Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

I. The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

J. The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

Article 3 – Equal Opportunity for Businesses and Lower Income Persons Located Within the Project Area

(Applicable to Section 236 projects, where the estimated replacement cost of the project as determined by the Secretary of Housing and Urban Development exceeds \$500,000, and to all projects, including Section 236 regardless of estimated replacement cost, receiving rent supplement assistance under Title I, Section 101 of the Housing and Urban Development Act of 1965.)

A. The work to be performed under this contract is on a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. Section 3 requires that to the greatest extent feasible opportunities for training and employment be given lower income residents of the unit of local government or the metropolitan area (or nonmetropolitan county) as determined by the Secretary of Housing and Urban Development in which the projects located and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the same metropolitan area (or nonmetropolitan county) as the project.

Article 4 – Health and Safety

A. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

B. The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 (formerly part 1518) and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96).

C. The Contractor shall include the provisions of this Article in every subcontract so that such provisions will be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development of the Secretary of Labor shall direct as a means of enforcing such provisions.

**SECTION 007000
GENERAL CONDITIONS**

PART 1 GENERAL

1.01 FORM OF GENERAL CONDITIONS

- A. AIA Document A201, General Conditions of the Contract for Construction, 2017 Edition, attached, is hereby incorporated herein and made a part of the General Conditions between the Owner and Contractor.

PART 2 PRODUCTS - NOT USED)

PART 3 EXECUTION - NOT USED

END OF SECTION

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Johnson-Betts Meadows
SE 31st Street & SE Fremont Street
Topeka, KS 66605

THE OWNER:

(Name, legal status and address)

Johnson-Betts Meadows
2010 SE California Ave
Topeka, KS 66607

THE ARCHITECT:

(Name, legal status and address)

Rosemann & Associates, P.C. a Missouri professional corporation
1526 Grand Boulevard
Kansas City, MO 64108-1404

TABLE OF ARTICLES

- 1 GENERAL PROVISIONS**
- 2 OWNER**
- 3 CONTRACTOR**
- 4 ARCHITECT**
- 5 SUBCONTRACTORS**
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**
- 7 CHANGES IN THE WORK**
- 8 TIME**
- 9 PAYMENTS AND COMPLETION**
- 10 PROTECTION OF PERSONS AND PROPERTY**
- 11 INSURANCE AND BONDS**
- 12 UNCOVERING AND CORRECTION OF WORK**
- 13 MISCELLANEOUS PROVISIONS**

ADDITIONS AND DELETIONS:

The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™–2017, Guide for Supplementary Conditions.

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES



INDEX

(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, **12.3**

Access to Work

3.16, 6.2.1, 12.1

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,
10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.4**

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**

Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8

Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9,
3.12.10.1, 4.2.7, 9.3.2, 13.4.1

Arbitration

8.3.1, 15.3.2, **15.4**

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2,
9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,
13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and
Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2,
4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4,
9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,
7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,
13.4.2, 15.2

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,
3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16,
3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,
9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5,
15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**

Building Information Models Use and Reliance

1.8

Building Permit

3.7.1

Capitalization

1.3

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

Certificates for Payment

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7,
9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

Certificates of Inspection, Testing or Approval
13.4.4

Certificates of Insurance

9.10.2

Change Orders

1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
1.1.4, **6**

Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5**, **15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, **6.1.2**
Contractor's Construction and Submittal Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6,

10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2

Decisions to Withhold Certification

9.4.1, **9.5**, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1

Definitions

1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1

Delays and Extensions of Time

3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5

Digital Data Use and Transmission

1.7

Disputes

6.3, 7.3.9, 15.1, 15.2

Documents and Samples at the Site

3.11

Drawings, Definition of

1.1.5

Drawings and Specifications, Use and Ownership of
3.11

Effective Date of Insurance

8.2.2

Emergencies

10.4, 14.1.1.2, **15.1.5**

Employees, Contractor's

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1

Equipment, Labor, or Materials

1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2

Execution and Progress of the Work

1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

Extensions of Time

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**

Failure of Payment

9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Faulty Work

(See Defective or Nonconforming Work)

Final Completion and Final Payment

4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3

Financial Arrangements, Owner's

2.2.1, 13.2.2, 14.1.1.4

GENERAL PROVISIONS

1

Governing Law

13.1

Guarantees (See Warranty)

Hazardous Materials and Substances

10.2.4, **10.3**

Identification of Subcontractors and Suppliers

5.2.1

Indemnification

3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3

Information and Services Required of the Owner

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4

Initial Decision

15.2

Initial Decision Maker, Definition of

1.1.8

Initial Decision Maker, Decisions

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Initial Decision Maker, Extent of Authority

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Injury or Damage to Person or Property

10.2.8, 10.4

Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,

9.9.2, 9.10.1, 12.2.1, 13.4

Instructions to Bidders

1.1.1

Instructions to the Contractor

3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2

Instruments of Service, Definition of

1.1.7

Insurance

6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5,

11

Insurance, Notice of Cancellation or Expiration

11.1.4, 11.2.3

Insurance, Contractor's Liability

11.1

Insurance, Effective Date of

8.2.2, 14.4.2

Insurance, Owner's Liability

11.2

Insurance, Property

10.2.5, 11.2, 11.4, 11.5

Insurance, Stored Materials

9.3.2

INSURANCE AND BONDS

11

Insurance Companies, Consent to Partial Occupancy

9.9.1

Insured loss, Adjustment and Settlement of

11.5

Intent of the Contract Documents

1.2.1, 4.2.7, 4.2.12, 4.2.13

Interest

13.5

Interpretation

1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1

Interpretations, Written

4.2.11, 4.2.12

Judgment on Final Award

15.4.2

Labor and Materials, Equipment

1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1,

10.2.4, 14.2.1.1, 14.2.1.2

Labor Disputes

8.3.1

Laws and Regulations

1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4

Liens

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Limitations, Statutes of

12.2.5, 15.1.2, 15.4.1.1

Limitations of Liability

3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6,

4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3,

11.3, 12.2.5, 13.3.1

Limitations of Time

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,

5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,

9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15,

15.1.2, 15.1.3, 15.1.5

Materials, Hazardous

10.2.4, **10.3**

Materials, Labor, Equipment and

1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2,

10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2

Means, Methods, Techniques, Sequences and

Procedures of Construction

3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Mechanic's Lien

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Mediation

8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1,

15.4.1.1

Minor Changes in the Work

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**

MISCELLANEOUS PROVISIONS

13

Modifications, Definition of

1.1.1

Modifications to the Contract

1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,

10.3.2

Mutual Responsibility

6.2

Nonconforming Work, Acceptance of

9.6.6, 9.9.3, **12.3**

Nonconforming Work, Rejection and Correction of

2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,

12.2

Notice

1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4,

3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4,

8.2.2, 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1,

13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5,

15.1.6, 15.4.1

Notice of Cancellation or Expiration of Insurance

11.1.4, 11.2.3

Notice of Claims

1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5,

15.1.6, 15.2.8, 15.3.2, 15.4.1

Notice of Testing and Inspections

13.4.1, 13.4.2

Observations, Contractor's

3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5,
9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1,
13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2,
4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1,
7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2,
10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4,
15.2.7
Owner's Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.5, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor

3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals

3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2**, 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT

14

Tests and Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**

TIME

8

Time, Delays and Extensions of

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5

Time Limits

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4

Time Limits on Claims

3.7.4, 10.2.8, 15.1.2, 15.1.3

Title to Work

9.3.2, 9.3.3

UNCOVERING AND CORRECTION OF WORK

12

Uncovering of Work

12.1

Unforeseen Conditions, Concealed or Unknown

3.7.4, 8.3.1, 10.3

Unit Prices

7.3.3.2, 9.1.2

Use of Documents

1.1.1, 1.5, 2.3.6, 3.12.6, 5.3

Use of Site

3.13, 6.1.1, 6.2.1

Values, Schedule of

9.2, 9.3.1

Waiver of Claims by the Architect

13.3.2

Waiver of Claims by the Contractor

9.10.5, 13.3.2, **15.1.7**

Waiver of Claims by the Owner

9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**

Waiver of Consequential Damages

14.2.4, 15.1.7

Waiver of Liens

9.3, 9.10.2, 9.10.4

Waivers of Subrogation

6.1.1, **11.3**

Warranty

3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2

Weather Delays

8.3, 15.1.6.2

Work, Definition of

1.1.3

Written Consent

1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Orders

1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the

purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as

constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The

Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the

Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term “Sub-subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor’s Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor’s Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor’s rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others

whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

- or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;

- 2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- 3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve

the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to

fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or

approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- 1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- 2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- 3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- 4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner

may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially

similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

**SECTION 008000
SUPPLEMENTARY CONDITIONS**

PART 1 GENERAL

1.01 PREVAILING WAGE

- A. See attached prevailing wage document Davis-Bacon Act Wage Determination Number MO170071, dated 06/02/2017. Modification Number 3.

1.02 LABOR STANDARDS

- A. See attached Federal Labor Standards Provision form HUD-4010 dated (06/2009)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED)

END OF SECTION

**SECTION 009500
MBE/WBE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents
- B. Certification upon Completion of the Work.

1.02 REQUIREMENTS OF CONTRACTOR AND SUBCONTRACTORS:

- A. It is a condition of this Contract that the Contractor and any Subcontractor doing business under this Contract agrees to refrain from any unlawful employment practice as presently defined in Ordinances of the Columbia, Missouri, and that such person(s) will post at their employment office a notice setting forth the provisions of said City and that such person(s) agreed to abide by said provisions.
- B. The Contractor shall make good faith efforts to employ minorities and women in all trades throughout the workforce.
- C. Each person(s) shall be bound by the terms of Rules and Regulations promulgated for administration of said Sections; and such person(s) agree to execute the supportive documents for one of the following options:
 - 1. A proposed Affirmative Action Plan
 - 2. A certificate of compliance.

1.03 MBE/WBE REQUIREMENTS

- A. The Contractor must fully comply with the requirements, terms and conditions of the MBE/WBE Requirements, including the use of a goal oriented system for minority/women business participation contained herein and all other requirements, terms and conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GOALS

- A. Policy: Minority/Women's businesses shall have the maximum feasible opportunity to participate in the performance of this contract.
- B. Subcontract Award: The Contractor agrees to make every effort to carry out this MBE/WBE policy through award of subcontractors to minority/women's business enterprises to the fullest extent consistent with the efficient performance of this contract.
 - 1. It is the Owner's goal that a minimum of TEN PERCENT (10%) of the total contracted portion of work be awarded to MBE businesses; and
 - 2. It is the Owner's goal that a minimum of FIVE PERCENT (5%) of the total contracted portion of work be awarded to WBE businesses.

3.02 DEFINITIONS

- A. As used in this Contract the term "minority/women's businesses" means a business at least fifty-one percent (51%) of which is owned and controlled by minority group members or women and is certified such by a recognized agency as listed and approved by MHDC.
- B. Minority/Women's ownership must exercise actual day to day management.
- C. THE MBE/WBE MUST SERVE A USEFUL BUSINESS PURPOSE AND BE CAPABLE OF PERFORMING THE PARTICULAR SCOPE OF WORK INDEPENDENT OF THE CONTRACTOR.
- D. For the purpose of this definition, minority group members are Black Americans, Hispanic Americans, Asian Americans, American Indians, American Eskimos and American Aleuts.
- E. CONTRACTOR MUST MAKE REASONABLE EFFORTS TO INSURE THAT MBE/WBE SUBCONTRACTORS ARE CERTIFIED AS HAVING THE CAPABILITY OF PERFORMING

THE INTENDED SUBCONTRACT SCOPE OF WORK PRIOR TO BEID OPENING. (I.E. THE MBE/WBE MUST BE CABALE OF PROVIDING THE NECESSARY EQUIPMENT AND LABOR FORCE INDEPENDENT OF THE Contractor, AND BE ABLE TO DEMONSTRATE SATISFACTORY PERFORMANCE ON CAPARIBLE TYPE AND SIZE OF PROJET)

- F. For the purpose of this contract, the term “subcontract” includes all construction, modification and service work constructed for and by the Contractor in the execution of the Work under this contract.
- G. Although it is not made a requirement herein for approval of a contract that a Contractor in fact meets or exceeds these goals in their contracting, it is a requirement for contract approval that a Contractor objectively demonstrate every effort has been exerted to meet these goals.

3.03 ACCEPTABLE METHODS OF CONFORMANCE TO POLICY

- A. Requirements for making every effort possible for minority/women owned subcontractor participation may be satisfied by the following methods; (Other equivalent methods proposed by a Contractor which are described in detail prior to award may also be approved).
 - 1. Negotiated Subcontract: The Contractor, will establish the scope of work in sufficient detail consistent with the capability of minority/women’s firms. Upon establishment of the scope of work to be performed, negotiation of mutually acceptable price may proceed with one or more minority/women’s firms. Most minority/women’s contractors are small, with limited resources, experience, and bonding capacity and cannot be expected to compete with the more experienced and specialized non-minority/women’s subcontractors.
 - 2. Joint Venture: The Contractor may utilize minority/women’s firm(s) and bid jointly with such firm(s) for construction services required in the Plans and Specifications. If the joint venture method is utilized, credit toward the goal attainment will be determined on the basis of the percentage of the dollar amount of the work to be performed by the MBE/WBE (e.g., if a minority majority joint venture proposes to perform fifty percent (50%) of the project quoted at \$500,000.00 and fifty percent (50%) of the work is to be performed by the minority party in the joint venture, minority participation will be credited at twenty-five percent (25%) of the work or \$125,000.00).
 - 3. The Contractor may negotiate or form joint ventures with minority and women owned subcontractors which are not shown on the current certification list.
 - 4. All Contractors are required to secure Minority/Women’s participation through either negotiated subcontractors or the formation of joint ventures.
 - 5. Records and Awards: The Contractors shall maintain records and shall submit an affidavit showing awards to minority/women’s businesses, delineated by name, address, telephone number, employer identification number, area/scope of work, referencing contract document section and dollar amount of the contract award, giving a narrative or specific efforts to identify and award subcontractors to minority/women’s businesses.

3.04 EVALUATION OF POSITIVE EFFORTS

- A. The Contractor shall be deemed to be in compliance with the requirements, terms and conditions if the program goals expressed herein are met or exceeded.
 - 1. No Contractor shall be found to be in non-compliance solely on account of failure to meet the MBE/WBE goal. A Contractor unable to meet the percentage goal assigned to this contract shall be given the opportunity to objectively demonstrate that specific affirmative action steps specified have been instituted and that every effort has been made toward the attainment of the designated goals.

3.05 POST-BID COMPLIANCE

- A. If any deficiency(ies) are correctable, the prospective Contractor will be advised what action must be taken to correct the deficiency(ies). The Owner will withhold approval of the proposed contract until satisfactory corrective action has been taken. FAILURE ON THE PART OF THE CONTRACTOR TO TAKE THE REQUISIT CORRECTIVE ACTION OR TO EXPLAIN WHY THE CORRECTIVE ACTION CANNOT BE TAKEN MAY RESULT IN A FINDING THAT THE Contractor IS NON-RESPONSIVE AND MAY BE GROUNDS FOR REJECTION OF THE BID.

3.06 POST-CONTRACT AWARD COMPLIANCE

- A. Contractors are required to execute and submit copies of all MBE/WBE's related sub-agreements within fifteen (15) days after contractor award and, from time to time report on the status of their compliance with appropriate requirements.

3.07 PROVISIONS FOR MBE/WBE SUBSTITUTION

- A. Should it be discovered after bid opening that any one of the intended participant MBE/WBE'S declaration of minority/women's ownership is invalid, or after contract award should an MBE/WBE be unable to perform as originally intended, the general contractor (Contractor) must then make every reasonable attempt to replace the invalid MBE/WBE with a bona fide MBE/WBE from those who have furnished him bids prior to bid opening.
- B. In the event this substitution is necessary and no other MBE/WBE's have bid the General Contractor (Contractor) in this particular area of the contract, the General Contractor (Contractor) may, as an alternative to substitution, adjust the MBE/WBE involvement in another area of the total contract bid in order to meet minimum MBE/WBE participation requirements.

3.08 DEVIATION FROM CONTRACTOR'S PROPOSED MBE/WBE PARTICIPATION

- A. Any deviation from the MBE/WBE utilization proposal as noted in the contractor's submission, whether before or after contract award and/or whether before or after commencement of work on the project, shall be immediately reported by the Contractor to the Owner.

3.09 SUBMITTAL OF REQUIRED DOCUMENTS

- A. The Contractor shall submit as necessary the following completed MBE/WBE information:
 - 1. TO BE SUBMITTED WITH BID:
 - a. An Affirmative Action Plan or Certificate of Compliance or Letter of Intent.
 - b. Statement of Intended Utilization of Subcontractors.
 - 2. TO BE SUBMITTED W/BID IF APPLICABLE:
 - a. Joint Venture Disclosure
 - 3. TO BE SUBMITTED AFTER BID OPENING BY LOW CONTRACTOR:
 - a. Schedule for MBE/WBE Utilization

3.10 ACCESS TO INFORMATON

- A. Every Contractor or subcontractor employed under this contract is hereby deemed to agree to permit the Owner or their duly authorized agents or employees, access at all reasonable times to all such persons, books, papers, as may be necessary to ascertain compliance with the Affirmative Action Program previously filed, and to furnish such further information as may be required, all within ten (10) days of the date of the written request.

END OF SECTION

**SECTION 011000
SUMMARY**

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Use of premises.
 - 3. Specification format and conventions.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Johnson-Betts Meadows
 - 1. Project Location: SE 31st Street & SE Fremont Street; Topeka, Kansas 66605
- B. Owner: Johnson-Betts Meadows, LP
 - 1. Owner's Representative: Connor Menard; 1620 S 84th Street; Lincoln, Nebraska 68506
- C. Architect: Rosemann & Associates, P.C., 1526 Grand, Kansas City, MO 64108
- D. Contractor:
- E. The Work consists of the following:
 - 1. The Project shall consist of the design and construction of approximately 176 new residential dwelling units. These units shall be constructed in approximately 9 separate buildings throughout the site and shall consist of a mix of 1, 2, and 3 bedroom units. The Project shall also include an independent community building and outdoor site amenities. The buildings shall all be slab-on-grade, wood framed structures. The Project is being financed in part through funding provided by the Kansas Housing Resource Corporation and other various sources.

1.03 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.04 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 6-digit MasterFormat numbering system.
 - 1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Contract: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall", "shall be", or "shall comply with", depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 012300
ALTERNATES**

PART 1 GENERAL

1.01 ACCEPTANCE OF ALTERNATES

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

1.02 SCHEDULE OF ALTERNATES

- A. Alternate No. 01:
 - 1. Base Bid Item: Section 072700 and Drawing number G-005.
 - 2. Alternate Item: Section 061605 and Drawing number G-006.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 012600
CONTRACT MODIFICATION PROCEDURES**

PART 1 GENERAL

1.01 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.02 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect 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. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request 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 costs of labor and supervision directly attributable to the change.
 - d. 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.
 - e. Quotation Form: Use forms acceptable to Architect.
- 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 Architect.
 - 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 costs of labor and supervision directly attributable to the change.
 - 5. 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.
 - 6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use form acceptable to Architect.

1.03 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA G701

1.04 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect 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.
 - 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 012900
PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the specifications 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. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G702
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
 - 4. Round amounts to nearest whole dollar; total shall equal 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.
 - 6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 - 7. 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.
 - 8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
 - 9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.02 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the fifteenth (15) 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 G702 as form for Applications for Payment.
- E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in the Project Manual.
- F. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 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. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- I. 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.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
- J. Application for Payment at Substantial Completion: After issuing 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.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: 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. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707-1994, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. 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.
 9. Final liquidated damages settlement statement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 013000
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Requests for Interpretation (RFI) procedures.
- H. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

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

3.02 PROGRESS MEETINGS

- A. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
 - 5. Major subcontractors.
- B. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Maintenance of progress schedule.
 - 7. Corrective measures to regain projected schedules.
 - 8. Planned progress during succeeding work period.
 - 9. Maintenance of quality and work standards.
 - 10. Effect of proposed changes on progress schedule and coordination.
 - 11. Other business relating to work.
- C. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

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

3.04 REQUESTS FOR INTERPRETATION (RFI)

- A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 - 1. Prepare a separate RFI for each specific item.
- B. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

3.05 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

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

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a separate transmittal for each item.
 - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 3. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 - b. Use form generated by Electronic Document Submittal Service software.
 - 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
- B. Product Data Procedures:
 - 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.

3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.10 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 2. Not Authorizing fabrication, delivery, and installation:
- E. Architect's and consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
 - 9. Project closeout activities.

1.02 REQUESTS FOR INFORMATION (RFIS)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect 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.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Architect.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Specification Section number and title and related paragraphs, as appropriate.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.03 PROJECT MEETINGS

- A. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; 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.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.

- e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Sustainable design requirements.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- B. Progress Meetings: Conduct progress meetings at biweekly intervals.
- 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. 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) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.

- 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. 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.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 013300
SUBMITTAL PROCEDURES**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.02 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 modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.03 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of CAD Drawings 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 of requested Contract Drawings for use in preparing Shop 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. Contractor shall execute a data licensing agreement in the form prepared by the Architect
- B. 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. 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 reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect 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 15 calendar days for review of each resubmittal.
- D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Include the following information for processing and recording action taken:
 - a. Project name.

- b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Other necessary identification.
- E. Options: Identify options requiring selection by the Architect.
- F. Deviations: Identify deviations from the Contract Documents on submittals.
- G. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
- 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 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: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.01 SUBMITTAL PROCEDURES

- A. 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.

6. Submit Product Data in the following format:
 - a. Three paper copies of Product Data, unless otherwise indicated. Architect will return two copies.
- B. 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, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
 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 (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1067 mm).
 3. Submit Shop Drawings in the following format:
 - a. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- C. 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.
 3. 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.
 4. 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 two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.
 5. 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 sets of Samples. Architect will retain one Sample sets; remainder will be returned.

- b. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. 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. Submit product schedule in the following format:
 - a. Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.
- E. 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.
- F. 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 American Welding Society (AWS) forms. Include names of firms and personnel certified.
- G. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- H. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- I. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- J. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- K. 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.
- L. Product Test Reports: Submit written reports indicating 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.
- M. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

2.02 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 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

3.01 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.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "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.

3.02 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

**SECTION 014000
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 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.

1.02 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
 - 1. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.03 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. 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.

1.04 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 to those indicated for this Project in material, design, and extent.
- F. 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.
- G. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow five days for initial review and each re-review of each mockup.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.05 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.
 - 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.
- 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. 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.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- C. **Manufacturer's Field Services:** Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- D. **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.
- E. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. 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.
- F. **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. Preliminary design mix proposed for use for material mixes that require control by testing agency.
- G. **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.

1.06 SPECIAL TESTS AND INSPECTIONS

- A. **Special Tests and Inspections:** Owner shall engage and Contractor Shall coordinate a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
- B. **Special Tests and Inspections:** Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 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 Division 01 Section "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 015000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

1.02 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.03 QUALITY ASSURANCE

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

1.04 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.01 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized steel bases for supporting posts.

2.02 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.03 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 1. Install electric power service underground, unless otherwise indicated.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide temporary parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
- H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.
- L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."
- F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- G. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
 2. Protect air-handling equipment.
 3. Provide walk-off mats at each entrance through temporary partition.

- L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.05 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Discard or replace water-damaged and wet material.
 - 4. Discard, replace or clean stored or installed material that begins to grow mold.
 - 5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.06 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

**SECTION 015850
PROJECT SIGNS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project identification sign.

1.02 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr wind velocity.
- B. Sign Painter: Experienced as a professional sign painter for minimum three years.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized.
- D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- E. Lettering: Exterior quality paint, colors as needed.

2.02 PROJECT IDENTIFICATION SIGN

- A. One painted sign, 32 sq. ft area, and bottom 6 feet above ground.
- B. Content: Project sign content to be verified by the Architect. Sign to include but not limited to the following.
 - 1. Project number, title, logo and name of project.
 - 2. Names and titles of authorities.
 - 3. Names and titles of Rosemann & Associates, P.C. and Consultants.
 - 4. Graphic Design, Colors, Style of Lettering: Designated by Rosemann & Associates, P.C.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at designated location.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface pump and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

**SECTION 016000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within [10] days of receipt of request, or [7] days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.
 - 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.03 PRODUCT WARRANTIES

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

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- B. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 017300
EXECUTION**

PART 1 GENERAL

1.01 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit three copies signed by land surveyor.
- E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.02 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction.
 - 2. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 - 3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

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

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.04 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.07 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.08 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.09 PROTECTION OF INSTALLED CONSTRUCTION

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

END OF SECTION

**SECTION 017700
CLOSEOUT PROCEDURES**

PART 1 GENERAL

1.01 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.02 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.03 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.04 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the Owner. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 8. Complete final cleaning requirements, including touchup painting.
 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.06 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MATERIALS

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

PART 3 EXECUTION

3.01 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - p. Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - r. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.02 REPAIR OF THE WORK

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

- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

**SECTION 017823
OPERATION AND MAINTENANCE DATA**

PART 1 GENERAL

1.01 CLOSEOUT SUBMITTALS

- A. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Agent will return copy with comments.
 - 1. Correct or modify each manual to comply with Architect's and Commissioning Agent's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Agent's comments and prior to commencing demonstration and training.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Agent.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversized drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.
- F. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- G. Emergency Procedures: Include the following, as applicable:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.02 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Operating standards.
 3. Operating procedures.
 4. Wiring diagrams.
 5. Control diagrams.
 6. Piped system diagrams.
 7. Precautions against improper use.
 8. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.

- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.03 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.04 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

- 5. Aligning, adjusting, and checking instructions.
- 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 EXECUTION

3.01 MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- C. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

**SECTION 017839
PROJECT RECORD DOCUMENTS**

PART 1 GENERAL

1.01 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and two set(s) of prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit two of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

PART 2 PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets, including AS Built Survey and other HUD required documents.
 2. Format: Annotated PDF electronic file.

2.02 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 EXECUTION

3.01 RECORDING AND MAINTENANCE

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

END OF SECTION

**SECTION 017900
DEMONSTRATION AND TRAINING**

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.

1.02 CLOSEOUT SUBMITTALS

- A. At completion of training, submit complete training manual(s) for Owner's use.

1.03 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.01 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.

- c. Routine and normal operating instructions.
- d. Regulation and control procedures.
- e. Control sequences.
- f. Safety procedures.
- g. Instructions on stopping.
- h. Normal shutdown instructions.
- i. Operating procedures for emergencies.
- j. Operating procedures for system, subsystem, or equipment failure.
- k. Seasonal and weekend operating instructions.
- l. Required sequences for electric or electronic systems.
- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.01 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

3.02 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times.
 - 1. Schedule training with Owner with at least seven days' advance notice.

END OF SECTION

**SECTION 033000
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Concrete reinforcement.
- C. Joint devices associated with concrete work.
- D. Concrete curing.

1.02 REFERENCE STANDARDS

- A. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- B. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- E. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- F. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
- H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.
- L. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- N. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- O. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- P. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.
- Q. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- R. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2025.
- S. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- T. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.
- U. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2023.
- V. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.
- W. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

- X. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2025.
- Y. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- Z. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids; 2016a (Reapproved 2021).
- AA. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.
- BB. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.
- CC. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.
- DD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).
- EE. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- FF. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
 - 2. For chemical-resistant waterstops, provide data on ASTM D471 test results.
- 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.
- D. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- E. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.
- F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 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.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Moisture Emission-Reducing Curing and Sealing Compound, Membrane-Forming: Provide warranty to cover cost of flooring delamination failures for 10 years.

1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.
- C. Termite-Resistant Vapor Barrier Sheet: Provide five year manufacturer's limited warranty.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 1. Type: Deformed billet-steel bars.
 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
 1. Form: Coiled Rolls.
- C. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.03 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

2.04 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
 1. Grout: Comply with ASTM C1107/C1107M.
 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.
 3. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.

2.05 BONDING AND JOINTING PRODUCTS

- A. Epoxy Bonding System:
 1. Complying with ASTM C881/C881M and of Type required for specific application.
- B. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
 1. Configuration: As indicated on drawings.
 2. Size: As indicated on drawings.

- C. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.
- D. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
- E. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.06 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- C. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Clear, liquid sealer for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
 - 1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
 - 2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
 - 3. VOC Content: Less than 100 g/L.
 - 4. Solids Content: 25 percent, minimum.
- D. Moisture-Retaining Sheet: ASTM C171.
 - 1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
- E. Water: Potable, not detrimental to concrete.

2.07 CONCRETE MIX DESIGN

- A. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- B. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3500 pounds per square inch.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Cement Content: Minimum 500 pounds per cubic yard.
 - 4. Water-Cement Ratio: Maximum 42 percent by weight.
 - 5. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
 - 6. Maximum Slump: 3 inches.
 - 7. Maximum Aggregate Size: 5/8 inch.

2.08 MIXING

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Verify that forms are clean and free of rust before applying release agent.

- B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
- D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- F. 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.
- G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 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.
- E. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
 - 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
 - 3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
 - 4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.

- B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155/E1155M, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 - 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 2. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.
- B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.08 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.
- C. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - 3. Final Curing: Begin after initial curing but before surface is dry.

3.09 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. 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.
- D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

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

END OF SECTION

**SECTION 035400
CAST UNDERLAYMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment.
 - 1. Use gypsum-based type at _____.

1.02 SUBMITTALS

- A. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.
- B. Manufacturer's Instructions.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.04 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gypsum Underlayment:
 - 1. ARDEX Engineered Cements; ARDEX K 22 F: www.ardexamericas.com/#sle.
 - 2. Hacker Industries, Inc; Firm-Fill 2010+: www.hackerindustries.com/#sle.
 - 3. Maxxon Corporation; Commercial EZ Crete: www.maxxon.com/#sle.

2.02 MATERIALS

- A. Cast Underlayments, General:
 - 1. Comply with applicable code for combustibility or flame spread requirements.
- B. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
 - 1. Compressive Strength: Minimum 2500 pounds per square inch, tested per ASTM C472.
 - 2. Density: Maximum ____ pounds per cubic foot.
 - 3. Final Set Time: 1 to 2 hours, maximum.
 - 4. Thickness: 3/4 inch to maximum 3-1/2 inch.
 - 5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.
- D. Primer: Manufacturer's recommended type.
- E. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

- A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
- B. Vacuum clean surfaces.
- C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- D. Close floor openings.

3.03 APPLICATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

3.04 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.
- B. Air cure in accordance with manufacturer's instructions.

3.05 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

**SECTION 042000
UNIT MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clay facing brick.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.

1.02 SUBMITTALS

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- B. Samples: Submit two samples of facing brick units to illustrate color, texture, and extremes of color range.

1.03 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 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
 - 1. Nominal size: As indicated on drawings.
 - 2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, Type N.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches.

2.04 FLASHINGS

2.05 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Exterior, non-loadbearing masonry: Type N.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.

- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

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. Brick Units:
 - 1. Bond: Running.
 - 2. Mortar Joints: Concave.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

3.09 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

3.10 LINTELS

- A. Install loose steel lintels over openings.

3.11 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.

3.12 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.

3.13 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Clean soiled surfaces with cleaning solution.

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.
- C. Accessories.

1.02 SUBMITTALS

- A. Product Data: Provide data for AMSMV units, mortar, and lath, including:
- B. Verification Samples: For each finish product specified, two samples, minimum size 12 inches square, representing actual product, color, patterns and texture.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Prevent mechanical damage and contamination by other materials.
- C. Protect products from precipitation combined with freezing temperatures. Do not install products with visible frozen moisture.
- D. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.

1.04 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Adhered Manufactured Stone Masonry Veneer (AMSMV):

2.02 ADHERED MANUFACTURED STONE MASONRY VENEER (AMSMV)

- A. AMSMV: Cast masonry units using a mixture of cement, lightweight aggregates, concrete additives and color pigments to replicate appearance of natural stone and designed to be applied with a cementitious mortar to a backing surface, complying with ASTM C1670/C1670M and ICC-ES AC51.
 - 1. Color, Texture, Range, Special Shapes: As selected by Architect from manufacturer's standard styles.

2.03 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.
- B. Mortar Color: Natural gray unless otherwise indicated.
- C. Scratch Coat Mortars: Scratch coat mortars for application directly to metal lath.
- D. Setting Bed Mortars: Setting bed used to adhere AMSMV units to scratch coat mortar or to bondable concrete or concrete masonry.
- E. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual AMSMV units once the setting bed mortar has sufficiently cured.

2.04 MORTAR MIXES

2.05 ACCESSORIES

- A. Metal Lath with Rainscreen Drainage Material: Factory-assembled combination of mesh drainage material and metal lath.

1. Diamond Mesh Metal Lath: ASTM C847, galvanized, self-furring.
 - a. Weight: To suit application and as specified in ASTM C841 for framing spacing.
- B. Cleaning Solution: Non-acidic, not harmful to AMSMV work or adjacent materials, approved by AMSMV manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that built-in items are in proper location, and ready for installation of AMSMV.

3.02 PREPARATION

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Clean concrete surfaces of foreign matter using approved acid solutions, solvents, or detergents, and then rinse surfaces thoroughly with clean water.
- C. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.
- D. Apply dash bond coat to solid bases and moist cure for at least 24 hours before applying setting bed.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

3.04 INSTALLATION - SCRATCH COAT

- A. Apply mortar scratch coat of 1/2 inch nominal to cover metal lath in accordance with ASTM C926. Scratch surface when somewhat firm. If scratch coat dries before applying setting bed mortar and AMSMV, moisten scratch coat by misting it with water.

3.05 INSTALLATION - AMSMV

- A. Windows, Doors and Wall Openings: Butt AMSMV units to wall opening.
- B. Sills: Install sills where located on drawings.
- C. Caps: Install capstones where located on drawings.
- D. Seal all joints at wall openings and penetrations with sealant approved for use with AMSMV.

3.06 INSTALLATION - MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.07 TOLERANCES

- A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.08 CUTTING AND FITTING

- A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.09 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.

- B. Clean soiled surfaces with cleaning solution.

END OF SECTION

**SECTION 055213
PIPE AND TUBE RAILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps.

1.02 SUBMITTALS

- A. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

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.
- 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.
- E. Provide welding 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 Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. 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.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.

3.03 TOLERANCES

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

END OF SECTION

**SECTION 061000
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Structural composite lumber framing.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- D. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).
- E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.
- F. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products; 2021, with Editorial Revision.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- H. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.
- I. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
- J. PS 1 - Structural Plywood; 2023.
- K. PS 2 - Performance Standard for Wood Structural Panels; 2019.
- L. PS 20 - American Softwood Lumber Standard; 2025.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
- C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

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.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Provide wood harvested within a 500 mile radius of the project site.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Stud Framing (2 by 2 through 2 by 6):
 - 1. Grade: No. 2.
- D. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 - 1. Species and Grades: As indicated on drawings for various locations.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 STRUCTURAL COMPOSITE LUMBER

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
- B. Structural Composite Lumber Materials: Factory-fabricated engineered wood products consisting of wood veneers, strands, or flakes pressed with moisture-resistant adhesive into blocks of material, evaluated in accordance with ASTM D5456.
 - 1. Laminated Veneer Lumber (LVL): Engineered wood products consisting of thin wood veneer bonded together with adhesive with grain of veneers running parallel to long dimension.
 - a. Manufacturer's Published Modulus of Elasticity, E: 1,800,000 psi, minimum.
 - 2. Parallel Strand Lumber (PSL): Engineered wood products consisting of long wood strands bonded together with adhesive with grain running parallel to long dimension.
 - a. Strand Length-to-Thickness Ratio: Approximately 300.
 - b. Manufacturer's Published Modulus of Elasticity, E: 1,800,000 psi, minimum.
 - 3. Laminated Strand Lumber (LSL): Engineered wood products consisting of flaked wood strands bonded together with adhesive.
 - a. Strand Length-to-Thickness Ratio: Approximately 150.
 - b. Manufacturer's Published Modulus of Elasticity, E: 1,800,000 psi, minimum.
 - 4. Oriented Strand Lumber (OSL): Engineered wood product consisting of flaked wood strands bonded together with adhesive.
 - a. Strand Length-to-Thickness Ratio: Approximately 75.
 - b. Manufacturer's Published Modulus of Elasticity, E: 1,800,000 psi, minimum.

2.04 CONSTRUCTION PANELS

- A. Subfloor/Underlayment Combination: Rated single floor.
 - 1. Plywood: PS 1.
 - 2. Oriented Strand Board: PS 2.

3. Bond Classification: Exposure 1.
 4. Span Rating: 48.
 5. Performance Category: 1-1/8 PERF CAT.
 6. Edges: Tongue and groove.
- B. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
 2. Bond Classification: Exposure 1.
 3. Performance Category: 5/8 PERF CAT.
 4. Span Rating: 40/20.
 5. Edges: Square.
 6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
 7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
- C. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
 2. Bond Classification: Exposure 1.
 3. Performance Category: 5/8 PERF CAT.
 4. Span Rating: 40/20.
 5. Edges: Square.
 6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
 7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
- D. 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.

2.05 ACCESSORIES

- A. Metal and Finish of Fasteners:
1. Untreated Wood: Unfinished steel.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Sill Gasket on Top of Foundation Wall: 3/8 inch thick, closed-cell plastic foam.
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.
- E. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.
- F. Water-Resistive Barrier: See Section 072500.

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 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and _____.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.03 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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. 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.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide nonstructural framing and blocking to support the following:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Wall paneling and trim.
 - 8. Joints of rigid wall coverings that occur between studs.
 - 9. Other wall- or ceiling-mounted items indicated on drawings.

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

- B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. At long edges use sheathing clips where joints occur between roof framing members.
 - 2. Nail panels to framing; staples are not permitted.
- C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.
- D. 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. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size and Location: As indicated on drawings.

3.06 TOLERANCES

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

3.07 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 061605
SHEATHING - ZIP SYSTEM (ALTERNATE NO. 01)

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Combination wall sheathing, water-resistive barrier, and air barrier.
 - 2. Self-adhering flexible flashing.
- B. Related Sections:
 - 1. Other Division 6 Section Rough Carpentry for sheathing other than wall sheathing.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Capable of demonstrating that all wood procurement operations are conducted in accordance with procedures and policies of the Sustainable Forestry Initiative (SFI) Program.
- B. Code Compliance: Comply with requirements of the following:
 - 1. International Code Council (ICC), ICC-ESR1474 (ZIP System Wall Sheathing).
 - 2. International Code Council (ICC), ICC-ESR2227 (ZIP System Tape).

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Outdoor Storage: Comply with manufacturer's recommendations
 - 1. Set panel bundles on supports to keep off ground.
 - 2. Cover panels loosely with waterproof protective material.
 - 3. Anchor covers on top of stack, but keep away from sides and bottom to assure adequate air circulation.
 - 4. When high moisture conditions exist, cut banding on panel stack to prevent edge damage.

1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sheathing system that fail due to manufacturing defects within specified warranty period.
 - 1. System Warranty Period: 15 years from date of Substantial Completion.
 - 2. Panel Warranty Period: 30 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

2.02 WOOD PANEL PRODUCTS

- A. Oriented Strand Board: DOC PS 2.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.03 COMBINATION WALL SHEATHING, WATER-RESISTIVE BARRIER, AND AIR BARRIER

- A. Oriented-Strand-Board Wall Sheathing: With integral water-resistive barrier, Exposure 1 sheathing.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Huber Engineered Woods LLC; ZIP System Wall Sheathing or a comparable product.
2. Span Rating and Nominal Thickness: Not less than 24/16; 7/16 inch .
3. Edge Profile: Square edge.
4. Provide fastening guide on top panel surface with pre-spaced fastening symbols for 16-inches (406 mm) and 24-inches (610 mm) on centers spacings.
5. Factory laminated integral water-resistive barrier facer.
6. Perm Rating of Integral Water-Resistive Barrier: 12-16 perms.
7. Assembly maximum air leakage of 0.0072 cfm/sq. ft. infiltration and 0.0023 cfm/ sq. ft. exfiltration at a pressure differential of 1.57 psf.
8. Exposure Time: Designed to resist weather exposure for 120 days.

2.04 FASTENERS

- A. General: Provide fasteners of size and type that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International Residential Code, Wood Frame Construction manual, and National Design Specification.

2.05 MISCELLANEOUS MATERIALS

- A. Self-Adhering Tape: Pressure-sensitive, self-adhering, cold-applied, proprietary seam tape consisting of polyolefin film with acrylic adhesive.
 1. Basis-of-Design Product: Subject to compliance with requirements provide Huber Engineered Woods; ZIP System Tape or a comparable product.
 2. Thickness: 0.012 inch (0.3 mm).

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Chapter 23 in ICC's "International Building Code."
 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - c. Install fasteners 3/8 inch to 1/2 inch from panel edges.

- d. Space fasteners in compliance with requirements of authority having jurisdiction.

3.03 SHEATHING JOINT TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply proprietary seam tape to joints between sheathing panels.
 - 2. Utilize self-adhering tape gun or hard rubber roller provided by manufacturer to ensure tape is completely adhered to substrates.

3.04 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1. After flashing has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.

END OF SECTION

SECTION 061753
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop-fabricated wood trusses.
- B. Truss bridging.

1.02 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- B. SBCA (BCSI) - Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses; 2018 (Updated 2020).
- C. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
- C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
 - 1. Include identification of engineering software used for design.
 - 2. Provide shop drawings stamped or sealed by design engineer.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural _____ Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Fabricator 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. Handle trusses in accordance with SBCA (BCSI).
- B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES

- A. Wood Trusses: Design and fabricate trusses in accordance with ANSI/TPI 1 and to achieve specified design requirements indicated.
 - 1. Connectors: Steel plate.
 - 2. Structural Design: Comply with applicable code for structural loading criteria.

2.02 MATERIALS

- A. Lumber:
 - 1. Moisture Content: Between 7 and 9 percent.
 - 2. Lumber fabricated from old growth timber is not permitted.
 - 3. Provide lumber harvested within a 500 mile radius of the project site.

- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 061000.
- B. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install trusses in accordance with manufacturer's instructions, SBCA (BCSI); maintain a copy of applicable documents on site until installation is complete.
- B. Set members level and plumb, in correct position.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field-cut or alter structural members without approval of Architect.
- E. Install permanent bridging and bracing.
- F. Coordinate placement of decking with work of this section.

3.04 TOLERANCES

- A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

**SECTION 062000
FINISH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood casings and moldings.

1.02 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - 2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Woodwork Items:

2.02 SUSTAINABILITY CHARACTERISTICS

2.03 FASTENINGS

2.04 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Opaque:
 - a. Color: As selected by Architect.
 - b. Sheen: Semigloss.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.02 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

**SECTION 066100
CAST POLYMER FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 SUBMITTALS

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Polymer Synthetic Stone Fabrications:
 - 1. St. Louis Marble; Cultured Marble.
 - 2. Color: White on White Swirl
 - 3. Substitutions: Not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify substrates are prepared to receive cast polymer fabrications.

3.02 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written instructions.

3.03 INSTALLATION

- A. Install cast polymer units in accordance with manufacturer's written instructions.
- B. Align work plumb and level.
- C. Rigidly anchor to substrate to prevent misalignment.

3.04 CLEANING

- A. Clean exposed surfaces of installed units in accordance with manufacturer's instructions.

END OF SECTION

**SECTION 067300
COMPOSITE DECKING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior decking [and railing] work made from wood and polypropylene composite material.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide exterior decking [and railing] components capable of meeting the following minimum design loads when installed in the configuration indicated:
1. Deck: Uniform Live Load: 125 lbf/sq. ft. (6 kN/sq. m).
 2. Treads of Stairs: Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m), and concentrated load: 300 lbf (1.33 kN) on area of 4 sq. in. (25.8 sq. cm), whichever produces the greater stress.
 3. Guard Top Rail Concentrated Load: 200 lbf (0.89 kN) applied at any point in any direction.
 4. Guard Top Rail Uniform Load: 50 lbf/ft. (0.73 kN/m) applied in any direction.
 5. Intermediate Rail and Baluster Concentrated Load: 50 lbf (0.22 kN) applied to 1 sq. ft. (0.093 sq. m) area.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data sheets, installation instructions, and maintenance recommendations for composite decking materials.
- B. Samples:
1. 4 inches (102 mm) long for each size and type of composite decking [and railing] component.
 2. For each type of fastener and hanger.
 3. Selection Samples: For each finish product specified, two complete sets of color chips depicting the manufacturer's full range of available colors and textures.
 4. Verification Samples: For each product selected, two samples depicting the specified color and pattern.

1.04 QUALITY ASSURANCE QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in manufacture of similar products in use in similar environments.
1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time period allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with performance requirements in Part 1 and material requirements in Part 2.
 - b. Samples of each type of product specified.
 - c. Project references: Minimum of 5 installations not less than 3 years old, with owner contact information, available for evaluation by Architect.
 - d. Sample warranty.
- B. Source Limitations: Obtain composite decking [and railings] through one source from a single approved manufacturer.
- C. Fire-Test-Response Characteristics per ASTM E 84 or UL Standard 723: Flame spread index: 100 or less; Smoke developed index: 450 or less.
- D. Mockup: Build mockup to verify approved materials and demonstrate acceptable workmanship.
1. Do not proceed with work until mockup has been approved by the Architect.
 2. Approved mockups may be incorporated in finished work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather. Store on flat surface with adequate support. Provide for air circulation within and around stacks and under temporary coverings.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form indicating manufacturer's intent to replace composite decking materials that fail within 25 years following Substantial Completion under normal conditions of use and exposure. Failures are defined to include the following:
 - 1. Rot, decay, splitting, checking, splintering, or termite damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Composite decking design is based upon product of the manufacturer below.
 - 1. Provide basis of design product[, or comparable products approved by Architect prior to bid].
 - 2. Correct Building Products, 8 Morin St, Biddeford, ME 04005; Phone: (877) 332-5877, (207) 284-5600; Fax: (207) 284-1001; Email: specs@correctdeck.com; Website: www.CorrectDeck.com.
 - 3. [Specifier: Insert additional product manufacturers meeting requirements of Quality Assurance Article above, if required for project.]

2.02 MATERIALS

- A. Composite Lumber, General: Wood thermoplastic composite material, UV- and heat-stabilized,
 - 1. consisting of combination of wood fiber and polypropylene, extrusion-molded into sizes and
 - a. Flexural Strength, ASTM D 6109: 4000 lbf/sq. in. (27.58 MPa), minimum.
 - b. Tensile Strength, ASTM D 7031: 2700 lbf/sq. in. (18.62 MPa), minimum.
 - c. Modulus of Elasticity, ASTM D 6109: 850,000 lbf/sq. in. (5860 MPa), minimum.
 - d. Modulus of Rupture, ASTM D 6109: 5400 lbf/sq. in. (37.23 MPa), minimum.
 - e. Weatherability Affect on Modulus of Rupture, 2000 hours, ASTM D 2565: 16 percent reduction of baseline MOR.
 - f. Density: ASTM D 6111: 6.0 lb/cu. ft. (1.15 g/cu. c), minimum.
 - g. Impact Resistance: ASTM D 4812: 1.4 ft-lbf/in. (0.747 J/cm) parallel to length, minimum.
 - h. Coefficient of Thermal Expansion, ASTM E 228: 1.5 x 10⁻⁵ in/in/deg. F (2.7 x 10⁻⁵ mm/mm/deg. C), maximum.
 - i. Water Absorption, ASTM D 4442: 1.5 percent, maximum.
 - j. Screw Withdrawal, ASTM D 1761: 1400 lbf (6220 N), minimum.
 - k. Termite Resistance, AWWPA E1: 9.0, minimum
 - l. Fungal Resistance, ASTM D 1413: No decay.
 - m. Abrasion Resistance, ASTM D 4060: .06 g/1000 cycles.
 - n. Flame Spread Index, ASTM E 84: 100 or less (Class III).
 - o. Coefficient of Friction, ASTM D 2394: 0.7, minimum, dry.
 - p. Coefficient of Friction, ASTM D 2394: 0.6, minimum, wet.
 - q. Resistance to Mold Growth, ASTM D 3273, CorrectDeck CX: 10 rating (no mold growth).
 - r. Fade Resistance, ASTM D 6864, CorrectDeck CX: 1.5 Delta E.

2.03 DECKING

- A. Composite Decking:
 - 1. Basis of Design Product: Correct Building Products, [CorrectDeck] [CorrectDeck CX].
 - 2. Nominal Size: [5/4 by 6] [5/4 by 4].
 - 3. Profile: [Edge grooved] [Solid].
 - 4. Fastening: [Concealed fastening clip] [Face fastened].
 - 5. Face Surface: Embossed wood grain textured.
 - 6. Color: As selected by Architect from manufacturer's full line.
- B. Stair Treads and Risers:

1. Basis of Design Product: Correct Building Products, [CorrectDeck] [CorrectDeck CX] [and] [CorrectDeck Dimensional Composite Lumber].
2. Size: As indicated.
3. Profile: Solid.
4. Fastening: Face fastened with screws.
5. Color and Texture: As selected by Architect from manufacturer's full line.

C. Composite Trim: Composite lumber components matching decking, of dimension indicated.

2.04 RAILINGS

- A. Railing System, Prefabricated: Consisting of newel posts, extruded top and bottom rails, and balusters, with pre-engineered connectors and trim accessories.
1. Basis of Design Product: Correct Building Products, CorrectDeck [RapidRail] [RapidRail CX].
 2. Color and Texture: As selected by Architect from manufacturer's full line.
 3. Newel Posts: Nominal 4 by 4.
 4. Railings: 3-1/2 by 2-3/4 inch (88.9 by 69.8 mm) extruded profiles, routed to accept balusters where required.
 5. Balusters: [1-1/4 by 1-1/4 inch (32 by 32 mm) hollow profile] [1-1/2 by 1-3/8 inch (30.5 by 34.9 mm) solid profile].
- B. Railing System, Site Fabricated: Composite lumber components matching decking system, nsisting of newel posts, rails, and balusters.
1. Basis of Design Product: Correct Building Products, CorrectDeck Dimensional Composite Lumber.
 2. Color and Texture: As selected by Architect from manufacturer's full line.
 3. Newel Posts: Nominal 4 by 4.
 4. Railings: [3-1/2 by 2-3/4 inch (88.9 by 69.8 mm) extruded profiles, solid profile] [As indicated].
 5. Balusters: [1-1/4 by 1-1/4 inch (32 by 32 mm) hollow profile] [1-1/2 by 1-3/8 inch (30.5 by 34.9 mm) solid profile] [As indicated].

2.05 ACCESSORIES

- A. Fasteners for Decking: Trim head screws, stainless steel, non-magnetic, 304 alloy, sized according to manufacturer's recommendations.
- B. Brackets, Flanges, and Fittings: Manufacturer's recommended stainless steel, non-magnetic, 304 alloy, bolts, nuts, washers, and screws.

2.06 FABRICATION

- A. General: Fabricate railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes.
- B. Provide inserts and other anchorage devices for connection railing systems to structure.
1. Fabricate anchorage devices capable of withstanding loading imposed by railing systems.
 2. Coordinate anchorage devices with supporting structure.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation of composite decking [and railings] upon correction of unsatisfactory conditions.

3.02 INSTALLATION, GENERAL

- A. Install composite decking [and railings] in accordance with manufacturer's recommended installation instructions, details, and requirements of authorities having jurisdiction.
1. Install over support members of adequate size and spacing, sloped as recommended.

- a. Provide minimum recommended airspace beneath composite decking. Extend decking across minimum of three supports. Center joints on support.
- 2. Provide 1/8 inch (3 mm) gap between deck boards for control of drainage and thermal movement. Allow recommended end-to-end gap based upon ambient temperature at time of installation.
- B. Install composite decking [and railings] true to line and aligned with adjacent materials. Use secured concealed shims where necessary for alignment. Remove burrs and rough edges.

3.03 DECKING INSTALLATION, CONCEALED FASTENER

- A. Fasten channeled decking using specially profiled fastener configured to fit in side channels of deck boards and accept face fastener to secure decking to supports. Face fasten first and last deck boards.

3.04 DECKING INSTALLATION, FACE-FASTENED

- A. Fasten decking using two fasteners at each support. Locate fasteners minimum 1/2 inch from edge of decking. Predrill decking. Countersink screw heads.

3.05 STAIR INSTALLATION

- A. Composite Stair Treads and Risers: Secure composite treads and risers by screwing to carriages. Countersink screw heads. Extend treads over carriages.
 - 1. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.06 POST AND RAILING INSTALLATION

- A. Install posts and railings as indicated and as recommended by railing manufacturer. Set railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack. Provide anchorage devices and fasteners where necessary for securing railings to existing construction. Predrill holes for fasteners.
- B. Newel Posts: Where required for access to post fasteners, install posts prior to installing decking. Do not notch posts. Secure posts to supports by through-bolting, using post fastening kit supplied by post manufacturer.
- C. Railings, Prefabricated: Center pre-routed railings between posts to provide equal spacing between terminal balusters and posts. Install squash block under center of bottom rail at midspan. Secure railings to posts with metal angle brackets and screws. Conceal angle bracket vertical leg with end of railing; mortise railing end to provide snug fit over bracket leg to post.
 - 1. Balusters: Fit balusters to mortised railings prior to screwing railings in place.
- D. Railings, Site Fabricated: Secure railings to posts with fasteners and connectors of size and type recommended by manufacturer. Install railings parallel to each other and to stair runs.
 - 1. Balusters: Space balusters evenly and in accordance with requirements of authorities having jurisdiction. Fasten balusters to railings.

3.07 CLEANING

- A. Clean surfaces as required, following procedures and employing cleaning materials as recommended by decking manufacturer.

3.08 PROTECTION

- A. Protect installed products from damage by subsequent construction activities, until completion of Project.
- B. Field repair of damaged product finishes is limited to surface scratch repairs only. Use manufacturer's recommended field repair procedures. Replace products that have been structurally damaged by subsequent construction activities.

END OF SECTION

**SECTION 070523
BUILDING ENVELOPE TESTING**

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.
- B. This Section includes testing building envelope systems.

1.02 DEFINITIONS

- A. Acceptance Criteria: The measured value(s) or range(s) that determine if the results of the test pass or fail.
- B. Accuracy: The capability of an instrument to indicate the true value of a measured quantity.
- C. ACH75: The ratio of the air leakage rate at 75 Pa (0.3 in. H₂O), corrected for a standard air density, to the volume of the test zone (1/h).
- D. AHJ: The local governing Authority Having Jurisdiction over the installation.
- E. Air Barrier System: A system in the building construction that is designed and installed to reduce air leakage either into or through the building envelope.
- F. Air Change Rate: The calculated number of times the total air volume of a defined space is replaced in a given unit of time. This is ordinarily computed by dividing the total volume of the room supply or exhaust air in cubic meters (cubic feet), per unit of time, by the total volume of the subject space. It is normally expressed as air changes per hour, ACH.
- G. Air Exfiltration: Air leakage out of the building.
- H. Air Infiltration: Air leakage into the building.
- I. Airflow Rate: The volume of airflow through the fan or blower door per unit of time (m³/s or ft³/min, cfm).
- J. Air Leakage Area: The effective leakage area (AL) at the test pressure.
- K. Air Leakage Change Rate: Air leakage rate in volume units/h divided by the building space volume with identical volume units, normally expressed as air changes per hour, ACH.
- L. Air Leakage Graph: A graphic representation that shows the relationship of measured airflow rates to the corresponding measured pressure differences, usually plotted on a log-log scale.
- M. Air Leakage Rate: The total volume of air passing through the test zone or building envelope per unit of time (ft³/min [cfm] or m³/s).
 - 1. Discussion: This movement includes flow through joints, cracks, and porous surfaces, or a combination thereof. The driving force for such an air leakage, in service can be mechanical pressurization and de-pressurization, natural wind pressures, or air temperature differentials between the building interior and the outdoors, or a combination thereof.
- N. Air Leakage Site: A location on the building envelope or air barrier system where air can move between the building interior and the outdoors.
- O. Air Tightness: The degree to which a test zone or building envelope resists the flow of air.
 - 1. Discussion: Air leakage rate, effective leakage area and the rating term such as ACH50 are examples of measures of building tightness.
- P. Anomalous Thermal Image: An observed thermal pattern of a structure that is not in accordance with the expected thermal pattern.
- Q. Baseline Building Pressure: The natural building pressure difference measured when there is no flow through the blower door. This is also referred to as the Bias Pressure.

- R. Blower Door: A fan pressurization device incorporating a controllable fan and instruments for airflow measurement and building pressure difference measurement that mounts securely in a door or other opening.
- S. Building Envelope: The boundary or barrier separating the interior volume of a building from the outside environment.
 - 1. Discussion: For the purpose of this test procedural standards, the interior volume is the deliberately conditioned space within a building, generally not including attics, basements, and attached structures, for example, garages, unless such spaces are connected to the heating and air conditioning system, such as a crawl space plenum.
- T. Building Pressure Difference: The pressure differential across the test zone or building envelope.
- U. Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.
- V. Certificate of Compliance (Conformance): A written statement, signed by a qualified party, attesting that the items or services are in accordance with specified requirements, and accompanied by additional information to substantiate the statement.
- W. Certification: The process of validation required to obtain a certificate of compliance.
- X. CFM75: The airflow leakage value in cubic feet per minute at a test pressure of 75 Pascals (Pa). The subscript value defines the test pressure.
- Y. Closed: The condition of a building used to test the air barrier in an unoccupied building to test the air barrier with intentional openings sealed.
- Z. Differential Pressure (DP): The difference between two pressures measured between a sample point and reference point.
 - 1. Discussion: This movement includes flow through joints, cracks, and porous surfaces, or a combination thereof. The driving force for such an air leakage, in service can be wind pressures, or air temperature differentials between the building interior and the outdoors, or a combination thereof.
- AA. Deficiency: Any circumstance or operation that affects the measurement results as compared to the design criteria required by the contract documents.
- BB. Effective Leakage Area: In order to take values generated by fan pressurization and to use them in determining natural air exchange, the effective leakage area of a building must be calculated. Each gap and crack in the building envelope contributes a certain amount of area to the total leakage area of the building. The Effective Leakage Area assumes that all of the individual leakage areas in the building are combined into a single idealized orifice or hole. The ELA will change depending on the reference pressure used to calculate it.
- CC. Envelope: The construction, taken as a whole or in part, that separates the indoors of a building from the outdoors.
- DD. Equivalent Leakage Area: EqLA, usually taken at 10Pa using 0.61 discharge coefficient, but for the purposes of this Specification, it is taken at 75 Pa.
- EE. Field-of-View (FOV): The total angular dimensions, expressed in degrees or radians, within which objects can be imaged, displayed, and recorded by a stationary imaging device.
- FF. Framing Spacing: Distance between the centerlines of joists, studs, or rafters.
- GG. Function: Function in this standard refers to the specific type of data measurement specified in Section 4, Standards for Instrumentation and Calibration.
- HH. Infrared Imaging System: An instrument that converts the spatial variations in infrared radiance from a surface into a two-dimensional image of that surface, in which variations in radiance are displayed as a range of colors or tones.

- II. Infrared Thermography: The process of generating thermal images that represent temperature and emittance variations over the surfaces of objects.
- JJ. Instantaneous Field of View (IFOV): The smallest angle, in milliradians, that can be instantaneously resolved by a particular infrared imaging system.
- KK. Intentional Opening: Openings within the envelope that are designed to remain open to atmosphere during the building's operation. Intentional openings include building components such as air intake, exhaust louvers, pressure relief dampers or louvers, dryer and exhaust vents, combustion flues and any other leakage site that is designed to remain open during the building's normal operation. Windows, doors, conduits, mechanical piping, sleeves and structural steel are not intentional openings.
- LL. M³/S75: The airflow leakage value in cubic meters per second at a test pressure of 75 Pascals (Pa). The subscript value defines the test pressure.
- MM. Masonry Veneer: Frame construction with a non-load bearing exterior masonry surface.
- NN. May: Used to indicate a course of action that is permissible as determined by the NEBB Certified BET Firm.
- OO. Minimum Resolvable Temperature Difference (MRTD): A measure of the ability of the operators of an infrared imaging system to discern temperature differences with that system. The MRTD is the minimum temperature difference between a four-slot test pattern of defined shape and size and its blackbody background at which an average observer can discriminate the pattern with that infrared imaging system at a defined distance.
- PP. N/A: Not Available, Not Applicable, or Not Accessible. The simple notation "N/A" without definition is not allowed.
- QQ. NEBB Certified BET Firm: A NEBB Certified BET Firm is a firm that has met and maintains all the requirements of the National Environmental Balancing Bureau for firm certification in Building Envelope Testing and is currently certified by NEBB. A NEBB Certified BET Firm shall employ at least one NEBB Certified BET Professional in a full-time management position.
- RR. NEBB Certified BET Report: The data presented in a NEBB Certified BET Report accurately represents system measurements obtained in accordance with the current edition of the NEBB Procedural Standards for Building Envelope Testing. A NEBB Certified BET Report does not necessarily guarantee that systems measured conform to the design requirements or stated guidelines. The report is an accurate representation of the measured results only.
- SS. NEBB Certified BET Professional: A NEBB Certified BET Professional is a full-time employee of the firm in a management position who has successfully passed the professional level written and practical qualification examinations and maintains the professional re-qualification requirements of NEBB.
- TT. Nominal Airflow Rate: The flow rate indicated by the blower door using the manufacturer's calibration coefficients (m³/s or ft³/min, CFM).
- UU. Orifice Blower Door: A blower door in which airflow rate is determined by means of the pressure drop across an orifice or nozzle.
- VV. Open: The condition of a building used to test the ventilation rate in a occupied building with intentional openings unsealed.
- WW. Precision: The ability of an instrument to produce repeatable readings of the same quantity under the same conditions. The precision of an instrument refers to its ability to produce a tightly grouped set of values around the mean value of the measured quantity.
- XX. Precision Index of the Average: The sample standard deviation divided by the square root of the number of samples.
- YY. Pressure Station: A specified induced change in the building pressure difference from the initial zero-flow building pressure difference (Pa, in. w.c.).
- ZZ. PPM: Parts per million

- AAA. Procedure: The approach to and execution of a sequence of work operations to yield a repeatable and defined result.
- BBB. Range: The upper and lower limits of an instrument's ability to measure the value of a quantity for which the instrument is calibrated.
- CCC. Resolution: The smallest change in a measured variable that an instrument can detect.
- DDD. Shall: The term is used to indicate mandatory requirements that must be followed in order for the project to become a NEBB certified project. Work must conform to these standards and procedures and no deviation is permitted: In the event unique circumstances prevent a required action from being fulfilled, a notation shall be included in the BET report explaining the reason that the requirement was not completed. For example, such notation could be one of the following: Not Available, Not Applicable, or Not Accessible. The simple notation "N/A" without definition is not allowed.
- EEE. Should: The term is used to indicate that a certain course of action is preferred but not necessarily required.
- FFF. Single Zone: A space in which the pressure differences between any two places, differ by no more than 5% of the inside to outside pressure difference.
1. Discussion: A multi-room space that is interconnected within itself with door- sized openings through any partitions or floors is likely to satisfy this criterion if the fan airflow rate is less than 3 m³/s (6357 ft³/min).
- GGG. Specified Test Pressure: The required induced differential static air pressure across the specimen.
- HHH. Standard: A required qualification, action, or result for BET work.
- III. Standard Operating Procedure: An internal policy prepared by each BET firm and / or prepared by the Owner/Buyer. Procedures are written to provide guidance, direction, JJJ. and step-by-step details relating to issues such as safety, testing protocols, acceptance criteria, etc. NEBB BET Firm SOP's shall be utilized in an absence of SOP's prepared by the Owner.
- KKK. Test Pressure Difference or Differential: The measured pressure difference across the building envelope, expressed in Pascals (Pa) or in inches of water column (in. w.c.).
- LLL. Test Zone: A building or a portion of a building that is configured as a single zone for the purpose of this standard. For detached dwellings, the test zone envelope normally comprises the thermal envelope.
- MMM. Test Zone Envelope: The barrier or series of barriers between a test zone and the outdoors and internal spaces not included in the test zone.
- NNN. Testing: The use of specialized and calibrated instruments to measure fluid quantities, temperatures, pressures, rotational speeds, electrical characteristics, velocities, and sound and vibration levels,
- OOO. Testing, Adjusting, and Balancing (TAB): A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are addressed in the current edition of the NEBB "PROCEDURAL STANDARDS FOR THE TESTING, ADJUSTING AND BALANCING OF ENVIRONMENTAL SYSTEMS".
- PPP. Thermal Pattern: A representation of colors or tones that indicate surface temperature and emittance variation.
- QQQ. Thermogram: A recorded image that maps the apparent temperature pattern of an object or scene into a corresponding contrast or color pattern.
- RRR. Total air flow: The volume of air flowing per unit of time through the test zone inclusive of the air flowing through the test zone under differential test pressure conditions converted to standard conditions for temperature and density.

SSS. Unit of Length: The sum of all perimeters of operable ventilators, sash, or doors that are contained in the test specimen based on overall dimensions of such parts. Where two such operable parts meet two adjacent lengths of perimeter shall be counted as only one length.

TTT. Zone: A volume of building served by a single ventilation system. For buildings with natural ventilation only, the whole building shall be considered a zone.

1.03 BET FIRM QUALIFICATIONS

- A. The BET Firm shall be NEBB Certified in Building Envelope Testing. Building envelope testing shall be conducted by the NEBB Certified BET Professional or by technicians directly under the supervision of the NEBB Certified BET Professional.

1.04 BET FIRM SUBMITTALS

- A. Qualification Data: When requested, submit 2 copies of evidence that BET firm and this Project's BET team members meet the qualifications specified in Sub-section 1.3 BET Firm Qualifications.
- B. BET Agenda: When requested, submit 2 copies of the BET Agenda. Include a complete set of report forms intended for use on this Project.
- C. Certified BET Reports: Submit a final BET report in accordance with the current edition of the NEBB Procedural Standards for Building Envelope Testing.

1.05 QUALITY ASSURANCE

- A. The NEBB Certified BET Firm shall submit a copy of the firm's NEBB BET Certification.
- B. When requested, the NEBB Certified BET Firm shall provide the NEBB Certificate of Conformance Certification.
- C. BET Report Forms: Prepare report forms in accordance with the requirements from the current edition of the NEBB Procedural Standards for Building Envelope Testing.
- D. Instrumentation Calibration: Calibration of instruments shall be in accordance with the current edition of the NEBB Procedural Standards for Building Envelope Testing.

1.06 CONSTRUCTION TEAM RESPONSIBILITY TO BET AGENCY

- A. Provide the NEBB Certified BET Firm with a conformed set of contract documents that pertain to the air barrier (drawings, specifications, and approved submittals), including all current approved change orders and contract modifications.
- B. Develop a project schedule with the input of the NEBB Certified BET Firm that coordinates the work of other disciplines and provides adequate time in the construction process to allow successful completion of the building envelope testing and remedial work.
- C. Notify the NEBB Certified BET Firm of all schedule changes.
- D. Ensure that the building enclosure is complete, including but not limited to, all structural components, the air barrier and vapor barrier complete, windows and doors installed, door hardware complete, door sweeps and weather stripping complete, floor and ceilings complete. Ensure that the building enclosure and components are complete and operational such that the performance of the building envelope tests would not be adversely affected.
- E. Provide all project preparation and setup for the BET tests, this may include but is not limited to temporary sealing of intentional openings, removing ceiling tile, opening access doors, opening interior doors and affixing them so they cannot close during the tests. This may include preparation of adjoining spaces. This would also include staging the building so no people will be opening doors or windows during the BET tests.
- F. Provide temporary or permanent power for BET tests.
- G. For building pressure test method using the Building Air Moving Equipment systems:
 - 1. Ensure that all necessary building systems are complete and are operating in a safe manner.

2. Complete the installation of permanent electrical power systems serving the building systems. Such electrical systems shall be properly installed in accordance with all applicable codes to ensure the safety of all construction personnel.
3. Perform startup of all building systems in accordance with manufacturers' recommendations.
4. Complete the installation, programming, calibration and startup of all building control systems.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper BET of systems and equipment. Contract Documents are defined in the General and Supplementary Conditions of Contract. Report deficiencies discovered.

3.02 PRELIMINARY PROCEDURES FOR BUILDING ENVELOPE TESTING

- A. Conduct the Preliminary Procedures in accordance with procedures contained in the current edition of the NEBB Procedural Building Envelope Testing and this section. This includes that the Design Professionals and/or the Owner are responsible to define the objectives and the acceptance criteria for the testing. Additionally, they are responsible to define which air leakage test(s) are to be performed by the NEBB Certified BET Firm.

3.03 INSTRUMENTS AND EQUIPMENT

- A. Instruments and equipment necessary to perform Building Envelope Testing shall meet the requirements of the current edition of the NEBB Procedural Building Envelope Testing and this section.

3.04 COMMON TEST PROCEDURES FOR BUILDING ENVELOPE TESTING

- A. Perform Building Envelope Testing on all systems to be tested according to the procedures contained in the current edition of the NEBB Procedural Building Envelope Testing and this section. As stated in Section 3.1 above, the test method shall be defined by the Design Professionals and /or the Owner. The procedures listed below apply to both test methods and shall be followed when performing either the Blower Door Test Method or the Building Air Moving Equipment System Test method.
- B. Establish the exterior test zone envelope. This is accomplished by defining the test zone envelope and ensuring it is appropriate for the goals of the test.
- C. Select the appropriate test envelope condition; open or closed. For the closed condition, close all operable openings and seal other intentional openings to evaluate envelope air tightness. For the open condition, leave all operable openings in the normal operating condition of the building's occupancy to assess the envelope's effect on natural air change rates. The closed condition shall be the default option if no compelling reason exists to utilize the open condition.
- D. Adjust all building components in accordance with Table 1 below and/or per the specification. For testing a building in the closed condition, close all operable openings and seal other intentional openings to evaluate envelope air tightness. For occupied condition, leave all operable openings in the normal operating condition of the building's occupancy.
- E. Prior to conducting the test, perform the preliminary procedures identified in Section 3.1. If the performance of these preliminary procedures is the responsibility of others, survey the site and building to insure that all preliminary procedures have been properly completed.
- F. Establish the interior test zone. This is accomplished by opening all interior building doors including fire doors, corridor doors, pass-throughs, in the test zone so that a uniform inside pressure is created within the zone. If there are hard ceilings with access doors, all access doors are to be open.

- G. Measure and record the wind velocity and direction on the windward side of the building at a distance 30 to 50 feet away from the buildings. Preferred test conditions are wind velocity of 0 to 2 m/s (0 to 4 mph). If the surrounding building induced winds or the wind is gusting more than 4 mph above the steady state wind then the test should not be performed due to accuracy limits.
- H. Measure and record the outside temperature. Preferred test conditions are outside temperatures from 2°C to 35°C (35°F to 95°F). If test is performed below 2°C (35°F) there is a possibility of freezing pipes. If the test is performed above 35°C (95°F) damaging finished materials, building finishes or worker safety becomes a concern.
- I. Measure and record the indoor and outdoor temperatures at the beginning of the test so that their average values can be calculated.
- J. Determine the height & temperature factor. The factor is the product of the absolute value of the indoor/outdoor air temperature difference multiplied by the building height. If the factor is less than 200 m°C (1,180 ft°F), perform the test. If the factor is greater than 200 m°C (1,180 ft°F), the stack effect may influence the building envelope pressure difference and will reduce the accuracy of the result. When the factor is greater than the above stated values, the entire test shall be performed both under a pressurization and depressurization modes utilizing ASTM E 1827 Blower Door Test Method and the minimum induced test pressure shall be 25 Pa (0.10 in.w.c.).

K. TABLE 1: Recommended Pre-Test Building Preparations

	Closed	Open
Exhaust fans with back draft dampers	Sealed	No preparation
Supply fans with back draft dampers	Sealed	No preparation
Furnace room door for furnace outside test zone	Closed	Closed
Combustion air intake damper for boilers	Closed	Closed
Outside air intake damper for Air Handling Unit inside test zone	Sealed	Closed
Outside air intake for Air Handling Unit inside test zone without damper	Sealed	No preparation
Exhaust, Air Handling Units, Make-up Air Units, Energy Recovery Units, Supply fans, Furnaces, Fan Coil Units, Boilers, Gas Hot Water Heaters, All equipment requiring combustion air (including kitchen equipment, HVAC, etc.)	Off	Off
Fan inlet grilles with motorized damper	Closed	Closed
Fan inlet grills without motorized damper	Sealed	No preparation
Ventilators designed for continuous use	Sealed	Sealed
Supply and exhaust ventilator dampers	Sealed	Held closed
Clothes dryer	Off	Off
If clothes dryer is connected to the dryer vent	No preparation	No preparation
Vented combustion appliance	Off	Off
Ventilation to other zones	Sealed	Sealed
Windows	Closed and Latched	Closed and Latched
exterior doors	Closed and Latched	Closed and Latched
Window air conditioners	Sealed	No preparation

Through the wall air conditioners outside air vent	Sealed	No preparation
Openings leading to outside the test zone	Closed	Closed
All HVAC ducts going from inside the test zone to outside the test zone and back into the test zone	Sealed	Sealed
All electrical conduits going from inside the test zone to outside the test zone and back into the test zone	Sealed	Sealed
Openings within the test zone	Open	Open
Floor drains and plumbing traps	Filled	Filled
Elevator pressure relief openings	Closed	Closed
Elevator Doors	Closed	Closed
Elevator Door Frame spacing between the elevator door and frame if the elevator connects an area outside the air barrier	Sealed	Open
Elevator Door Frame spacing between the elevator door and frame if the elevator connects an area within the air barrier	Open	Open
Rooms with Exterior, non-ducted louvers (interior doors)	Closed	Closed
Loading Dock Doors (interior doors)	Closed	Closed

- L. Open all doors, windows, and other openings that connect portions of the building outside the test zone envelope with the outdoors. For example, if the building is a combination of office and warehouse, and only the office portion of the building is to be tested then open the warehouse doors. If the entire office and warehouse is to be tested, then all office and warehouse doors are to be closed to the outside but the doors between the office and warehouse are to be open.
- M. Remove sufficient ceiling tiles for lay-in ceilings, or open sufficient access panels for hard ceilings, were the pressure between the ceiling cavity and the room is equalized to within +/- 10% of the building envelope test pressure.
- N. Record the condition of the building's components including windows, exterior doors, interior doors, stairwell doors, elevator doors, walls, access doors, roof and floor (i.e. sealed or unsealed, open or closed, etc.).

3.05 BLOWER DOOR TEST METHOD PROCEDURES

- A. Install the blower door in an entry door, window or vent opening. The openings must be sealed or taped to avoid leakage at these points. Orient the blower door appropriately for depressurization or pressurization as required. The installation should have minimal obstructions of airflow into and out of the building.
- B. Install the pressure measuring instrument across the building envelope. It is good practice to use more than one location across the building envelope for pressure measurement. Preferred locations for exterior pressure measurement locations should be those that avoid extremes of exterior pressures. A good location avoids exterior corners and complex architectural features and should be close to the middle of the exterior wall.
- C. In addition, buildings more than 4 floors or 12.2 m (48.0 ft) in height, shall have pressures measured at a minimum of 2 locations or every 4 floors, whichever is greater.

- D. Average 10 baseline pressures points of 10 seconds per point, where the variation between any point and the mean must be no greater than 1 Pascal.
- E. Zero the pressure sensor by connecting the differential ports together. Note: Some blower doors may perform this or an equivalent step automatically. Follow the manufacturer's instructions accordingly.
- F. Before beginning the test, measure and record the baseline building differential pressure across the airflow measurement device with the blower off. If a damper is used to control airflow, it should be in a fully closed position for the baseline building pressure measurements. If the air moving equipment employs a blank-off plate, it should be fully closed for the baseline building tests.
- G. Start the blower door fans and pressurize / depressurize the building to the highest specified induced pressure differential. Measure and record the building envelope differential pressure.
- H. Pressure readings are to be taken to produce an accurate average building pressure. Fluctuations in pressure due to wind require pressure measurements to be taken on both the windward and leeward side of the building and averaged. If the buildings height or building configuration causes internal building pressure fluctuations, then interior pressure shall be taken and averaged.
- I. Perform a minimum of 10 building envelope pressure differentials and their corresponding airflow measurements for both the pressurization mode and the depressurization mode (a total of 20 measurements). The measurements shall be taken over a minimum of 10 seconds. The range of the building envelope pressure differences should be from a minimum of 25 Pa (0.10 in. w.c.) to maximum of 75 Pa (0.30 in. w.c.). Use increments of 5 Pa (0.02 in. w.c.) for the full range of building envelope pressure differences. (i.e. 25, 35, 40, 45, 50, 55, 60, 65, 70, 75 Pa) or (0.10, 0.14, 0.16, 0.18, 0.20, 0.22, 0.24, 0.26, 0.28, and 0.30 in. w.c.).
- J. Conduct tests at each building envelope pressure differential. Allow the fan and instrumentation to stabilize prior to taking any measurements. At each pressure differential, measure the airflow rate and the pressure differences across the envelope over at least a 10 second time interval. Average the airflow and pressure differentials over this time interval. For each building envelope pressure differential test, collect data for both pressurization and de- pressurization.
- K. After conducting the pressure tests, measure and record the baseline building differential pressure across the airflow measurement device with the fan off and sealed.
- L. Report the building envelope pressure differential, and the airflow for each test and the beginning and ending baseline building differential pressure.
- M. Subtract the average baseline differential pressure from the building envelope differential pressure and report this value for both pressurization and depressurization.
 - 1. NOTE: Some equipment may perform this step, or an equivalent step, automatically follow the manufacturer's instructions accordingly.
- N. Measure and record the indoor and outdoor temperatures at the end of the test so that their average values can be calculated.
- O. Repeat steps 8.2.3.9 through 8.2.3.14 for the alternate pressurization.

3.06 BUILDING AIR MOVING EQUIPMENT SYSTEM TEST METHOD PROCEDURES

- A. This test method can be utilized for pressurization or depressurization testing of the building envelope; however, the test is not as accurate as the ASTM 779 that is the blower door tests. This test should not be considered an equal to those tests. This is due to several reasons; none of which pertain to the abilities of the NEBB Certified BET Firm or the capabilities of the required instrumentation and equipment to perform the Building Air Moving Equipment Test Method. The major features that could affect the ability to perform the test and the accuracy of this test relate to the following:
 - 1. The ability of the installed HVAC equipment and systems to mechanically bring in sufficient amounts of outside air for pressurization and / or mechanically exhaust sufficient amounts of building air for depressurization.

2. The ability of the installed mechanical equipment and systems to generate the required airflows and associated static pressures to properly conduct the test
 3. The configuration of the equipment installed in the system to accurately measure airflow and static pressures. The most accurate method to measure airflow in the field is by performing a duct traverse using a Pitot tube and digital manometer. To accurately perform a traverse measurement requires an adequate length of straight duct downstream from any equipment, fittings or obstructions to provide an ideal duct traverse plane in which to obtain an accurate duct traverse.
 4. The ability of the most building air moving equipment systems to be manipulated in order to produce meaningful building pressure gradients
- B. When using the Building Air Moving Equipment System Method Test, the NEBB Certified BET Firm shall follow NEBB TAB procedures to measure the airflow. The preferred method to measure the airflow is by the traverse method that complies with NEBB procedures. If airflow monitoring stations are used, it is the NEBB firm's responsibility to verify the accuracy of the airflow monitor.
- C. If neither the traverse method nor the use of airflow monitoring stations is available, then three (3) alternate methods of measuring airflow per the NEBB TAB procedures shall be used. The three different methods should correlate flow to each other within 10%.
- D. The Building Air Moving Equipment Test Method consists of taking two sets of data at two different building pressures. The first set of data, identified as P1, is taken the higher differential pressure value. The second set of data identified as P2, is taken the lower differential pressure value. The criteria limits for values of P1 and P2 values shall be as follows:
1. P1 value shall be between 75 and 35 Pa (0.30 in.w.c. and 0.14 in.w.c).
 2. P2 value shall be 1/3 of the P1 value and shall be between 25 and 10 Pa (0.10 in.w.c. and 0.04 in.w.c).
 - a. If the above criteria cannot be achieved, then the Blower Door Test Method SHALL be performed utilizing both the pressurization and the depressurization modes.
 - b. A minimum of five replicate measurements of building envelope differential pressure and the corresponding airflow shall be taken at each value of P1 and P2. Thus, a total of 10 pressures measurements and 10 airflow measurements are required.
- E. Install the pressure measuring instrument across the building envelope. It is good practice to use more than one location across the building envelope for pressure measurement. Preferred locations for exterior pressure measurement locations should be those that avoid extremes of exterior pressures. A good location avoids exterior corners and complex architectural features and should be close to the middle of the exterior wall.
- F. In addition, buildings more than 4 floors or 12.2 m (48.0 ft) in height shall have pressures measured at a minimum of 2 locations or every 4 floors, whichever is greater.
- G. The pressures from each location should be averaged, typically using a manifold. Average the pressures over at least a 10 second time period.
- H. Zero the pressure sensor
- I. Measure and record the baseline building differential pressure by closing the dampers or otherwise seal off the fan(s) that will be creating the test flows.
- J. Conduct five (5) tests at the P1 building envelope pressure differential. Allow the fan and instrumentation to stabilize prior to taking any measurements. Measure the airflow and the building pressure differential simultaneously. Repeat until all 5 airflow measurements and 5 envelope pressure differential measurements have been taken. Each of the flow and corresponding pressure differentials measurements must occur within 5 minutes of each other.
- K. Repeat the entire procedure at P2 and conduct five (5) tests at the P2 building envelope pressure differential. Allow the fan and instrumentation to stabilize prior to taking any measurements. Measure the airflow and then measure the building pressure differential. Repeat until all 5 airflow measurements and 5 envelope pressure differential measurements

have been taken. Each of the flow and corresponding pressure differentials measurements must occur within 5 minutes of each other.

- L. Average the 5 airflow measurements to each other and average the 5 pressure differentials to each other for the data obtained at P1.
- M. Average the 5 airflow measurements to each other and average the 5 pressure differentials to each other for the data obtained at P2.
- N. Measure and record Baseline Building Pressure Differential at the end of the test.
- O. Measure and record the indoor and outdoor temperatures at the end of the test so that their average values can be calculated.
 - 1. NOTE: It is advisable to check that the condition of the building envelope has not changed after each pressure reading, for example, that sealed openings have not become unsealed or that doors, windows, or dampers have not been forced open by the building envelope pressure testing.

3.07 DATA ANALYSIS AND CALCULATIONS FOR BOTH THE BLOWER DOOR TEST METHOD AND THE BUILDING AIR MOVING EQUIPMENT SYSTEM TEST METHOD

- A. If the airflow measuring instrumentation being utilized does not provide the volumetric airflow at the temperature and pressure of the air flowing through the flowmeter during the test, the airflow values must be corrected for density.
- B. When correcting the readings of the airflow measurements for density, the preferred method is to use the temperature and the actual barometric pressure. A method to correct for density using temperature and elevation is available but does not account for weather impact. In the pressurization mode this will be the outside air temperature and barometric pressure. For depressurization test this will be the inside air temperature and barometric pressure.
- C. Average the baseline building envelope pressures measured before and after the flow measurements. Subtract the average from the measured envelope differential pressures readings to determine the corrected induced envelope pressures.
- D. Plot the measured airflow against the corrected induced pressure differences on a log-log plot to complete the air leakage graph for both pressurization and de-pressurization (for an example, see Appendix C, Section C.10 of the current edition of the NEBB Procedural Building Envelope Testing).
- E. Use the data to determine the air leakage coefficient.
- F. Correct the air leakage coefficient (C) to standard conditions. Use the data to determine the pressure exponent separately for pressurization and depressurization.
- G. If the pressure exponent (n) is less than 0.45 or greater than 0.8, then the test is invalid and shall be repeated.
- H. Use a log-linearized linear regression technique and the associated equation in Appendix C, Section C.5.5 of the current edition of the NEBB Procedural Building Envelope Testing, where Q is the airflow rate, in m³/s (cfm), and DP is the differential pressure in Pa (in.w.c.). In determining the fit of the above equation, the confidence intervals of the derived air leakage coefficient (C) and pressure exponent (n) should be calculated.
- I. The effective leakage area, AL, can be calculated from the corrected air leakage coefficient and the pressure exponent using a reference pressure (DPr). Calculate the leakage areas separately for pressurization and depressurization.
- J. To obtain a single value for flow coefficient, pressure exponent and leakage area for use in other calculations, the average of these values from the pressurization and depressurization envelope flows and pressure differences, with their offsets removed, may be combined together. This combined data set then is used in the same way as each individual data set to obtain C, n, and AL for the combined data. If the flow at a specified pressure difference, such as 50 Pa, is desired, it should be determined using the derived C and n and the specified reference pressure.

- K. Determine the upper confidence limits for the derived values which shall not exceed the leakage rate per square footage of air barrier.

3.08 ACCEPTANCE

- A. The acceptance criteria should be as specified in the contract documents or as agreed to between the Owner / Buyer and the NEBB Certified BET Firm.

3.09 FINAL REPORT

- A. The final report shall be in accordance with the requirements of the current edition of the NEBB Procedural Standards for the Building Envelope Testing.

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, ceiling, and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

PART 3 EXECUTION

3.01 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Install boards horizontally on foundation perimeter.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.02 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.

3.03 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof 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.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

**SECTION 072126
BLOWN INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior Walls: Blown insulation pneumatically placed into wall spaces through access holes.
- B. Ceiling and Attic: Blown insulation pneumatically placed into joist spaces through access holes.

1.02 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance criteria, and limitations.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Applications: Provide blown insulation in attic, exterior walls, and ceiling as indicated on drawings.
- B. Blown Insulation: ASTM C739, cellulosic fiber type, nodulated for pour and bulk for pneumatic placement.
 - 1. Installed Thickness: As indicated on drawings.

2.02 ACCESSORIES

- A. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing.
 - 1. Material: Polyvinyl chloride (PVC).
 - 2. Roof Joist/Truss Spacing: 16 inch on center, nominal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer's instructions.
- B. Place insulation against baffles, and do not impede natural attic ventilation to soffit.
- C. Completely fill intended spaces leaving no gaps or voids.

END OF SECTION

**SECTION 072700
AIR BARRIERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air barriers.

1.02 DEFINITIONS

- A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.04 SUBMITTALS

- A. Product Data: Provide data on material characteristics, performance criteria, and limitations.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Evaluated Air Barrier Assemblies; www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier Sheet, Mechanically Fastened:
 - 1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
 - 3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.
 - 4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, Class A, when tested in accordance with ASTM E84.
 - 5. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2-1/2 inches wide, compatible with sheet material; unless otherwise indicated.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
 - 2. Color: Green.
- C. Threshold Flashing: Closed-cell foam tape with rubberized adhesive membrane; seals subfloor under threshold.

1. Width: 5-1/2 inches.
2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Mechanically Fastened Sheets - On Exterior:
 1. Install sheets shingle fashion to shed water, with seams generally horizontal.
 2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
 3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
 4. Attach to framed construction with fasteners extending through sheathing into framing, and space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
 5. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
 6. Where stud framing rests on concrete or masonry substrate, extend lower edge of air barrier sheet at least 4 inches below bottom of framing and seal to substrate with sealant or approved mounting tape.
 7. Install air barrier underneath jamb flashings.
 8. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.
- E. Openings and Penetrations in Exterior Air Barriers:
 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
 4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.02 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

**SECTION 073113
ASPHALT SHINGLES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection, underlayment, and valley protection.

1.02 SUBMITTALS

- A. Product Data: Provide data indicating material characteristics, performance criteria, limitations, and ____.
- B. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern.
- C. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 WARRANTY

- A. Provide 5-year manufacturer's warranty for wind damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Asphalt Shingles:
 - 1. Certaineed; 30 Year architectural shingle
 - a. Color: Driftwood.
 - 2. Tamko; 30 year architectural shingle.
 - a. Color: Weatherwood
 - 3. Substitutions: Not permitted.

2.02 ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8-inch head diameter, 12-gauge, 0.109-inch nail shank diameter, 1-1/2 inches long and complying with ASTM F1667/F1667M.
- B. Plastic Ridge Vents: Extruded plastic with vent openings do not permit direct water or weather entry; flanged to receive shingles.

PART 3 EXECUTION

3.01 INSTALLATION

END OF SECTION

**SECTION 074646
FIBER-CEMENT SIDING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiber-cement siding.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.
- C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

1.04 FIELD CONDITIONS

- A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

- A. Lap Siding, S-1: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Style: Standard lap style.
 - 2. Texture: Simulated cedar grain.
 - 3. Length: 12 feet, nominal.
 - 4. Width (Exposure): 8 inches.
 - 5. Thickness: 5/16 inch, nominal.
 - 6. Finish: Factory applied primer.
 - 7. Warranty: 50 year limited; transferable.
- B. Lap Siding S-2: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Style: Standard lap style.
 - 2. Texture: Simulated cedar grain.
 - 3. Length: 12 feet, nominal.
 - 4. Width (Exposure): 6 inches.
 - 5. Thickness: 5/16 inch, nominal.
 - 6. Finish: Factory applied primer.
 - 7. Warranty: 50 year limited; transferable.
- C. Panel Siding, SP-1: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Texture: Smooth.
 - 2. Length (Height): 96 inches, nominal.

3. Width: 48 inches.
 4. Thickness: 5/16 inch, nominal.
 5. Finish: Factory applied primer.
 6. Warranty: 50 year limited; transferable.
- D. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
1. Texture: Smooth.
 2. Length: 96 inches, nominal.
 3. Width: 48 inches.
 4. Thickness: 5/16 inch, nominal.
 5. Finish: Factory applied primer.
 6. Manufacturer: Same as siding.

2.02 ACCESSORIES

- A. Trim: Same material and texture as siding.
- B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches, minimum.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect surrounding areas and adjacent surfaces during execution of this work.
- B. Install Sheet Metal Flashing:
1. Above door and window trim and casings.
 2. Above horizontal trim in field of siding.

3.02 INSTALLATION

- A. Install siding in accordance with manufacturer's instructions and recommendations.
1. Read warranty and comply with terms necessary to maintain warranty coverage.
 2. Use trim details as indicated on drawings.
 3. Touch up field cut edges before installing.
 4. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- E. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.
- F. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- G. Exterior Soffit Vents: Install in accordance with manufacturer's written instructions and at locations indicated on drawings; provide vent area as indicated on drawings.
- H. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

PART 2 PRODUCTS

2.01 SHEET MATERIALS

2.02 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 flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 GUTTERS AND DOWNSPOUTS

- A. Gutters: SMACNA (ASMM) Rectangular profile.
- B. Downspouts: Rectangular profile.
- C. Gutters and Downspouts: Size indicated on drawings.
- D. Seal metal joints.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer Type: Zinc chromate.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Secure gutters and downspouts in place with concealed fasteners.
- E. Slope gutters 1/4 inch per 10 feet, minimum.

END OF SECTION

**SECTION 077123
MANUFACTURED GUTTERS AND DOWNSPOUTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-finished aluminum gutters and downspouts.

1.02 SUBMITTALS

- A. Product Data: Provide data on prefabricated components.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pre-Finished Aluminum Sheet: ASTM B209/B209M; 0.032 inch thick.
 - 1. Finish: Plain, shop pre-coated with modified silicone coating.
 - 2. Color: As indicated.

2.02 COMPONENTS

- A. Gutters: CDA rectangular style profile.
- B. Downspouts: CDA rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Gutter Supports: Straps.
 - 2. Downspout Supports: Straps.
- D. Fasteners: Galvanized steel, with soft neoprene washers.

2.03 FABRICATION

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.04 FINISHES

- A. Modified silicone polyester coating: Baked enamel system, comply with AAMA 2603.

2.05 ACCESSORIES

- A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
 - 1. Configuration: Angular.
 - 2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

- A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Slope gutters 1/4 inch per foot .
- C. Connect downspouts to downspout boots at 6 inches above grade. Seal connection watertight.
- D. Connect downspouts to storm sewer system. Seal connection watertight.

END OF SECTION

**SECTION 078400
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.03 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

1.04 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
- B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
- C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
- D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.03 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.04 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

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 SUBMITTALS

- A. Product Data: Submit manufacturer's technical datasheets for each product to be used; include 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.
- B. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
 - d. Joints where sealant installation is specified in other sections.
 - e. Joints between suspended ceilings and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
 - 1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 1. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
- D. Interior Wet Areas: Bathrooms and kitchens; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.02 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. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 - 2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 3. Color: To be selected by Architect from manufacturer's standard range.
- B. 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. Color: To be selected by Architect from manufacturer's standard range.
- C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
 - 1. Color: To be selected by Architect from manufacturer's standard range.

- D. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.03 ACCESSORIES

- A. 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. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install 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 081113
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Fire-rated hollow metal doors and frames.
- C. Thermally insulated hollow metal doors with frames.

1.02 SUBMITTALS

- A. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.02 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
 - 2. Door Thickness: 1-3/4 inches, nominal.
- B. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
 - 2. Door Thickness: 1-3/4 inches, nominal.
- C. Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.

- d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
- 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
- 3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.
- 4. Door Thickness: 1-3/4 inches, nominal.

2.03 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Knock-down type.
 - 1. Weatherstripping: Separate, see Section 087100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
- D. Door Frames, Fire-Rated: Knock-down type.
 - 1. Fire Rating: Same as door, labeled.

2.04 FINISHES

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

2.05 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 087100.
 - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

3.03 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

**SECTION 081250
APPLIED CASING STEEL DOOR FRAMES**

PART 1 - GENERAL

1.01 WORK INCLUDED

1.02 SUBMITTALS

- A. Product Data: Indicate frame material, gauge, configuration and finishes.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Timely Industries, A Division of SDS Industries, Inc., 10241 Norris Avenue, Pacoima, CA, 91331-2292; Phone toll free: 800-247-6242; Fax: 818-492-3530. Web site: www.timelyframes.com.
- B. Frames: Provide interior frames shown on drawings and door schedule.
- C. Substitutions: Refer to Section 016000

2.02 FRAMES

- A. Frame Material: Hot dipped galvanized steel, for interior frames in normal atmospheric exposures.
- B. Frame Throat Opening: As shown on plan details to suit finished wall thickness.
- C. Where shown, fire rated frames to have kerf formed into frame profile for installation of smoke gasket or weatherstrip material
- D. Frame Profile - Unequal Rabbet profile, standard with manufacturer
1. AK" Series, 0.9 mm (20 guage) thick, with kerf for door seal/gasket, fire rated room entry, exterior locations - available as prime finish only (Specify only if using field applied finishes)
- E. Side Light Frames: 1.2 mm (18 guage) Verify glass dimensions for fire rated sidelights and borrowed lights
- F. Casings
1. Wood (Provided by Others) - Refer to Section 064100 - Architectural Woodwork. Provide frames with nail holes and oval slots only.

2.03 FRAME REINFORCEMENT AND ACCESSORIES

- A. Silencers: TA-5 vinyl, clear stick-on type. Silencers not required on Kerfed frames or frames schedule to receive stop mounted gasket or weatherstrip
- B. Glass Stops: TA-14 removable rolled steel, shape, butted ends. Pre-punch and countersink for flat head tek screws.
- C. Installation fasteners (Provided by others)
1. Interior Frames: #6 Drywall type length sufficient to penetrate studs or structure at least $\frac{1}{2}$ ".

2.04 FABRICATION

- A. Openings for single swing, pair, borrowed light and sidelight frames to be pre-cut, notched and fabricated at the manufacturer's facility. For fire rated and exterior openings, provide kerf at stop for installation of smoke gasket or weatherstrip
- B. Provide minimum 14 guage hinge reinforcement plate tapped for machine screws supplied with hinges. Hinge plate to be mechanically attached to hinge emboss on frame.
- C. Provide notches, tabs and/or stops for positive alignment of frame parts at all corners
- D. Mullions to be notched as required to provide tight joints

- E. Provide manufacturer's standard mullion brackets for positive connection of frame and mullion parts
- F. Provide manufacturer's standard steel glass stop pre-cut to exact length. Fire rated glazed openings to have hole for installation screw within 2" of each end of stop piece
- G. Provide insert channel full width of borrowed lights installed on finish floor. Provide full width head channel for ceiling height units.
- H. Attach approved mylar label to each fire-rated frame indicating fire rating details

2.05 FINISHING

- A. Frame Units: Prefinished with factory applied impact resistant, polyurethane baked enamel finish or optional electrostatic applied water based paint system
- B. Colors:
 - 1. High Definition White Primer - for AK series frames only

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify acceptability of existing conditions before starting work.
- B. Verify that opening sizes and wall thicknesses are within specified tolerances. Verify that all finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

- A. Install frames in accordance with manufacturer's requirements.
- B. Anchor frames with screws located at every casing clip or every 11" as shown on manufacturer's instructions. Field verify quantity and location of fasteners prior to installing casing.
- C. Coordinate installation of glass and glazing in glazed units.

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 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. 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.

1.03 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.

PART 2 PRODUCTS

2.01 DOORS AND PANELS

- A. Doors: See drawings for locations and additional requirements.

2.02 DOOR AND PANEL CORES

- A. 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.

2.03 DOOR FACINGS

2.04 DOOR CONSTRUCTION

- A. Cores Constructed with stiles and rails:
- B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- D. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

PART 3 EXECUTION

3.01 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. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.

3.02 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

**SECTION 081433
STILE AND RAIL WOOD DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood doors, stile and rail design; fire rated and non-fire rated.

1.02 SUBMITTALS

- A. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria.

1.03 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 DOORS

- A. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.
- B. Interior Doors: 1-3/8 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Opaque finish.
- C. Wood veneer facing for field opaque finish.
- D. Design Style/Pattern: Manufacturer's standard 6 panel.

2.02 DOOR AND PANEL FACINGS

- A. Materials for Opaque Finishes: Hardboard faces.
- B. Adhesive: Type I - Waterproof.

2.03 DOOR CONSTRUCTION

- A. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standards.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Field-Finished Doors: Trimming to fit is acceptable.
 - 1. Adjust width of non-rated doors by cutting equally on both jamb edges.
 - 2. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
 - 3. Trim fire-rated doors in strict compliance with fire rating limitations.
- C. Machine cut for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.

3.02 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

**SECTION 083100
ACCESS DOORS AND PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ceiling-mounted access units.

1.02 SUBMITTALS

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

1.03 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Fire-Rated Ceiling-Mounted Units:
 - 1. Ceiling Fire-Rating: As indicated on drawings.
 - 2. Size: 12 by 12 inches.

2.02 CEILING-MOUNTED UNITS

- A. Ceiling-Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Material: Steel.
 - 2. Door Style: Single thickness with rolled or turned in edges.
 - 3. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - 4. Steel Finish: Primed.
 - 5. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

**SECTION 085313
VINYL WINDOWS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vinyl-framed, factory-glazed windows.
- B. Operating hardware.
- C. Insect screens.

1.02 SUBMITTALS

- A. Product Data: Provide component dimensions, anchors, fasteners, and glass.
- B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.
- C. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
- B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.04 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and after installation of sealants.

1.05 WARRANTY

- A. Correct defective work within a 5-year period after Date of Substantial Completion.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of vinyl color finish. Complete form in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Vinyl Windows:
 - 1. Substitutions: See Section 016000 - Product Requirements.

2.02 DESCRIPTION

- A. Vinyl Windows: Factory-fabricated frame and sash members of extruded, hollow, ultraviolet-resistant, glass-fiber reinforced polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
 - 1. Configuration: As indicated on drawings.
 - a. Product Type: H - Hung window, vertically sliding in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 2. Interior Color: White.
 - 3. Exterior Color: Black.
 - 4. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
 - 5. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.

6. System Internal Drainage: Drain to exterior side by means of weep drainage network any water entering joints, condensation within glazing channel, or other migrating moisture within system.
7. Glazing Stops, Trim, Flashings, and Accessory Pieces: Formed of rigid PVC, fitting tightly into frame assembly.
8. Mounting Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.
9. Insect Screens: Tight fitting for operating sash location.

2.03 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 1. Performance Class (PC): LC.
- B. Design Pressure: In accordance with applicable codes.
- C. Condensation Resistance Factor: CRF of 60, minimum, the lower value of the glass and frame window components and determined in accordance with AAMA 1503.

2.04 COMPONENTS

- A. Glazing: Insulated double pane, annealed glass, clear, low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.
 1. Glass Stops: Snap-on PVC glazing bead with color to match sash and frame.
 2. Glazing Tape: Closed cell foam type with double sided adhesive.
 3. Setting Blocks: Manufacturer's standard.
- B. Frame Depth: Manufacturer's standard.
 1. Type: Nailing flange.
 2. Frame Corners: Block-reinforced butt-joint corner inserts.
- C. Insect Screens: Aluminum, extruded or roll-formed frame with mitered and reinforced corners; apply screen mesh taut to frame; secure to window with hardware to allow easy removal.
 1. Hardware: Manufacturer's standard; quantity as required per screen.
 2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's 18 x 16 mesh.
 3. Frame Finish: Manufacturer's standard, color to match window frame and sash color.
- D. Operable Sash Weatherstripping: Nylon pile; permanently resilient, profiled to maintain weather seal in accordance with AAMA 701/702.
- E. Fasteners: Stainless steel.
- F. Accessories: Provide related flashings, anchorage and attachment devices as necessary for full assembly.
- G. Sealants for Setting Window Sill Pan Flashing: Provide butyl tape, non-hardening butyl, polyurethane, or silicone sealant; in compliance with ASTM E2112 installation practices.

2.05 HARDWARE

- A. Vertical Sliding Sash: Metal and nylon spiral friction slide cylinder, provide two for each sash and jamb.
- B. Sash lock: Lever handle and keeper with cam lock, provide one, minimum, for each operating sash.
 1. Comply with ADA Standards for operating hardware.
- C. Window Opening Control Devices (WOCD): Provide operable window sash hardware that limits window opening to prevent passage of 4-inch diameter rigid sphere and is easily releasable to allow full window opening without use of keys, tools, or special knowledge. Comply with ASTM F2090.
- D. Finish of Exposed Hardware: Baked enamel, match interior sash and frame color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive this work.

3.02 INSTALLATION

- A. Install window unit assemblies in accordance with manufacturers instructions and applicable building codes.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities as necessary.
- C. Align window plumb and level, free of warp or twist, and maintain dimensional tolerances and alignment with adjacent work.
- D. Set sill members and sill flashing in continuous bead of sealant.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install operating hardware.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.04 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer and appropriate for application indicated.

END OF SECTION

**SECTION 088000
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

1.03 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.

PART 2 PRODUCTS

2.01 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:
- 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 7 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.03 INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.

2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 4. Spacer Color: Aluminum.
 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Gray.
 6. Purge interpane space with dry air, hermetically sealed.
- B. Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value), Summer - Center of Glass: _____, nominal.
 7. Visible Light Transmittance (VLT): _____ percent, nominal.
 8. Solar Heat Gain Coefficient (SHGC): _____, nominal.

2.04 GLAZING UNITS

- A. Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Annealed float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
- B. Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 2. Glass Type: Fully tempered safety glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.

2.05 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. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

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.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

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

3.05 CLEANING

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

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 088300
MIRRORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass mirrors.

1.02 SUBMITTALS

- A. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

1.03 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q1 (high-quality mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.
 - 1. Thickness: 1/4 inch.
 - 2. Size: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install mirrors in accordance with manufacturer's recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.02 CLEANING

- A. Remove labels after work is complete.

END OF SECTION

**SECTION 092116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Acoustic insulation.
- C. Cementitious backing board.
- D. Gypsum wallboard.
- E. Joint treatment and accessories.

1.02 SUBMITTALS

- A. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 BOARD MATERIALS

- A. 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 ceilings, unless otherwise indicated.
 - 2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 3. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- B. Backing Board For Wet Areas: One of the following products:
 - 1. Application: Surfaces behind tile in wet areas including tub and shower surrounds.
 - 2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
- C. 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: 5/8 inch.
 - 3. Edges: Tapered.

2.03 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 2 inch.
- 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, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Corner Beads: Low profile, for 90 degree outside corners.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Studs: Space studs at 16 inches on center.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
- B. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- C. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
- D. Furring for Fire Ratings: Install as required for fire resistance ratings indicated.
- E. Blocking: Install wood blocking for support of:
 - 1. Framed openings.
 - 2. Wall-mounted cabinets.
 - 3. Plumbing fixtures.
 - 4. Toilet accessories.
 - 5. Wall-mounted door hardware.
 - 6. Handrails

3.03 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. Place continuous bead at perimeter of each layer of gypsum board.
 - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 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. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- F. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
 - 1. Single-Layer Applications: Screw attachment.
 - 2. Double-Layer Application: Install base layer using screws. Install face layer using screws.

3.05 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.

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.

1.02 SUBMITTALS

- A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. 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.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Tile: 1 percent of each size, color, and surface finish combination.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 TILE

- A. Glazed Wall Tile: _____.
 - 1. Products:
 - a. Dal-Tile Corporation: www.daltile.com/#sle.
 - b. Size: 3" X 6"
 - c. Color: Artic White
 - d. Surface Finish: Semi-Gloss
 - e. Location: Community Room Kitchen Backsplash
 - f. Substitutions: Not permitted.
- B. Porcelain Tile:
 - 1. Products:
 - a. Daltile; Santino.
 - 1) Color: SN07
 - 2) Dimensions/Finish: Chiaro, 12" X 24"
 - 3) Location: Entryways
 - 4) Substitutions: Not permitted.
 - b. Daltile; Santino.
 - 1) Color: SN07
 - 2) Dimensions/Finish: Chiaro, 6" X 12"
 - 3) Location: Surround of fireplace
 - 4) Substitutions: Not permitted.
 - c. Daltile; Santino.
 - 1) Color: SN06
 - 2) Dimensions/Finish: Chiaro, 12" X 24"
 - 3) Location: Elevator Flooring
 - 4) Substitutions: Not permitted.
 - d. Daltile; Santino.
 - 1) Color: SN07
 - 2) Dimensions/Finish: Chiaro, 18" X 18"

- 3) Location: Tile Border around walkoff matt at vestibule and fireplace hearth
- 4) Substitutions: Not permitted.

2.02 SETTING MATERIALS

- A. Organic Adhesive: ANSI A136.1, thinset mastic type.

2.03 GROUTS

- A. Standard Grout: ANSI A118.6 standard cement grout.
 - 1. Applications: Use where indicated on drawings 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. Colors:
 - a. Mapei #11 Sahara Beige; 1/8", sealed
 - 1) Location: Fireplace surround, entryways, elevator flooring, tile border around walk off matat vestibule and fireplace hearth.
 - b. Mapei #38 Avalanche; 1/16", non-sanded/sealed
 - 1) Location: Community room kitchen backsplash
 - c. Substitutions: Not permitted.

2.04 MAINTENANCE MATERIALS

- A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
 - 1. Composition: Water-based colorless silicone.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.
- B. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

3.02 PREPARATION

- A. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated on drawings. 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 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. Form internal angles square and external angles bullnosed.
- F. Sound tile after setting. Replace hollow sounding units.
- G. Keep control and expansion joints free of mortar, grout, and adhesive.
- H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- I. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.

- J. 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. Elevator: Running Bond with 33% overlap

3.05 INSTALLATION - WALL TILE

- A. Over gypsum wallboard on wood or metal studs, install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat.
- B. Fireplace Surround: Running bond with a 33% overlap
- C. Kitchen Backsplash: Running bond

3.06 CLEANING

- A. Clean tile and grout surfaces.

END OF SECTION

**SECTION 096500
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient tile flooring.
- C. Installation accessories.

1.02 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Verification Samples: Submit two samples, ___ by ___ inch in size illustrating color and pattern for each resilient flooring product specified.

1.03 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 SHEET FLOORING

- A. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness.
 - 1. Manufacturer:
 - a. Mohawk; Portico Collection, Scottsdale.
 - b. Color: #592 Cool Sands
 - c. Substitutions: Not permitted.

2.02 TILE FLOORING

- A. Luxury Vinyl Plank: Printed film type, with transparent or translucent wear layer.
 - 1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 2. Wear Layer Thickness: 0.020 inch.
 - 3. Total Thickness: 0.125 inch.

2.03 ACCESSORIES

- A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- B. Sound Control Underlayment:
 - 1. Manufacturers:
 - a. Shaw; Groundworks, 087VS.
 - b. Substitutions: Not permitted.
 - 2. Thickness: 1.4 mm.
 - 3. Location: Elevated floors under Luxury Vinyl Plank Flooring

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.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - SOUND CONTROL UNDERLAYMENT

- A. Install in accordance with underlayment manufacturer's instructions.

3.05 INSTALLATION - SHEET FLOORING

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

3.06 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. Install plank tile with a random offset of at least 6 inches from adjacent rows.

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.

END OF SECTION

**SECTION 096816
SHEET CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet, stretched-in with cushion underlay and direct-glued.

1.02 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- B. Samples: Submit two samples ____by____ inch in size illustrating color and pattern for each carpet and cushion material specified.

1.03 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carpet - Type "A" Units (Glue Down):
 - 1. Mohawk; Sleek Upgrade.
 - 2. Color: Leather Bound
 - 3. Substitutions: Not permitted.
- B. Carpet - Type "B" Units (Stretched):
 - 1. Mohawk; Neutral Shift.
 - 2. Color: Sumatra Blend
 - 3. Substitutions: See Section 016000 - Product Requirements.
- C. Carpet - Multi Story Building:
 - 1. Mohawk Group; New Basics III 26.
 - 2. Color: Majolica Tin
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 CUSHION

- A. Cushion: Rebond.
 - 1. Nominal Thickness: 437 inch.

2.03 ACCESSORIES

- A. Subfloor Filler: Type recommended by carpet manufacturer.
- B. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.
- C. Seam Adhesive: Recommended by carpet manufacturer.
- D. Carpet Adhesive: Recommended by carpet manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesives to subfloor surfaces.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Verify carpet match before cutting to ensure minimal variation between dye lots.
- D. Lay out carpet.
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - 2. Do not locate seams perpendicular through door openings.
 - 3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
 - 4. Locate change of color or pattern between rooms under door centerline.
 - 5. Provide monolithic color, pattern, and texture match within any one area.
- E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 STRETCHED-IN CARPET

- A. Install tackless strips with pins facing the wall around entire perimeter, except across door openings. Use edge strip where carpet terminates at other floor coverings.
- B. Space tackless strips slightly less than carpet thickness away from vertical surfaces, but not more than 3/8 inch.
- C. Install cushion in maximum size pieces using spot adhesive to adhere to subfloor.
- D. Lay out cushion so that seams will be perpendicular to, or offset from, minimum 6 inches from carpet seams.
- E. Butt cushion edges together and tape seams.
- F. Trim cushion tight to edge of tackless strip and around projections and contours.
- G. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to all cut edges immediately.
- H. Join seams using hot adhesive tape. Form seams straight, not overlapped or peaked, and free of gaps.
- I. Following seaming, hook carpet onto tackless strip at one edge, power stretch, and hook firmly at other edges. Follow manufacturer's recommendations for method and amount of stretch.
- J. Trim carpet neatly at walls and around interruptions. Tuck edges into space between tackless strip and wall.

3.05 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.

3.06 INSTALLATION ON STAIRS

- A. Use one piece of carpet for each tread and the riser below. Apply seam adhesive to all cut edges.

- B. Install carpet with pile direction in the length of the stair.
- C. Adhere carpet tight to stair treads and risers.

3.07 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

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 SUBMITTALS

- A. 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.
- B. 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.

1.03 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.

1.04 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. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including 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.
 3. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
 1. One coat of alkyd primer.
 2. Gloss: Two coats of alkyd enamel.
- C. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 2. Semi-gloss: Two coats of alkyd enamel.
- D. Paint ME-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
 1. One coat galvanize primer.
 2. Gloss: Two coats of alkyd enamel.

2.03 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 1. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
 2. Water Based Primer for Galvanized Metal; MPI #134.
 3. Rust-Inhibitive Water Based Primer; MPI #107.
 4. Alkyd/Oil Primer for Exterior Wood; MPI #5.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. 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. Fiber Cement Siding: 12 percent.
 2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

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. 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. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- G. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

- A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- 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.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. 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. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 SUBMITTALS

- A. 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 products to be used in project; include description of each system.
- B. 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.

1.03 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.

1.04 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. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 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.

2.02 PAINT SYSTEMS - INTERIOR

- A. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
 1. One coat of alkyd primer sealer.
 2. Eggshell: Two coats of latex enamel; _____.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 1. Gypsum Wallboard: 12 percent.
 2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

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. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- F. Galvanized Surfaces:
 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 2. Prepare surface according to SSPC-SP 2.
- G. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- H. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

- D. Sand wood and metal surfaces lightly between coats to achieve required finish.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

SECTION 101400 SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- B. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.03 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to 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 comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Character Height: 1 inch.
 - 4. Sign Height: 2 inches, unless otherwise indicated.
 - 5. Office Doors: Identify with the room numbers indicated on drawings.
 - 6. Unit Doors: Identify with the room numbers indicated on drawings[<>].
 - 7. Service Rooms: Identify with the room names and numbers indicated on drawings.
 - 8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", and braille.

2.02 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Square.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: As selected from manufacturer's standard colors.
 - 4. Character Color: Contrasting color.

2.03 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 - 1. Total Thickness: 1/16 inch.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Residential toilet, shower, and bath accessories.
- C. Under-lavatory pipe supply covers.
- D. Utility room accessories.

1.02 SUBMITTALS

- A. 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.

2.02 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. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.03 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.
- B. Paper Towel Dispenser: Folded paper type, thermoplastic polymer, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
 - 1. Capacity: 500 multifold minimum.
- C. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
- D. Grab Bars: Aluminum, smooth surface.
 - 1. Dimensions: 1-1/4 inch outside diameter, minimum 0.080 inch wall thickness, bracket, 1-1/2 inch clearance between wall and inside of grab bar.

2.04 RESIDENTIAL UNIT TOILET, SHOWER, AND BATH ACCESSORIES

- A. Toilet Paper Holder: Surface mounted, single roll, concealed attachment.
 - 1. Material: Stainless steel; bright polished finish.
 - 2. Products:
 - a. American Specialties; 7305B.
 - b. Substitutions: Section 016000 - Product Requirements.
- B. Towel Bar: Square tubular bar; rectangular mounting posts, concealed attachment.
 - 1. Mounting Post Material: Stainless steel; bright polished finish.
 - 2. Bar Material: Stainless steel; bright polished finish.
 - 3. Products:
 - a. American Specialties; 7360B.
 - b. Substitutions: Section 016000 - Product Requirements.
- C. Towel Ring: Post with hanging ring, concealed attachment.
 - 1. Post Material: Stainless steel; bright polished finish.
 - 2. Ring Material: To match post material.
 - 3. Products:

- a. American Specialties; 0785Z.
 - b. Substitutions: Section 016000 - Product Requirements.
- D. Shower Curtain Rod: Straight tube, 1 inch diameter, with mounting flanges for concealed attachment.
 - 1. Material: Stainless steel; satin finish.
 - 2. Products:
 - a. American Specialties; 1214.
 - b. Substitutions: Section 016000 - Product Requirements.

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. 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 UTILITY ROOM ACCESSORIES

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.02 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

**SECTION 103090
MANUFACTURED ELECTRIC FIREPLACES**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Manufactured electric fireplaces.
- B. Accessories.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- C. Manufacturer's warranty.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

1.04 WARRANTY

- A. Provide the manufacturers 2 year limited warranty on electrical components.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Pre-fabricated Electric Fireplace:
 - 1. Base: Dimplex Electric Fireplace
Dimplex North America
1367 Industrial Road
Cambridge ON N1R 7G8
1-888-DIMPLEX
www.dimplex.com
archdesign@dimplex.com
 - 2. Substitutions not permitted

2.02 ELECTRIC FIREPLACES

- A. General:
 - 1. Provide all components and accessories required for a complete, functional unit.
 - 2. UL or CSA listed.
- B. Pre-fabricated Electric Fireplace:
 - 1. Base Product:
 - a. Dimplex Electric Fireplace
 - b. Model Number: BF39DXP
 - 2. Description: Realistic 39" Direct-wire electric firebox
 - 3. Dimensions:
 - a. Width: 38-3/4"
 - b. Height: 32-3/4"
 - c. Depth: 15-1/4"
 - d. Height at back: 30-1/8"
 - 4. Framing Dimensions:
 - a. Width: 39-1/2"
 - b. Height: 33-1/2"

- c. c) Depth: 16"
- 5. Electrical:
 - a. Volts: 120 / 240 / 208
 - b. Watts: 1,440 / 2,700 / 2,100
 - c. BTUs: 5,000 / 9,200 / 7,200
 - d. Amps: 12.0 / 11.3 / 10.1
- 6. Venting: Non-venting
- 7. Operation: Flame only, flame and heat
- 8. Heating: Louver-less, fan-forced circulation
- 9. Liner: Refractory brick-look
- 10. Standard features:
 - a. Flame/ember bed on/off
 - b. Purifire® Air Treatment System
 - c. Direct wire 120V or 240V
 - d. 3D flame effect with mirrored rear glass
 - e. On-demand fan-forced heater
 - f. Operable mesh spark screens
 - g. Cast urethane, inner-glow logs and pulsing ember bed
- 11. Optional door kits:
 - a. Tamper-proof glass door
 - b. Bi-fold look glass door
 - c. Swing door
- 12. Optional trim kit: 3" black surround trim
- 13. Control options:
 - a. 3-stage remote control (flame, flame and half-heat, flame and full-heat)
 - b. Wall switch remote control kit
 - c. Wall-mount thermostat
 - d. 110/120V plug kit with 7 ft. cord

PART 3 - EXECUTION

3.01 INSPECTION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify proper power supply and fuel source are available.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.
- B. Use manufacturer's guidelines for minimum clearances to combustibles, walls, and finishes.
- C. Anchor all components firmly in position for long life under hard use.
- D. Upon completion of installation, visually inspect all exposed surfaces. Touch up scratches and abrasions with touch up paint recommended by Manufacturer; make imperfections invisible to the unaided eye from a distance of 5 feet.

3.04 3.4 PROTECTION

- A. Protect installed products until completion of project.

- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

**SECTION 104400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.02 SUBMITTALS

- A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

- A. General Requirements: 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.
 - 2. Size: 10 pound.
 - 3. Finish: Baked polyester powder coat, color as selected.

2.02 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire-resistance rating of walls where cabinet installed.
- B. Fire-Rated Cabinet Construction: One-hour fire rated.
- C. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Projected Trim: Returned to wall surface, with [4] inch projection.
- D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.
- E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- F. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled 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.

2.03 ACCESSORIES

- A. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and interfaces with other work.
- B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.
- C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.
- D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 42 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.

END OF SECTION

**SECTION 105500
POSTAL SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Central mail delivery boxes.

1.02 SUBMITTALS

- A. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, maintenance information, and current USPS approval documentation.
- B. Shop Drawings: Indicate plans for each unit or groups of units, front elevations with compartment layout and model number, overall dimensions, rough-in opening sizes, construction and anchorage details.

1.03 WARRANTY

- A. Provide manufacturer's warranty against defects in materials or workmanship for a period of 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CENTRAL MAIL DELIVERY BOXES

- A. Manufacturers:
 - 1. Florence Manufacturing Company; _____: www.florencemailboxes.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Central Mail Delivery Boxes: Provide products approved for United States Postal Service (USPS) delivery.
 - 1. Materials: Aluminum with stainless steel hardware.
 - 2. Finish: Powder coat in color selected by Architect from manufacturer's standard colors.
 - 3. Unit Types and Sizes: As indicated on drawings.
 - 4. Configurations: See drawings for overall dimensions and layouts.
- C. Wall-Mounted Mailboxes: Fully-recessed, complying with 39 CFR 111 (USPS-STD-4C).

2.02 RENT DROP BOX (RDB):

- A. Wall Drop Box: Through-wall, adjustable chute.
 - 1. Keyed Lock
 - 2. 12" X 6" X 16"
- B. Protex Model MDL-170
- C. Finish: Beige

2.03 COMPONENTS

- A. Locking - Front Loading Master Door: Three-point latching mechanism with USPS master lock furnished and installed by postmaster.
- B. Locking - Customer Compartment Doors: USPS approved cam lock, 3 keys each lock.
- C. Locking - Parcel Compartment Doors: Double-lock arrangement with USPS approved cam lock for customer access, and USPS master lock furnished and installed by postmaster.
- D. Pedestals: Standard aluminum pedestal with rubber mounting pad designed to meet USPS and height requirements of ADA Standards.
- E. Identification - Customer and Parcel Compartments: Sequential numerical or alphabetic characters, top to bottom, left to right; factory-installed.
 - 1. Engraved characters, 3/4 inch high, with black fill.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete base and anchor bolts are ready to receive pedestal-mounted units.
- B. Verify that rough-openings are ready to receive wall-mounted units.
- C. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

- A. Install postal specialties in accordance with approved shop drawings, manufacturer's instructions, and USPS requirements.
- B. Adjust and lubricate door hardware to operate properly.

END OF SECTION

**SECTION 105723
CLOSET AND UTILITY SHELVING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted wire closet shelving.
- B. Accessories.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, with installation instructions.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.
- C. Store flat to prevent warpage and bending.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wire Storage Shelving:
 - 1. ClosetMaid Corporation: www.closetmaid.com/#sle.
 - 2. Rubbermaid, Inc; Wire Closets: www.rubbermaidpro.com/#sle.

2.02 WIRE STORAGE SHELVING SYSTEMS

- A. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with components and connections required to produce a rigid structure that is free of buckling and warping.
 - 1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
 - 2. Coating: PVC or epoxy, applied after fabrication, covering surfaces.
 - 3. PVC Coating: 9 to 11 mils thick.
 - 4. Epoxy Coating: Nontoxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils thick.
 - 5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch.
 - 6. Free-Sliding Hanging Rod: Integral hanging rod that permits uninterrupted sliding of hangers the full width of the shelf.
 - 7. Corner Units: Same wire spacing as standard mesh shelves; provide wherever shelves meet at right angles.
- B. Mounting Hardware for Wire Shelving: Provide manufacturer's standard mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect areas to receive shelving or storage system, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.
- B. Verify appropriate fastening hardware.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- A. Install wire shelving in accordance with manufacturer's instructions, with shelf surfaces level.
- B. Cap exposed ends of cut wire shelving.
- C. Install wire shelving back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.

3.03 PROTECTION

- A. Protect installed work from damage.
- B. Touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION

**SECTION 113013
RESIDENTIAL APPLIANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.
- B. Laundry appliances.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

1.03 QUALITY ASSURANCE

- A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.04 WARRANTY

- A. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- B. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES - RESIDENTIAL UNITS

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator, All Units
 - 1. ADA Approved
 - 2. Exterior Finish: Porcelain enameled steel, color white.
 - 3. Manufacturers:
 - a. GE Appliances; GIE18ETHWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- C. Range, Type "B" Units
 - 1. Exterior Finish: Porcelain enameled steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; JB2558DMWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- D. ADA Range, Type "A" Units
 - 1. ADA Approved
 - 2. Exterior Finish: Porcelain enameled steel, color white.
 - 3. Manufacturers:
 - a. GE Appliances; JD630DFWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- E. ADA Range Backguard Kit
 - 1. Exterior Finish: Porcelain enameled steel, color white
 - 2. Manufacturers:
 - a. GE Appliances; [JXS32WW]: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted
- F. Range Hood (Vented), Type "A" Units
 - 1. Exterior Finish: Porcelain enameled steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; JV348LWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.

- G. Range Hood (Recirculating), Type "A" Units
 - 1. Exterior Finish: Porcelain enameled steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; JN327HWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- H. Range Hood (Vented), Type "A" Units
 - 1. Exterior Finish: Porcelain enameled steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; JV348L: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- I. Over-the-Range Microwave, Type "B" Units
 - 1. Exterior Finish: Porcelain enameled steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; JNM3163DJWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- J. ADA Microwave, Type "A" Units
 - 1. ADA Approved
 - 2. Exterior Finish: White.
 - 3. Manufacturers:
 - a. GE Appliances; PEM31DJWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- K. Garabage Disposal
 - 1. Exterior Finish: Black.
 - 2. Manufacturers:
 - a. GE Appliances; GFC525V: www.geappliances.com/#sle.
 - b. Badger; Badger 5 Half Horsepower, 76037H.
 - c. Substitutions: Not permitted.
- L. Dishwasher, Type "B" Units
 - 1. Finish: Porcelain enameled steel , color white.
 - 2. Manufacturers:
 - a. GE Appliances; GSD3301KWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- M. ADA Dishwasher, Type "A" Units
 - 1. ADA Approved
 - 2. Finish: Porcelain enameled steel, color white.
 - 3. Manufacturers:
 - a. GE Appliances; GDT225SGLWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.

2.02 KITCHEN APPLIANCES - MULTI STORY BUILDING COMMON AREAS

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator:
 - 1. ADA Approved
 - 2. Exterior Finish: Stainless/Black.
 - 3. Manufacturers:
 - a. GE Appliances; GFE26GSKSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- C. Under Counter Refrigerator:
 - 1. Exterior Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; ZIFS241: www.geappliances.com/#sle.

- b. Substitutions: Not permitted.
- D. Range:
 - 1. ADA Approved
 - 2. Exterior Finish: Stainless/Black.
 - 3. Manufacturers:
 - a. GE Appliances; JD630SFSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- E. Oven/Microwave Combo
 - 1. Exterior Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; JT3800S: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- F. Range Hood
 - 1. Exterior Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; J VX3300S: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- G. Microwave
 - 1. Exterior Finish: Stainless/Black.
 - 2. Manufacturers:
 - a. GE Appliances; PEM31S: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- H. Microwave Trim Kit
 - 1. Exterior Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; JX830SF: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- I. Garbage Disposal
 - 1. Exterior Finish: Black.
 - 2. Manufacturers:
 - a. GE Appliances; GFC525V: www.geappliances.com/#sle.
 - b. Badger; Badger 5 Half Horsepower, 76037H.
 - c. Substitutions: Not permitted.
- J. Dishwasher
 - 1. Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; GDT225SSLSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- K. ADA Dishwasher
 - 1. ADA Approved
 - 2. Finish: Stainless/Black.
 - 3. Manufacturers:
 - a. GE Appliances; GLDT696JSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- L. ADA Ice Maker
 - 1. ADA Approved
 - 2. Finish: Stainless.
 - 3. Manufacturers:
 - a. U-Line; ADA151M.
 - b. GE/Summit; BIM44GADA

- c. Substitutions: Not permitted.
- M. Ice Maker
 - 1. Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; UCC15N: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.

2.03 KITCHEN APPLIANCES - FREE STANDING COMMUNITY BUILDING

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator:
 - 1. ADA Approved
 - 2. Exterior Finish: Stainless/Black.
 - 3. Manufacturers:
 - a. GE Appliances; GFE26GSKSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- C. Range:
 - 1. ADA Approved
 - 2. Exterior Finish: Stainless/Black.
 - 3. Manufacturers:
 - a. GE Appliances; JD630SFSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- D. Oven/Microwave Combo
 - 1. Exterior Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; JT3800S: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- E. Range Hood:
 - 1. Exterior Finish: Stainless.
 - 2. Manufacturers:
 - a. GE Appliances; J VX3300S: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- F. Microwave:
 - 1. Exterior Finish: Stainless/Black.
 - 2. Manufacturers:
 - a. GE Appliances; PEM31SFSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- G. Microwave Trim Kit
 - 1. Exterior Finish: Stainless/Black.
 - 2. Manufacturers:
 - a. GE Appliances; JX830SF: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- H. Ice Maker, Type ICE.1
 - 1. Exterior Finish: Stainless
 - 2. Manufacturers:
 - a. GE Appliances; UCC15N: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- I. Ice Maker, Type ICE.2
 - 1. ADA Approved
 - 2. Exterior Finish: Stainless
 - 3. Manufacturers:

- a. U-Line; ADA151M.
 - b. GE/Summit; BIM44GADA
 - c. Substitutions: Not permitted.
- J. Garbage Disposal
 - 1. Exterior Finish: Black.
 - 2. Manufacturers:
 - a. GE Appliances; GFC525V: www.geappliances.com/#sle.
 - b. Badger; Badger 5 Half Horsepower, 76037H.
 - c. Substitutions: Not permitted.
- K. Dishwasher:
 - 1. ADA Approved
 - 2. Finish: Stainless/Black.
 - 3. Manufacturers:
 - a. GE Appliances; GDT225SSLSS: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.

2.04 LAUNDRY APPLIANCE - RESIDENTIAL UNITS

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Stacked Washer/Dryer
 - 1. Finish: Painted steel , color white.
 - 2. Manufacturers:
 - a. GE Appliances; GUD27ESSJWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- C. Top-Loading Clothes Washer
 - 1. Finish: Painted steel , color white.
 - 2. Manufacturers:
 - a. GE Appliances; GTW220ACKWW: www.geappliances.com/#sle.
 - b. GE Appliances; GTW490AC: www.geappliances.com/#sle.
 - c. Substitutions: Not permitted.
- D. Clothes Dryer
 - 1. Finish: Painted steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; GTX22EASKWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- E. Washer/Dryer Combo
 - 1. Finish: Painted steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; HLC1700AXW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- F. Front-Loading Clothes Washer
 - 1. Finish: Painted steel , color white.
 - 2. Manufacturers:
 - a. GE Appliances; GFW400SCKWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.
- G. Front-Loading Clothes Dryer
 - 1. Finish: Painted steel , color white.
 - 2. Manufacturers:
 - a. GE Appliances; GFD40ESC: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.

2.05 LAUNDRY APPLIANCES - MULTI STORY BUILDING COMMON AREAS

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Stacked Washer/Dryer
 - 1. Finish: Painted steel , color white.
 - 2. Manufacturers:
 - a. GE Appliances; GUD27ESSJWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.

2.06 LAUNDRY APPLIANCES - FREE STANDING COMMUNITY BUILDING

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Stacked Washer/Dryer
 - 1. Finish: Painted steel, color white.
 - 2. Manufacturers:
 - a. GE Appliances; GUD27ESSJWW: www.geappliances.com/#sle.
 - b. Substitutions: Not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

**SECTION 116813
PLAYGROUND EQUIPMENT**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Play Equipment
- B. Engineered Wood Fiber

1.02 DESCRIPTION OF WORK

- A. The Contractor shall furnish all labor, materials, and equipment necessary to install, adjust, field test, and place in satisfactory condition the playground equipment as listed below.
- B. The playground equipment shall be installed with anchors, concrete footings, and/or other fastening devices.
 - (1) Under this item of work the Contractor shall install playground equipment required to complete the work of this Contract in accordance with the Plans, Specifications, and directions of the Authority.

1.03 RELATED SECTIONS AND DOCUMENTS

- A. Section 32 13 13: Concrete
- B. Section 32 92 00: Turfs and Grasses
- C. Drawings and Contracts, including City of Topeka Design Criteria and Drafting Standards.

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM) "Standard Consumer Safety Performance Specification for Playground Equipment for Public Use."
- B. US Consumer Product Safety Commission (CSPC) Public Playground Safety Handbook

1.05 SUBMITTALS

- A. Product Date: Submit manufacturer's technical data and installation instructions for each item of equipment required, for the engineered wood fiber (EWF), and drainage system, if included. Provide manufacturer's samples for review.
- B. Play Equipment Product Data: Provide statement of accessibility from manufacturer, including the total number of play components as well as total number of accessible components. Provide both plan view and 3-dimensional views of equipment.

1.06 QUALITY ASSURANCE

- A. Engineered Wood Fiber Certifications
 - (1) EWF shall meet impact attenuation requirements of ASTM F1292-99 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment and ASTM F 1292-04 – Standard Specification for Impact Attenuation of Surfacing Materials within the use zone of playground Equipment.
 - (a) G-max values less than 120G for 12" system at a 12' drop height.
 - (b) HIC value less than 1,000 for both new and 12-year old material.
 - (c) Meet Requirements of ASTM F 1951, Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
- B. Place no EWF until all structures have been placed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All requests for substitutions must be submitted in writing with supporting documentation by or through the Contractor to the Owner for evaluation and final approval. Subject to compliance with requirements, the equipment shall be provided by American Parks Company, with the following product:
 - (1) (Qty 1) Word to the Wise (Model No 6890113425A)

2.02 SURFACING

- A. EWF: Meet certification requirements listed above.

2.03 DRAINAGE ROCK

- A. To be placed as shown on plans.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Playground equipment and EWF surfacing shall be installed only by person trained and certified by the manufacturer.

3.02 INSPECTION

- A. Verify gradients and elevations of base. Verify compaction for all footings and subgrades. Beginning of installation means acceptance of existing conditions.

3.03 FIELD QUALITY CONTROL

- A. All items must be protected from staining, cracking, chipping, vandalism, and other drainage during progress of the work and left in a first-class condition after completion.
- B. Regularly inspect and maintain ground surfaces to ensure continued compliance with ASTM F1951.
- C. One month following installation, check settled depth of EWF and topdress as needed to maintain the greater of 12" total settled depth or minimum depths as required by CSPSC and/or other applicable guidelines.

END OF SECTION 11 68 13

**SECTION 122113
HORIZONTAL LOUVER BLINDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Horizontal slat louver blinds.
- B. Operating hardware.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the placement of concealed blocking to support blinds.

1.03 SUBMITTALS

- A. Product Data: Provide data indicating physical and dimensional characteristics.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Horizontal Louver Blinds - FREE STANDING COMMUNITY BUILDING AND MULTI-STORY BUILDING COMMON AREAS:
 - 1. Royal Windows; STK Faux Wood.
- B. Horizontal Louver Blinds - RESIDENTIAL UNITS:
 - 1. Vinyl Plu Mini Blind.

2.02 BLINDS - FREE STANDING COMMUNITY BUILDING AND MULTI-STORY BUILDING COMMON AREAS.

- A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
- B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by cord.
- C. Plastic Slats: PVC foam, square slat corners.
 - 1. Width: 2 inch.
 - 2. Color: Antique White.
 - 3. Texture: Smooth.
- D. Slat Support: Woven polypropylene cord, ladder configuration.
- E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
 - 1. Color: Same as slats.
- F. Bottom Rail: Pre-finished, formed PVC; with end caps.
 - 1. Color: Same as headrail.
- G. Lift Cord: Braided nylon, continuous loop with restraining device; comply with WCMA A100.1.
 - 1. Free end weighted.
 - 2. Color: As selected by Architect.
- H. Headrail Attachment: Wall brackets.
- I. Accessory Hardware: Type recommended by blind manufacturer.

2.03 BLINDS - RESIDENTIAL UNITS

- A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
- B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.
- C. Plastic Slats: Vinyl, square slat corners.
 - 1. Width: 1 inch.
 - 2. Color: Alabaster.
 - 3. Texture: Smooth.

- D. Slat Support: Woven polypropylene cord, ladder configuration.
- E. Head Rail: Pre-finished, formed steel box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
 - 1. Color: Same as slats.
- F. Bottom Rail: Pre-finished, formed steel; with end caps.
 - 1. Color: Same as headrail.
- G. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
- H. Control Wand: Extruded hollow plastic; hexagonal shape.
 - 1. Color: Same as slats.
- I. Headrail Attachment: Wall brackets.
- J. Accessory Hardware: Type recommended by blind manufacturer.

2.04 FABRICATION

- A. Determine sizes by field measurement.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive the work.
- B. Ensure structural blocking and supports are correctly placed. See Section 061000.

3.02 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.
- B. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

- A. Adjust blinds for smooth operation.

3.05 CLEANING

- A. Clean blind surfaces just prior to occupancy.

END OF SECTION

**SECTION 123530
RESIDENTIAL CASEWORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen cabinets.
- B. Vanity cabinets.

1.02 SUBMITTALS

- A. Product Data: Provide component dimensions, configurations, and construction details.
- B. Shop Drawings: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Residential Casework - Residential Units:
 - 1. Meubles Wood.
 - 2. Material: Birch
 - 3. Color: As selected from manufacturer's standard painted finishes.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Residential Casework - Multi Story Building Common Areas:
 - 1. Meubles Wood.
 - 2. Material: Birch
 - 3. Color: As selected from manufacturer's standard painted finishes.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 HARDWARE

- A. Hardware: Manufacturer's standard unless noted otherwise.
- B. Drawer and Door Pulls: Liberty Hardware P0270A-SN-C, 3-3/4 inches wide.
 - 1. Substitutions: Not permitted.

2.03 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Fabricate corners and joints without gaps.
- C. Fabricate each unit to be rigid and not dependent on adjacent units for rigidity.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Set casework items plumb and square, securely anchored to building structure.
- C. Carefully scribe casework abutting other components.

3.02 ADJUSTING

- A. Adjust doors, drawers, hardware, and other moving or operating parts to function smoothly.

3.03 CLEANING

- A. Clean casework, countertops, shelves, and hardware.

3.04 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION

**SECTION 123600
COUNTERTOPS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Countertops for manufactured casework.
- C. Sinks molded into countertops.

1.02 SUBMITTALS

- A. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- B. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- C. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

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

1.04 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Sinks and Bowls: Integral castings; minimum 3/4 inch wall thickness; comply with IAPMO Z124.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - 3. Other Components Thickness: 1/2 inch, minimum.
 - 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
 - 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 - 6. Skirts: As indicated on drawings.

2.02 MATERIALS

- A. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.

3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
 1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed 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. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

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

3.05 CLEANING

- A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

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

END OF SECTION

SECTION 210010 – FIRE SUPPRESSION PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Sprinkler Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Sprinkler systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
- C. Refer to Architectural, Structural, Mechanical, Electrical and Plumbing Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, piping and other sprinkler work are indicated diagrammatically by the drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
- B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
- D. Do not scale drawings for dimensions. Contractor shall accurately layout work from the dimensions indicated on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of sprinkler systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineer's option. Equivalents will ONLY be considered approved when listed by addendum.
- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in sprinkler or electrical service requirements necessary

to accommodate such substitution.

- H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

- A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of \$50 per sheet, \$100 minimum and \$25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

- A. Provide sprinkler systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation, code compliance and completion of sprinkler systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.
- B. Contractor shall become familiar with equipment provided by other contractors that require sprinkler connections and controls.
- C. Electrical work required to install, monitor and control sprinkler systems and equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal.
- D. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be paid for by Sprinkler Contractor at no cost to Owner or Architect-Engineer.
- E. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of sprinkler and electrical equipment are made to attain intended control sequences and system operation.
- F. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.
- G. Contractor shall obtain complete electrical data on sprinkler shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of sprinkler equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.16. WORK NOT INCLUDED IN CONTRACT

- A. Consult Division 16 of specifications for work to be provided by Electrical Contractor in conjunction with installation of sprinkler equipment.

1.17. CODES, RULES AND REGULATIONS

- A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.

- B. Conform to latest editions and supplements of following codes, standards or recommended practices.
- C. BUILDING CODES:
 - 1. International Codes (Latest adopted version of applicable codes)
- D. SAFETY CODES:
 - 1. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
 - 2. Occupational Safety and Health Standard (OSHA) - Department of Labor.
- E. NATIONAL FIRE CODES:
 - 1. NFPA No. 13 Standard for the installation of Sprinkler Systems
 - 2. NFPA No. 14 Standard for the installation of Standpipe and Hose Systems
 - 3. NFPA No. 70 National Electrical Code
 - 4. NFPA No. 101 Life Safety Code
- F. UNDERWRITERS LABORATORIES INC:
 - 1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.
- G. MISCELLANEOUS CODES:
 - 1. ANSI A117.1 - Handicapped Accessibility
 - 2. Americans with Disabilities Act (ADA)

1.18. STANDARDS

- A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.19. PERMITS/FEES

- A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.
- B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SUBMITTALS

- A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
- B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.
 - 1. Submittals shall be furnished in an Adobe PDF format.
 - 2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.
 - a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.
 - 3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
 - 4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
 - 5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall

- bear the equipment manufacturer's name and address.
6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
 7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.
- C. Contractor review:
1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.
 2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
 3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- D. Review Schedule:
1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
 2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
 3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
 4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the Contractor's responsibility.
- E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
- F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
- G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
- H. Coordination
1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.2. SHOP DRAWINGS

- A. Shop drawings shall meet all of the above requirements for submittals.
- B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
- C. No work shall be fabricated until Architect-Engineer's review has been obtained.
- D. Sprinkler shop drawings for main entrance and detailed areas shall be a minimum of 1/4" scale. Drawings shall show details of the following: Plans, elevations above finished floor, sections, components, and attachments to other work. Sprinkler layout indicating sizes on plans, fittings, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, and any required seismic restraints.

3.3. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
- B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:
 - 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
 - 2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
 - 3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
 - 4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of sprinkler system.
- D. Provide brochure bound in black vinyl three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - 1. Project name and address.
 - 2. Section of work covered by brochure, i.e., Fire Suppression.

3.4. RECORD DOCUMENTS

- A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
- C. Provide one copy of on high quality heavy weight presentation type paper. Blueprints or other media which fade shall not be used.
- D. Provide one electronic scanned version of record documents in Adobe PDF format – PDFs may be submitted on electronic media (DVD, USB) or via an FTP or other file sharing site. Provide electronic copies in conjunction with hard copy documents.

3.5. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all ductwork and equipment at the completion of the project.
- C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.6. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.7. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
- C. Patching shall be by the contractors of the particular trade involved and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of sprinkler work shall be repaired at Sprinkler Contractor's expense to approval of Architect-Engineer.

3.8. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
- B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
- C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Sprinkler contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
- F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.9. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

- A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.
- B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.
- C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.10. FINAL CONSTRUCTION REVIEW

- A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 210010

SECTION 210011 – BASIC FIRE SUPPRESSION MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 210010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. MOTORS

- A. Motors shall be installed in strict accordance with rules set forth by NEC and equipment manufacturer.
- B. ELECTRIC MOTORS (Less than ½ HP)
 - 1. Motors 1/3 horsepower and smaller shall be selected by manufacturer of driven equipment with motor speed and torque characteristics best suited for application.
 - 2. Motors shall have a minimum service factor of 1.15 for open dripproof enclosure and 1.00 for totally enclosed motors. Wherever applicable provide motors with cushion bases. Motor enclosure shall be proper type required for operating environment.
 - 3. Motors shall have a plus or minus 10% voltage tolerance and plus or minus 5% frequency tolerance. Motors shall operate satisfactorily in ambient temperature range of 0 degrees C (32°F) to 140°C (104°F) at altitudes below 3300 feet.
 - 4. Provide motors with built-in thermal overload protection. Motors readily accessible to operating personnel shall have manual reset protector. All other shall have automatic reset protectors.
 - 5. Motors shall have AFBMA standard double-shielded ball bearings sized for average life of at least 100,000 hours under normal loading conditions. Bearings housing shall have provisions for adding new lubricant without major disassembly and shall have seals to prevent entrance of foreign matter and leakage of bearing lubricant.
 - 6. Motor bolts, screws and other external hardware shall be treated with corrosion resistant plating and motor enclosure prime painted with corrosion resistant metal primer finished with a durable machinery enamel.
 - 7. Unless indicated otherwise motors shall be rated for continuous operation at 115, 200, or 277 volt single phase 60 hertz. Where equipment manufacturer offers a choice provide permanent split capacitor motors in lieu of shaded pole motors.
 - 8. Motor leads shall be marked throughout entire length for easy identification and terminate with brass or copper terminal lugs. Motor shall have permanently attached nameplate with electrical characteristics and wiring connection diagram.
- C. ELECTRIC MOTORS (1/2 HP and Larger)
 - 1. Provide equipment requiring electric motors with NEMA Standard motors. Shop drawings, submitted and equipment provided with electric motors shall include motor manufacturer, horsepower, voltage, full load amperes, NEMA design type, insulation class, shaft bearing type, mounting base type, and enclosure type. To greatest extent possible motors for this project shall be by one manufacturer.
 - 2. Motors shall conform to current NEMA Standard MG1. Motor shall operate successfully without derating under the following conditions.
 - 3. 40 degrees C (104°F) maximum ambient temperature, 3,300 Ft. maximum altitude, voltage variations of plus or minus 10% of nameplate rating, frequency variations of plus or minus 5% of nameplate rating, combined voltage and frequency variation of plus or minus 10% total as long as frequency does not exceed plus or minus 5%.
 - 4. Motors shall meet or exceed locked rotor (Starting) and breakdown (maximum) torques specified for the NEMA design rating. Lock rotor currents shall not exceed NEMA maximum values for motor NEMA design rating.
 - 5. Motor service factors shall be 1.15 for open dripproof motors and 1.00 for totally enclosed motors.
 - 6. Unless indicated otherwise, motor insulation may be manufacturers standard for Class A, B or F provided that maximum permissible temperature for insulation is not exceeded when motor is operating at its service factor load in a 40 Degrees C (104°F) ambient.
 - 7. Motor frame/HP relationship shall conform to current NEMA Standard for "T" frames. Motors shall have antifriction ball or roller bearings sized for average life of at least 100,000 hours under normal v-belt loading conditions. Bearings shall be AFBMA Standard and shield mounted ball bearings of ample capacity for motor rating. Bearing housing shall have provisions for adding new lubricant and draining out old lubricant without major motor disassembly. Bearing housing shall have seals to protect bearing from entrance of foreign matter and to prevent leakage of bearing lubricant.

8. Conduit box mounting shall rotate to allow conduit entrance from top, bottom or either side. Conduit holes shall conform to NEC Standards.
9. Motor leads shall have same insulation class as motor windings. Leads shall be marked throughout entire length for easy identification and terminated with brass or copper terminal lugs. Motor shall have permanently attached nameplate with electrical characteristics and wiring connection diagram.
10. Motor bolts, screws and other external hardware shall be treated with a corrosion resistant plating. Motor enclosure shall be prime painted with corrosion resisting metal primer and finished with a durable machinery enamel paint.
11. Unless indicated otherwise motors shall be rated for continuous operation at rated voltage, three phase, 60 hertz. Motors shall be T-frame squirrel cage induction. Type NEMA design B with Class B insulation. Motors shall be dripproof totally enclosed or explosion-proof as required by motor environment.

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

- A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
- B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
- C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
- D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
- E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
- F. For test pressure schedules see Section 15100 of this specification.

3.2. TEST METHODS AND PRESSURES

- A. Test methods and pressures shall be as follows:
 1. Hydrostatic Test (Closed Systems):
 - a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.
 2. Hydrostatic Test (Open System):
 - a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.
 3. Pneumatic Test:
 - a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
 - b. Allow at least 1 hour after test pressure has been applied before making initial test.
 - c. Curing test, completely isolate entire system from compressor or other sources of air pressure.
 4. Pressure Relief and Safety Valve:
 - a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
 - b. Tag items that pass test with date of test, observed relief pressure setting and inspector's signature.
 - c. Items installed in systems without test tag attached will be rejected.

3.3. CLEANING OF SYSTEMS AND EQUIPMENT

- A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

3.4. MAINTENANCE OF SYSTEMS

- A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
- B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
- C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.5. PAINTING OF MATERIALS AND EQUIPMENT

- A. Touch-up painting and refinishing of factory applied finishes shall be by Sprinkler Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- B. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- C. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- D. Where extensive refinishing is required equipment shall be completely repainted.

3.6. PIPING IDENTIFICATION

- A. Provide pipe markers at 10'-0" maximum spacing to identify piping in sprinkler rooms and 20'-0" maximum spacing in all other areas with Seaton Setmark pipe markers with letters and flow direction arrows.
- B. Colors and wording shall be of standard pipe markers as available from Seaton or equal. Submit for approval list of colors and wording prior to purchase of pipe markers.
- C. Pipe marker nomenclature/colors shall meet applicable ANSI Standard and OSHA requirements.

3.7. VALVE IDENTIFICATION

- A. Mark all valves with Seton No. 300-BL brass identification tags with system legend, valve number and size stamped on tag. Lettering shall be black ½" high. Tags shall be minimum 2" in diameter and attached to valve with Seton No. 16 brass jack chain.
- B. Prepare four copies of typewritten list of valve tags. List shall be typed in upper case and contain tag number, valve size, type, function and location. Frame one list under glass and mount near operating instruction in main equipment rooms.

3.8. EXCAVATION AND BACKFILL

- A. Perform necessary excavation to receive Work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove it at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
- B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
- C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by Architect-Engineer. Mechanically tamp backfill under concrete and pavings in six inch layers to 95% standard density, Reference Division 2.
- D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
- E. When available, refer to test hole information on Architectural or Civil drawings or specifications for types of soil to be encountered in excavations.

3.9. FIRE BARRIERS

- A. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
 - 1. Equivalent by Dow, Chemelex, 3M.
- B. All holes or voids created by the sprinkler contractor to extend piping or ductwork through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

3.10. EQUIPMENT ANCHORS

- A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
- B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
- C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

3.11. WELDING

- A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.1.
- B. Welded pipe joints shall be made by certified welding procedures and welders. Welding electrodes shall be type and material recommended by electrode manufacturer for materials to be welded. All pipe and fittings ends shall be beveled a minimum of 30 degrees prior to welding.
- C. Only welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required shall do welding. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders' code, date and types of latest qualification test passed by each welder.
- D. Welded joints shall be fusion welded in accordance with Level AR3 of American Welding Society Standard AWS D10.9 "Standard for Qualification of Welding Procedures and Welders for Pipe and Tubing". Welders qualified under National Certified Pipe Welding Bureau will be acceptable.
- E. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

END OF SECTION 210011

SECTION 210013 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each related sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3. COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Delivery and processing of submittals.
 - 2. Progress meetings.
 - 3. Preinstallation conferences.
 - 4. Project closeout activities.
 - 5. Startup and adjustment of systems.

1.4. SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.

3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
- F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
- H. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- I. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.
- J. Adjust location of piping, ductwork, conduit, wiring, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

- a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

1.6. DRAWINGS AND FILES

- A. The Drawings show only the general run of MEP systems, equipment, fixtures, piping and ductwork and other components as well as approximate location of items such as outlets, switches, diffusers, lights, and equipment connections, etc. Coordinate all exact locations of items with other trades, architectural elevations, equipment requirements, owner requirements, ceilings, access, serviceability, etc. All such modifications and coordination shall be made without additional cost to the Owner. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made
- B. Wherever the work is of sufficient complexity, additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field. Attend meetings with other trades to review all documents.
- C. When directed by the General Contractor for areas of necessary coordination provide 3D building modelling coordination files and documents with other trades. Transmit information electronically and attend meetings as directed by the G/C as well as take part in coordination activities and documentation. Contractor shall be required to generate their own electronic files for this process.

1.7. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Manufacturer's written recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
 - b. Review present and future needs of each contractor present, including the following:
 - i. Interface requirements.

- ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication.
 - vi. Access.
 - vii. Quality and work standards.
 - viii. Change Orders.
 - 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- 1.8. REQUESTS FOR INTERPRETATION (RFIs)
- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
 - 1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 210013

SECTION 211314 – WET PIPE FIRE PROTECTION SYSTEM (NFPA 13R)

PART 1 – GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 210010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DEFINITIONS

- A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig (1200 kPa), but not higher than [250 psig (1725 kPa)] [300 psig (2070 kPa)].
- B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig (1200 kPa) maximum.

1.3. SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.
- B. Deluge Sprinkler System: Open sprinklers are attached to piping connected to water supply through deluge valve. Fire-detection system, in same area as sprinklers, opens valve. Water flows into piping system and discharges from attached sprinklers when valve opens.

1.4. PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. High-Pressure Piping System Component: Listed for 250-psig minimum working pressure.
- C. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5. SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. Compressed air piping.
 - 3. HVAC hydronic piping.
 - 4. Items penetrating finished ceiling include the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. HVLS or other types of Ceiling Fans
- E. Qualification Data: For qualified Installer and professional engineer.
- F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13R, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
 - 1. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.
- G. Welding certificates.
- H. Fire-hydrant flow test report.
- I. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13R. Include "Contractor's Material and Test Certificate for

- Aboveground Piping.”
- J. Field quality-control reports.
- K. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.6. QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13R – “Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies.” Comply with latest version or version as adopted by AHJ, whichever is more stringent.
- E. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 - 1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

1.7. PROJECT CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
- B. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.
- C. Do not proceed with interruption of sprinkler service without Owner's written permission.

1.8. COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9. EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13R and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.10. AUTOMATIC SPRINKLER SYSTEM

- A. Provide wet or combination wet/dry sprinkler system as required, complete with alarm valves, drain valves, mains, risers, branches, sprinkler heads, test pipes, gauges, and dialers as hereinafter specified or shown on plans.
- B. An approved automatic sprinkler subcontractor shall perform all work under this heading. The system shall be installed in strict accordance with the NFPA requirements and all local and state authorities having jurisdiction. The sprinkler system shall be certified. Contractor shall retain certification until such time as Contractor turns copies of certificates and permits over to Owner.
- C. Sprinkler system shall be installed using hydraulically designed system by Contractor's option. Sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 15 percent, including losses through water-service piping, valves, and backflow preventers.
- D. Design of sprinkler system shall coordinate main and branch lines with structure, ceilings, piping, ductwork and light fixtures.
- E. Entire building shall be sprinklered.

PART 2 – PRODUCTS

2.1. SERVICE RISER

- A. Provide a double check detector backflow preventer listed for fire service duty. Omit detector portion of assembly where allowed by local jurisdiction.

2.2. SPRINKLER HEADS

- A. Provide as required by NFPA 13R sprinkler heads as manufactured by Viking, Reliable, Tyco and Victaulic. Sprinkler heads shall be semi-recessed chrome plated brass where exposed. Rough brass where concealed and where exposed in mechanical rooms and shall be provided with all necessary hardware for mounting into gypsum board ceiling or acoustical ceilings. The fire protection contractor shall be responsible to reference the architectural drawings for ceiling types and locations. Where no ceilings occur, provide standard brass upright or pendant as required by construction.
- B. Sprinkler heads shall be Underwriters-approved, automatic spray type. Temperature rating of heads shall be 165 degrees F., except furnish 212 degrees F. heads where required.
- C. Heads shall be of the following types:
 - 1. Areas without ceilings: Standard bronze upright type.
 - 2. Areas with lay in ceilings: Bronze flush pendent type with satin chrome finish, with satin chrome semi recessed escutcheon.
 - 3. Areas with hard ceilings: Concealed pendent with finish to match ceiling color or finish.
 - 4. Sidewall: Bronze sidewall type with satin chrome finish.
- D. Multi-Use Flexible Sprinkler Fittings shall be [UL, cUL, FM] and may be used in lieu of rigid pipe offsets or return bends for sprinkler drops. Flexible hose shall consist of a true 1" ID corrugated braided type 304/316 stainless steel UL listed per UL-2443 to 175psi with a 2" minimum bend radius and FM approved per FM-1637 to 200psi with a 7" minimum bend radius. Equal to Victaulic VicFlex™.
 - 1. In lieu of rigid connections to dry sprinkler heads, a Victaulic VicFlex™ dry sprinkler, Model VS1, may be used. The sprinkler shall provide a vertical or horizontal flexible connection with a bend radius to 2", and allow for up to 4 bends.
- E. Location of sprinkler heads is not shown on drawings but nevertheless shall be furnished and installed to meet the requirements of these specifications and NFPA 13R. General scheme of head spacing shall be so as to clear ducts, beams, pipes, air units, lights and conduits. Exact location of heads shall be approved by the Architect.
- F. Install sprinkler heads located in center of ceiling tiles or ceiling panels or as otherwise directed by architect.
- G. Provide head guards where required by NFPA.
- H. Furnish spare heads for each type of head mounted in metal cases where directed by Architect and as required by NFPA. Cases shall include wrenches for each type of head.
- I. Escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.
- J. Wrenches shall be provided by the sprinkler manufacturer that directly engage the wrench boss cast in the sprinkler body.

2.3. PIPE, FITTINGS, AND HANGERS

- A. Provide pipe material and schedule as required by NFPA 13R.
 - 1. Submit detailed pipe material submittals indicating thickness and joining methods.
 - 2. Pipe 2" and smaller shall be threaded connected Schedule 40 black steel pipe or thicker with cast iron fittings. Pipe 2-1/2" and larger may be roll grooved or welded connected Schedule 10 black steel pipe or thicker.
 - a. In lieu of threaded steel piping systems, the Victaulic FireLock IGS System with "Installation-Ready™" fittings and couplings may be used for NPS 1 (DN 25) Schedule 10 and Schedule 40 carbon steel pipe in fire protection applications. System rated for a working pressure to 365 psi (2517 kPa). Not for use with Type F Schedule 40 pipe. Victaulic V9 coupling sprinkler heads may be used in direct substitution where applicable.
 - 3. Steel pipe with wall thicknesses less than Schedule 40 shall not be joined by threaded fittings.
 - 4. In wood framed structure, CPVC piping shall be acceptable in concealed locations where allowed by NFPA. No plastic shall be located in exposed locations except in mechanical and utility spaces not viewable by residents or public.
 - 5. All Dry systems shall be galvanized.

- B. Pipe shall be scale free, round, straight and true to size, free from weld flaws and other defects. Steel pipe shall be as manufactured by U.S. Steel, Sawhill, Wheatland, LTV, Laclede or approved equal. All piping shall be U.L. listed and F.M. approved. All fire service piping below grade shall be ductile iron pipe of the thickness Class 52 complete with all accessories conforming to ANSI A21.51; ASTM A536, Grade 60-42-10. The joints shall be of the push-on type conforming to ANSI A21.11 except gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable. The pipe shall be cement-mortar lined conforming to ANSI A21.4 and shall be coated inside and out with a coal-tar enamel. Fittings shall be ductile iron or cast iron fittings complete with accessories and shall be ASTM A536, Grade 80-60-03 conforming to ANSI A21.10, 150 p.s.i. pressure rating. The joints shall be of standard mechanical joint type or of the push-on type conforming to ANSI A21.11. All fittings shall be cement-mortar lined conforming to ANSI A21.4 and shall be coated inside and out with a coal-tar enamel.
- C. Grooved fittings to be [UL, FM] and designed to accept grooved end couplings and shall be cast of ductile iron conforming to ASTM A-536, Grade 65-45-12. Equal to Victaulic Firelock Installation-Ready™. All fittings inside building shall be sprinkler fittings approved by Underwriters' Laboratories and meeting approval of Factory Mutual. Flanges, of the same pressure rating as the fittings above specified, shall be installed in piping 8" and over, and elsewhere where required.
- D. Pipe hangers shall be of type and spacing required to support pipes from building construction and meet the approval of the Underwriters' Laboratories. Note: Do not support piping from pipes, ducts or conduits. Furnish structural steel headers bolted to concrete and bolted or welded to steel joists as required. Do not support pipes from bulb tees or steel roof decks. Support exposed risers in stairs from structure below. Do not support risers in stairs from pipe clamps set on floor exposed to view and traffic.
- E. Contractor, at their option, may install fire protection piping using Victaulic couplings with gaskets, reducing couplings and gaskets, outlet couplings, flanges with gaskets, fittings, reducers, adapter nipples, flange adapters, bolts, nuts and miscellaneous material required to install fire protection piping system to meet NFPA approval in lieu of screwed and flanged fittings specified above. The piping system shall be grooved, assembled, installed and supported as covered in Victaulic Piping and Installation Manual.

2.4. PIPE SLEEVES AND COLLARS

- A. Pipes passing through walls and partitions shall be run through not less than No. 12 gauge steel pipe sleeves finishing flush with the finished wall surfaces. Where covered pipes pass through the walls or partitions, same shall be centered in steel pipe sleeves. All sleeves or thimbles shall be independent of the pipes they enclose and centered in sleeves to insure free movement of the pipes without injury to wall or other finish. Caulk around all pipes and pipe sleeves passing through walls, floors or ceilings with untarred jute and make airtight and soundproof.
- B. Covered and uncovered pipes passing through fire and smoke walls and partitions shall be run through Proset Proseal fire rated wall sleeves, or approved equal wall sleeving system, consisting of PVC sleeves in masonry walls, 20 Ga. Galvanized iron split wall sleeves in gypsum walls, ceramic fiber firefill to fill the void between the pipe and the interior wall of the sleeve, and PVC or neoprene rubber Proseal plug on each end of sleeve.
- C. Pipe passing through floors shall be run through Proset Proseal or approved equal fire rated floor sleeve assemblies, consisting of PVC couplings, ceramic fiber firefill to fill the void between the pipe and the interior wall of the sleeve, and PVC or neoprene rubber Proseal plug on each end of sleeve. Sleeves shall be watertight and fireproof.
- D. Pipe sleeves through outside walls shall be Schedule 40 steel pipe sleeves with 1-1/2" collar welded to center of sleeve and cast in wall. Caulk between sleeves and pipes and make watertight.

2.5. MAIN CUTOFF VALVES

- A. Furnish and install 150 p.s.i. Underwriter's approved OS&Y or butterfly flanged type cutoff valves in piping for each standpipe, sprinkler mains, ahead of each flow switch and at all other points shown on drawings or required by NFPA. Cutoff valves in fire service piping below grade shall be 150 p.s.i. U.L. and F.M. approved type for underground service. Provide cast iron curb box to grade, with key, for main shut off valve at point of connecting to water main and fire hydrant.

2.6. CHECK VALVES

- A. Check Valves shall be [UL, FM] and 250 psi (1725 kPa) rated with grooved ends. Ductile iron body conforming to ASTM A-536, stainless-steel spring and shaft, with stainless steel disc and elastomer seat/seal, or elastomer coated ductile iron disc and welded in nickel seat. Suitable for both vertical or horizontal installation. Equal to Victaulic Series 717.
- B. Furnish and install 175 p.s.i. Underwriter's approved flanged type check valves in fire service, at Fire Department connection, and where required by NFPA. Check valve at Fire Department connection shall be installed with automatic ball drip with drain pipe extended and turned down over floor drain.

2.7. VALVES

- A. Ball Valves shall be UL listed and rated to 175 psi [FM approved and rated to 500 psi] and shall have a brass

- body and chrome plated ball per ASTM B124.
- B. Butterfly Valves shall be [UL, FM], 300 psi (2065 kPa), grooved ends, black enamel coated ductile iron body (ASTM A-536, Grade 65-45-12). Electroless-nickel coated ductile iron disc, with pressure-responsive elastomer seat and stainless-steel stem (stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating). Complete with weatherproof actuator and pre-wired supervisory switches.
 - 1. Supervised Normally Open shall be similar or equal to Victaulic Series 705 [Victaulic Series 765 for high pressure applications].
 - 2. Supervised Normally Closed shall be similar or equal to Victaulic Series 707C [Victaulic Series 766 for high pressure applications]
 - C. Drain valves and test valves shall be similar and equal to Stockham B-22 screwed globe of Fig. B-222 screwed angle, bronze body 150 lb., screw over bonnet and renewable disc.
 - D. Gauge control valves shall be bronze body needle type with inspector's test connections and plug.
 - E. Gate valves 2" and smaller shall be UL approved for 175 lb. WWP, bronze gate, solid wedge, screw in bonnet, outside screw and yoke, rising stem, Stockham B-122 or approved equal.
 - F. Gate valves 2-1/2" and larger shall be UL approved for 175 lb. WWP, iron body, bronze mounted, solid wedge, outside screw and yoke, rising stem, Stockham Fig. G-634 or approved equal.
 - G. Check valves 2-1/2" and larger shall be UL approved 175 lb. WWP iron body, bronze mounted, Stockham G-939 or approved equal.
 - H. Shotgun Riser Check assembly shall be ductile iron construction, incorporating a control valve, check valve, flow switch, test & drain assembly, adjustable relief valve, and system gauges in one compact body/footprint, and shall be manufactured for "right" and "left"-hand orientations. The test & drain assembly shall contain an adjustable relief valve, with a range of 175 to 310 psi, and a universal test orifice. Shotgun riser check assembly shall be rated for use at the maximum service pressure of 300 psi and shall be UL listed and FM approved. Assembly shall be similar or equal to Victaulic Series UMC.

2.8. INDICATOR POST

- A. Furnish and install Underwriters' approved indicator post at fire service cutoff valve where shown on drawings or as required by AHJ.
- B. Bolt indicator post to cutoff valve.
- C. Indicator post shall be installed absolutely vertical.

2.9. VANE TYPE WATER FLOW DETECTORS

- A. Furnish and install Notifier WFD Series or approved equal vane type, U.L. approved, water flow detector switches full size of piping served. Detectors shall be installed at each sprinkler zone and where indicated on drawings. Switches shall be designed for 150 p.s.i. working pressure and shall make contact with flow in one direction only.
- B. Each detector shall include a vane-operated, retard switch assembly mounted on an aluminum base plate, a cast aluminum pipe saddle to which the base plate is attached, a steel "U" bolt to clamp saddle to the sprinkler piping, and a steel cover enclosure to enclose the switch assembly consisting of two (2) SPDT circuit switches rated 10 amperes, 125 volt A.C., for actuating the fire alarm system.

2.10. TAMPER SWITCHES

- A. Furnish and install U.L. and F.M. approved tamper switches for indicator post and for each gate or butterfly type cutoff valve for pipes 2" and above in sprinkler and standpipe systems. Furnish and install tamper switches on certain valves under 2" as indicated or required. Switches shall be similar and at least equal to Notifier tamper switches for connecting to alarm system. Omit tamper switches on drain valves.

2.11. SIGHT GLASSES

- A. Furnish and install at each inspector's test valve where test pipe does not terminate where it can be readily observed an approved sight test connection containing a smooth bore orifice giving a flow equivalent to one sprinkler head.

2.12. FIRE PROTECTION PIPING

- A. Size of fire service piping is shown on drawings. All other fire protection piping shall be sized according to hydraulic calculations to provide the prescribed densities hereinbefore specified.
- B. Conceal mains back or above the construction in finished areas.
- C. Pipes shall have ends reamed to full bore.
- D. Piping shall clear lighting fixtures, construction, conduits, air outlets, air ducts and miscellaneous service pipes. Piping shall be designed to provide maximum head room in all areas.
- E. Piping shall not pierce ductwork.
- F. Sprinkler piping shall be divided into zones as required by NFPA area limitations.
- G. Pitch all dry pipe sprinkler piping to drain according to NFPA requirements, without exception and without

traps. Wet pipe sprinkler systems may be pitched to drain or run level, but piping must be installed straight and true, without traps.

- H. Furnish and install suitable drain valves and inspector test valves as necessary to drain the system and meet the requirements of NFPA. Furnish and install cutoff valve, vane type flow detector, test valve, drain valve, sight glass and tamper switch in each sprinkler zone, of type hereinbefore specified.
- I. No sprinkler piping shall be installed below a ceiling, (exposed) unless the contractor has specific approval from the Architect.

2.13. UNDERGROUND FIRE SERVICE PIPING

- A. Pipe and fittings for underground fire service and for connections for fire hydrant shall be as hereinbefore specified. Connect fire service piping to water main with tapping sleeve.
- B. Provide Underwriter's approved waterproof pipe connection at point where pipe pierces wall of building and connects to steel pipe. Pipe connections shall be complete with bridle rods and clamps as required to prevent blowouts and to meet Underwriters' requirements. Support pipe outside building concrete piers resting on rock or undisturbed soil, and provide waterproof sleeves and caulking as specified for water services under Plumbing Section.
- C. Pour concrete anchor blocks for underground pipes as required by the authorities having jurisdiction to prevent blowouts. Provide bridle rods and clamps where cast iron pipe changes to steel pipe, and anchor piping to concrete blocks as required to prevent blowouts. Anchor blocks shall be sized as per NFPA requirements.
- D. Underground piping shall have 48" cover minimum.

2.14. FIRE DEPARTMENT CONNECTION

- A. Furnish and install Potter-Roemer 5100 Series, equivalent Croker Standard or Guardian, U.L. and F.M. approved, 2-way flush wall type Fire Department connections, complete with check valve and ball drip. Fire Department connection shall have 4" inlet and two (2) 2-1/2" outlets, each complete with cap and chain. Verify requirements and connections with flow requirements and local Fire Department requirements.
- B. Hose connection shall have threads that will meet standards of the local Fire Department.
- C. Fire Department connections shall be polished brass. The Fire Department connection shall have words per NFPA requirements cast in plate as to service.
- D. Provide wall template for Fire Department connection and turn over to General Contractor for forming openings in wall. Anchor Fire Department connection to wall and caulk around wall connection with silicone base caulking compound and make watertight. Extend piping to inside building and connect to system with check valve and ball drip.

2.15. FIRE SPRINKLER MONITORING PANEL

- A. In facility without fire alarm system provide a noncoded system, dedicated to monitoring of fire suppression system in building. Provide all wiring, components, dialers, detectors, flow switches, tamper switches, indicating devices as required for NFPA compliance and local jurisdictional and code requirements. Include all power and low voltage wiring required as well as coordination of all monitoring services and startup, checkout, etc.

PART 3 – EXECUTION

3.1. GENERAL

- A. All modifications and additions shall be performed without hampering the proper operation of the remaining system. Shop drawing submittals shall indicate by calculation total system compliance.
- B. Provide installation of water flow switches and tamper switches on bypass lines and shut-off valves. Wiring by Electrical Contractor. Coordinate with early warning fire detection system.
- C. Submit drawings and calculations to the State Fire Marshall, owner's insurance company and local building officials for approval.

3.2. PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13R and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.3. SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to utility water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 2 Section "Facility Fire-Suppression Water-Service Piping."
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated and required by NFPA and specifically as required by local utility and fire marshal and/or fire department at connection to water-service piping.

- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.4. PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.
 - 1. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13R.
 - 2. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
 - 3. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13R.
- E. Install sprinkler piping with drains for complete system drainage.
- F. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- G. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- H. Install alarm devices in piping systems.
- I. Install hangers and supports for sprinkler system piping according to NFPA 13R. Comply with requirements for hanger materials in NFPA 13R.
- J. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.
- K. Pressurize and check pre-action sprinkler system piping and air-pressure maintenance devices.
- L. Fill sprinkler system piping with water.
- M. Sprinkler piping in areas subject to freezing shall be installed with glycol systems in accordance with NFPA installation requirements. Electric cables or insulation shall not be considered and adequate means of freeze protection.

3.5. JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel

pipe.

- K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.
- M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- O. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
- P. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3.6. INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

- A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and with NFPA 13R for supports.

3.7. VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13R and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.
 - 3. Deluge Valves: Install in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.8. EXCESS-PRESSURE PUMP INSTALLATION

- A. Assemble components and mount on wood backing. Comply with requirements in Division 6 Section "Rough Carpentry" for wood backing material and installation.
- B. Install excess-pressure pumps, controls, devices, and supports for sprinkler piping application.
- C. Mounting: Install attached to water-supply pipe.

3.9. SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of [narrow dimension of] acoustical ceiling panels.
- B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.
- D. Do not install sprinklers that have been dropped, damaged, show a visible loss of fluid, or a cracked bulb.
- E. The sprinkler bulb protector shall be removable by hand, without tools or devices that may damage the bulb

3.10. FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire-department connections.
- B. Install yard-type, fire-department connections in concrete slab support. Comply with requirements for concrete in Division 3 Section "Cast-in-Place Concrete."
 - 1. Install protective pipe bollards around each fire-department connection. Paint as directed by architect.
- C. Install automatic (ball drip) drain valve at each check valve for fire-department connection.
- D. Fire Department connections shall be in accordance with local fire department requirements and configurations.

3.11. ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.

3.12. SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.
- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 7 Section "Joint Sealants."
- G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 7 Section "Joint Sealants."
- H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.
- I. Seal space outside of sleeves in concrete slabs and walls with grout.
- J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.
 - 1. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 7 Section "Through-Penetration Firestop Systems."

3.13. SLEEVE SEAL INSTALLATION

- A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
- B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.14. IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13R.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

3.15. FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Flush, test, and inspect sprinkler systems according to NFPA 13R, "Systems Acceptance" Chapter.
- D. Energize circuits to electrical equipment and devices.
- E. Start and run excess-pressure pumps.
- F. Coordinate with fire-alarm tests. Operate as required.
- G. Coordinate with fire-pump tests. Operate as required.
- H. Verify that equipment hose threads are same as local fire-department equipment.
- I. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- J. Prepare test and inspection reports.

3.16. CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

3.17. DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves and pressure-maintenance pumps.

3.18. TESTS

- A. All piping shall be tested and made tight to meet requirements of NFPA Pamphlets No. 13 and 14 before joints are covered. Such tests shall be witnessed by the Owner's Representative and the Architect. Provide three (3) copies of test certificates to Architect-Engineer.
- B. Furnish all gauges, pumps, compressors and equipment required to perform tests.

3.19. PAINTING

- A. Paint all pipes and valves not in furred walls or ceilings with one (1) metal surface rust inhibiting prime coat and one (1) coat of approved equal enamel, in color and finish as directed by architect.

END OF SECTION 211314

END OF DIVISION 210000

SECTION 220010 – PLUMBING PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Plumbing Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Plumbing systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
- C. Refer to Architectural, Structural and Electrical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping and ductwork in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, piping and other plumbing work are indicated diagrammatically by the plumbing drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
- B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
- D. Do not scale mechanical, plumbing and electrical drawings for dimensions. Contractor shall accurately layout work from the dimensions indicated on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of plumbing systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.
- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in plumbing or electrical service requirements necessary

to accommodate such substitution.

- H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

- A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of \$50 per sheet, \$100 minimum and \$25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

- A. Provide plumbing systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of plumbing systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.
- B. Contractor shall become familiar with equipment provided by other contractors that require plumbing connections and controls.
- C. Electrical work required to install and control plumbing equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal.
- D. All automatic temperature control devices shall be mounted as indicated in automatic temperature control section of specifications.
- E. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be paid for by Plumbing Contractor at no cost to Owner or Architect-Engineer.
- F. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of plumbing and electrical equipment are made to attain intended control sequences and system operation.
- G. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.
- H. Contractor shall obtain complete electrical data on plumbing shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of plumbing equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.16. WORK NOT INCLUDED IN CONTRACT

- A. Consult Division 21, 23, and 26 of specifications for work to be provided by Electrical Contractor in conjunction with installation of plumbing equipment.

1.17. CODES, RULES AND REGULATIONS

- A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.

- B. Conform to latest editions and supplements of following codes, standards or recommended practices.
- C. BUILDING CODES:
 - 1. International Codes (Latest adopted version of applicable codes)
- D. SAFETY CODES:
 - 1. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
 - 2. Occupational Safety and Health Standard (OSHA) - Department of Labor.
- E. NATIONAL FIRE CODES:
 - 1. NFPA No. 54 Gas Appliance & Gas Piping Installation
 - 2. NFPA No. 70 National Electrical Code
 - 3. NFPA No. 89M Clearances, Heat Producing Appliances
 - 4. NFPA No. 204 Smoke & Heating Vent Guide
- F. UNDERWRITERS LABORATORIES INC:
 - 1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.
- G. MISCELLANEOUS CODES:
 - 1. ANSI A117.1 - Handicapped Accessibility
 - 2. Applicable State Boiler Codes
 - 3. Americans with Disabilities Act (ADA)
- H. ENERGY EFFICIENCY REQUIREMENTS:
 - 1. All plumbing systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.18. STANDARDS

- A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.19. PERMITS/FEES

- A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.
- B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SUBMITTALS

- A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
- B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.
 - 1. Submittals shall be furnished in an Adobe PDF format.
 - 2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.
 - a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.

3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
 4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
 5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall bear the equipment manufacturer's name and address.
 6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
 7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.
- C. Contractor review:
1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.
 2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
 3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- D. Review Schedule:
1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
 2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
 3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
 4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the Contractor's responsibility.
- E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
- F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
- G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
- H. Coordination
1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.2. SHOP DRAWINGS

- A. Shop drawings shall meet all of the above requirements for submittals.
- B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
- C. No work shall be fabricated until Architect-Engineer's review has been obtained.

- D. Plumbing shop drawings for pipe fabrication shall be a minimum of 1/4" scale. Provide drawings where the complexity of the system or confines of the space require coordination with construction and other trades. Plumbing shop drawings shall not be a reproduction of the contract document and shall show details of the following: Plans, elevations above finished floor, sections, components, insulation and attachments to other work. Plumbing layout indicating sizes on plans, fittings, insulation, clearances, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and attachment.

3.3. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
- B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:
 - 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
 - 2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
 - 3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
 - 4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of plumbing system.
- D. Provide brochures bound in three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - 1. Project name and address.
 - 2. Section of work covered by brochure, i.e., "Plumbing", etc.

3.4. RECORD DOCUMENTS

- A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
- C. Provide one copy of on high quality heavy weight presentation type paper. Media which fade shall not be used.
- D. Provide one electronic version of record documents in Adobe PDF format on a DVD or otherwise electronically transmitted. Transmit electronic copies in conjunction with hard copy documents.

3.5. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all ductwork and equipment at the completion of the project.
- C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.6. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.7. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's

- and Structural Engineer's approval and in a manner approved by them.
- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
 - C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of plumbing work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.8. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
- B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
- C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Plumbing contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
- F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.9. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

- A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.
- B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructors name, names of Owner's personnel attending and total hours of instruction given each individual.
- C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.10. FINAL CONSTRUCTION REVIEW

- A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 220010

SECTION 220011 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Provide documentation of all completed tests described herein and their results.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

- A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
- B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
- C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
- D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
- E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
- F. For test pressure schedules see Section 221100 of this specification.

3.2. TEST METHODS AND PRESSURES

- A. Test methods and pressures shall be as follows:
 - 1. Hydrostatic Test (Closed Systems):
 - a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.
 - 2. Hydrostatic Test (Open System):
 - a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.
 - 3. Pneumatic Test:
 - a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
 - b. Allow at least 1 hour after test pressure has been applied before making initial test.
 - c. Curing test, completely isolate entire system from compressor or other sources of air pressure.
 - 4. Pressure Relief and Safety Valve:
 - a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
 - b. Tag items that pass test with date of test, observed relief pressure setting and inspector's signature.
 - c. Items installed in systems without test tag attached will be rejected.

3.3. STERILIZATION OF DOMESTIC WATER SYSTEMS

- A. After final pressure testing of distribution system thoroughly flush entire system with water until free of dirt and construction debris. Fill system with solution of liquid chlorine or hypochlorite of not less than 50 PPM. Retain treated water in system until test indicates non-spore-forming bacteria have been destroyed or for 24 hours whichever is greater.

- B. All points in systems shall have at least 10 PPM of solution at end of retention period. Open and close each valve at least six times in system during sterilization process to sterilize valve parts.
- C. When time and concentration conditions have been met, drain system and flush with fresh domestic water until residual cleaning solution is less than 1.0 PPM. Open and close each valve in system six times during flushing operation.
- D. Test samples taken from several points in system shall indicate absence of pollution for two full days. Repeat sterilization as required. Acceptance of system will not be given until satisfactory bacteriological results are obtained.

3.4. CLEANING OF SYSTEMS AND EQUIPMENT

- A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

3.5. MAINTENANCE OF SYSTEMS

- A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
- B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
- C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.6. PAINTING OF MATERIALS AND EQUIPMENT

- A. Paint all exterior piping with (2) two coats of an enamel rust inhibiting exterior paint in a color selected by architect.
- B. Touch-up painting and refinishing of factory applied finishes shall be by Plumbing Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- C. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- D. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- E. Where extensive refinishing is required equipment shall be completely repainted.

3.7. PIPING IDENTIFICATION

- A. Provide pipe markers at 10'-0" maximum spacing to identify piping in mechanical rooms and 20'-0" maximum spacing in all other areas with Seaton Setmark pipe markers with letters and flow direction arrows.
- B. Colors and wording shall be of standard pipe markers as available from Seaton or equal. Submit for approval list of colors and wording prior to purchase of pipe markers.
- C. Pipe marker nomenclature/colors shall meet applicable ANSI Standard and OSHA requirements.

3.8. VALVE IDENTIFICATION

- A. Mark all valves with Seton No. 300-BL brass identification tags with system legend, valve number and size stamped on tag. Lettering shall be black ½" high. Tags shall be minimum 2" in diameter and attached to valve with Seton No. 16 brass jack chain.
- B. Prepare four copies of typewritten list of valve tags. List shall be typed in upper case and contain tag number, valve size, type, function and location. Frame one list under glass and mount near operating instruction in main equipment rooms.

3.9. EQUIPMENT LABELS:

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware. Black letters on white background.
- B. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- C. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- D. Fasteners: Stainless-steel rivets or self-tapping screws.
- E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- F. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

3.10. EXCAVATION AND BACKFILL

- A. Perform necessary excavation to receive Work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove it at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
- B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
- C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by Architect-Engineer. Mechanically tamp backfill under concrete and pavings in six inch layers to 95% standard density, Reference Division 2.
- D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
- E. When available, refer to test hole information on Architectural or Civil drawings or specifications for types of soil to be encountered in excavations.

3.11. FIRE BARRIERS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. SUBMITTALS
 - 1. Product Data: For each type of product indicated.
 - 2. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - a. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - b. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
 - 3. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - a. Types of penetrating items.
 - b. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - c. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.
- G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
- H. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- I. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- J. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers

recommendations.

1. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.12. EQUIPMENT ANCHORS

- A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
- B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
- C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

3.13. WELDING

- A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.1.
- B. Welded pipe joints shall be made by certified welding procedures and welders. Welding electrodes shall be type and material recommended by electrode manufacturer for materials to be welded. All pipe and fittings ends shall be beveled a minimum of 30 degrees prior to welding.
- C. Only welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required shall do welding. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders' code, date and types of latest qualification test passed by each welder.
- D. Welded joints shall be fusion welded in accordance with Level AR3 of American Welding Society Standard AWS D10.9 "Standard for Qualification of Welding Procedures and Welders for Pipe and Tubing". Welders qualified under National Certified Pipe Welding Bureau will be acceptable.
- E. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

END OF SECTION 220011

SECTION 220013 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each related sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3. COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Delivery and processing of submittals.
 - 2. Progress meetings.
 - 3. Preinstallation conferences.
 - 4. Project closeout activities.
 - 5. Startup and adjustment of systems.

1.4. SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.

3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
- F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
- H. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- I. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.
- J. Adjust location of piping, ductwork, conduit, wiring, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

- a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

1.6. DRAWINGS AND FILES

- A. The Drawings show only the general run of MEP systems, equipment, fixtures, piping and ductwork and other components as well as approximate location of items such as outlets, switches, diffusers, lights, and equipment connections, etc. Coordinate all exact locations of items with other trades, architectural elevations, equipment requirements, owner requirements, ceilings, access, serviceability, etc. All such modifications and coordination shall be made without additional cost to the Owner. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made
- B. Wherever the work is of sufficient complexity, additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field. Attend meetings with other trades to review all documents.
- C. When directed by the General Contractor for areas of necessary coordination provide 3D building modelling coordination files and documents with other trades. Transmit information electronically and attend meetings as directed by the G/C as well as take part in coordination activities and documentation. Contractor shall be required to generate their own electronic files for this process.

1.7. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Manufacturer's written recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
 - b. Review present and future needs of each contractor present, including the following:
 - i. Interface requirements.

- ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication.
 - vi. Access.
 - vii. Quality and work standards.
 - viii. Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8. REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
 1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

3.1. EQUIPMENT FURNISHED BY OTHERS

- A. Description:
 1. Items furnished by other trades (electrical contractor, etc.) such as disconnect switches, etc.
 2. Kitchen Equipment (may be furnished by owner, owner's vendor, or separate sub-contractor)
 3. Equipment furnished by general contractor
 4. Equipment furnished by owner
- B. General
 1. Fully review manufacturer's installation instructions for equipment. Installation of all related plumbing items shall be per same.
 - a. Plumbing contractor shall obtain same from others if not readily available.

END OF SECTION 220013

SECTION 220523 – VALVES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. EQUIVALENTS

- A. Equivalent valves shall be used only from the following specified valve manufacturers and listed on current comparison charts by Apollo, Hammond, Hays, Milwaukee, Muessco, Nibco, Rockwell-Nordstrom, Stockham, and Watts.

1.3. SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.4. QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service and NSF 372 for lead content.

PART 2 - PRODUCTS

2.1. GENERAL REQUIREMENTS FOR VALVES

- A. Plumbing valve applications specified in this Section are limited to NPS 12 (DN 300).
- B. Refer to valve schedule articles for applications of valves.
- C. Caution: Revise pressure ratings and insert temperature ratings in valve articles if valves with higher ratings are required.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 - 2. Handwheel: For valves other than quarter-turn types.
 - 3. Handlever: For quarter-turn valves NPS 6 and smaller[except plug valves.
 - 4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.
- G. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.
- H. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Solder Joint: With sockets according to ASME B16.18.
 - 3. Threaded: With threads according to ASME B1.20.1.
 - 4. Grooved: With grooved ends to copper-tube dimensions or similar to AWWA C606.

2.2. VALVES

A. BALL VALVES

- 1. Ball valves shall be scheduled as type "BLV" valves. Valve specifications by type number shall be as follows:
- 2. Provide ball handle with extension or offset as required to clear piping insulation.
 - a. BLV-1: 2-1/2" valves and smaller, Hammond #8501 (screwed) or 8511 (solder) series bronze two piece large port ball valve 600 PSI-WOG/150 PSI-WSP reinforced TFE seats, chrome plate brass ball (tunnel or drilled design), silicon bronze stem vinyl-covered steel lever handle. Stainless steel ball and stem shall be provided for steam applications.
 - b. BLV-2: Ball valve shall be flexible lip seat to assure positive shut off (in both directions) and self compensates for wear. Material - fiberglass reinforced teflon, single piece. Self-

adjusting, low friction teflon box ring stem seals pre-loaded by Belleville washers. Two-piece carbon steel body. Four bolt design with locking fasteners for vibration resistance and joint integrity, one piece teflon body seal. Valve shall be rated for 250 PSI steam service. 316 stainless steel ball and stem. Provide with insulated handle. Neles Jamesbury Model 21-2236MT. Equivalent by Worchester. MCF Series 56-HT.

B. GLOBE VALVES

1. Globe valves shall be scheduled as type "GLV" valves. Valve specifications by type number shall be as follows:
 - a. GLV-1: 2-1/2" valves and smaller, Hammond #IB413T (screwed) or IB423 (solder) bronze globe valve, 300 PSI-WOG/150 PSI-WSP union bonnet, Teflon disc, malleable iron handwheel.

C. PLUG VALVES

1. Plug valves shall be scheduled as type "PLV" valves. Valve specifications by type number shall be as follows:
 - a. PLV-1: 1" valves and smaller Hays 7400 series iron body gas cock, 175 PSI-WOG bronze plug washer and nut, screwed ends.
 - b. PLV-2: 1-1/4" through 4" valves, Rockwell-Nordstrom Fig. 142, semi-steel lubricated plug valve, 175 PSI-WOG coated plug, two bolt cover, and short pattern screwed ends. Provide complete with standard pattern cast handle.

D. GATE VALVES

1. Gate valves shall be scheduled as type "GTV" valves. Valve specifications by type number shall be as follows:
 - a. GTV-1: 2" and smaller Hammond #IB640 (screwed) or IB635 (solder) ASTM B 62 bronze body and bonnet with malleable iron handwheel, 200 PSI-WOG/125 PSI-WSP.
 - b. GTV-2: 2 1/2" and larger Hammond #IR1140 HI, flanged, bolted bonnet, O.S. & Y., ASTM 126 iron body, bronze trimmed, 200 PSI-WOG/125 PSI-WSP.

E. CHECK VALVES

1. Check valves shall be scheduled as type "SCV" valves. Valve specifications by type number shall be as follows:
 - a. SCV-1: 2" valves and smaller Hammond #IB940 (screwed) or IB912 (solder) bronze check valve, 200 PSI-WOG/125 PSI-WSP, Teflon or bronze disc and seat ring.
 - b. SCV-2: 2-1/2" and larger Hammond #IR1124 HI flanged, ASTM 126 iron body, bronze trimmed, 200PSI-WOG/125 PSI-WSP.

F. BUTTERFLY VALVES

1. Butterfly valves shall be scheduled as Type "BFV" valves. Valve specifications by type number shall be as follows:
 - a. BFV-1: Size 3" and larger Hammond #6211-01 (lever) or 6211-03 (gear) ASTM A 126 cast iron drilled and tapped full lug body, 200 PSI-WOG 12" and smaller, 150 PSI-WOG 14" and larger, extended neck, bronze disc, stainless steel stem, field-replaceable EPDM or (buna for oil or lubricated service) sleeve and stem seals.
 - b. BFV-2: Size 3" and larger Victaulic Series 608N (lever or gear), brass cast body to UNS C87850, copper-tube dimensioned grooved ends, 300 PSI CWP, aluminum-bronze disc, stainless steel stem, and pressure responsive fluoroelastomer seat. (Stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.)
2. UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.

2.3. VALVE SCHEDULE

SYSTEM	SIZE	STOP	CHECK	BALANCE
Domestic Water	1/2"-2-1/2"	BLV-1	SCV-1	BAV-1
Domestic Water	3" and up	BFV-1 or 2	SCV-2	BAV-1

PART 3 – EXECUTION

3.1. VALVE INSTALLATION

- A. Install valves with unions, grooved joint couplings, or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2. INSTALLATION

- A. Install necessary valves within piping systems to provide required flow control, to allow isolation for inspection, maintenance and repair of each piece of equipment or fixture, and on each main and branch service loop.
- B. Each valve shall be installed so that it is easily accessible for operation, visual inspection, and maintenance and wherever possible, gate, check and ball valves shall be installed on a horizontal run with the handle upright and within 15 degrees of vertical. Butterfly valves shall be installed with the stem in the horizontal position and the handle at 90 degrees from vertical.
- C. Valves installed in piping systems shall be compatible with system maximum test pressure, pipe materials, pipe joining method, and fluid or gas conveyed in system.
- D. Valves 2-1/2" and smaller shall have soldered, grooved, or screwed end connections as required by piping materials unless otherwise specified or shown on drawings. Install union connection in the line within two feet of each screw end valve unless valve can be otherwise easily removed from line. Valves 3" and over shall have flange or grooved end connections.
- E. Non-rising stem valves shall not be installed at any point in the piping systems. With permission of Architect-Engineer non-rising stem valve may be installed at particular points where space is restricted.
- F. Provide butterfly valves 6" and smaller with 10 position lever handle for on-off application and infinite position handle for throttling applications. Provide butterfly valves 8" and up with fully enclosed all weather gear operators.
- G. Install globe valves with pressure on top of disc except that must be completely drained for inspection, maintenance or to prevent freezing shall be installed with stem in horizontal position to insure complete drainage of pipelines.
- H. Gate valves shall not be installed in pipelines where intended for throttling service or where piping is subject to vibration as part of normal operating conditions.
- I. Valves shall be designed for repacking under pressure when fully opened and backseated.
- J. Balancing valves installed by means of sweating or soldering shall have their interiors removed before installation and reinstalled upon dissipation of the heat associated with installation. Using a wet rag in lieu of removing the valve interior as a means of heat dissipation during installation is not acceptable.

3.3. ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

SECTION 220700 – PLUMBING INSULATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. 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. Section Includes:

- 1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.
- 2. Insulating cements.
- 3. Adhesives.
- 4. Mastics.
- 5. Sealants.
- 6. Factory-applied jackets.
- 7. Field-applied jackets.
- 8. Tapes.

B. SUBMITTALS

- 1. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- 2. Shop Drawings:
 - a. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - b. Detail attachment and covering of heat tracing inside insulation.
 - c. Detail insulation application at pipe expansion joints for each type of insulation.
 - d. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - e. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - f. Detail application of field-applied jackets.
 - g. Detail application at linkages of control devices.
 - h. Detail field application for each equipment type.
- 3. Qualification Data: For qualified Installer.
- 4. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. QUALITY ASSURANCE

- 1. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- 2. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - a. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - b. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.3. DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.4. COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.5. SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.1. INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2. PIPING AND EQUIPMENT INSULATION

- A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
- B. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; All-Service Duct Wrap.
- C. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000(Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- D. Plenum Fire Wrap:
 - 1. Installation shall be in strict accordance with manufacturer's written instructions, as shown on the approved shop drawings.
 - 2. 3M™ Fire Barrier Plenum Wrap 5A+ shall be a high-temperature fiber blanket thermal insulation encapsulated in a fiberglass-reinforced aluminized foil.

3. Plenum Wrap density shall be nominal 6 pcf (96 kg/m³) and have a nominal 1/2 inch (12.7 mm) thickness.
4. The fiber blanket shall have a continuous use limit in excess of 1832°F (1000°C). Flame Spread Index and Smoke Developed Index of the foil encapsulated blanket shall be <25/<50.

2.3. INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.4. ADHESIVES

- A. Military Specification referenced in this article is the only standard available when this Section was updated. MIL-A-3316C was last updated in October 1987.
- B. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
1. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5. MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
1. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 200 deg F.
 3. Solids Content: 63 percent by volume and 73 percent by weight.
 4. Color: White.

2.6. SEALANTS

- A. Joint Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Permanently flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 4. Color: White or gray.
 5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 4. Color: Aluminum.
 5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7. FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

2.8. FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for equipment and pipe.

2.9. FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Although other thicknesses for PVC jackets are available, a flame-spread index of 25 and a smoke-developed index of 50 apply only to thicknesses of 30 mils (0.8 mm) and less.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
 5. Factory-fabricated tank heads and tank side panels.

2.10. TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches.
 2. Thickness: 11.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
1. Width: 2 inches.
 2. Thickness: 6 mils.
 3. Adhesion: 64 ounces force/inch in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.
- E. PVDC Tape: White vapor-retarder PVDC tape with acrylic adhesive.
1. Width: 3 inches.
 2. Film Thickness: 6 mils.
 3. Adhesive Thickness: 1.5 mils.
 4. Elongation at Break: 145 percent.
 5. Tensile Strength: 55 lbf/inch in width.

2.11. SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.12. INSULATION SCHEDULE

- A. See plans for piping and insulation schedule. Other insulation requirements are scheduled below:

INSULATION SERVICE		SIZE	TYPE	THICKNESS	JACKET
Drinking Fount. Drain		All Sizes	FE	1"	ASJ-SSL
Condensate Drain		All Sizes	FE	½"	ASJ-SSL
Roof Drain Bodies		All Sizes	FE	½"	ASJ-SSL
MF - Mineral-Fiber	CG - Cellular Glass	FE - Flexible Elastomeric			

2.13. LAVATORIES AND SINK INSULATION

- A. Insulate all exposed hot, cold and waste piping associated with lavatories and sinks with Truebro "Handi Lav-Guard" insulation kit model no. 102. Equivalent by Brocar Products Inc. or Proto P-trap and valve covers.

PART 3 – EXECUTION

3.1. EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3. GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids

- throughout the length of equipment and piping including fittings, valves, and specialties.
- B. All portions of piping shall be insulated, including inside walls, chases and other concealed spaces.
 - C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
 - D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
 - E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
 - F. Install multiple layers of insulation with longitudinal and end seams staggered.
 - G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
 - H. Keep insulation materials dry during application and finishing.
 - I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
 - J. Install insulation with least number of joints practical.
 - K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
 - L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
 - M. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
 - N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
 - O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
 - P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
 - Q. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.
 - R. Undamaged insulation systems on cold surface piping and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.

3.4. PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Penetration Firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Penetration Firestopping."

3.5. GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
 1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth

- finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6. PLENUM WRAP INSTALLATION

- A. Where piping or materials that are not plenum rated are found to existing in existing building conditions that will remain in a return air plenum as a part of the construction fire rated plenum wrap shall be utilized.
- B. When piping materials that are not rated for installation in a plenum are installed in a plenum, in lieu of replacing the piping, fire rated plenum wrap shall be applied at no additional cost.
- C. Application shall be in strict accordance with manufacturers recommendation and listing requirements.
- D. The surface of any wrapped items should be cleaned. The following additional items/materials are required for product installation: min. 3/4 in. (19 mm) wide Scotch® Filament Tape 898 (or equivalent), 3M™ FSK Facing Tape 3320 (or equivalent), min. 1/2 in. (12.7mm) wide x min. 0.015 in. (0.38mm) thick carbon steel or stainless steel banding material with steel banding clips or 16 gauge steel tie wire as alternate for banding, banding tensioner, crimping tool, and banding cutter.

3.7. FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8. MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9. FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

E. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Plumbing Contractors expense at no cost to owner.

END OF SECTION 220700

SECTION 221000 – PLUMBING PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product to be used.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

- A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. See piping material schedule at end of this Section for materials to be used for each piping system.
 1. Cast Iron Bell and Spigot Soil Pipe
 - a. Pipe and fittings shall be gray cast iron bell and spigot conforming to ASTM A-74.
 - b. Seal joints with neoprene gaskets conforming to ASTM C-564.
 - c. Pipe and fittings shall be marked with the CISPI trademark or receive approval of engineer.
 - d. Pipe and fittings by AB&I, Charlotte, Star or Tyler
 2. Hubless Cast Iron Soil Pipe
 - a. Pipe and fittings shall be gray cast iron conforming to CISPI 301.
 - b. Pipe joints shall be no-hub heavy duty couplings consisting of neoprene rubber sleeve conforming to ASTM C-564 and mfg. by Husky SD 4000, Clamp all-125 or MG. Equivalent Mission.Heavyweight, Ideal Clamp Product.
 - c. Pipe and fittings shall be marked with the CISPI trademark or receive approval of engineer.
 - d. Pipe and fittings by AB&I, Charlotte, Star or Tyler
 3. Ductile Iron Pipe:
 - a. Pipe
 - i. Ductile iron shall be ANSI A21.51, AWWA C151. All pipe joints shall be mechanical unless otherwise indicated. Pipe shall be color coded by blotches of paint. The Contractor shall submit a "color class" schedule of the pipe as marked by the manufacturer.
 - ii. Inside coating shall be cement-mortar lining with seal coat of bituminous material in accordance with ANSI A21.4.
 - iii. American Water Works Associations (AWWA) Standards: C151-86 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water, or other liquids.
 - iv. American National Standards Institute (ANSI): A21.4-1985 Cement mortar lining for gray-iron and Ductile-Iron Pipe and Fittings for water. A21.10-1987 Gray-Iron and Ductile-Iron Fittings, 3 inch through 48 inch for water and other liquids. A21.11-1985 Rubber gasket joints for gray-iron and ductile-iron pressure pipe and fittings. A21.51-1986 Ductile-iron pipe centrifugally cast in metal molds for sand-lined molds for water or other liquids (AWWA C151-1981).
 - b. Ductile Iron Pipe Joints and Fittings:
 - i. Joints: Ductile iron shall be mechanical joints of the latest approved design of the manufacturer. Joints shall be so designed to guarantee a water-tight joint for the life of the pipeline.
 - ii. Fittings: Ductile iron shall be short body mechanical as shown on the drawings, or required of the same pressure design as the pipe. Dimensional control and joint design shall conform to ANSI Standard A21.10 and A21.11. All fittings shall be coated as specified for the pipe. Where rods or ties are shown or called for, fittings shall be provided with anchoring lugs.
 - iii. Joint Materials: Ductile Iron Joint: Mechanical joints, bolts, glands, retainer glands and gaskets, ANSI Standard A21.11.
 4. Carbon Steel Pipe (1/8" thru 2"):

- a. Pipe:
 - i. Provide seamless carbon steel conforming to ASTM specification A-106.
 - ii. Pipe joints shall be threaded conforming to ANSI Standard B2.1.
 - b. Carbon Steel Welding Fittings:
 - i. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.
 - c. Grooved Joint Fittings:
 - i. Provide ductile iron fittings conforming to ASTM A536, Grade 65-45-12; or factory-fabricated from ASTM A53 steel pipe.
 - d. Branch Connection Welding Fittings:
 - i. Provide carbon steel weldolet fittings conforming to ANSI Standards B16.9, B16.11, B31.1.0 and ASTM specification A105, Grade 11.
 - e. Branch Connection, Welding to Screwed Fitting:
 - i. Provide carbon steel threadolet fitting conforming to ANSI Standards B16.9, B16.11, B31.1, and ASTM Specification A105, Grade 11.
 - f. Carbon Steel Flanges:
 - i. Provide carbon steel flanges conforming to ASTM Specification A181, Grade 1, and ANSI Standard B16.5.
 - g. Malleable Iron Screwed Fittings:
 - i. Provide screwed malleable iron fittings conforming to ANSI Standard B16.3, and ASTM Specification A-47 grade 32510.
 - h. Cast Iron Screwed Fittings:
 - i. Provide screwed cast iron fittings conforming to ANSI Standard B16.4, B2.1, and ASTM Specification A-126, Class A.
 - i. Roll Grooved Pipe Couplings:
 - i. Provide Victaulic Installation-Ready Style 107N (rigid) couplings with Grade "EHP" gasket (EPDM compound) in mechanical areas. Provide Victaulic Installation-Ready Style #177 or approved equal style (flexible) couplings with Grade "EHP" or "E" gasket in other areas. Provide with ductile iron housing and nuts and bolts.
 - ii. UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.
5. Carbon Steel Pipe (2-1/2" and above):
- a. Pipe:
 - i. Provide electric resistance welded carbon steel pipe conforming to ASTM Specification A-53.
 - ii. Pipe ends shall be beveled for welding.
 - b. Carbon Steel Welding Fittings:
 - i. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.
 - c. Branch Connection Welding Fittings:
 - i. Provide carbon steel weldolet fittings conforming to ANSI Standards B16.9, B16.11, B31.1.0 and ASTM specification A105, Grade 11.
 - d. Branch Connection, Welding to Screwed Fitting:
 - i. Provide carbon steel threadolet fitting conforming to ANSI Standards B16.9, B16.11, B31.1, and ASTM Specification A105, Grade 11.
 - e. Carbon Steel Flanges:
 - i. Provide carbon steel flanges conforming to ASTM Specification A181, Grade 1, and ANSI Standard B16.5.

- f. Malleable Iron Screwed Fittings:
 - i. Provide screwed malleable iron fittings conforming to ANSI Standard B16.3, and ASTM Specification A-47 grade 32510.
- g. Cast Iron Screwed Fittings:
 - i. Provide screwed cast iron fittings conforming to ANSI Standard B16.4, B2.1, and ASTM Specification A-126, Class A.
- h. Grooved Joint Fittings:
 - i. Provide ductile iron fittings conforming to ASTM A536, Grade 65-45-12; or factory-fabricated from ASTM A53 steel pipe.
- i. Pipe Flange Gaskets:
 - i. Provide 1/16" thick asbestos free gaskets full face or ring type as required. Gaskets shall be factory cut.
 - ii. Gaskets by Durable Mfg. Co. or Garlock Company.
- j. Roll Grooved Pipe Couplings:
 - i. Provide Victaulic Installation-Ready Style 107N couplings with Grade "EHP" gasket (EPDM compound) in mechanical areas. Provide Victaulic Installation-Ready Style #177 or approved equal style (flexible) couplings with Grade "EHP" or "E" gasket in other areas. Provide with ductile iron housing and nuts and bolts.
 - ii. UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.
- 6. Copper Tube:
 - a. Tube/Pipe:
 - i. Provide hard temper copper water tube conforming to requirements of current ASTM Specification B-88. Tubing shall be Type K, L, or M as listed in schedule. Tubing joints shall be soldered, brazed or Viega Pro-Press style fittings. See schedule for joining method to be used.
 - ii. Pipe by Anaconda, Cerro, Chase, Mueller or Revere Copper.
 - b. Wrought Copper Fittings:
 - i. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
 - ii. Fittings by Anaconda, Chase, Viega or Nibco.
 - c. Grooved Joint Fittings: ASME B16.22 wrought copper or cast bronze to ASME B16.18. Manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.) Victaulic Copper Connection.
 - d. Provide Victaulic Installation-Ready Style 607H couplings with grade 'EHP' gasket. Copper-tube dimensions with offsetting, angle-pattern bolt pads.
- 7. Copper Tube Type ACR:
 - a. Pipe/Tube:
 - i. Provide hard temper nitrogenized copper refrigerant tube conforming to requirements of current ASTM B-88. Tubes shall be Type L or K as listed in schedule.
 - ii. Tubing joints shall be brazed.
 - iii. Pipe by Anaconda, Cerro, or Mueller.
 - b. Wrought Copper Fittings:
 - i. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
 - ii. Fittings by Anaconda, Chase or Nibco.
- 8. Polyethylene Pipe Natural Gas Piping:
 - a. Provide polyethylene pipe for gas service conforming to ASTM D-1248. Pipe shall be UV stabilized.
 - b. SDR of 11.

- c. Pipe by Driscopipe or equal.
9. Polyvinyl Chloride Drain Waste Pipe:
 - a. Pipe:
 - i. Provide Schedule 40 polyvinyl chloride solid core plastic drain waste and vent pipe conforming to ASTM D2665. Joints shall be properly cleaned, primed and glued where scheduled.
 - ii. Polyvinyl Chloride (PVC) Pipe & Fittings Cell Class 12454 B. ASTM D 2241 SDR-26
 - iii. Pipe by Charlotte, Genova, Crestline or equal.
 - b. PVC Fittings:
 - PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.
 - Joints shall be of a push-on type with a bell-end grooved to receive a synthetic rubber gasket when scheduled. Solvent welded joints are not allowed outside the building. The joint shall be made in accordance with ASTM D 3212.
 - ii. Equivalents: Spears, Lasco or equal.
10. Cross linked Polyethylene Pipe:
 - a. Tubing Standard: ViegaPEX High-Density Cross-linked polyethylene tubing shall be manufactured to the requirements of ASTM F876 and meet the standard grade hydrostatic pressure ratings from Plastic Pipe Institute in accordance with TR-4/03. The following three standard grade ratings are required.
 - i. 200 degrees F at 80 psig
 - ii. 180 degrees F at 100 psig
 - iii. 73.4 degrees F at 160 psig
 - b. Chlorine testing: According to ASTM F876 shall meet or exceed the following end use condition.
 - i. End use conditions of : 100% @ 140°F
 - ii. Per PEX 5006 (CL5) or NSF P171 (CLR)
 - c. Tubing Standard: FostaPEX High-Density Cross-linked polyethylene tubing shall be manufactured to the requirements of ASTM F876 and meet the standard grade hydrostatic pressure ratings from Plastic Pipe Institute in accordance with TR-4/03. The following three standard grade ratings are required.
 - i. 200 degrees F at 80 psig
 - ii. 180 degrees F at 100 psig
 - iii. 73.4 degrees F at 160 psig
 - d. Fitting Standard: PEX Press fittings shall be manufactured from UNS C83600, C87700 or C87710 Bronze and meet the requirements of ASTM F877 tested as a system with ViegaPEX tubing. The PEX Press sleeve shall be manufactured out of a 304 grade or better stainless steel and have one to three view holes incorporated in it to ensure proper PEX tubing insertion.
 - e. Equivalent system by Uponor
 - i. Pipe/Tube
 - Material: Cross-linked polyethylene (PEX) manufactured by PEX-a or Engel method. Type: Wirsbo AQUAPEX. Material Standard: Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third party agency. Standard grade hydrostatic design and pressure ratings from PPI.
 - ii. Fittings
 - Material: Fitting assembly shall be manufactured from material listed in paragraph 5.1 of ASTM F1960. Material Standard: Comply with ASTM F1960. Type: PEX-a cold expansion fitting. Assembly shall consist of the appropriate ProPEX insert with a corresponding ProPEX Ring.
11. HDPE Below Grade Polyethylene Water Piping:

- a. Provide high density polyethylene pipe listed for use in underground water service applications. Pipe shall be UV stabilized.
- b. DR 9, ASTM D3035, AWWA C901, NSF
- c. PE3408/PE3608 material conforming to ASTM D3350 with the cell classification of 345464C/E and is listed with the Plastic Pipe Institute's (PPI) TR4. Formulated with carbon black and ultraviolet stabilizer for maximum protection against UV rays for added assurance.
- d. Joints shall be fused.

PART 3 EXECUTION

3.1. PIPING INSTALLATION

- A. Piping systems materials and installation shall conform to the following standards and codes.
 1. System: Natural Gas Piping
 - a. Code: ANSI Standard B31.12 "Fuel Gas Piping"
- B. Natural Gas piping and other fuel piping systems shall be installed per code. All fittings in chases, solid walls, floors, etc. shall be welded, fused or otherwise listed for installation in concealed locations. Other acceptable methods shall include providing ventilated casings for installation in these situations. Unions, elbows, bushings, etc shall not be installed in concealed locations and shall only be installed in accessible locations.
- C. No piping containing water shall be located in areas subject to freezing temperatures, including: unheated attics, unheated plenums, chases wall spaces or cavities within exterior walls, under slabs, or in concrete.
- D. Pipe sizes indicated on plans and as specified refer to nominal size in inches, unless otherwise indicated. Pipes are sized to nearest 1/2". In no case shall piping smaller than size specified be used.
- E. Install drainage piping pitched down at a minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent) for piping 4 inch and larger. Install vent piping pitched to drain back by gravity to the sanitary drainage piping system.
- F. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings.
- G. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.
- H. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.
- I. Install piping so that systems can be completely drained. Provide piping systems with valve drain connections at all low pipe and ahead of all sectionalizing valves whether shown on plans or not. Drain lines shall be 3/4".
- J. Drain valves on closed piping systems such as chilled water system shall have lock shields and plugged or capped outlets to protect system from inadvertent drainage.
- K. Pitch all piping and where possible make connections from horizontal piping so that air can be properly vented from system. Provide air vents as specified at all system high points and at drop in piping in direction of flow. Use eccentric reducers where necessary to avoid air pockets in horizontal piping.
- L. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.
- M. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.
- N. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.
- O. Brazed socket type joints shall be made with suitable brazing alloys. Minimum socket depth shall be sufficient for intended service. Brazing alloy shall be end fed into socket, and shall fill completely annular clearance between socket and pipe or tube. Brazed joints depending solely upon a fillet rather than a socket type joint will not be acceptable.
- P. Soft soldered socket type joints shall be made with sill-floss or 95-5 tin-antimony solder as required by temperature and pressure rating of piping system. Soldered socket-type joints shall be limited to systems containing non-flammable and non-toxic fluids. Soldered socket-type joints shall not be used on piping systems subject to shock vibration. Soldered joints depending solely upon a fillet rather than a socket-type joint will not be acceptable.
- Q. Make changes in piping size and direction with approved factory made fittings. Provide fittings suitable for at

least 125 PSI working pressure or of pressure rating required for maximum working pressure of system whichever is greater.

3.2. PIPING SUPPORTS, ANCHORS, SLEEVES AND SEALS

- A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Sleeves are not required for supply and waste piping through wall supporting plumbing fixtures or for cast iron soil pipe passing through concrete slab or grade except where penetrating a membrane waterproof floor.
- B. Plumbing Contractor shall supervise installation of sleeves to insure proper location and installation.
- C. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.
- D. Sleeves passing through above grade floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchens shall be cast iron with integral flanges and shall extend 1 inch above finished floor. Size sleeves for and seal space between pipe sleeve with Thunderline Link-Seal.
- E. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core drill.
- F. Pipe insulation shall run continuous through pipe sleeves with 1/4" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves with Thunderline High Temperature Link Seal.
- G. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.
- H. All below grade and exterior wall penetrations shall be installed in a pipe sleeve and sealed between the pipe and pipe sleeve with Thunderline High Temperature Link Seal.
- I. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around cables with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
 - 1. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.3. PIPE HANGERS AND SUPPORTS

- A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.
- B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.
- C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position.
- D. Hangers shall not become disengaged by movements of supported pipe.
- E. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.
- F. Unless indicated otherwise on drawings support horizontal steel piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4"	3/8"	8 Ft.
1-1/2" to 2"	3/8"	10 Ft.
2-1/2" to 3-1/2"	1/2"	12 Ft.
4" and 5"	5/8"	15 Ft.

- G. Unless indicated otherwise on drawings support horizontal copper tubing as follows:

NOM. TUBING SIZE	ROD DIAMETER	MAXIMUM SPACING

Up to 1"	3/8"	6 Ft.
1-1/4" to 1-1/2"	3/8"	8 Ft.
2"	3/8"	9 Ft.
2-1/2"	1/2"	9 Ft.
3" and 4"	1/2"	10 Ft.

- H. Support horizontal cast iron soil pipe with two hangers for each section located close to each hub.
- I. Support vertical cast iron soil pipe at every floor, steel and copper tubing at every other floor except where indicated otherwise on drawings.
- J. Provide continuous threaded hanger rods wherever possible. No chain, wire, or perforated straps shall be used.
- K. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Architect-Engineer for review prior to fabrication.
- L. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	1/2" thru 4"	CT-121
Steel	3/4" thru 20"	261

- M. Provide Grinnell Fig. 194, 195 or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.
- N. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation.
- O. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide calcium silicate blocking insulation at each pipe hanger in thickness of other adjacent insulation. Insulation vapor barrier jacket shall overlap to maintain vapor barrier continuous.

3.4. INSULATION MATERIALS AND APPLICATIONS METHODS (HANGERS, SUPPORTS, ANCHORS, GUIDES, EXPANSION JOINTS, ETC.)

- A. Insulation materials and application methods for piping hangers supports, anchors, guides expansion joints, etc., shall be as follows:
 - 1. Insulate hangers and supports from direct contact with cold or hot surfaces (-120°F to 450°F) with rigid calcium silicate insulation at suspension points to prevent crushing of insulation.
 - 2. The length or thickness of the insulation support same as the pipe insulation thickness. Provide ASJ type discs or otherwise reestablish vapor barrier.
- B. Structural attachments for pipe hangers shall be as follows:
- C. Concrete Structure: Provide Grinnell Fig. No. 285 cast in concrete insert for loads up to 400 lbs. and Grinnell Fig. 281 wedge cast in type concrete insert for loads up to 1200 lbs.
- D. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIALS	PIPE SIZE	HANGER FIG. NO.
Copper	1/2" thru 4"	CT-65
Steel	3/8" thru 4"	65
Steel	5" thru 30"	260

- E. Provide Fee and Mason Fig. 600 channel trapeze pipe hangers for horizontal multiple pipe runs with pipe clamps or pipe rollers as follows:

PIPE MATERIALS	PIPE SIZE	CLAMP NO.	ROLLER NO.
Copper	3/8" thru 4"	8600 CP*	8010 CP*
Steel	3/8" thru 6"	8500	8010

*Copper Plated

- F. Pipe supports for horizontal piping mounted on pipe racks or stanchions shall be Advanced Thermal Systems low friction graphite slide supports or equivalent by Elcen or Grinnell. Where racks and supports are not detailed on drawings submit detailed support drawings to Architect-Engineer for review prior to fabrication.
- G. Provide Fee and Mason Fig. 404 vibration control hangers at locations where piping vibrations would be transmitted to building structure by conventional hangers. Apply hangers within their load supporting range.
- H. Provide Elcen Fig. 50 pipe saddle with adjuster to support piping from floor. Provide complete with pedestal type floor stand.
- I. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Architect-Engineer prior to installations.
- J. Equivalent hangers and supports by Auto-Grip, Basic Engineer, Bee Line, Elcen, Fee & Mason, Fluorocarbon Company, Unistrut or Super Strut Inc.
- K. Provide premanufactured pipe support for piping located on flat roofs, unless otherwise indicated on drawings. Support will be of modular designs with roller bearings and guide saddles for straight piping runs longer than 50' and Unistrut type clamp/support type for other shorter runs. Maximum pipe support spacing shall be 10' for steel piping. Copper piping and refrigerant piping shall be supported at shorter distances. Piping near equipment connections shall be supported within 3' of units. System supports shall be compatible with roofing materials and shall be provided with plates, pads, etc to spread weight and wear on roof surface. Provide pipe supports from Miro Industries, B-Line, or approved equivalent.

END OF SECTION 221000

SECTION 221119 – DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. NSF Compliance:
 - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
 - 2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1. INSULATING UNIONS AND FLANGES

- A. Provide insulating unions and flanges conforming to following specifications and plainly and permanently marked with manufacturers name and pressure class rating. Unions and flanges shall be as follows:
 - 1. Steel pipe to steel pipe screwed end:
 - a. Provide Stockham malleable iron No. 693-1/2 insulating union with high dielectric strength insulating sleeve and gasket.
 - 2. Steel pipe to steel pipe flanged end:
 - a. Provide two weld neck flanges of proper pressure rating insulated on both sides with Central or Klingerit Flange Insulation Kit.
 - 3. Iron or steel pipe to copper pipe:
 - a. Provide Epco Dielectric union or flange with screwed or solder joint as required. Union shall have 250 PSI rating and flange 175 PSI rating at 190 degrees F.
 - b. Dielectric Waterway Fitting: Copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service, with threaded or grooved ends. Victaulic Style 647 or equal.

2.2. UNIONS

- A. Provide unions or flanged joint in each line preceding connections to equipment or valves requiring maintenance.
 - 1. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.
- B. Provide Stockham brass seat unions of material and pressure rating required by piping system.
- C. Where piping systems of dissimilar materials are jointed together provide proper insulating union as specified under this specification.
- D. Equivalent unions by Fairbanks or Grinnell.

2.3. STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers:
 - 1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
 - 2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
 - 3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 - 4. Screen: Stainless steel with round perforations, unless otherwise indicated.
 - 5. If retaining more than one screen size, indicate screen size on Drawings.
 - 6. Perforation Size:

- a. Strainers NPS 2 and Smaller: 0.062 inch
 - b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
 - c. Strainers NPS 5 and Larger: 0.125 inch.
7. Drain: Factory-installed, hose-end drain valve.
- B. Install strainers upstream from automatic control valves, water service backflow preventers and RPZ backflow preventers 1" and larger. Where strainers are an integral part of these items or incorporated in accessory equipment directly upstream, individual line strainers will not be required. Strainers shall be same size as piping. Provide strainers with proper isolation and blow down valves to allow basket removal for cleaning.
- C. Install strainer so that basket contains debris by gravity at no flow conditions to allow removal of large debris not able to be passed by blow down.

2.4. HOSE BIBBS

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation: Wheel handle.
13. Include operating key with each operating-key hose bibb.
14. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.5. WALL HYDRANTS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. Prier Products, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Woodford Manufacturing Company.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with locking cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): One with each wall hydrant.

2.6. TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.7. BACKFLOW PREVENTERS

- A. Provide where shown on plans the following types of backflow preventers. Provide isolation valve ahead of backflow preventers.
- B. Equivalent backflow prevents by Watts, Febco, Lawler.
 1. Reduced Pressure Zone Principle (1/4"-1/2"):
 - a. Watts Series 009 reduced pressure backflow preventer complete with strainers and valves.
 2. Reduced Pressure Zone Principle (3/4"-10"):
 - a. Watts Series 909 reduced pressure backflow preventer complete with strainers and valves. Provide isolation valve ahead of backflow preventers. Provide with air gap fitting and pipe to floor drain.
 3. Double Check Valve (1/2"-2"):
 - a. Watts Series 007 double check valve assembly complete with ball type test cocks, full port ball valve shut offs and strainer.
 4. Double Check Valve (2-1/2"-10"):
 - a. Watts Series 709 double check valve assembly complete with ball type test cocks, OS&Y valve shut offs and strainer. Epoxy coated cast iron check valve bodies with bronze seats.
 5. Pressure Vacuum Breakers (1/2"-2"):
 - a. Watts Series 800M4QT pressure vacuum breaker with integral ball valve shut offs.
 6. Pressure Vacuum Breakers (3/8"-1/2"):
 - a. Watts Series 008QT pressure vacuum breaker for anti-spill applications, with integral ball valve shut offs.
 7. Atmospheric Vacuum Breaker (1/4"-3"):
 - a. Watts Series 288A atmospheric vacuum breaker in plain brass finish.
 8. Hose Bibb Vacuum Breakers
 - a. Vacuum Breakers for hose end connections shall be Watts Series 8 non removable type.

2.8. DOMESTIC HOT WATER EXPANSION TANKS

- A. The expansion tank shall be welded steel, diaphragm type tank, and pre-charged to the minimum operating pressure. Tanks shall be suitable for domestic water service.
- B. Provide expansion tanks as shown on plans by Amtrol, Bell and Gossett, Watts.

2.9. WATER PRESSURE-REDUCING VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cash Acme.
 2. Conbraco Industries, Inc.
 3. Honeywell Water Controls.
 4. Victaulic Company.
 5. Watts Industries, Inc.; Water Products Div.
 6. Zurn Plumbing Products Group; Wilkins Div.
- B. Standard: ASSE 1003.
- C. Pressure Rating: Initial working pressure of 150 psig.
- D. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
 1. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.10. WATER HAMMER ARRESTERS:

- A. ASSE 1010 or PDI-WH 201, piston type with pressurized metal-tube cushioning chamber. Sizes indicated are based on ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F. Manufacturers: Amtrol, Josam, Sioux Chief, Watts, Zurn.
- B. Provide water hammer arrestors for all plumbing banks with fixtures utilizing flush valves in any capacity. Locate arrester between the last two fixtures served on the branch line. Water Closet = 10FU, Urinals = 5FU, Lavatories = 1.5FU.

FIXTURE UNITS (FU)	UNIT SIZE
1-11	A
12-32	B
33-60	C
61-113	D
114-154	E
155-330	F

- C. When no flush valves are installed on a branch of piping provide $\frac{3}{4}$ "x12" air chambers at each hot and cold water supply connection to a plumbing fixture. Contractor may provide water hammer arresters above the ceiling before dropping into masonry construction in lieu of air chambers. Connections to other items such as washers, ice makers, or other equipment shall be provided with an appropriately sized water hammer arrester for each water connection.

2.11. RECIRCULATION PUMPS

- A. The pump shall be of the horizontal, oil-lubricated type and of all bronze construction. Specifically designed and guaranteed for quiet operation. Suitable for 125# working pressure.
- B. The pump shall have a ground and polished steel shaft with a hardened integral thrust collar. The shaft shall be supported by two horizontal sleeve bearings designed to circulate oil. The pump is to be equipped with a mechanical seal with carbon seal face rotating against a ceramic seat. The motor shall be non-overloading at any point on pump curve.
- C. The motor shall be of the drip-proof, sleeve-bearing, quiet-operating, rubber-mounted construction. Motors shall have built-in thermal overload protectors.
- D. Provide pump with aquastat or built in temperature control/timer system.
- E. Mount pumps at approximately 6' AFF in mechanical rooms for access and maintenance. Alternatively mount pumps adjacent to water heaters for access and maintenance where heaters are on mezzanine or otherwise elevated above floor.
- F. Equivalent pumps by Grundfos, Armstrong, Bell & Gossett and Taco.

2.12. THERMOMETERS AND GAUGES

A. GENERAL

- 1. Provide thermometers and wells and pressure test plugs as hereinafter specified and shown on the plans so that proper testing and balancing and trouble shooting can be accomplished.

B. THERMOMETERS

- 1. Thermometers shall be red reading mercury type having scale length of not less than 9", and scale divisions of 2 degrees F, or less similar and approved equal to Moeller Instrument Company, Inc., Style AJ. Range shall be as specified or as required for the duty. Thermometers and wells must be of at least the quality and design specified. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Moeller, Terice or Weksler.
- 2. Install thermometers at eye level (5'-0") at easily readable locations.

C. GAUGES

- 1. Gauges shall be bourdon tube with minimum 4-1/2" dial and die cast aluminum case with black enamel finish. The movement shall be all stainless steel with Grade A phosphor bronze bourdon tube brazed at socket and tip. The accuracy of the gauge shall be within $\frac{1}{2}$ percent of the scale range. The pointer shall be the micrometer adjustment type recalibrated from the front. Pressure, compound, and differential pressure gauges shall have suitable scale ranges, shall be submitted and are subject to the review of the Engineer. Graduations shall be one pound or less on all gauges where this is standard for the required range.
- 2. Gauges shall have $\frac{1}{4}$ " IPS connections and shall be Moeller "Vantage" gauges with Case Style No. 2, or approved equal. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Ashcroft, Marsh, Terice, Moeller, Weksler, Taylor, Weiss,

- or Midwest.
3. Install a Sisco 1/4" or 1/2" NPT fitting (Test Plug) of solid brass at desired indicated locations. Test plug shall be capable of receiving either a pressure or temperature probe 1/8" o.d. Dual seal core shall be neoprene for temperature to 200°F and shall be rated zero leakage from vacuum to 1000 psig.
 4. Install gauges vertically.

D. INSTALLATION

1. Thermometers shall be installed as hereinafter specified. Where thermometer is scheduled, a thermometer well shall be provided.
2. All thermometer wells shall be constructed of brass or stainless steel and where installed in insulated piping shall have at least 2-1/2" lagging extension. Gauges shall be installed as hereinafter specified.
3. Gauge cocks shall be polished brass A10 1/4" tee handle type with threaded ends. 125 psi rated.
4. Provide gauge cock with 1/4" pipe nipple for connection to gauge cock.
5. Pressure temperature ratings of each well shall be suitable for the system in which it is installed in accordance with specifications and as indicated on the drawings. All wells shall be filled with Silicon and be complete with caps and chains.
6. Thermometers shall have the temperature ranges as required for the intended application and shall be installed as scheduled.

E. THERMOMETER & TEST GAUGE COCK INSTALLATION SCHEDULE

SERVICE	Thermometer & Well	Press Gauge & Gauge Cock
Water Service ahead of PRV		X
Water Service after PRV	X	X
Fire Water Service		X

PART 3 EXECUTION

3.1. INSTALLATION

- A. Refer to other Division 22 Sections for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to plumbing equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet. Install at approximately 6' AFF for service and maintenance.
 1. Install thermometers and water regulators if specified.
 2. Install cabinet-type units recessed in or surface mounted on wall as specified.
- F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.
- G. Install water hammer arresters in water piping according to PDI-WH 201.
- H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- I. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- J. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2. FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test each backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3. ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.
- D. Prior to occupancy the contractor shall balance all components of the recirculation system to insure hot water is delivered throughout the building. This shall be done at times of low usage of the domestic system to insure systems functions during times of low/no use. Mark all valves, record settings of balance and provide documentation to owner at turnover.

END OF SECTION 221119

SECTION 221319 – SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:

1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof and Overflow Drains
5. Downspout Nozzles
6. Trench drains.
7. Channel drainage systems.
8. Air-admittance valves.
9. Miscellaneous sanitary drainage piping specialties.
10. Roof flashing assemblies.
11. Interceptors.

1.3. SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
 1. Cleanouts.
 2. Drains (floor, roof, trench, etc.).

1.4. QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

PART 2 PRODUCTS

2.1. BACKWATER VALVES

- A. Horizontal, Cast-Iron Backwater Valves

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.14.1.
3. Size: Same as connected piping.
4. Body: Cast iron.
5. Cover: Cast iron with bolted or threaded access check valve.
6. End Connections: Hub and spigot or hubless.
7. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition.
8. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

2.2. CLEANOUTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated below or a comparable product by one of the following:
 1. Josam Company; Josam Div.

2. Sioux Chief Manufacturing Company, Inc.
 3. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 4. Tyler Pipe; Wade Div.
 5. Watts Drainage Products Inc.
 6. Zurn Plumbing Products Group; Specification Drainage Operation.
- B. Floor (Concrete Floor Finish):
1. Wade #W-6000-XS cast iron cleanout with square, heavy duty, scoriated nickel bronze top, adjustable above to finished floor.
- C. Floor (Quarry Tile Floor Finish):
1. Same as concrete floor finish.
- D. Floor (Tile Floor Finish):
1. Wade #W-6000-TS cast iron cleanout with square heavy duty nickel bronze top, recessed for tile and adjustable to finished floor.
- E. Floor (Carpet Floor Finish):
1. Wade #W-6000-XS-72 cast iron cleanout with round, heavy duty nickel bronze top with carpet retainer and adjustable to finished floor after concrete has set.
- F. Wall:
1. Wade #W-8450-C cleanout with dura-coated cast iron ferrule and cadmium plated cast iron counter-sunk plug complete with round smooth nickel bronze wall access cover and flush over-wall frame.
- G. Verify floor materials used from Architectural plans and provide proper cleanout tops, where they occur in carpet, quarry tile, vinyl tile or ceramic tile.

2.3. FLOOR DRAINS

- A. Cast-Iron Floor Drains:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group.
 2. Standard: ASME A112.6.3.
 3. Body Material: Gray iron.
 4. Seepage Flange: Required for all elevated slabs.
 5. Anchor Flange: Required.
 6. Clamping Device: Required.
 7. Outlet: Bottom.
 8. Top or Strainer Material: Nickel bronze in public spaces or rough bronze in mechanical spaces unless otherwise scheduled.
 9. Top of Body and Strainer Finish:
 10. Top Shape: Square in tiled areas. All others shall be round.
 11. Dimensions of Top or Strainer: As scheduled.
 12. Trap Material: Cast iron.
 13. Trap Pattern: Deep-seal P-trap.
 14. Trap Features: Trap-seal primer valve drain connection where shown on plans.

2.4. ROOF AND OVERFLOW DRAINS

- A. Drains shall be type and style listed below.
1. Equivalent drains by J.R. Smith, Zurn, Watts or Josam.
- B. Roof Drain Type 1
1. Wade #W-3000 cast iron roof drain with flange, flashing ring with gravel stop and cast iron dome.

C. Overflow Roof Drain Type 1

1. Wade #W-3000 cast iron roof drain with flange, flashing ring with gravel stop and cast iron dome. Provide with 2" dam.

2.5. DOWNSPOUT NOZZLES

- A. Provide Wade series 3940 cast bronze downspout nozzles with threaded outlet and flange to secure nozzle to wall.
- B. Equivalent drains by J.R. Smith, Zurn, or Josam.

2.6. TRENCH DRAINS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Josam Company.
 2. MIFAB, Inc.
 3. Smith, Jay R. Mfg. Co.
 4. Tyler Pipe; Wade Div.
 5. Watts Drainage Products Inc.
 6. Zurn Plumbing Products Group.
 7. DuraTrench
- B. Standard: ASME A112.6.3 for trench drains.
- C. Material: Ductile or gray iron.
- D. Flange: Anchor.
- E. Clamping Device: Required.
- F. Grate Material: Ductile iron>.
- G. Grate Finish: Painted.
- H. Top Loading Classification: Heavy Duty.
- I. Trap Material: Cast iron.
- J. Trap Pattern: Standard P-trap.

2.7. CHANNEL DRAINAGE SYSTEMS

- A. Polymer-Concrete Channel Drainage Systems:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABT, Inc.
 - b. Josam Company; Mea-Josam Div.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Josam Company; Mea-Josam Div.
 - e. Strongwell Corporation; Lenoir City Division.
 - f. Zurn Plumbing Products Group; Flo-Thru Operation.
 - g. DuraTrench
 2. Type: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - a. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.
 - i. Dimensions: 4-inch (102-mm) inside width. Include number of units required to form total lengths indicated.
 - ii. Frame: Gray-iron or galvanized steel for grates.
 - b. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - i. Material: Ductile iron
 - ii. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
 - c. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - d. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.

- e. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.8. AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ayrlett, LLC.
 - b. Durgo, Inc.
 - c. Oatey.
 - d. ProSet Systems Inc.
 - e. RectorSeal.
 - f. Studor, Inc.
- 2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
- 3. Housing: Plastic.
- 4. Operation: Mechanical sealing diaphragm.
- 5. Size: Same as connected fixture or branch vent piping.

B. Stack Air-Admittance Valves :

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Durgo, Inc.
 - b. Oatey.
 - c. Studor, Inc.

C. Standard: ASSE 1050 for vent stacks.

D. Housing: Plastic.

E. Operation: Mechanical sealing diaphragm.

F. Size: Same as connected stack vent or vent stack.

2.9. MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains

- 1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
- 2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Expansion Joints :

- 1. Standard: ASME A112.21.2M.
- 2. Body: Cast iron with bronze sleeve, packing, and gland.
- 3. End Connections: Matching connected piping.
- 4. Size: Same as connected soil, waste, or vent piping.

2.10. FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

- 1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
- 2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
- 3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.11. GREASE INTERCEPTORS

A. Grease Interceptors :

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a.
 - b. Josam Company; Josam Div.
 - c. MIFAB, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Tyler Pipe; Wade Div.
 - f. Watts Drainage Products Inc.
 - g. Zurn Plumbing Products Group.
2. Standard: ASME A112.14.3 and PDI-G101, for intercepting and retaining fats, oils, and greases from food-preparation wastewater.
3. Plumbing and Drainage Institute Seal: Required.
4. Body Material: Cast iron or steel.
5. Interior Lining: Corrosion-resistant enamel.
6. Exterior Coating: Corrosion-resistant enamel.
7. Body Extension: As required.
8. Rate in subparagraph below is limited to 100 gpm (6.3 L/s).
9. Flow Rate: As scheduled.
10. Capacity in first subparagraph below is limited to 200 lb (90.7 kg).
11. Grease Retention Capacity: As scheduled
12. Flow-Control Fitting: Required.

2.12. OIL INTERCEPTORS

A. Oil Interceptors

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Rockford Sanitary Systems, Inc
 - d. Smith, Jay R. Mfg. Co.
 - e. Tyler Pipe; Wade Div.
 - f. Watts Drainage Products Inc.
 - g. Zurn Plumbing Products Group.
2. Type: Factory-fabricated interceptor for separating and removing light oil from wastewater.
3. Body Material: Cast iron or steel.
4. Flow-Control Fitting: Required.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
 4. Locate at base of each vertical soil and waste stack.
 5. Not all required cleanouts are shown on the plans in the interest of drawing clarity. Cleanout that are shown are shown are to be located as shown. Additional code required cleanouts shall be located to be along walls (not in middle of halls or large floor areas) and out of general sight lines where possible. Install cleanouts so they are accessible by extending them through walls, and floors, to outside of building, or to above grade as required.
- D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

- E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- G. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.
- H. Assemble and install ASME A112.3.1, stainless-steel channel drainage systems according to ASME A112.3.1. Install on support devices so that top will be flush with surface.
- I. Assemble non-ASME A112.3.1, stainless-steel channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
- J. Assemble FRP channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
- K. Assemble plastic channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
- L. Install fixture air-admittance valves on fixture drain piping only when specifically shown or directed by Engineer.
- M. Install stack air-admittance valves at top of stack vent and vent stack piping only when specifically shown or directed by Engineer.
- N. Install air-admittance-valve wall boxes recessed in wall.
- O. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- P. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- Q. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
- R. Install deep-seal traps on floor drains and other waste outlets..
- S. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- T. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- U. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- V. Install vent caps on each vent pipe passing through roof.
- W. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- X. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
 - 1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
 - 2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
 - 3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
 - 4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
- Y. Install grease removal devices on floor. Install trap, vent, and flow-control fitting according to authorities having jurisdiction. Install control panel adjacent to unit, unless otherwise indicated.
- Z. Install oil interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing. Coordinate oil-interceptor storage tank and gravity drain with Division 23 Section "Facility Fuel-Oil Piping."
- AA. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary

drainage and vent systems.

- BB. Install wood-blocking reinforcement for wall-mounting-type specialties.
- CC. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- DD. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2. CONNECTIONS

- A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.
- B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Install piping adjacent to equipment to allow service and maintenance.
- D. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.
- E. Grease Removal Devices: Connect controls, electrical power, factory-furnished accessories, and inlet, outlet, and vent piping to unit.
- F. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.
- G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3. FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
 - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4. PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221429 – SUMP PUMPS

PART 1 GENERAL

1.1. SUMMARY

- A. This Section includes wet-pit-mounted, vertical and submersible sump pumps and accessories, inside the building, for building storm drainage systems.

1.2. SUBMITTALS

- A. Product Data: For each type and size of sump pump specified. Include certified performance curves with operating points plotted on curves, and rated capacities of selected models, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
- B. WET-PIT-MOUNTED, VERTICAL SUMP PUMPS
 - 1. Manufacturers:
 - a. Alyan Pump Company.
 - b. Weil Pump Company, Inc.
 - c. Zoeller
 - d. Armstrong
- C. Description: Factory-assembled and -tested, single-stage, centrifugal, end-suction sump pumps complying with UL 778. Vertical, separately coupled, suspended pumps complying with HI 1.1-1.2 and HI 1.3 for wet-pit-volute sump pumps.
 - 1. Pump Arrangement: Simplex or Duplex as scheduled.
 - 2. Casing: Cast iron, with screened inlet and threaded connection for NPS 2 and smaller and flanged connection for NPS 2-1/2 and larger discharge piping.
 - 3. Impeller: ASTM A 48/A 48M, Class No. 25 A or higher cast iron; statically and dynamically balanced nonclog design; overhung, single suction, keyed and secured to shaft.
 - 4. Pump Shaft and Sleeve Bearings: Stainless-steel shaft with bronze sleeve bearings. Include oil-lubricated, intermediate sleeve bearings at 48-inch maximum intervals if basin depth is more than 48 inches, and grease-lubricated, ball-type thrust bearings.
 - 5. Pump and Motor Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
- D. Pump Discharge Piping: Manufacturer's standard galvanized-steel or bronze pipe.
- E. Pit Cover: Cast iron or steel with bituminous coating and strong enough to support pumps, motors, and controls.
- F. Cover Shaft Seal: Stuffing box, with graphite-impregnated braided-yarn rings and bronze packing gland.
- G. Motor: Single speed; grease-lubricated ball bearings. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment" with built-in thermal-overload protection appropriate for motor size and duty.
 - 1. Mounting: On vertical, cast-iron pedestal.
- H. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switches; with floats, float rods, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate multiple units if one pump cannot handle load.
 - 1. Float Guide: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
 - 2. High-Water Alarm: Cover-mounted, micropressure-switch alarm, with electric bell; 120-V ac, with transformer and contacts for remote alarm bell.

2.2. SUBMERSIBLE SUMP PUMPS

- A. Manufacturers:
1. ABS Pumps, Inc.
 2. Goulds Pumps; ITT Industries.
 3. Grundfos Pumps Corp.
 4. Liberty Pumps.
 5. Little Giant Pump Co.
 6. Paco Pumps, Inc.
 7. Stancor, Inc.
 8. Weil Pump Company, Inc.
 9. Zoeller Company.
- B. Description: Factory-assembled and tested, simplex or duplex as scheduled, single-stage, centrifugal, end-suction, submersible, direct-connected sump pumps complying with UL 778 and HI 1.1-1.2 and HI 1.3 for submersible sump pumps.
- C. Casing: Cast iron; with cast-iron inlet strainer, legs that elevate pump to permit flow into impeller, and vertical discharge with companion flange for piping connection.
- D. Impeller: ASTM A 48/A 48M, Class No. 25 A or higher cast iron; statically and dynamically balanced, semiopen nonclog design, overhung, single suction, keyed and secured to shaft.
- E. Casing and Impeller: Cast iron casing with metal inlet strainer and brass, bronze, or cast-iron impeller.
- F. Casing and Impeller: Cast iron or plastic casing with inlet strainer and metal or plastic impeller.
- G. Pump and Motor Shaft: Stainless steel with factory-sealed, grease-lubricated ball bearings and single-mechanical seals.
- H. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection; three-conductor waterproof power cable of length required, and with grounding plug and cable-sealing assembly for connection at pump. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment"
- I. Pump Discharge Piping: Factory or field fabricated, ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe.
- J. Basin Cover: Cast iron or steel with bituminous coating and strong enough to support controls.
- K. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switch; with float, float rod, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate multiple units if one pump cannot handle load.
- L. Controls: NEMA 250, Type 6, 120-V ac, float switch, mounted on discharge piping and alarm for simplex pumps.

2.3. SUBMERSIBLE SUMP PUMPS FOR USE IN ELEVATOR SUMPS

- A. Provide submersible pump as specified above and provide control systems capable of pumping water while containing oil. The system shall function automatically and shall provide for an alarm in the event of (a) the presence of oil in the sump (b) high liquid in the sump or (c) high amps or a locked rotor condition. An alarm that sounds only in the event of a high liquid condition shall not be acceptable.
1. CONTROLS:
- a. The control shall be approved to UL 508 standards and housed in a gasketed Nema 4X enclosure with stainless steel hinged hardware and 8-pin twist-lock electrical receptacle. The control shall include dual "Oil-Minder Relays" with variable sensitivity settings, magnetic contactor with separate over-current relay, self-cleaning stainless steel sensor probe, high decibel warning horn with illuminated red light and alarm silencing switch, dual floats, clearly marked terminal board and remote monitoring contact. A Nema 4X box with 8-pin twist-lock electrical receptacle and 25' (additional lengths available) of mating cable shall be provided. All cables between the pump and junction box shall be 16' long and the cable and plug from the control unit shall be 8' long. The control unit, pump, floats and sensor probe shall be factory assembled as a complete, ready to use system and shall be tested and approved by a nationally recognized testing laboratory such as ENTELA.

2.4. SUMP PUMP BASINS

- A. Description: Factory fabricated basin with sump, pipe connections, and separate cover.
- B. Sump: Fabricate watertight, with sidewall openings for pipe connections.
1. Material: Fiberglass.
 2. Reinforcement: Mounting plates for pumps, fittings, and accessories.
 3. Anchor Flange: Same material as or compatible with sump, cast in or attached to sump, in location and of size required to anchor basin in concrete slab.

- C. Cover: Fabricate with openings having gaskets, seals, and bushings, for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.
 - 1. Material: Cast iron or steel with bituminous coating.
 - 2. Reinforcement: Steel or cast iron, capable of supporting foot traffic for basins installed in foot-traffic areas.

2.5. SUMP PUMP PITS

- A. Description: Concrete pit with sump, pipe connections, curb frame, and separate cover.
- B. Sump: Construct of watertight, cast-in-place, reinforced concrete with sidewall openings for pipe connections.
- C. Curb Frame and Cover:
 - 1. Curb Frame Material: Galvanized steel or steel with bituminous coating.
 - a. Pattern: Z-cross-section shape with raised outer rim of height matching cover, for recessed mounting having installed cover flush with top of floor slab.
 - 2. Cover: Fabricate with openings having gaskets, seals, and bushings, for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.
 - a. Material: Cast iron or steel with bituminous coating.
 - b. Reinforcement: Steel or cast iron, capable of supporting foot traffic for pits installed in foot-traffic areas.

PART 3 EXECUTION

3.1. CONCRETE

- A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 22 Section "Common Work Results for Plumbing."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
 - 2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 3. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.2. SUMP PUMP INSTALLATION

- A. Install sump pumps according to applicable requirements in HI 1.4.
- B. Install pumps and arrange to provide access for maintenance including removal of motors, impellers, couplings, and accessories.
- C. Suspend wet-pit-mounted, vertical sump pumps from basin and pit covers. Make direct connections to storm drainage piping.
- D. Set submersible sump pumps on basin or pit floor. Make direct connections to storm drainage piping.
- E. Install sump pump basins and connect to drainage piping. Brace interior of basins according to manufacturer's written instructions to prevent distortion or collapse during concrete placement. Set basin cover and fasten to basin top flange. Install cover so top surface is flush with finished floor.
- F. Construct sump pump pits and connect to drainage piping. Set pit curb frame recessed in and anchored to concrete. Fasten pit cover to pit curb flange. Install cover so top surface is flush with finished floor.
- G. Support piping so weight of piping is not supported by pumps.
- H. Install piping adjacent to sump pumps to allow service and maintenance.
- I. Connect storm drainage piping to pumps.
 - 1. Install flexible connectors adjacent to pumps in discharge piping.
 - 2. Install check and shutoff valves on discharge piping from each pump. Install unions on pumps having threaded pipe connections. Install valves same size as connected piping.
- J. Ground equipment according to Division 26.
- K. Connect wiring according to Division 26.

END OF SECTION 221429

SECTION 223300 – ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. ELECTRICAL WORK REQUIRED

- A. Contractor shall provide electrical connections for any equipment that requires electrical connections for power or control. Electrical requirements and work shall be coordinated with Electrical Contractor.

1.3. SUBMITTALS

- A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.
- C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.
- D. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.
- E. Warranties: Special warranties specified in this Section.

1.4. QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
- D. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
 - 1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
 - 2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

1.5. WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
- C. Warranty Period: From date of Substantial Completion:
 - 1. Storage Tanks: 5 years.

PART 2 - PRODUCTS

A. POINT-OF-USE, STORAGE, ELECTRIC WATER HEATERS 30 GALLONS AND LESS

- 1. Provide water heaters as scheduled by State, Rheem, Eemax, A.O. Smith, Bosch. Refer to schedule for capacities and characteristics.
- 2. Storage Tank Construction: Steel with 150-psig working-pressure rating.
- 3. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
- 4. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
- 5. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
- 6. Jacket: Steel, with enameled finish.
- 7. Heating Elements: electric, screw-in, immersion type.
- 8. Temperature Control: Adjustable thermostat for each element.

9. Anode Rod: Factory installed, magnesium.
10. Drain Valve: ASSE 1005, factory installed.
11. Electrical characteristics as scheduled. Coordinate with electrician for wiring requirements.
12. Provide with 3 year warranty.
13. Where unit is suspended provide adequate supports and shelf. Mount above ceiling where ceiling is accessible. Mount all components for heater where suspended or wall mounted no lower than 6'-8" above finished floor.
14. Where unit is located in cabinetry or under sinks, take care to coordinate with other trades and piping to provide all adequate clearances and serviceability.

B. COMMERCIAL, POINT-OF-USE, STORAGE, ELECTRIC WATER HEATERS LARGER THAN 30 GALLONS

1. Provide water heaters as scheduled by State, Rheem, A.O. Smith, PVI. Refer to schedule for capacities and characteristics.
2. Description: Comply with UL 174 or UL 1453, and listed by manufacturer for commercial applications.
3. Storage Tank Construction: Non-ASME-code steel with 150-psig working-pressure rating.
 - a. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
 - b. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
 - c. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
 - d. Jacket: Steel, with enameled finish.
4. Heating Elements: Two, unless otherwise indicated; electric, screw-in, immersion type.
 - a. Temperature Control: Adjustable thermostat.
5. Anode Rod: Factory installed, magnesium.
6. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.
7. Special Requirement: NSF 5 construction.
8. Provide water heaters as scheduled by State, Rheem, National, or A.O. Smith. Refer to schedule for capacities and characteristics.
9. Units shall have a porcelainized glasslined tank, protected in the following ways:
 - a. Against failure due to overheating caused by the buildup of scale, film and other sediment by a cold water inlet tube, which is an integral part of the heater, that churns and agitates particles of sand, silt or scale present in the water, so they are carried out of the water heater on successive hot water draws.
 - b. Against electrolytic corrosion by conveniently located, easily replaceable magnesium anode rods.
10. Water heaters shall have the U.L. seal of certification, a working pressure rating of 160 psi, a factory installed Temperature and Pressure Relief Valve, and a full-size (4"x5") inspection port. Water heater shall also be equipped with N.S.F. construction.
11. Water heater tanks shall be covered by a 3 year limited warranty against failure due to metal fatigue and overheating caused by buildup of sand, sediment or sludge.

PART 3 - EXECUTION

3.1. WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
- B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Anchor water heaters to substrate.
- D. Install seismic restraints for water heaters where located in seismic zones. Anchor to substrate.
- E. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- F. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

- G. Install vacuum relief valves in cold-water-inlet piping.
- H. Install vacuum relief valves in water heater storage tanks that have copper lining.
- I. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Plumbing Specialties" for drain valves.
- J. Install thermometers on water heater inlet and outlet piping. Refer to Division 22 Section "Meters and Gages" for thermometers.
 - 1. Exception: Omit thermometers for water heaters 30 gallons and less.
- K. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, and thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 15 Section "Valves" for general-duty valves and Division 22 Section "Meters and Gages" for thermometers.
- L. Arrange for insulation on equipment and piping not furnished with factory-applied insulation.
- M. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- N. Fill water heaters with water.
- O. Charge compression tanks with air.

3.2. ELEVATED TANKS

- A. Elevated tanks shall be securely supported from structure and provided with drain pan.
- B. Pipe drain pan to nearest floor drain or mop sink.
- C. Install tank and support assembly at a minimum of 6'-6" above finished floor level. Install higher if structure allows, but no higher than 10' above finish floor unless specifically indicated.

3.3. CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
- D. Make connections with dielectric fittings where piping is made of dissimilar metal.
- E. Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit service.
- F. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4. FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to perform startup service.
- B. In addition to manufacturer's written installation and startup checks, perform the following:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
 - 2. Verify that piping system tests are complete.
 - 3. Check for piping connection leaks.
 - 4. Check for clear relief valve inlets, outlets, and drain piping.
 - 5. Check operation of circulators.
 - 6. Test operation of safety controls, relief valves, and devices.
 - 7. Energize electric circuits.
 - 8. Adjust operating controls.
 - 9. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.
 - 10. Balance water flow through manifolds of multiple-unit installations.

3.5. DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.
 - 1. Train Owner's maintenance personnel on procedures for starting and stopping troubleshooting, servicing, and maintaining equipment.
 - 2. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 223300

SECTION 224000 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Shop Drawings: As applicable, provide dimensional data and diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- D. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify components properly fit in construction, cabinetry, chases, etc.

1.3. ELECTRICAL WORK REQUIRED

- A. Contractor shall provide electrical connections for any equipment that requires electrical connections for power or control. Electrical requirements and work shall be coordinated with Electrical Contractor.

1.4. PIPING SYSTEMS

- A. Refer to Section 221116 of this specification for piping material specifications and installation instructions. Specific piping materials and joining methods for systems installed under this section shall be as listed in schedule.

1.5. PIPING SYSTEMS VALVES

- A. Refer to Section 22 "Valves" of this specification for valve type specifications and installation instructions.

1.6. PIPING SYSTEMS INSULATION

- A. Refer to Section 22 "Insulation" insulation type specifications and installation instructions.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

- A. Equivalent fixtures and accessories by following manufacturers will be acceptable.
 - 1. Fixtures: American Standard, Kohler, Crane, Zurn, Toto.
 - 2. Institutional/Correctional: Bradley, or Acorn
 - 3. Stainless Steel Fixtures: Elkay, Just, Moen Commercial
 - 4. Fittings and Supports: Josam, Smith, Wade, Zurn, or Jonespec.
 - 5. Seats: Church, Olsonite, Bemis or Beneke.
 - 6. Drinking Fountains: Halsey Taylor, Elkay, Oasis, or Haws.
 - 7. Lavatory & Sink Trim: Eljer, Chicago, Bradley, Sloan, Moen Commercial or American Standard.
 - 8. Traps, Supplies and Stops: Dearborn, Brass Craft, Central D, Sanitary Dash or as specified under plumbing fixtures.
 - a. Supplies and Stops: Dearborn Fig. No. 2700 CW ½" compression loose key stop and 3/8" O.D. risers in length required. Provide deep chrome plated brass escutcheons.
 - b. Traps: Dearborn #FS510 (1-1/2") and/or EFS507 (1-1/4") cast brass body with clean-out and 17 gauge tube outlet "P" trap. Provide deep chrome plated brass escutcheon with set screw.

2.2. PLUMBING FIXTURES

- A. Provide plumbing fixtures as shown on drawings and as specified complete including piping and connections. China fixtures shall be of best grade vitreous ware without pit holes or blemishes and outlines shall be generally true. Architect-Engineer reserves right to reject any piece, which in their opinion is faulty. Fixtures fitting against walls shall have ground backs. Exposed piping and fittings shall be chrome plated.
- B. All wall mounted urinals and lavatories shall be furnished with concealed arm carriers. All wall-mounted water closets shall be furnished with concealed carriers.
- C. Set fixtures true and level with all necessary supports for fixtures installed before wall finish is done. Nipples through wall to fixture connections shall be chrome plated brass. Provide silicone sealer around perimeter of lavatories, water closets, and urinals at connection to wall and/or floor.

2.3. LAVATORY FAUCETS:

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. American Standard Companies, Inc.
 2. Bradley Corporation.
 3. Chicago Faucets.
 4. Delta Faucet Company.
 5. Eljer.
 6. Kohler Co.
 7. Moen Commercial
 8. Zurn Plumbing Products Group; Commercial Brass Operation.
- B. Description: Single-control mixing, Single-control nonmixing, and Two-handle mixing as scheduled valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
1. Body Material: Commercial, solid brass
 2. Finish: As Scheduled.
 3. Maximum Flow Rate: 0.5 gpm (1.5 L/min.) for public lavatories. Private lavatories shall be a maximum of 2.2 gpm (8.3 L/min.)
 4. Centers: As scheduled and coordinated with fixtures.
 5. Valve Handle(s): ADA Compliant wrist blade, 4 inches (102 mm) unless otherwise scheduled.
 6. Spout: Rigid in public locations. Coordinate gooseneck swing or rigid installation with architect prior to installation.
 7. Spout Outlet: As scheduled.
 8. Tempering Device: Provide thermostatic tempering device piped in supply for all public lavatories unless tempering is otherwise provided.
 9. Where electronic fixtures are specified, provide will all transformers, cables, junction boxes, sensors and controls. All equipment and installation shall have neat and orderly appearance.

2.4. FLUSHOMETERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. Sloan.
 2. Zurn.
 3. Toto.
- B. Description: Flushometers for urinal or water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.
1. Internal Design: Diaphragm or piston operation as scheduled.
 2. Style: Exposed or Concealed as scheduled.
 3. Consumption: Low flow type coordinated with flow requirements of fixture served.
 4. Tailpiece Size: Coordinated with spud of fixture and length as required for valve location to properly mounted fixture elevation.
- C. Provide recessed vandal proof covers and boxes for all recessed/concealed style flush valves.
- D. Provide all required junction boxes, power supplies and wiring for line voltage style flush valves when scheduled.
- E. All exposed components shall be chrome finished or brushed nickel or similar durable finish.

2.5. PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Co.
 - b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing Co., Inc.
 - d. Plumberex Specialty Products Inc.
 - e. TCI Products.
 - f. TRUEBRO, Inc.
 - g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 EXECUTION

3.1. GENERAL

- A. All plumbing fixtures shall be cleaned and free of all construction debris.
- B. Electric water cooler shall be protected during construction.
- C. Any chrome trim with wrench marks shall be removed and new trim installed.
- D. Architect-Engineer reserves the right to reject any plumbing fixture.
- E. See plans for Plumbing Fixture Schedule.

3.2. INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install floor mounted water closets and other fixtures with solid waste using only 45 degree and combination fittings. Do not use sanitary tees in horizontal applications.
- F. Install wall-mounting fixtures with tubular waste piping attached to supports.
- G. Install fixtures level and plumb according to roughing-in drawings.
- H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- L. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- M. Install toilet seats on water closets.
- N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- Q. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- R. Install traps on fixture outlets.
 1. Exception: Omit trap on fixtures with integral traps.
 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- S. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- T. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install in sink deck where sink is stainless steel type or on countertop at sink where sink is integral or there is no deck for sink. Connect inlet hose to dishwasher and outlet hose to disposer.
- U. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.
- V. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- W. Set bathtubs and showers in leveling bed of cement grout.
- X. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.3. CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size

fittings required to match fixtures.

- C. Ground equipment according to Division 26 Section "Grounding and Bonding."
- D. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4. FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

3.5. PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

SECTION 230010 – MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Mechanical Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Mechanical systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
- C. Refer to Architectural, Structural and Electrical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping and ductwork in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, piping and other mechanical work are indicated diagrammatically by the mechanical drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
- B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
- D. Do not scale mechanical and electrical drawings for dimensions. Contractor shall accurately layout work from the dimensions indicated on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of mechanical systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. Warranty for all equipment shall take effect from the date of substantial completion regardless of the date equipment was installed.
- C. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.

- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in mechanical or electrical service requirements necessary to accommodate such substitution.
- H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

- A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of \$50 per sheet, \$100 minimum and \$25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. TEMPORARY USE OF PERMANENT HVAC UNITS

- A. If the Contractor elects to use permanent equipment for temporary conditioning only that permanent equipment associated with the heating system shall be allowed for use as space conditioning during the construction period. The Mechanical Contractor shall take full responsibility for all permanent equipment used for temporary conditioning during the construction period and shall provide a total of two years warranty covering all parts and labor on all permanent equipment utilized for temporary conditioning. This warranty shall cover all piping, fittings, valves, pipe and equipment insulation, pumps, boilers, chillers, condensing units, cooling towers, air handling units, exhaust and relief air fans, ductwork, ductwork insulation, diffusers, temperature controls, all electric motors, starters, disconnect switches, fuses, wire and conduit. This warranty shall cover all required maintenance on the system with the exception of filter changes, and shall start on the date shown on the final completion certificate.
- B. CAUTION: The Contractor is being warned that the Architect-Engineer will not accept dirty equipment caused by construction contamination.

1.14. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.15. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.16. EXTENT OF CONTRACT WORK

- A. Provide mechanical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of mechanical systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.
- B. Electrical work required to install and control mechanical equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal. Mechanical systems and components are to be installed as a complete system, including all miscellaneous interlock (low voltage and minor line voltage power wiring such as control motors, limit switches, relays, etc), control wiring, safeties. Coordinate interlock to other systems such as fire alarm that interlock to mechanical systems and insure that provisions are made in equipment for connection of these systems. Coordinate with all other trades for specific needs and requirements based on submitted systems.
- C. Contractor shall become familiar with equipment provided by other contractors that require mechanical connections and controls.
- D. All automatic temperature control devices shall be mounted as indicated in automatic temperature control section of specifications.
- E. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which

was not used for basis of design as outlined in specifications shall be paid for by Mechanical Contractor at no cost to Owner or Architect-Engineer.

- F. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of mechanical and electrical equipment are made to attain intended control sequences and system operation.
- G. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.
- H. Contractor shall obtain complete electrical data on mechanical shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of mechanical equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.17. WORK NOT INCLUDED IN CONTRACT

- A. Consult Division 26 of specifications for work to be provided by Electrical Contractor in conjunction with installation of mechanical equipment.

1.18. CODES, RULES AND REGULATIONS

- A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.
- B. Conform to latest editions and supplements of following codes, standards or recommended practices.
- C. BUILDING CODES:
 - 1. International Codes (Latest adopted version of applicable codes)
- D. SAFETY CODES:
 - 1. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
 - 2. Occupational Safety and Health Standard (OSHA) - Department of Labor.
- E. NATIONAL FIRE CODES:
 - 1. NFPA No. 54 National Fuel Gas Code
 - 2. NFPA No. 70 National Electrical Code
 - 3. NFPA No. 89M Clearances, Heat Producing Appliances
 - 4. NFPA No. 90A Air Conditioning and Ventilating Systems
 - 5. NFPA No. 91 Standard for Exhaust Systems
 - 6. NFPA No. 101 Life Safety Code
 - 7. NFPA No. 204 Standard for Smoke and Heat Venting
- F. UNDERWRITERS LABORATORIES INC:
 - 1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.
- G. MISCELLANEOUS CODES:
 - 1. ANSI A117.1 - Handicapped Accessibility
 - 2. Applicable State Boiler Codes
 - 3. Americans with Disabilities Act (ADA)
- H. ENERGY EFFICIENCY REQUIREMENTS:
 - 1. All mechanical systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.19. STANDARDS

- A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.20. PERMITS/FEEES

- A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by

governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.

- B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SUBMITTALS

- A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
- B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.
 - 1. Submittals shall be furnished in an Adobe PDF format.
 - 2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.
 - a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.
 - 3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
 - 4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
 - 5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall bear the equipment manufacturer's name and address.
 - 6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
 - 7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.
- C. Contractor review:
 - 1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.
 - 2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
 - 3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- D. Review Schedule:
 - 1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
 - 2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
 - 3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
 - 4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the

Contractor's responsibility.

- E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
- F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
- G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
- H. Coordination
 - 1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.2. SHOP DRAWINGS

- A. Shop drawings shall meet all of the above requirements for submittals.
- B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
- C. No work shall be fabricated until Architect-Engineer's review has been obtained.
- D. Sheet metal shop drawings for duct fabrication shall be a minimum of 1/4" scale. Sheet metal shop drawings shall not be a reproduction of the contract document and shall show details of the following: Fabrication, assembly, and installation, including plans, elevations above finished floor, sections, components, and attachments to other work. Duct layout indicating pressure classifications and sizes on plans, fittings, reinforcement and spacing, seam and joint construction, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.

3.3. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
- B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:
 - 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
 - 2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
 - 3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
 - 4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of mechanical system.
- D. Provide brochures bound in three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - 1. Project name and address.
 - 2. Section of work covered by brochure, i.e., "Plumbing", etc.

3.4. RECORD DOCUMENTS

- A. A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
- C. Provide one copy of on high quality heavy weight presentation type paper. Blueprints or other media which fade shall not be used.

- D. Provide one electronic scanned version of record documents in Adobe PDF format on a DVD. Transmit DVD in conjunction with hard copy documents.

3.5. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all ductwork and equipment at the completion of the project.
- C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.6. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.7. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
- C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of mechanical work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.8. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
- B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
- C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Mechanical contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
- F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.9. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

- A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.
- B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructors name, names of Owner's personnel attending and total hours of instruction given each individual.
- C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall

become property of the owner.

3.10. FINAL CONSTRUCTION REVIEW

- A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 230010

SECTION 230011 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Provide documentation of all completed tests described herein and their results.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

- A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
- B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
- C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
- D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
- E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
- F. For test pressure schedules see piping material schedules.

3.2. TEST METHODS AND PRESSURES

- A. Test methods and pressures shall be as follows:
 - 1. Hydrostatic Test (Closed Systems):
 - a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.
 - 2. Hydrostatic Test (Open System):
 - a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.
 - 3. Pneumatic Test:
 - a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
 - b. Allow at least 1 hour after test pressure has been applied before making initial test.
 - c. Curing test, completely isolate entire system from compressor or other sources of air pressure.
 - 4. Pressure Relief and Safety Valve:
 - a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
 - b. Tag items that pass test with date of test, observed relief pressure setting and inspector's signature.
 - c. Items installed in systems without test tag attached will be rejected.

3.3. TESTING OF REFRIGERANT LINES

- A. After the system is installed and before any piping is insulated, the entire refrigeration circuit must be thoroughly leak tested. Test all pipe joints for leaks. Make certain that all joints are inspected thoroughly. Mark carefully any spots where leaks occur.
- B. Leaks are repaired by disassembling the connection, cleaning the fitting and remaking. No attempt should be made to repair a leak by simply adding brazing material.

3.4. MISCELLANEOUS CONTROL WIRING

- A. All control wiring regardless of voltage shall be routed in a concealed manner.
- B. All exterior control wiring shall be installed in conduit.
- C. Wiring to thermostats and other wall mounted devices and sensors shall be routed in ¾" conduit to backboxes in walls and to an accessible ceiling or location.
- D. All conduit and wiring shall be installed in accordance with Division 26.
- E. Cabling and circuiting shall be plenum rated where required.
- F. Refer to additional specifications where systems and controls are specified as DDC or similar.

3.5. CLEANING OF SYSTEMS AND EQUIPMENT

- A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

1. Air Handling Systems:

- a. Before starting any air system clean all debris, foreign matter and construction dirt from air system and fan. Provide equipment requiring filters, such as air handling units, fan coil units, blower, etc., with throw-away filters. After cleaning air system install temporary filters and run continuously for a minimum of eight hours at full volume before installing permanent filters. Provide temporary throw-away filters in all permanent heating and air conditioning equipment systems being utilized during construction. Prior to testing and balancing systems remove temporary filter media and install clean unused filters of the type specified. Clean filters shall be installed in equipment by mechanical contractor before final acceptance inspection by Architect and Engineer.

3.6. MAINTENANCE OF SYSTEMS

- A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
- B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
- C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.7. PAINTING OF MATERIALS AND EQUIPMENT

- A. Touch-up painting and refinishing of factory applied finishes shall be by Mechanical Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- B. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- C. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- D. Where extensive refinishing is required equipment shall be completely repainted.

3.8. EXCAVATION AND BACKFILL

- A. Perform necessary excavation to receive Work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove it at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
- B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
- C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by Architect-Engineer. Mechanically tamp backfill under concrete and pavings in six inch layers to 95% standard density, Reference Division 2.
- D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
- E. When available, refer to test hole information on Architectural or Civil drawings or specifications for types of soil to be encountered in excavations.

3.9. FIRE BARRIERS

A. General

- 1. For penetrations through fire-resistance-rated constructions, including both empty openings and

openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Submittals

1. Product Data: For Each Type Of Product Indicated.
2. Shop Drawings: For Each Through-Penetration Firestop System, Show Each Type Of Construction Condition Penetrated, Relationships To Adjoining Construction, And Type Of Penetrating Item. Include Firestop Design Designation Of Qualified Testing And Inspecting Agency That Evidences Compliance With Requirements For Each Condition Indicated.
 - a. Submit Documentation, Including Illustrations, From A Qualified Testing And Inspecting Agency That Is Applicable To Each Through-Penetration Firestop System Configuration For Construction And Penetrating Items.
 - b. Where Project Conditions Require Modification To A Qualified Testing And Inspecting Agency's Illustration For A Particular Through-Penetration Firestop Condition, Submit Illustration, With Modifications Marked, Approved By Through-Penetration Firestop System Manufacturer's Fire-Protection Engineer As An Engineering Judgment Or Equivalent Fire-Resistance-Rated Assembly.
3. Through-Penetration Firestop System Schedule: Indicate Locations Of Each Through-Penetration Firestop System, Along With The Following Information:
 - a. Types Of Penetrating Items.
 - b. Types Of Constructions Penetrated, Including Fire-Resistance Ratings And, Where Applicable, Thicknesses Of Construction Penetrated.
 - c. Through-Penetration Firestop Systems For Each Location Identified By Firestop Design Designation Of Qualified Testing And Inspecting Agency.
- C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.
- G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
- H. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- I. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- J. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
- K. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.10. EQUIPMENT ANCHORS

- A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
- B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
- C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

3.11. WELDING

- A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.1.
- B. Welded pipe joints shall be made by certified welding procedures and welders. Welding electrodes shall be type and material recommended by electrode manufacturer for materials to be welded. All pipe and fittings ends shall be beveled a minimum of 30 degrees prior to welding.

- C. Only welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required shall do welding. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders' code, date and types of latest qualification test passed by each welder.
- D. Welded joints shall be fusion welded in accordance with Level AR3 of American Welding Society Standard AWS D10.9 "Standard for Qualification of Welding Procedures and Welders for Pipe and Tubing". Welders qualified under National Certified Pipe Welding Bureau will be acceptable.
- E. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

END OF SECTION 230011

SECTION 230013 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each related sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3. COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Delivery and processing of submittals.
 - 2. Progress meetings.
 - 3. Preinstallation conferences.
 - 4. Project closeout activities.
 - 5. Startup and adjustment of systems.

1.4. SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.

3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
- F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
- H. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- I. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.
- J. Adjust location of piping, ductwork, conduit, wiring, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

- a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

1.6. DRAWINGS AND FILES

- A. The Drawings show only the general run of MEP systems, equipment, fixtures, piping and ductwork and other components as well as approximate location of items such as outlets, switches, diffusers, lights, and equipment connections, etc. Coordinate all exact locations of items with other trades, architectural elevations, equipment requirements, owner requirements, ceilings, access, serviceability, etc. All such modifications and coordination shall be made without additional cost to the Owner. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made
- B. Wherever the work is of sufficient complexity, additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field. Attend meetings with other trades to review all documents.
- C. When directed by the General Contractor for areas of necessary coordination provide 3D building modelling coordination files and documents with other trades. Transmit information electronically and attend meetings as directed by the G/C as well as take part in coordination activities and documentation. Contractor shall be required to generate their own electronic files for this process.

1.7. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Manufacturer's written recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
 - b. Review present and future needs of each contractor present, including the following:
 - i. Interface requirements.

- ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication.
 - vi. Access.
 - vii. Quality and work standards.
 - viii. Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8. REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
- 1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 220013

SECTION 230713 – DUCT INSULATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. 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. Section Includes:
 - 1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.
 - 2. Insulating cements.
 - 3. Adhesives.
 - 4. Mastics.
 - 5. Sealants.
 - 6. Factory-applied jackets.
 - 7. Field-applied jackets.
 - 8. Tapes.

1.3. SUBMITTALS

- 1. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- 2. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

B. QUALITY ASSURANCE

- 1. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - a. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - b. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.4. DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5. COORDINATION

- A. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 PRODUCTS

2.1. INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2. DUCT LINER

- A. Fibrous-Glass Duct Liner (Flat Applications): Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with

NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 2. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- B. Fibrous-Glass Duct Liner (Round Applications): Engineered, pre-formed insulation designed for specific duct diameters and fittings. Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." Rigid, resin bonded fibrous glass board with a damage-resistant, flame retardant veil faced airstream surface with a reinforced aluminum foil (FRK) backing.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - i. Maximum Thermal Conductivity:
 - Type I, Flexible: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- C. Fiber-Free Duct Liner (Flat Applications): Polyester blanket insulation with FSK facing. Comply with ASTM C 1071, NFPA 90A, or NFPA 90B.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ductmate.
 2. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 4. Duct liner shall be an engineered nonwoven, thermally bonded Polyester with a smooth and durable FSK facing. Liner must have a noise reduction coefficient of at least 0.65 and have thermal values greater or equal to an R-4.2 at 1", R-5 at 1.25", R-6 at 1 Yi" and R-8 at 2" respectively.
 5. Polyester liner must be able to withstand a constant internal temperature up to 250°F must be compliant with Greenguard Environmental Institute, and contain zero VOCs per ASTM D5116. Liner must comply with all applicable standards including ASTM E84, ASTM C518, ASTM G-21, NFPA 90A and 90B, and UL 181.
 6. Polyester duct liner must be attached using a non-flammable, low VOC water based adhesive. When applicable, apply a non-flammable, low voe water based lagging adhesive to the exposed leading edge of the insulation. Install fasteners per SMACNA HV AC Duct Liner installation instructions. Liner must consist of at least 25% recycled content.
 7. Polyester duct liner must be installed per section 7.4 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal and Flexible," Third Edition unless otherwise specified
- D. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534,

Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA Inc.
 - b. Armacell LLC.
 - c. Rubatex International, LLC
2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

2.3. DUCT WRAP

- A. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article. 1.0 lb. density standard duct insulation type IV with foil-scrim-craft facing and .27 BTUH thermal conductivity at 75 degrees mean temperature.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; All-Service Duct Wrap.
- B. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Fibrex Insulations Inc.; FBX.
 - c. Johns Manville; 800 Series Spin-Glas.
 - d. Knauf Insulation; Insulation Board.
 - e. Manson Insulation Inc.; AK Board.
 - f. Owens Corning; Fiberglas 700 Series.
- C. Flexible Elastomeric Duct Wrap: Closed cell insulation with a 16 mil laminated covering membrane (a UV protective white or silver, blended polymeric top surface and a puncture-resistant blended polymeric base, around a scrim reinforced core). The membrane has a 10-year limited warranty against breakdown due to UV radiation. Mold-resistant flexible elastomeric thermal insulation. It is manufactured without the use of CFCs, HFCs or HCFCs.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armacell LLC ArmaTuff Plus II.
 2. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
- D. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Fibrex Insulations Inc.; FBX.
 - c. Johns Manville; 800 Series Spin-Glas.
 - d. Knauf Insulation; Insulation Board.
 - e. Manson Insulation Inc.; AK Board.
 - f. Owens Corning; Fiberglas 700 Series.
- E. Fire-Rated Insulation Systems

1. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by a NRTL acceptable to authority having jurisdiction.
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; FlameChek.
 - b. Johns Manville; Firetemp Wrap.
 - c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
 - d. Thermal Ceramics; FireMaster Duct Wrap.
 - e. 3M; Fire Barrier Wrap Products.
 - f. Unifrax Corporation; FyreWrap.
 - g. Vesuvius; PYROSCAT FP FASTR Duct Wrap.

F. Insulation Pins and Washers:

- a. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

2.4. INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.5. ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
1. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- D. PVC Jacket Adhesive: Compatible with PVC jacket.

2.6. MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
1. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 200 deg F.
 3. Solids Content: 63 percent by volume and 73 percent by weight.
 4. Color: White.

2.7. SEALANTS

- A. Joint Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Permanently flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 4. Color: White or gray.
 5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.

3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8. FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.9. FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
 2. Factory cut and rolled to size.
 3. Finish and thickness are indicated in field-applied jacket schedules.
 4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 6. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. End caps.
 - c. Beveled collars.
 - d. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.10. TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.

PART 3 – EXECUTION

3.1. EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3. INSULATION SCHEDULE

- A. Refer to drawings for insulation and ductwork schedule.

3.4. GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - 4. For below ambient services, apply vapor-barrier mastic over staples.
 - 5. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Access doors.
- P. Undamaged insulation systems on cold surface ductwork and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.
- Q. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."
 - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 - 3. Butt transverse joints without gaps, and coat joint with adhesive.
 - 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 - 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. For double wall ductwork, secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

3.5. PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 1. Comply with requirements in Penetration Firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Penetration Firestopping."

3.6. MINERAL-FIBER INSULATION INSTALLATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- B. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 1. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 2. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

- C. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
- D. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- E. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 - 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 - 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7. FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8. EXTERIOR FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. install using manufacturer recommended adhesives or with pre-applied pressure sensitive adhesive (PSA) for application to large, flat or curved metal surfaces such as ducts, vessels, very large pipes or tanks.
- B. The seams must be installed in compression and sealed with adhesives. Adhesives are contact adhesives and shall be applied to duct and insulation surfaces.
- C. Cover seams with manufactured Seal Tape specific for application matching jacket.
- D. Exterior duct work must be pitched to allow rain water to run off the insulation.
- E. Do not install below ground.
- F. The application temperature should be above 40°F (+4°C) and 100°F (+38°C).

3.9. FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
 - 1. Draw jacket material smooth and tight.
 - 2. Install lap or joint strips with same material as jacket.
 - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 - 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10. FINISHES

- A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11. FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
 2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.
- E. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Mechanical Contractors expense at no cost to owner.

3.12. FIELD QUALITY ASSURANCE

- A. Upon completion of insulation work and before operation is to commence, visually inspect the work and verify that it has been correctly installed.
- B. Open all system dampers and turn on fans to blow all scraps and other loose pieces of material out of the duct system. Allow for a means of removal of such material.
- C. Check the duct system to ensure that there are no air leaks through joints.

3.13. PROTECTION

- A. Replace damaged insulation, which cannot be satisfactorily repaired, including insulation with duct liner damage and moisture-saturated insulation.
- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

END OF SECTION 230713

SECTION 230913 – PROGRAMMABLE THERMOSTATS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each control device indicated.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- B. Operation and maintenance data.

PART 2 PRODUCTS

2.1. GENERAL

- A. Provide Thermostats by Honeywell, Johnson Controls, White-Rogers, Carrier or approved equal.

2.2. UNITS

- A. Provide programmable thermostats with stages of cooling and heating as required by stages of cooling and heating on specified equipment (Refer to drawings and other portions of this specification to determine exact control required.)
- B. Thermostat shall have the following:
 - 1. Seven (7) day programming capability with 2 occupied/unoccupied periods per day.
 - 2. Automatic heat/cool change over.
 - 3. Start time optimization
 - 4. Continuous fan operation in occupied mode.
 - 5. Intermittent fan operation in unoccupied mode.
 - 6. Battery backup
 - 7. Temporary override capability
 - 8. Locking setpoints to prevent tampering.
 - 9. Anti-recycle controls
- C. Provide with all subbases required and interfaces to other equipment as required.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Coordinate with Electrical Contractor to provide all wiring between condensing units, furnaces, thermostats and all other required controls.
- B. Provide backbox and ¾" conduit to above accessible ceilings inside walls for thermostat wiring.
- C. All wiring shall be concealed in conduit or above accessible ceilings.
- D. Obtain a desired operational schedule from the owner or tenant and program each thermostat with desired settings.
- E. Provide Thermostats by Honeywell, Johnson Controls, White-Rogers, Carrier or approved equal.

END OF SECTION 230913

SECTION 232000 – HVAC PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product to be used.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

- A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. See piping material schedule on the drawings for materials to be used for each piping system.
 - 1. Copper Tube:
 - a. Provide hard temper copper water tube conforming to requirements of current ASTM Specification B-88. Tubing shall be Type K, L, or M as listed in schedule. Tubing joints shall be soldered or brazed. See schedule for joining method to be used.
 - b. Pipe by Anaconda, Cerro, Chase, Mueller or Revere Copper.
 - 2. Copper Tube Type ACR:
 - a. Provide hard temper nitrogenized copper refrigerant tube conforming to requirements of current ASTM B-88. Tubes shall be Type L or K as listed in schedule.
 - b. Tubing joints shall be brazed.
 - c. Pipe by Anaconda, Cerro, or Mueller.
 - 3. Polyvinyl Chloride Drain Waste Pipe:
 - a. Provide Schedule 40 polyvinyl chloride solid core plastic drain waste and vent pipe conforming to ASTM D2665. Joints shall be properly cleaned, primed and glued where scheduled.
 - b. Polyvinyl Chloride (PVC) Pipe & Fittings Cell Class 12454 B.
 - i. ASTM D 2241 SDR-26
 - c. Pipe by Charlot, Genova, Crestline or equal.

2.2. PIPING FITTINGS

- A. Piping fitting used throughout project shall be proper type for installation method used and shall be compatible with piping system material. Fittings listed in piping material schedule shall conform to the following specifications:
 - 1. Wrought Copper Fittings:
 - a. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
 - b. Fittings by Anaconda, Chase or Nibco.
 - 2. Cast Bronze Fittings:
 - a. Provide cast bronze solder joint fittings conforming to ANSI Standard B16.18.
 - b. Fittings by Anaconda, Chase or Nibco.
 - 3. PVC Fittings:
 - i. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.
 - ii. Joints shall be of a push-on type with a bell-end grooved to receive a synthetic rubber gasket when scheduled. Solvent welded joints are not allowed outside the building. The joint shall be made in accordance with ASTM D 3212.
 - b. Equivalents: Spears, Lasco or equal.

PART 3 - EXECUTION

3.1. PIPING INSTALLATION

- A. Piping systems materials and installation shall conform to the following standards and codes.
 - 1. System: Heating and Air Conditioning Piping
 - a. Code: ANSI Standard B31.1.0 "Power Piping"
- B. No piping containing water shall be located in areas subject to freezing temperatures, including: unheated attics, unheated plenums, chases wall spaces or cavities within exterior walls, under slabs, or in concrete.
- C. Pipe sizes indicated on plans and as specified refer to nominal size in inches, unless otherwise indicated. Pipes are sized to nearest $\frac{1}{2}$ ". In no case shall piping smaller than size specified be used.
- D. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings.
- E. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.
- F. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.
- G. Install piping so that systems can be completely drained. Provide piping systems with valve drain connections at all low pipe and ahead of all sectionalizing valves whether shown on plans or not. Drain lines shall be $\frac{3}{4}$ ".
- H. Drain valves on closed piping systems such as chilled water system shall have lock shields and plugged or capped outlets to protect system from inadvertent drainage.
- I. Pitch all piping and where possible make connections from horizontal piping so that air can be properly vented from system. Provide air vents as specified at all system high points and at drop in piping in direction of flow. Use eccentric reducers where necessary to avoid air pockets in horizontal piping.
- J. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.
- K. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.
- L. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.
- M. Brazed socket type joints shall be made with suitable brazing alloys. Minimum socket depth shall be sufficient for intended service. Brazing alloy shall be end fed into socket, and shall fill completely annular clearance between socket and pipe or tube. Brazed joints depending solely upon a fillet rather than a socket type joint will not be acceptable.
- N. Soft soldered socket type joints shall be made with sill-floss or 95-5 tin-antimony solder as required by temperature and pressure rating of piping system. Soldered socket-type joints shall be limited to systems containing non-flammable and non-toxic fluids. Soldered socket-type joints shall not be used on piping systems subject to shock vibration. Soldered joints depending solely upon a fillet rather than a socket-type joint will not be acceptable.
- O. Make changes in piping size and direction with approved factory made fittings. Provide fittings suitable for at least 125 PSI working pressure or of pressure rating required for maximum working pressure of system whichever is greater.

3.2. PIPING SUPPORTS, ANCHORS, SLEEVES AND SEALS

- A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Sleeves are not required for supply and waste piping through wall supporting plumbing fixtures or for cast iron soil pipe passing through concrete slab or grade except where penetrating a membrane waterproof floor.
- B. Mechanical Contractor shall supervise installation of sleeves to insure proper location and installation.
- C. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.
- D. Sleeves passing through above grade floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchens shall be cast iron with integral flanges and shall extend 1 inch above finished floor. Size sleeves for and seal space between pipe sleeve with Thunderline Link-Seal.
- E. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and

- ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core drill.
- F. Pipe insulation shall run continuous through pipe sleeves with 1/4" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves with Thunderline High Temperature Link Seal.
 - G. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.
 - H. All below grade and exterior wall penetrations shall be installed in a pipe sleeve and sealed between the pipe and pipe sleeve with Thunderline High Temperature Link Seal or similar compressed link type system.
 - I. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around cables with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
 - J. Equivalent by Dow, Chemelex, 3M.

3.3. PIPE HANGERS AND SUPPORTS

- A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.
- B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.
- C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position.
- D. Hangers shall not become disengaged by movements of supported pipe.
- E. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.
- F. Unless indicated otherwise on drawings support horizontal steel piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4"	3/8"	8 Ft.
1-1/2" to 2"	3/8"	10 Ft.
2-1/2" to 3-1/2"	1/2"	12 Ft.
4" and 5"	5/8"	15 Ft.

- G. Unless indicated otherwise on drawings support horizontal copper tubing as follows:

NOM. TUBING SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1"	3/8"	6 Ft.
1-1/4" to 1-1/2"	3/8"	8 Ft.
2"	3/8"	9 Ft.
2-1/2"	1/2"	9 Ft.
3" and 4"	1/2"	10 Ft.

- H. Support horizontal cast iron soil pipe with two hangers for each section located close to each hub.
- I. Support vertical cast iron soil pipe at every floor, steel and copper tubing at every other floor except where indicated otherwise on drawings.
- J. Provide continuous threaded hanger rods wherever possible. No chain, wire, or perforated straps shall be used.
- K. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Architect-Engineer for review prior to fabrication.

- L. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	½" thru 4"	CT-121
Steel	¾" thru 20"	261

- M. Provide Grinnell Fig. 194, 195 or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.
- N. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation.
- O. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide wood block at each pipe hanger in thickness of insulation. Insulation vapor barrier jacket shall overlap wood block to maintain vapor barrier.
- P. Structural attachments for pipe hangers shall be as follows:
- Q. Concrete Structure: Provide Grinnell Fig. No. 285 cast in concrete insert for loads up to 400 lbs. and Grinnell Fig. 281 wedge cast in type concrete insert for loads up to 1200 lbs.
- R. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIALS	PIPE SIZE	HANGER FIG. NO.
Copper	½" thru 4"	CT-65
Steel	3/8" thru 4"	65
Steel	5" thru 30"	260

- S. Provide Fee and Mason Fig. 600 channel trapeze pipe hangers for horizontal multiple pipe runs with pipe clamps or pipe rollers as follows:

PIPE MATERIALS	PIPE SIZE	CLAMP NO.	ROLLER NO.
Copper	3/8" thru 4"	8600 CP*	8010 CP*
Steel	3/8" thru 6"	8500	8010

*Copper Plated

- T. Pipe supports for horizontal piping mounted on pipe racks or stanchions shall be Advanced Thermal Systems low friction graphite slide supports or equivalent by Elcen or Grinnell. Where racks and supports are not detailed on drawings submit detailed support drawings to Architect-Engineer for review prior to fabrication.
- U. Provide Fee and Mason Fig. 404 vibration control hangers at locations where piping vibrations would be transmitted to building structure by conventional hangers. Apply hangers within their load supporting range.
- V. Provide Elcen Fig. 50 pipe saddle with adjuster to support piping from floor. Provide complete with pedestal type floor stand.
- W. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Architect-Engineer prior to installations.
- X. Equivalent hangers and supports by Auto-Grip, Basic Engineer, Bee Line, Elcen, Fee & Mason, Fluorocarbon Company, Unistrut or Super Strut Inc.
- A. Provide premanufactured pipe support for piping located on flat roofs, unless otherwise indicated on drawings. Support will be of modular designs with roller bearings and guide saddles for straight piping runs longer than 50' and Unistrut type clamp/support type for other shorter runs. Maximum pipe support spacing shall be 10' for steel piping. Copper piping and refrigerant piping shall be supported at shorter distances. Piping near equipment connections shall be supported within 3' of units. System supports shall be compatible with roofing materials and shall be provided with plates, pads, etc to spread weight and wear on roof surface. Provide pipe supports from Miro Industries, B-Line, or approved equivalent.

END OF SECTION 232000

SECTION 233113 – METAL DUCTS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. 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. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Double-wall rectangular ducts and fittings.
 - 3. Single-wall round and flat-oval ducts and fittings.
 - 4. Double-wall round and flat-oval ducts and fittings.
 - 5. Sheet metal materials.
 - 6. Sealants and gaskets.
 - 7. Hangers and supports.

1.3. PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4. SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Factory- and shop-fabricated ducts and fittings.
 - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 4. Elevation of top of ducts.
 - 5. Dimensions of main duct runs from building grid lines.
 - 6. Fittings.
 - 7. Reinforcement and spacing.
 - 8. Seam and joint construction.
 - 9. Penetrations through fire-rated and other partitions.
 - 10. Equipment installation based on equipment being used on Project.
 - 11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 - 12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Delegated-Design Submittal:
 - 1. Sheet metal thicknesses.
 - 2. Joint and seam construction and sealing.
 - 3. Reinforcement details and spacing.
 - 4. Materials, fabrication, assembly, and spacing of hangers and supports.
- D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 - 2. Suspended ceiling components.
 - 3. Structural members to which duct will be attached.
 - 4. Size and location of initial access modules for acoustical tile.

- 5. Penetrations of smoke barriers and fire-rated construction.
- 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- E. Welding certificates.
- F. Field quality-control reports.

PART 2 PRODUCTS

2.1. SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct allowing for insulation if lined.

2.2. SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
 - f. Norlock Metal Products, Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- F. All exposed round ducts shall be spiral wound construction.
- G. Concealed low pressure round ducts may be snap-lock construction when 8" or less. 10" round ducts shall be spiral wall construction.

2.3. ELBOW CONFIGURATION:

- A. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - 1. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

- B. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - 1. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - a. Radius-to Diameter Ratio: 1.5.
 - 2. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - 3. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

2.4. BRANCH CONFIGURATION:

- A. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - 1. Rectangular Main to Rectangular Branch: 45-degree entry.
 - 2. Rectangular Main to Round Branch: High Efficiency 45 degree takeoff.
- B. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - 1. Velocity 1000 fpm or Lower: 90-degree tap.
 - 2. Velocity 1000 to 1500 fpm: Conical tap.
 - 3. Velocity 1500 fpm or Higher: 45-degree lateral.

2.5. SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils thick on sheet metal surface of ducts and fittings exposed to corrosive conditions, and minimum 1 mil thick on opposite surface.
 - 3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.
- D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- F. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

2.6. SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Sealant: Modified styrene acrylic.
 - 3. Indoor and outdoor, Water resistant, Mold and mildew resistant.
 - 4. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
- C. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.

4. Indoor or outdoor, Water resistant, Mold and mildew resistant.
 5. VOC: Maximum 75 g/L (less water).
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
- D. Solvent-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Base: Synthetic rubber resin.
 3. Solids Content: Minimum 60 percent.
 4. Indoor or outdoor, Water resistant, Mold and mildew resistant.
 5. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
- E. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
- F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- G. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.
- H. Pressure sensitive duct joint sealer:
1. Provide Hard Cast, Inc. "Foil Grip" pressure sensitive duct joint sealer. Seal class "A", "B", and "C".

2.7. HANGERS AND SUPPORTS

- A. Indicate the extent of corrosive environment on Drawings.
- B. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- C. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- D. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- E. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- F. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- G. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- H. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- I. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 EXECUTION

3.1. DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. All metal ductwork scheduled for interior thermal and acoustical liner is not sized on plans to include the proper thickness of insulation. Add 1" or 2" in height and width of ductwork as required to accommodate insulation thickness. Mount specialties such as turning vanes, dampers, etc., to ductwork with that section insulated "Build Outs" to maintain continuity of thermal barrier.
- D. All ductwork within 15 feet of connection to rooftop units shall be constructed to 6" WG class regardless of unit static pressure ratings and be a minimum of 18 gauge sheet metal. Roof deck shall only be cut out as required for ductwork penetrations and annular gap around duct shall be sealed with elastomeric caulk to reduce rooftop unit breakout noise.
- E. Install round and flat-oval ducts in maximum practical lengths.
- F. Install ducts with fewest possible joints.

- G. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- H. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- K. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- L. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- M. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- N. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2. INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3. DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the scheduled seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
- C. In residential occupancies duct tightness shall be verified by either of the following:
 - 1. Postconstruction test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.
 - 2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.
 - 3. Exception: The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope.

3.4. HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet

metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5. CONNECTIONS

- A. Coordinate duct installations and specialty arrangements with Drawings.
B. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
C. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6. PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7. FIELD QUALITY CONTROL

- A. Perform tests and inspections.
B. Leakage Tests:
1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:
a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.
C. Duct System Cleanliness Tests:
1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
3. Duct system will be considered defective if it does not pass tests and inspections.
4. Prepare test and inspection reports.

3.8. START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9. DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

SYSTEM	Material	Pressure Class	Min. SMACNA Seal Class	Leakage Class
Supply				
Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units	Galv. SM	2" Pos.	C	Round-3 Rect-6
Return				
Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units	Galv. SM	2" Neg.	C	Round-3 Rect-6

Exhaust				
Ducts Connected to General Exhaust	Galv. SM	2" Pos. or Neg.	B	Round-3 Rect-6
Outside Air				
Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units	Galv. SM	2" Neg.	C	Round-3 Rect-6

3.10. CLOTHES DRYER EXHAUST SYSTEM DUCTWORK

- A. Dryer exhaust ducts shall be constructed of minimum 0.016-inch thick (0.4 mm) ridged metal ducts, having smooth interior surfaces with joints running in the direction of flow. Exhaust Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the flow. Ductwork shall be riveted for a smooth interior connector. Tape shall not be used as the only means to secure the connections.
- B. Exhaust ducts shall terminate on the outside of the building. Exhaust duct terminations shall be made in accordance with the dryer manufacturer's installation instructions. Exhaust ducts shall terminate at a location as required by the manufacturer's instructions. If the manufacture's instructions do not specify a termination location, the exhaust duct shall terminate not less than 3 feet (914 mm) in any direction from openings into buildings. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination.
- C. The maximum length of a clothes dryer exhaust duct shall not exceed 25 feet from the dryer location to the wall or roof termination. The maximum length of the duct shall be reduced 2.5 feet for each 45-degree bend and 5 feet for each 90-degree bend. The maximum length of the exhaust duct does not include the transition duct.
- D. After riveting duct joints shall be sealed using Hard Cast, Inc. "Foil Grip" pressure sensitive duct joint sealer.
- E. For residential style exhaust systems exceeding 25 feet in equivalent length and less than 60 feet and 6 elbows provide Fantech Model FR110 capable of 100cfm at 0.7" ESP, 120 volt. Provide with automatic pressure switch to turn fan on and off when dryer is running.

END OF SECTION 233113

SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control damper installations.
 - d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
 - e. Wiring Diagrams: For power, signal, and control wiring.
 - 2. Operation and maintenance data.
- C. QUALITY ASSURANCE
 - 1. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
 - 2. Comply with AMCA 500-D testing for damper rating.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2. BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Air Balance Inc.
 - 2. Cesco Products.
 - 3. Duro Dyne Inc.
 - 4. Greenheck Fan Corporation.
 - 5. Nailor Industries Inc.
 - 6. NCA Manufacturing, Inc.
 - 7. Pottorff, a division of PCI Industries, Inc.
 - 8. Ruskin Company.
 - 9. SEMCO Incorporated.
 - 10. Vent Products Company, Inc.
- B. Description: Gravity balanced.
- C. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- D. Blades: Multiple single-piece blades, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.
- E. Blade Action: Parallel.
- F. Blade Seals: Neoprene, mechanically locked.

- G. Blade Axles: Nonferrous metal.
- H. Tie Bars and Brackets: Galvanized steel.
- I. Return Spring: Adjustable tension.
- J. Bearings: Steel ball or synthetic pivot bushings.
- K. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Counterweights and spring-assist kits for vertical airflow installations.
 - 3. Electric actuators.
 - 4. Chain pulls.
 - 5. Retain one of first two subparagraphs below.
 - 6. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20-gage minimum.
 - b. Sleeve Length: 6 inches minimum.
- L. Screen: Rear mounted. Galvanized steel. Bird.
- M. 90-degree stops.

2.3. MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.
 - b. Flexmaster U.S.A., Inc.
 - c. McGill AirFlow LLC.
 - d. METALAIRE, Inc.
 - e. Nailor Industries Inc.
 - f. Pottorff; a division of PCI Industries, Inc.
 - g. Ruskin Company.
 - h. Trox USA Inc.
 - i. Vent Products Company, Inc.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames: Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness. Mitered and welded corners. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades: Multiple or single blade. Parallel blade design for mixing applications and opposed-blade design for balance only applications. Stiffen damper blades for stability. Galvanized-steel, 0.064 inch thick.
 - 5. Blade Axles: Galvanized steel.
 - 6. Bearings: Molded synthetic. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 7. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
 - 1. Size: 1-inch diameter.
 - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
 - 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 - 2. Include center hole to suit damper operating-rod size.
 - 3. Include elevated platform for insulated duct mounting.

2.4. CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cesco Products.
 - 2. Duro Dyne Inc.
 - 3. Flexmaster U.S.A., Inc.
 - 4. Greenheck Fan Corporation.
 - 5. McGill AirFlow LLC.

6. METALAIRE, Inc.
 7. Nailor Industries Inc.
 8. NCA Manufacturing, Inc.
 9. Ruskin Company.
 10. Vent Products Company, Inc.
 11. Young Regulator Company.
- B. Frames: Hat shaped. Galvanized-steel channels, 0.064 inch thick. Mitered and welded corners.
- C. Blades: Multiple blade with maximum blade width of 8 inches. Parallel-blade design when used at junctions of differing air temperatures and opposed-blade design otherwise. Galvanized steel. 0.064 inch thick. Closed-cell neoprene edging for low leakage applications.
- D. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
- E. Bearings: Molded synthetic. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft. Thrust bearings at each end of every blade.

2.5. FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Air Balance Inc.; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Greenheck Fan Corporation.
 4. McGill AirFlow LLC.
 5. METALAIRE, Inc.
 6. Nailor Industries Inc.
 7. NCA Manufacturing, Inc.
 8. Pottorff; a division of PCI Industries, Inc.
 9. Prefco; Perfect Air Control, Inc.
 10. Ruskin Company.
 11. Vent Products Company, Inc.
- B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
- G. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
- H. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- I. Mounting Orientation: Vertical or horizontal as indicated.
- J. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- K. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- L. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.6. SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Air Balance Inc.; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Greenheck Fan Corporation.
 4. Nailor Industries Inc.
 5. Prefco.
 6. Ruskin Company.
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Frame: Multiple-blade type; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- D. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- E. Leakage: Class I.
- F. Rated pressure and velocity to exceed design airflow conditions.
- G. Mounting Sleeve: Factory-installed, 0.052-inch- thick, galvanized sheet steel; length to suit wall or floor

application.

H. Damper Motors: two-position action.

1. Electrical Connection: 115 V, single phase, 60 Hz. Coordinate voltage with Fire alarm contractor prior to ordering. Where building is not equipped with a fire alarm system, provide a stand alone 120v smoke detector and remote LED indicator light mounted in ceiling below duct detector. Mount detector within 5' of damper and provide all necessary wiring and interconnections to damper and detector and relays/power supplies.

2.7. FIRE/SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Prefco.
6. Ruskin Company.

B. Frame: Multiple-blade type; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

C. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

D. Leakage: Class I.

E. Rated pressure and velocity to exceed design airflow conditions.

F. Mounting Sleeve: Factory-installed, 0.052-inch- thick, galvanized sheet steel; length to suit wall or floor application.

G. Damper Motors: two-position action.

1. Electrical Connection: 115 V, single phase, 60 Hz. Coordinate voltage with Fire alarm contractor prior to ordering. Where building is not equipped with a fire alarm system, provide a stand alone 120v smoke detector and remote LED indicator light mounted in ceiling below duct detector. Mount detector within 5' of damper and provide all necessary wiring and interconnections to damper and detector and relays/power supplies.
2. Power open, locked and reset, spring closed.

2.8. TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vaness and Vane Runners," and 2-4, "Vane Support in Elbows."

C. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.9. DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cesco Products; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Nailor Industries Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. Ventfabrics, Inc.
9. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

- a. Double wall, rectangular. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. 1-by-1-inch butt or piano hinge and cam latches.
 - b. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.10. FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
 1. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene. 26 oz./sq. yd. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

2.11. LOW PRESSURE FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
 3. Thermaflex
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Low Pressure Flexible Duct
 1. Thermaflex M-KE rated for +6" W.G. max. and -1" W.G. max. for duct sizes 4" to 14", +6" W.G. max. and -0.5" W.G. max for duct sizes 14" to 16", +4" W.G. max. and -0.5" W.G. max for duct sizes 18" to 20". Rated for 3500 FPM maximum velocity. UL listed "UL-181 Standards Class I Duct Material" complying with NFPA Standards 90A and 90B. Duct shall be composed of an acoustically rated inner polymeric liner duct bonded to coated steel wire helix. Fiberglass insulation and tear resistant metalized polyester film outer vapor barrier. Maximum flexible duct length or run shall be 5'-0" unless otherwise noted. Flexible ductwork shall be securely attached to both the rigid duct connection and diffuser neck with plastic band clamps or stainless steel worm driven clamps. Equivalent by Wiremold, Cleavaflex, Flexmaster.

2.12. HIGH PRESSURE FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
 3. Thermaflex
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Flexible Duct Inlet to Terminal Boxes
 1. Flexmaster type Triple Lock-Acoustic (TL/A) insulated acoustic air duct, manufactured by using a dead soft aluminum strip which is perforated, spirally wound and mechanically joined together. The inner duct is draped with a thick fiberglass insulation and covered by a flame retardant, non-toxic polyethylene vapor barrier. UL-181 Class 1 product uses a Triple Lock (T/L basic) perforated core with an open area of 20% to 25% to completely cushion sounds such as air movement and duct vibrations.
 2. Maximum flexible duct length or run shall be 4'-0" unless otherwise noted. Attach ducts with metal screws and stainless steel clamp. Equivalent by Wiremold, Cleavaflex, Flexmaster.

2.13. DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft and control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream and downstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. Control devices requiring inspection.
 - 8. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.
- K. Install flexible connectors to connect ducts to equipment.
- L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- M. Retain first paragraph below to allow use of flexible duct to connect terminal units to metal duct.
- N. Connect terminal units to supply ducts directly with maximum 12-inch lengths of high pressure flexible duct. Do not use flexible ducts to change directions.
- O. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- P. Connect flexible ducts to metal ducts with draw bands.
- Q. Install duct test holes where required for testing and balancing purposes.

3.2. FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233400 – HVAC FANS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and scheduled.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

PART 2 PRODUCTS

2.1. CEILING AND CABINET EXHAUST FANS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Broan Mfg. Co., Inc.
 - 2. Carnes Company HVAC.
 - 3. Greenheck.
 - 4. Loren Cook Company.
 - 5. NuTone Inc.
 - 6. Panasonic.
 - 7. Penn Ventilation.
- B. Motor and drives shall be isolated from the exhaust airstream. Air for cooling the motor shall be supplied to the internal motor compartment through a vent tube from a location free from discharge contaminants. Motors shall be readily accessible for maintenance. The wheel shaft shall be ground, polished, coated with a rust inhibitive finish and mounted in heavy duty, permanently sealed pillow block ball bearings which are capable of 200,000 hours of life, average operation. The drives shall be sized at a minimum of 165% of driven horsepower. Drive belts shall be oil-resistant, non-static and be capable of 25,000 hours of life, average operation. Sheaves shall be fully machined cast iron or pressed steel, keyed and securely attached to the shafts. Variable pitch motor sheaves shall be standard.
- C. Provide where shown on plans exhaust fans as hereinafter specified. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance. Reference the exhaust fan schedule on plans.
- D. Provide exhaust fans with speed controls to be furnished to the electrical contractor for mounting at the fan.

PART 3 EXECUTION

3.1. INSTALLATION

- 1. Install power ventilators level and plumb.
 - 2. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. At least one anchor shall be installed on each side of unit when attaching atop a curb.
 - 3. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
 - 4. Support suspended units from structure using threaded steel rods and spring hangers. Vibration-control devices are specified in SECTION 230548 – MECHANICAL SOUND AND VIBRATION CONTROL
 - 5. In seismic zones, restrain support units.
 - 6. Install units with clearances for service and maintenance.
 - 7. Label units according to requirements specified in Division 23 Section "Mechanical Identification."
- B. CONNECTIONS
 - 1. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Duct Accessories."
 - 2. Install ducts adjacent to power ventilators to allow service and maintenance.
 - 3. Ground equipment.
 - 4. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and

UL 486B.

5. Interlock operation of fans to associated backdraft and control dampers.

C. FIELD QUALITY CONTROL

1. Equipment Startup Checks:

- a. Verify that shipping, blocking, and bracing are removed.
- b. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
- c. Verify that cleaning and adjusting are complete.
- d. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
- e. Verify lubrication for bearings and other moving parts.
- f. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
- g. Disable automatic temperature-control operators.

2. Starting Procedures:

- a. Energize motor and adjust fan to indicated rpm.
- b. Measure and record motor voltage and amperage.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Shut unit down and reconnect automatic temperature-control operators.
6. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
7. Replace fan and motor pulleys as required to achieve design airflow.
8. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

D. ADJUSTING

1. Adjust damper linkages for proper damper operation.
2. Adjust belt tension.
3. Lubricate bearings.

E. CLEANING

1. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.
2. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

F. DEMONSTRATION

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 233400

SECTION 233713 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1. GRILLES, REGISTERS AND DIFFUSERS

- A. Provide units by Titus, E.H. Price, Metal-Aire, Tuttle & Bailey, Krueger
- B. Provide product data for each type of product indicated, include the following: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings. Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- C. Submit information showing ceiling suspension assembly members, method of attaching hangers to building structure, size and location of initial access modules for acoustical tile. ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings. Duct access panels.
- D. Unless noted otherwise finish shall be off white when mounted in ceiling, prime coat when mounted on wall finish.
- E. All devices shall be provided with balancing means by either a damper in the takeoff to device or a damper that is part of the diffuser/grille assembly. All dampers shall be accessible to operate and balance.

PART 3 EXECUTION

3.1. GENERAL

- A. Provide where shown on plans grilles, registers, and diffusers. See drawings for types, sizes, air flow and quantity. Refer to schedule on plans.

3.2. INSTALLATION

- A. Installation of diffusers, registers, and grilles shall meet the following requirements:
 - 1. Installed units shall be level and plumb.
 - 2. Set all units with rubber gaskets for air tight connection with mounting surface.
 - 3. Install all registers with curve of louver away from line of sight. Unless noted otherwise, provide duct mounted diffusers and registers with standard margins.
 - 4. For units installed in lay-in ceiling panels, locate units in the center of panel.
 - 5. For duct-mounted units, install with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3. COORDINATION

- A. Provide proper mounting supplies and arrangements for areas shown. Check Architectural drawings for ceiling and all construction.
- B. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
 - 1. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical.

3.4. BALANCING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 238116 – MINI-SPLIT SYSTEMS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and scheduled.
- B. Wiring Diagrams: For units with fan coils fed from/through the outdoor units.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

PART 2 PRODUCTS

2.1. GENERAL

A. MANUFACTURERS:

- 1. Approved equivalent manufacturers: Daikin, Mitsubishi, LG, Samsung.

B. QUALITY ASSURANCE

- 1. The units shall be listed by Electrical Laboratories (ETL) and bear the cETL label.
- 2. All wiring shall be in accordance with the National Electric Code (NEC).
- 3. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- 4. The outdoor unit will be factory charged with R-410A.

C. DELIVERY, STORAGE AND HANDLING

- 1. Unit shall be stored and handled according to the manufacturer's recommendations.

D. WARRANTY

- 1. The units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of six (6) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at factory by trained service professional.

2.2. UNITS

A. GENERAL

1. REQUIREMENTS

- a. Units shall be operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation within a conditioned space. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with remote control. A mold-resistant, resin net air filter shall be included as standard equipment.
 - b. Indoor units shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
 - c. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 - d. Both refrigerant lines shall be insulated from the outdoor unit.
 - e. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift.
 - f. The indoor units shall be equipped with a return air thermistor.
 - g. The voltage range will be 253 volts maximum and 187 volts minimum.
- 2. Fan: The fan shall be statically and dynamically balanced impeller with high and low fan speeds available. The airflow rate shall be available in high and low settings. The fan motor shall be thermally protected.

3. Coil:
 - a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 - b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 - c. The coil shall be a 2 or 3-row cross fin copper evaporator coil with design completely factory tested.
 - d. The refrigerant connections shall be flare connections.
 - e. A condensate pan shall be located under the coil.
 - f. A condensate pump shall be located below the coil in the condensate pan with a built in safety alarm.
 - g. A thermistor will be located on the liquid and gas line.
 4. Filter: The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
 5. Electrical: A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 6. Control: The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system. The unit shall be compatible with interfacing with connection to LonWorks networks or interfacing with connection to BMS system. Consult with manufacturer prior to applying controls and provide all necessary interface materials and labor.
- B. 4 WAY CEILING CASSETTE UNIT
1. General: Indoor unit shall be a ceiling cassette fan coil unit for installation into the ceiling cavity equipped with an air panel grill. It shall be available from 7,500 Btu/h to 36,000 Btu/h. It shall be a four-way air distribution type, ivory white, impact resistant with a washable decoration panel.
 2. Indoor Unit:
 - a. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
 - b. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
 - c. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift.
 3. Unit Cabinet:
 - a. The cabinet shall be space saving and shall be located into the ceiling.
 - b. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
 - c. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
 - d. Fresh air intake shall be possible by way of optional fresh air intake kit.
 - e. A branch duct knockout shall exist for branch ducting supply air.
 - f. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
 - g. Optional high efficiency air filters are available for each model unit.
 4. Fan: The fan shall be direct-drive turbo fan type.
 5. Filter Optional high efficiency filters shall be available.
 6. Accessories: Fresh air intake and supply air duct connections. Remote "in-room" sensor kit.
- C. CONCEALED CEILING DUCTED UNIT
1. General: Indoor unit shall be a built-in ceiling concealed fan coil unit for installation into the ceiling cavity. The unit shall be constructed of a galvanized steel casing. It shall be available from 9,500 Btu/h to 48,000 Btu/h capacities. It shall be a horizontal discharge air with horizontal return air or bottom return air configuration.
 2. Unit Cabinet: The cabinet shall be located into the ceiling and ducted to the supply and return openings. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
 3. Fan: The fan shall be direct-drive Sirocco type fan.
 4. Accessories: Remote "in-room" sensor kit, Suction panel and air suction canvas.
- D. CEILING SUSPENDED CASSETTE UNIT
1. General: Indoor unit shall be a ceiling suspended fan coil unit for installation onto a wall or ceiling within a conditioned space. This compact design with finished white casing shall be available from

- 12,000 Btu/h to 36,000 Btu/h capacities.
2. Unit Cabinet: The cabinet shall be affixed to a factory supplied wall/ceiling hanging brackets and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Fan: The fan shall be a direct-drive cross-flow fan.
4. Accessories: Remote "in-room" sensor kit, condensate pump.

E. WALL MOUNTED UNIT

1. General: Indoor unit shall be a wall mounted fan coil unit for installation onto a wall within a conditioned space. This compact design with finished white casing shall be available from 7,500 Btu/h to 24,000 Btu/h capacities.
2. Unit Cabinet: The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Fan: The fan shall be a direct-drive cross-flow fan.
4. Accessories: Remote "in-room" sensor kit, condensate pump.

2.3. OUTDOOR UNIT

A. General

1. The outdoor unit is designed specifically for use with series components.
2. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
 - a. High/low pressure gas line, liquid and suction lines must be individually insulated between the outdoor and indoor units.
3. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
4. The unit shall incorporate an auto-charging feature and a refrigerant charge check function.
5. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
6. The outdoor unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
7. The system shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet:

1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
2. The outdoor unit shall have factory installed hail guards or field installed Permatron model # Hailguard 54 black polypropylene netting.

C. Fan: The condensing unit shall consist of one or more propeller type, direct-drive 350 and 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:

1. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" with a maximum speed of 7,980 rpm.
2. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the

- neodymium magnets will position the rotor into the optimum position for a low torque start.
3. The capacity control range shall be as low as 6% to 100%.
 4. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
 5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
 6. Oil separators shall be standard with the equipment together with an intelligent oil management system.
 7. The compressor shall be spring mounted to avoid the transmission of vibration.
 8. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

F. Electrical:

1. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded, stranded 2 conductor cable.

PART 3 EXECUTION

3.1. COORDINATION

- A. Provide approved submittals to other parties or verify G/C has provided record submittals for use in coordination of connections between other trades well in advance to coordinate other submittals and construction rough-ins.

3.2. UNIT INSTALLATION

- A. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
- B. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
- C. Identify according to Division 23 Section Mechanical Identification.
- D. Manufacturer to final size all refrigerant lines. Provide all valves, fittings and any other components as required for refrigerant line lengths indicated by drawings. Provide all refrigerant and oil required for each refrigerant circuit.

3.3. AIR HANDLER CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect condensate drain pans. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- C. Connect ducts according to Division 23 Section Ductwork.
- D. Install piping adjacent to machine to allow service and maintenance.
- E. Ground equipment according to Division 26 Section "Grounding and Bonding."
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4. AIR HANDLER ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set controls, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.5. SYSTEM AND EQUIPMENT IDENTIFICATION

- A. Provide engraved equipment labels for all pieces of equipment including indoor units and outdoor units.

3.6. FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.
- B. Perform the following field quality-control tests and inspections and prepare test reports:
 1. After installing units and after electrical circuitry has been energized, test units for compliance with requirements.
 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 5. Remove malfunctioning units, replace with new units, and retest as specified above.

3.7. STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 - 1. Inspect for visible damage to unit casing.
 - 2. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
 - 3. Inspect internal insulation.
 - 4. Verify that labels are clearly visible.
 - 5. Verify that clearances have been provided for servicing.
 - 6. Verify that controls are connected and operable.
 - 7. Verify that filters are installed.
 - 8. Clean outside coil and inspect for construction debris.
 - 9. Adjust vibration isolators.
 - 10. Lubricate bearings on fan.
 - 11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 - 12. Start unit according to manufacturer's written instructions.
 - 13. Complete startup sheets and attach copy with Contractor's startup report.
 - 14. Inspect and record performance of interlocks and protective devices; verify sequences.
 - 15. Operate unit for an initial period as recommended or required by manufacturer.
 - 16. Calibrate thermostats/sensors.
 - 17. Adjust and inspect high-temperature limits.
- C. Start refrigeration system and measure and record the following:
 - 1. Coil leaving-air, dry- and wet-bulb temperatures.
 - 2. Coil entering-air, dry- and wet-bulb temperatures.
 - 3. Outside-air, dry-bulb temperature.
 - 4. Outside-air-coil, discharge-air, dry-bulb temperature.
- D. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
- E. Measure and record the following minimum and maximum airflows.
 - 1. Supply-air volume.
 - 2. Return-air volume.
 - 3. Outside-air intake volume.
- F. Simulate maximum cooling demand and inspect the following:
 - 1. Compressor refrigerant suction and hot-gas pressures.
- G. After startup and performance testing, change filters, vacuum cooling and outside coils, lubricate bearings.
- H. Provide one spare set of clean filters and deliver to owner.

3.8. COMMISSIONING

- A. Verify that units are installed and connected according to the Contract Documents.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
- C. Inspect for physical damage to unit casing.
- D. Verify that access doors move freely and are weathertight.
- E. Clean units and inspect for construction debris.
- F. Check that all bolts and screws are tight.
- G. Adjust vibration isolation and flexible connections.
- H. Verify that controls are connected and operational.
- I. Lubricate bearings on fans.
- J. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
- K. Adjust fan belts to proper alignment and tension.
- L. Start unit according to manufacturer's written instructions.
- M. Complete manufacturer's starting checklist.
- N. Measure and record airflow over coils.
- O. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- P. After startup and performance test lubricate bearings.

3.9. UNIT DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
- B. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown,

troubleshooting, servicing, and preventive maintenance.

- C. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

3.10. AIR HANDLER CLEANING

- A. After completing installation, clean units internally according to manufacturer's written instructions.
- B. Install new filters in each unit within 14 days after Substantial Completion.

3.11. COORDINATION

- A. Provide approved submittals to other parties or verify G/C has provided record submittals for use in coordination of connections between other trades well in advance to coordinate other submittals and construction rough-ins.
- B. Review other trades submittals for coordination of connections and related installation clearances, appurtenances and related equipment.
- C. Conduct coordination meeting with all related trades prior to installation of equipment. Bring all apparent conflicts to the attention of the Architect/Engineer.

3.12. CONDENSING UNIT INSTALLATION

- A. Install condensing units according to manufacturer's written instructions.
- B. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- C. Install ground-mounted units on 4-inch-thick, reinforced concrete base, 4 inches larger than condensing unit on each side. Coordinate installation of anchoring devices.
- D. Install roof-mounted units on manufactured equipment supports. Anchor unit to supports with removable fasteners.
- E. Install hailguards on outdoor units. Permatron model # Hailguard 54 black polypropylene netting.

3.13. CONDENSING UNIT CONNECTIONS

- A. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- B. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories.
- C. Ground equipment.
- D. All exterior control wiring shall be installed in conduit.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.14. CONDENSING UNIT FIELD QUALITY CONTROL

- A. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.
- B. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units with new units and retest.

3.15. CONDENSING UNIT CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Clean units to remove dirt and construction debris and repair damaged finishes.

END OF SECTION 238116

SECTION 238128 – SPLIT SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and scheduled.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

PART 2 PRODUCTS

2.1. GENERAL

- A. Provide complete systems as scheduled on plans by one manufacturer.
- B. Equivalents by Carrier, York, Daikin, Lennox, Trane, Goodman.

2.2. UNITS

A. HEAT PUMP UNITS

1. GENERAL

- a. Units shall be assembled on heavy gauge steel mounting/lifting rails and shall be weather proof. Units shall include a hermetic reciprocating compressor(s), plate fin condenser coil, fans and motors, controls and holding charge of R-22. Operating range shall be between 115 degrees F and 35 degrees F in cooling as standard from the factory. Units shall be UL 1995 listed, CAS CAN/CAS-C22.2 No. 236-M90, certified and rated in accordance with ARI Standard 210/240, 360 and 270.

2. CASING

- a. Unit casing shall be constructed of 18 gauge zinc coated heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Units' surface shall be tested 500 hours in salt spray test. Units shall have removable end panels which allow access to all major components and controls.

3. REFRIGERATION SYSTEM - SINGLE COMPRESSOR

- a. Units shall have a single refrigeration circuit. Each refrigeration circuit has an integral subcooling circuit. A refrigeration filter drier shall be provided as standard. The units shall have both a liquid line and suction gas line service valve with gauge port.
- b. Units shall have one scroll compressor. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Crankcase heater, temperature and current-sensitive motor overloads shall be included for maximum protection. Shall have integral spring isolation and sound muffling to minimize vibration transmission and noise. External high and low pressure cutout devices shall be provided. Evaporator defrost control provided in indoor shall prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

4. CONDENSER COIL

- a. Coils shall be internally finned or smooth bore 3/8" copper tubes mechanically bonded to configured aluminum plate fin as standard. Factory pressure and leak tested to 425 psig air pressure. Metal grilles with PVC coating for coil protection is optional.

5. CONDENSER FAN AND MOTOR(S)

- a. Direct-drive, statically and dynamically balanced propeller fan(s) with aluminum blades and electro-coated steel hubs shall be used in draw-through vertical discharge position. Either permanently lubricated totally enclosed or open construction motors shall be provided and

shall have built in current and thermal overload protection. Motor(s) shall have to be either ball or sleeve bearing type.

6. DEFROST CONTROLS

- a. Electronic timed initiated, temperature terminated defrost system with choice of 50, 70 or 90 minute cycle. Timed override limits defrost cycle to 10 minutes.

7. CONTROLS

- a. Heat pump units shall be completely factory wired with necessary controls terminal block for power wiring.
- b. Condensing units shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Control wiring shall be 24-volt control circuit which includes fusing and control transformer. Units shall provide external location for mounting a fused disconnect device. Time delay timers to prevent compressors in dual compressor units from simultaneous start-up and anti-recycle timers are available as optional accessories.

8. ACCESSORIES

- a. Time Delay Relay: Shall prevent compressors in dual compressor unit from coming on line simultaneously. Timer shall be 24-volt, 60 cycle, with four minute timing period.
- b. Anti-Short-Cycle Timer: Shall prevent rapid on-off conditions by not allowing compressor to operate for 5-7 minutes upon shutdown. Shall consist of a solid state timing device, 24 volt, 60 cycle with either 5 or 7 minute fixed-off timing period.
- c. Provide unit with louvered condenser coil hail guard to alleviate coil damage.

B. SMALL HEAT PUMP AIR HANDLERS

1. GENERAL

- a. Air handler units shall be completely factory assembled including coil condensate drain pan, fan motor(s), filters and controls in an insulated casing that can be applied in either vertical or horizontal configuration. Units shall be rated and tested in accordance with ARI Standard 210, 240, 360. Units shall be UL listed and labeled in accordance with UL 465/1995 for indoor blower coil units. Air handler units shall be internally isolated to prevent sound transmission to building structure. Units shall be mounted on 4" high heavy gauge steel rails.

2. CASING

- a. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Casing is completely insulated with fire-retardant, permanent, odorless glass fiber material. Knockouts shall be provided for unit electrical power and refrigerant piping connections. Captive screws shall be standard on all access panels.

3. REFRIGERATION SYSTEM

- a. A factory-installed thermal expansion valve controls each refrigeration circuit.

4. EVAPORATOR COIL

- a. Configured aluminum fin surface shall be mechanically bonded to 3/8" internally enhanced copper tubing and factory pressure and leak tested at 375 psig. Coil is arranged for draw-through airflow and shall provide condensate drain pan constructed of PVC plastic and provide external connections on either side of the unit.

5. EVAPORATOR FAN

- a. Double inlet, double width, forward curved, centrifugal-type fan(s) with adjustable belt drive shall be standard. Thermal overload protection shall be standard on motor. Fan and motor bearings shall be permanently lubricated.

6. CONTROLS

- a. Magnetic evaporator fan contactor, low voltage terminal strip, check valve(s), and single point power entry shall be included. All necessary controls shall be factory-installed and wired. Evaporator defrost control shall be included to prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

7. FILTERS

- a. Filters shall be Farr 30/30 type and shall have 2-inch thick fiberglass media contained in a rigid frame. Filters shall have a rigid supporting maze across both the entering and leaving faces of the media. Filters shall be sized so as not to exceed scheduled face velocities.

8. ACCESSORIES

- a. Electric Heaters:
 - i. UL and CSA approved electric heat modules shall be available for installation directly on fan discharge. Electric Heaters shall be as scheduled with two stage control, single-point electric power connection and terminal strip connections. Electric heater elements shall be constructed of heavy duty nickel chromium elements internally delta connected on 208/240 volt, three phase. Each 208/240 volt heater shall have pilot duty with secondary backup fuse links for automatic reset of high limit controls.
 - ii. Evaporator Coils:
 - Shall be completely factory assembled including the expansion valves and drain pans. Single circuit condensing units shall be matched to single circuit coils and dual circuit condensing units to dual circuit coils. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with an enamel finish. Casing shall be completely insulated with fire-retardant, permanent, odorless glass fiber material. The coils shall be convertible to either vertical and/or horizontal airflow configuration. Aluminum fin surface shall be mechanically bonded to 3/8" OD copper tubing. Coils shall be factory pressure and leak tested.
 - iii. Vibration Isolators:
 - Shall reduce transmission of noise and vibration to building structures, equipment and adjacent spaces. Packages shall be available in either neoprene-in shear or spring-flex types in floor or suspended mountings.

9. THERMOSTATS

- i. Provide 7-day electronic programmable thermostat for stages of heating and cooling as required.

PART 3 EXECUTION

3.1. AIR HANDLER INSTALLATION

- A. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
- B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
- C. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
- D. Identify according to Division 23 Section Mechanical Identification.
- E. Manufacturer to final size all refrigerant suction and liquid lines. Provide all accumulators, solenoid valve and any other components as required for refrigerant line lengths indicated by drawings. Provide all refrigerant and oil required for each refrigerant circuit.
- F. Mount units on 3½" reinforced concrete pads a minimum of 6" larger in each dimension.

3.2. AIR HANDLER CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect condensate drain pans. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- C. Connect ducts according to Division 23 Section Ductwork.
- D. Install piping adjacent to machine to allow service and maintenance.
- E. Ground equipment according to Division 26 Section "Grounding and Bonding."
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- G. Connect and wire any outside air dampers and interlock with unit operation. Install all electrical in accordance with Division 26. Provide all necessary relays, interlocks and circuiting to open outside air dampers during operation of unit fan.

3.3. FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field quality-control tests and inspections and prepare test reports:

1. After installing units and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Remove malfunctioning units, replace with new units, and retest as specified above.

3.4. STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
3. Inspect internal insulation.
4. Verify that labels are clearly visible.
5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Clean outside coil and inspect for construction debris.
9. Adjust vibration isolators.
10. Lubricate bearings on fan.
11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
12. Start unit according to manufacturer's written instructions.
13. Complete startup sheets and attach copy with Contractor's startup report.
14. Inspect and record performance of interlocks and protective devices; verify sequences.
15. Operate unit for an initial period as recommended or required by manufacturer.
16. Calibrate thermostats/sensors.
17. Adjust and inspect high-temperature limits.

C. Start refrigeration system and measure and record the following:

1. Coil leaving-air, dry- and wet-bulb temperatures.
2. Coil entering-air, dry- and wet-bulb temperatures.
3. Outside-air, dry-bulb temperature.
4. Outside-air-coil, discharge-air, dry-bulb temperature.

D. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.

E. Measure and record the following minimum and maximum airflows.

1. Supply-air volume.
2. Return-air volume.
3. Outside-air intake volume.

F. Simulate maximum cooling demand and inspect the following:

1. Compressor refrigerant suction and hot-gas pressures.

G. After startup and performance testing, change filters, vacuum cooling and outside coils, lubricate bearings.

H. Provide one spare set of clean filters and deliver to owner.

3.5. AIR HANDLER ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set controls, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.6. AIR HANDLER CLEANING

A. After completing installation, clean units internally according to manufacturer's written instructions.

B. Install new filters in each unit within 14 days after Substantial Completion.

3.7. CONDENSING UNIT INSTALLATION

A. Install condensing units according to manufacturer's written instructions.

B. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended

clearances.

- C. Install ground-mounted units on 4-inch-thick, reinforced concrete base, 4 inches larger than condensing unit on each side. Concrete, reinforcement, and formwork requirements are specified in Division 3. Coordinate installation of anchoring devices.
- D. Install roof-mounted units on equipment supports specified in Division 7. Anchor unit to supports with removable fasteners.
- E. Install units on spring isolators specified in Division 23 Section "Mechanical Vibration Controls and Seismic Restraints."

3.8. CONDENSING UNIT CONNECTIONS

- A. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- B. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories.
- C. Ground equipment.
- D. All exterior control wiring shall be installed in conduit.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.9. CONDENSING UNIT FIELD QUALITY CONTROL

- A. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.
- B. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units with new units and retest.

3.10. CONDENSING UNIT CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Clean units to remove dirt and construction debris and repair damaged finishes.

3.11. CONDENSING COMMISSIONING

- A. Verify that units are installed and connected according to the Contract Documents.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
- C. Inspect for physical damage to unit casing.
- D. Verify that access doors move freely and are weathertight.
- E. Clean units and inspect for construction debris.
- F. Check that all bolts and screws are tight.
- G. Adjust vibration isolation and flexible connections.
- H. Verify that controls are connected and operational.
- I. Lubricate bearings on fans.
- J. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
- K. Adjust fan belts to proper alignment and tension.
- L. Start unit according to manufacturer's written instructions.
- M. Complete manufacturer's starting checklist.
- N. Measure and record airflow over coils.
- O. Check operation of condenser capacity control device.
- P. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- Q. After startup and performance test, lubricate bearings and adjust belt tension.

3.12. CONDENSING UNIT DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
- B. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
- C. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

END OF SECTION 238128

SECTION 238240 – ELECTRIC HEATERS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Plans, elevations, sections, and details.
 - 2. Location and size of each field connection.
 - 3. Equipment schedules to include rated capacities, furnished specialties, and accessories.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 PRODUCTS

2.1. CABINET UNIT HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berko Electric Heating; a division of Marley Engineered Products.
 - 2. Carrier Corporation.
 - 3. Chromalox, Inc.; a division of Emerson Electric Company.
 - 4. Indeeco.
 - 5. International Environmental Corporation.
 - 6. Markel Products; a division of TPI Corporation.
 - 7. Marley Electric Heating; a division of Marley Engineered Products.
 - 8. Daikin Applied International.
 - 9. QMark Electric Heating; a division of Marley Engineered Products.
- B. Description: A factory-assembled and -tested unit complying with ARI 440.
 - 1. Comply with UL 2021.
- C. Coil Section Insulation: Glass-fiber insulation; surfaces exposed to airstream shall be aluminum-foil facing to prevent erosion of glass fibers.
 - 1. Thickness: 1/2 inch.
 - 2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg Fmean temperature.
 - 3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
 - 4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
 - 5. Retain subparagraph below to comply with LEED-NC Prerequisite EQ 1.
 - 6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- D. Cabinet: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect]
 - 1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch-sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
 - 2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch-thick, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.

3. Recessing Flanges: Steel, finished to match cabinet.
 4. Control Access Door: Key operated.
 5. Base: Minimum 0.0528-inch- thick steel, finished to match cabinet, 4 inches high with leveling bolts.
- E. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
1. Pleated: 90 percent arrestance and 7 MERV.
- F. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.
- G. Fan and Motor Board: Removable.
1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
 2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 3. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- H. Basic Unit Controls:
1. Control voltage transformer.
 2. Wall-mounting or Unit-mounted thermostat as shown on plans or scheduled with the following features.
 - a. Heat-off switch.
 - b. Fan on-auto switch.
 - c. Manual fan speed switch.
 - d. Adjustable deadband.
 - e. Exposed set point.
 - f. Deg Findication.
- I. Electrical Connection: Factory wire motors and controls for a single field connection.

2.2. WALL AND CEILING HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Berko Electric Heating; a division of Marley Engineered Products.
 2. Chromalox, Inc.; a division of Emerson Electric Company.
 3. Indeeco.
 4. Markel Products; a division of TPI Corporation.
 5. Marley Electric Heating; a division of Marley Engineered Products.
 6. QMark Electric Heating; a division of Marley Engineered Products.
- B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- C. Cabinet:
1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
 2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.
- E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.
- F. Fan: Aluminum propeller directly connected to motor.
1. Motor: Permanently lubricated, multispeed. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- G. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit.
- H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install unit heaters to comply with NFPA 90A.
- B. Suspend cabinet unit heaters from structure with elastomeric hangers.
- C. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers.
- D. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.
- F. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
- G. Ground equipment according to Division 26.
- H. Connect wiring according to Division 26.

3.2. FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 238240

SECTION 260010 – ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Electrical Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Electrical systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
- C. Refer to Architectural, Structural and Mechanical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing conduit in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, conduit and other electrical work are indicated diagrammatically by electrical drawings. Layout work from dimensions on Architectural and Structural Drawings. Verify equipment size from manufacturers shop drawings.
- B. Study and become familiar with contract drawings of other trades and in particular general construction drawings and details in order to obtain necessary information for figuring installation. Cooperate with other workmen and install work in such a way to avoid interference with their Work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any conduit, apparatus, appliance or other electrical item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other Work caused by this contractor, subcontractor, workers or any cause whatsoever, shall be restored as specified for new work.
- D. Do not scale electrical drawings for dimensions. Accurately layout work from dimensions indicated on Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of mechanical systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for the Contractor to use their ingenuity and abilities to perform the work to their and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.
 - 1. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in mechanical or electrical service

requirements necessary to accommodate such substitution.

- G. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

- A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of \$50 per sheet, \$100 minimum and \$25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all conduits passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

- A. Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of electrical systems. In no case will claims for "Extra Work" be allowed for work about which Electrical Contractor could have been informed before bids were taken.
- B. Where specific information for devices, lights or equipment shown on the plans is missing, provide an allowance in the contract amount for furnishing a product reasonably implied by the level of other devices, lights and equipment provided in the contract documents.
- C. Electrical Contractor shall be familiar with equipment provided by other Contractors that require electrical connections and control. Follow circuiting shown on drawings for lighting, power and equipment connections.
- D. Make required electrical connections to equipment provided under Architectural and Mechanical divisions of this project. Receive and install electric control devices requiring field installation, wiring, and service connection. Equipment supplied by the automatic temperature control contractor shall be installed by the mechanical or automatic temperature control subcontractor. Make required internal field wiring modifications indicated on wiring diagrams of factory installed control systems for control sequence specified. These field modifications shall be limited to jumper connections and connection of internal wiring to alternate terminal block lugs. The cost for field modifications requiring rewiring of factory installed control systems for equipment provided by General or Mechanical Contractors shall be included in base bid of the respective contractor. All temperature control wiring shall be by a licensed electrician under the supervision of temperature control contractor.
- E. Check electrical data and wiring diagrams received from Mechanical Contractor of compliance with project voltages, wiring, controls and protective devices shown on electrical drawings. Promptly bring discrepancies found to attention of Architect-Engineer for a decision.
- F. Provide safety disconnect switches, contactors, and manual and magnetic motor starters for mechanical and electrical equipment requiring such devices. Omit these devices where included as part of factory installed prewired control systems provided with mechanical equipment. With exception of factory installed devices, provide safety disconnect switches, contacts and motor starters by one manufacturer to allow maximum interchangeability of repair parts and accessories for these devices.
- G. To maximum extent possible electrical controls in boiler rooms, equipment rooms, and control rooms shall be grouped in accessible locations and arranged according to function. Where possible use group control panels and combination starters in lieu of individually enclosed devices.

1.16. CODES, ORDINANCES, RULES AND REGULATIONS

- A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.
- B. Conform to latest editions and supplements of following codes, standards or recommended practices.
- C. BUILDING CODES:
 - 1. International Building Codes (Latest adopted version of applicable codes)
- D. SAFETY CODES:
 - 1. National Electrical Safety Code Handbook H30 - National Bureau of Standards
 - 2. Occupational Safety and Health Standard (OSHA) Department of Labor
 - 3. Safety Code for Elevators ANSI A17.1
- E. NATIONAL FIRE CODES AND STANDARDS:
 - 1. NFPA No. 70 National Electrical Code
 - 2. NFPA No. 72 National Fire Alarm and Signaling Code
 - 3. NFPA No. 90A Air Conditioning & Ventilation Systems
 - 4. NFPA No. 101 Life Safety Code
- F. UNDERWRITERS LABORATORIES INC.:
 - 1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.
- G. MISCELLANEOUS CODES:
 - 1. ANSI A117.1 - Handicapped Accessibility
 - 2. Americans with Disabilities Act (ADA)
- H. ENERGY EFFICIENCY REQUIREMENTS:
 - 1. All electrical systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.17. STANDARDS

- A. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect/Engineer in writing before proceeding with work so that necessary changes can be made. However, if Electrical Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.18. PERMITS/FEES

- A. Electrical Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect/Engineer with request for final review.
- B. Contractor shall include in bid any charges by local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exact which part of the work is to be performed by whom.

PART 2 - PRODUCTS

- A. Not Used

PART 3 – EXECUTION

3.1. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.

- E. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- F. The Drawings show only the general run of raceways and approximate location of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
- G. Obtain from the Architect/Engineer in the field the location of such outlets or equipment not definitely located on the Drawings.
- H. Circuit "tags" in the form of arrows are used where shown to indicate the home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuits numbers on the finished record drawings and on panel directory card. Where circuiting is not indicated, Electrical Subcontractor must provide required circuiting in accordance with the loading indicated on the drawings and/or as directed.
- I. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to fabrication.
 - 1. Right-of-Way:
 - a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
 - b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.
- J. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- K. Coordinate with the local Electric Utility Company and the local Telephone Company as to their requirements for service connections and provide all necessary materials, labor and testing.
- L. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.

3.2. SUBMITTALS

- A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
- B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.
 - 1. Submittals shall be furnished in an Adobe PDF format.
 - 2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.
 - a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.
 - 3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
 - 4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
 - 5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall bear the equipment manufacturer's name and address.
 - 6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
 - 7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.
- C. Contractor review:
 - 1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply,

- return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.
2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
 3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- D. Review Schedule:
1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
 2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
 3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
 4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the Contractor's responsibility.
- E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
- F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
- G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
- H. Coordination
1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.3. SHOP DRAWINGS

- A. Shop drawings shall meet all of the above requirements for submittals.
- B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
- C. No work shall be fabricated until Architect-Engineer's review has been obtained.
- D. Electrical equipment location and conduit coordination shop drawings for conduit fabrication and electrical equipment clearances shall be a minimum of 1/4" scale. Shop drawings shall not be a reproduction of the contract document and shall show details of the following: Fabrication, assembly, and installation, including plans, elevations above finished floor, sections, components, and attachments to other work.

3.4. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, three sets of operating and maintenance instructions and parts lists for all items of equipment provided. Instructions shall be prepared by equipment manufacturer.
- B. Keep in safe place, keys and wrenches furnished with equipment under this contract. Present to Owner and obtain receipt for same upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under his contract. Submit brochures to Architect/Engineer for review before delivery to Owner. Contractor at his option may prepare this brochure or retain an individual to prepare it for him. Include cost of this service in bid. Brochures shall contain following:
 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined under Section this specification.
 2. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
 3. Record copy of all submittals indicating actual equipment installed indicating options, characteristics.

- Copies of submittals shall bear the stamps of all parties that reviewed submittals.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of system.
 5. Record Set Drawings: The Contractor shall mark up a set of contract documents during construction noting all changes and deviations including change orders. These will be delivered to Architect at end of the project. After the originals are changed to reflect the blue line set, a copy shall be included in the brochure.
 6. Provide brochure bound in black vinyl three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - a. Project name and address.
 - b. Section of work covered by brochure, i.e., Electrical.

3.5. RECORD DOCUMENTS

- A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.

3.6. PREMIUM TIME WORK

- A. The following Work shall be performed at night or weekend other than holiday weekends as directed and coordinated with the Owner.
 1. All tie-in, cut-over and modifications to the existing electrical system and other existing system requiring tie-ins or modifications shall be arranged and scheduled with the Owner to be done at a time as to maintain continuity of the service and not interfere with normal building operations.

3.7. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all fixtures and equipment at the completion of the project.
- C. All switchboards, panelboards, wireways, trench ducts, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.8. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.9. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
- C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of electrical work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.10. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundations and provide proper anchor bolts and isolation as shown or specified. Level, shim, and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instruction. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
- B. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor

fastening in all cases.

- C. Provide electrical floor mounted equipment with 3-1/2" high concrete bases unless shown or specified otherwise. Electrical contractor shall size all pads. General contractor shall form all pads, provide and place all concrete for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- D. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Electrical contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required. Contractor shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect/Engineer for review before proceeding with fabrication or installation.
- E. Provide 3-1/2" high concrete housekeeping pad as specified above where two or more conduits penetrate floor below panelboards.

3.11. START-UP, CHANGEOVER, TRAINING AND OPERATION CHECK

- A. Electrical Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.
- B. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.12. FINAL CONSTRUCTION REVIEW

- A. At final construction review, Electrical Contractor and the major sub-contractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by Architect/Engineer, that the work complies with purpose and intent of plans and specifications. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 260010

SECTION 260011 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1. NEUTRAL AND GROUND WIRES

- A. Where individual circuit homeruns (hots, neutral, and ground as part of a single circuit) are indicated on the plans serving lighting and branch circuit receptacle loads, these shall be individual circuits with individual neutrals (no sharing of neutrals and/or grounds).
- B. Where shared circuit homeruns (hots, neutral, and ground as part of separate circuits) are indicated on the plans, these shall be allowed to share one (common) ground for three (3) circuits from different phases occurring in one (1) conduit run. When additional circuits occur in conduit run, additional ground wires shall be installed. Conduit shall be upsized and conductors shall be de-rated based on NEC current carrying conductor tables, counting all hots and neutrals as current carrying conductors.
 - 1. No sharing of neutral conductors is allowed in multi-wire branch circuit homeruns, unless the installation meets the requirements of 2014 NEC 210.4(B), and is specifically approved by the engineer of record.

3.2. TESTS RECORDING, REPORTING TESTS AND DATA

- A. Record nameplate horsepower, amperes, volts, phase service factor and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.
- B. Record motor starter catalog number, size and rating and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification for instructions for proper sizing of thermal-overload units.
- C. Record amperes-per-phase at normal or near-normal loading of each item of equipment furnished and/or connected.
- D. Record correct readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.
- E. Record voltage and ampere-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load.
- F. Short-Circuit Calculations
 - 1. Contractor shall contact utility company after utility company design is complete and determine exact available fault current in amperes at the point of utility connection (Service Point).
 - 2. Contractor shall utilize the above available fault current to calculate the available fault current in amperes (RMS-SYM) at the service equipment.
 - 3. The available fault current shall be labeled on the service equipment – refer to Section 260553.
- G. Submit at least two (2) typewritten copies of data noted above to Architect-Engineer for review prior to final inspection.
- H. Keep a record of all deviations made from routes, locations, circuiting, etc. shown on contract drawings. Prior to final inspection submit one new set of project drawings with all deviations and changes clearly indicated.

3.3. CLEANING AND PAINTING OF MATERIALS AND EQUIPMENT

- A. Before energizing switchboards, transformers, panelboards, starters, variable frequency drive and other similar electrical equipment, Contractor shall thoroughly vacuum out all dirt, dust and debris from inside of equipment and shall thoroughly clean outside and inside of equipment.
- B. Touch-up painting and refinishing of factory applied finishes shall be by Electrical Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- C. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- D. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- E. Where extensive refinishing is required equipment shall be completely repainted.

3.4. EXCAVATION AND BACKFILL

- A. Perform necessary excavation to receive work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
- B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
- C. Conduct excavations so no walls or footings are disturbed or injured.
- D. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by A/E.
- E. Mechanically tamp backfill under concrete and pavings in 6" layers to 95% standard density, Reference Division 2.
- F. Backfill trenches and excavations to required heights with allowance made for settlement.
- G. Tamp fill material thoroughly and moistened as required for specified compaction density.
- H. Dispose of excess earth, rubble and debris as directed by Architect.
- I. When available, refer to test hole information on architectural drawings or specifications for types of soil to be encountered in excavations.

3.5. FIRE BARRIERS

- A. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
- B. Equivalent by Dow, Chemelex, 3M.
- C. All holes or voids created by the electrical contractor to extend conduit or wiring through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

3.6. TEMPORARY COVERINGS

- A. Provide temporary covering over all electrical panels, distribution panelboards, outlet boxes and other equipment as required to keep same free from damage due to moisture, plaster, paint, concrete or other foreign materials. Any equipment with finish damaged by moisture, paint, plaster or other foreign materials shall be cleaned and refinished as directed by the Architect without additional cost to the Owner.
- B. All temporary openings in conduits shall be covered with metal or plastic caps.

3.7. PROTECTIVE COVERS

- A. Provide protective wire guards over all wall mounted and ceiling mounted devices subject to damage in areas such as gymnasiums, shops and similar occupancies.
- B. Provide lockable covers over thermostats and similar wall mounted devices where items are located in public spaces but should not be operable by the general public.

3.8. SLEEVES

- A. Provide proper type and size sleeves to General Contractor for electrical ducts, busses, conduits, etc. passing through building construction. Supervise installation to insure proper sleeve location. Unless indicated or approved install no sleeves in structural members.
- B. Provide cast iron sleeves extending 1 inch above finished floor where sleeves pass through floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchen. Seal opening between pipe and sleeve with Thunderline Corp. Link Seal.
- C. Unless specified otherwise provide 18 gauge galvanized sheet metal sleeves through floors and non-bearing walls. Where piping passes through exterior walls, equipment room walls, air plenum walls and walls between areas that must be isolated from occupied areas, seal space between sleeves and piping, air or water tight are required with Thunderline Corp. Link Seal.
- D. Provide O-Z Electrical Manufacturing Co., Inc. Type "FSK" or "WSK" or equivalent thruwall and floor seals where conduits pass through concrete foundation walls below grade.
- E. Provide Zurn Z-195 or equivalent flashing sleeve through walls and floors with waterproof membrane. Seal annular space between conduit and sleeve with Thunderline Link Seal or O-Z type CSM sealing bushing.

END OF SECTION 260011

SECTION 260519 – WIRE AND CABLE

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes the following:
1. Building wires and cables rated 600 V and less.
 2. Connectors, splices, and terminations rated 600 V and less.

1.3. SUBMITTALS

- A. Product Data: For each type of product indicated.
B. Qualification Data: For testing agency.
C. Field quality-control test reports.

1.4. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.

1.5. COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1. CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Southwire Company.
 2. General Cable Corporation.
 3. Encore Wire Corporation.
 4. AFC Cable Systems, Inc. (Multiconductor cable only)
- B. Copper Conductors: Comply with NEMA WC 70.
C. Aluminum Conductors: Comply with NEMA WC 70.
- a. Same shall be compacted aluminum (Stabiloy)
- D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN-2.
1. Provide consistent color coding of all circuits as follows:

Phase	Distribution System
	120/208
A	Black
B	Red
C	Blue
N	White
Ground	Green

Notes:

- 1) Stripe shall be white or yellow in color.
- E. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

2.2. CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cable manufacturers listed above under 2.1, Item A.
 2. Hubbell Power Systems, Inc.

3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1. CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
1. Aluminum conductors acceptable only when specifically shown/scheduled on drawings.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
1. Aluminum conductors are not permitted for branch circuit wiring.

3.2. CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Provide insulation / cable types for conductors as follows:

Application	Insulation / Cable Type		
	THHN/THWN-2 ¹	XHHW-2 ¹	MC Cable ³
Service Entrance	X ²	X	
Feeders:			
Exposed, Exterior	X ²	X	
Exposed, Interior	X		
Concealed in Ceilings, Walls, Partitions, and Crawlspace	X		
Concealed in Concrete, below Slabs-on-Grade, and Underground	X ²	X	
Branch Circuits:			
Exposed, Exterior	X ²	X	
Exposed, Interior - Including Crawlspace	X		
Concealed in Ceilings, Walls, and Partitions	X		X
Concealed in Concrete, below Slabs-on-Grade, and Underground	X ²	X	

Notes:

- 1) Single conductors in raceway. Refer to Section 260533 - Raceway & Boxes for acceptable raceway types/applications.
 - 2) THHN/THWN-2 is acceptable for these installations at contractor's discretion.
 - 3) Metal Clad (MC) cable installations shall be in accordance with the following:
 - (i) MC cable shall not be used for homeruns.
 - (ii) MC cable may be used for light fixture and equipment whips in lengths no longer than 6'-0". The use of MC cable from lighting fixture to lighting fixture shall not be allowed.
 - (iii) MC cable shall not be installed in exposed locations for lighting purposes. MC cable may be exposed in mechanical spaces for equipment whips.
1. Branch Circuits Concealed in Dwelling units: Nonmetallic-sheathed cable, Type NM.
- B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- C. Class 1 Control Circuits: Type THHN-THWN-2, in raceway.
- D. Class 2 Control Circuits: Type THHN-THWN-2, in raceway or Power-limited cable, concealed in building finishes.

3.3. INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables per National Electrical Code requirements.
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4. CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. For Aluminum Conductors:
 - a. Use oxide inhibitor in each splice and tap conductor, and at all terminations.
 - b. Provide compression-type one-hole or two-hole lug terminations.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5. FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Test Reports: Prepare a written report to record the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 – GROUNDING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

- A. Provide grounding electrodes, conductors, connections and equipment to provide a solidly grounded electrical system.

1.3. STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
 - 1. Underwriters Laboratory Standard No. U.L. 467.
 - 2. ANSI C-1 1978.
 - 3. IEEE Standards No. 142-1982, 1100-1992 and No. 80.
 - 4. National Electrical Safety Code.
 - 5. NFPA.

1.4. SUBMITTALS

- A. Submit test reports certifying resistance values for buried or driven grounds and water pipe grounds.

PART 2 - PRODUCTS

2.1. MATERIALS

- A. Ground Cables: green color coded, insulated, annealed stranded tinned copper wire as indicated on Drawings; insulated wire to conform with requirements of Section 16120.
- B. Ground Rods:
 - 1. Copper-clad steel fabricated by molten welding process.
 - 2. Diameter: 5/8 Inch. Use 3/4" for rocky soil.
 - 3. Length: 8 feet.

2.2. CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Ground Lugs and Connectors for Cable Tray: Tin-plated aluminum alloy suitable for use with aluminum or copper conductors.

2.3. GENERAL

- A. Grounding systems shall be installed in accordance with the requirements of the local authorities, and subject to the approval of the Architect/Engineer.
- B. All ground wires and bonding jumpers shall be stranded copper installed in conduit. All ground wires shall be without joints and splices over its entire length.
- C. The system neutral shall be grounded at the service entrance only, and kept isolated for grounding systems throughout the building.
- D. Each system of continuous metallic piping and ductwork shall be grounded in accordance with the requirements of the National Electrical Code.
- E. Mechanical equipment shall be bonded to the building equipment grounding system. This shall include but is not limited to, fans, pumps, chillers, etc.
- F. PVC conduits and portions of metallic piping and duct systems which are isolated by flexible connections, insulated couplings, etc., shall be bonded to the equipment ground with a flexible bonding jumper, or separate grounding conductor.

- G. Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings and other metal noncurrent-carrying parts that are to serve as grounding conductors shall be effectively bonded where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them. Any nonconductive paint, enamel, or similar coating shall be removed at threads, contact points, and contact surfaces or be connected by means of fittings so designed as to make such removal unnecessary.

2.4. RECEPTACLES

- A. Receptacles shall be grounded to the outlet box by means of a bonding jumper between the outlet box and the receptacle grounding terminal.

2.5. CONCENTRIC KNOCKOUTS

- A. Provide grounding type bushings for conduits terminated through multiple concentric knockouts not fully knocked out, on inside of electrical enclosures. Install bonding jumper between ground bushing and enclosure

2.6. TOGGLE SWITCHES

- A. Provide grounding clip on each toggle switch. Mount over device mounting strap such that contact is made between mounting strap, screw, faceplate and outlet box.
- B. Provide devices with ground screw and bond to switch box.

2.7. GROUNDING METHODS

- A. The metal frame of the building, where effectively grounded.
- B. A metal underground water piping system used for grounding shall be in direct contact with the earth for ten feet or more and shall be electrically continuous. Provide bonding jumpers at water meter and at insulated joints.
- C. Steel reinforcing bars used for grounding shall be encased by at least two inches of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth. Reinforcing bars shall be minimum 1/2 inch diameter and consisting of twenty feet of one or more steel reinforcing bars.
- D. All bonding jumpers for the above grounding systems shall be sized in accordance with National Electrical Code.

PART 3 - EXECUTION

3.1. APPLICATIONS

- A. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Bolted or Welded connectors.
 - 3. Connections to Structural Steel: Bolted or Welded connectors.

3.2. INSTALLATION

- A. Cold Water Pipe Grounding:
 - 1. Make connection with clamp type fitting; do not damage water pipe.
 - 2. Bond ground conductor and its conduit to water pipe.
 - 3. Install No. 4/0 AWG bonding jumper with ground clamps around water meter.
- B. Ground Conductors:
 - 1. Size as shown on Drawings or as required by National Electrical Code. Grounding conductors shall be as shown on plans or if not specifically shown shall be no smaller than that required by the NEC.
 - 2. Where ground cables are required, install insulated copper ground conductors in steel conduit, or as indicated.
 - 3. Where ground cable is installed in metallic conduit, bond cable to conduit at both ends.
 - 4. Connect ground conductors in cables and in conduit to appropriate ground buses (as in switchgear, motor control centers, and distribution panelboards) or directly to metallic enclosure if no ground bus is provided.
- C. Service Ground
 - 1. Connect system neutral ground and equipment ground system to common ground bus.
 - 2. Ground secondary services at supply side of each individual secondary disconnecting means and at related transformers in accordance with National Electric Code.
 - 3. Provide each service disconnect enclosure with neutral disconnecting means which interconnects with insulated neutral and uninsulated equipment ground sub to establish system common ground point.
 - 4. Neutral disconnecting links shall be located so that low voltage neutral bar with interior secondary

neutrals can be isolated from common ground bus and service entrance conductors.

D. Conduit Attachment to Electrical Equipment:

1. Ground conduits to metal framework of electrical equipment with double locknuts or grounding bushings and bonding jumpers unless otherwise noted.
2. Install bonding jumpers at all electrical equipment to provide continuous ground return path through conduit.
3. Install bonding jumpers across expansion fittings between conduit sections for ground path continuity.
4. Bond conduits to cable tray where conduit enters or exits tray.
5. Equipment grounding conductors for branch circuit home runs shown on the drawings shall indicate an individual and separate ground conductor for that branch circuit which shall be terminated at the branch circuit panelboard, switchboard, or other distribution equipment. No sharing of equipment grounding conductors sized according to the size of the overcurrent device and NEC Table 250-122 shall be allowed.
6. Required equipment grounding conductors and straps shall be sized in compliance with N.E.C. Table 250-122.
7. Equipment grounding conductors shall be provided with green type TW 600 volt insulation. Related feeder and branch circuit grounding conductors shall be connected to ground bus with approved pressure connectors.
8. Provide feeder servicing several panelboards with a continuous grounding conductor connected to each related panelboard ground bus. Installation shall include necessary precautions regarding terminations with dissimilar metals.

E. Circuiting

1. Provide low voltage distribution system with a separate green insulated equipment grounding conductor for each single or three-phase feeder.
2. Single phase 120 volt branch circuits for lighting and power shall consist of phase and neutral conductors and a green ground conductor installed in common metallic conduit which shall serve as grounding conductor.
3. Provide flexible metallic conduit utilized in conjunction with above single phase branch circuits with suitable green insulated grounding conductors connected to approved grounding terminals at each end of flexible conduit.
4. Single phase branch circuit installed in nonmetallic conduits shall be provided with separate grounding conductor.
5. Install grounding conductor in common conduit with related phase and/or neutral conductors.
6. Where parallel feeders are installed in more than one raceway, each raceway shall have a green insulated equipment grounding conductor.

F. Receptacles and Switches:

1. Install bonding jumpers between outlet box and receptacle grounding terminal except where contact device or yoke is provided for grounding purposes.

G. Wireways:

1. Install grounding jumpers for bonding between wireway and other panelboards, conduit, switchgear, motor control centers, and at any other point where solid connection would otherwise not be provided in supporting system to insure continuous ground.

H. Pull Boxes, Junction Boxes and Enclosures:

1. Connect all equipment grounding conductors together and connect to the box.

3.3. FIELD QUALITY CONTROL

A. Resistance Values for System and Equipment Grounds: for each ground rod and ground grid.

1. Acceptable Testing Equipment: Vibroground by Associated Research, Inc.; or Megger Earth Tester by James G. Biddle Co.
2. Method: Three (3) electrode fall of potential as prescribed by instrument manufacturer.
3. Drive additional ground rods spaced eight feet apart, if necessary, until total resistance of system is measured at five ohms or less.

END OF SECTION 260526

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
 - 1. Division 26 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3. DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4. PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5. QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.6. COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 PRODUCTS

2.1. SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and

- sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
 - E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - i. Hilti Inc.
 - ii. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - iii. MKT Fastening, LLC.
 - iv. Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated] steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - i. Cooper B-Line, Inc.; a division of Cooper Industries.
 - ii. Empire Tool and Manufacturing Co., Inc.
 - iii. Hilti Inc.
 - iv. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - v. MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2. FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

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

PART 3 EXECUTION

3.1. APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Support raceways at intervals no greater than ten (10) feet and with one support within three (3) feet of each coupling, box, fitting, or outlet box. Provide one support within three (3) feet of each elbow or bend.
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 20 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- F. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- G. Use one or two-hole saddle-type clamps where single conduits are exposed below 6'-0" AFF.

3.2. SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel:
 - a. Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts
 - b. Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69
 - c. Spring-tension clamps].
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3. INSTALLATION OF FABRICATED METAL SUPPORTS

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

3.4. CONCRETE BASES

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

END OF SECTION 260529

SECTION 260533 – RACEWAYS AND BOXES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

- A. Provide complete raceways systems, boxes and fittings for all required electrical systems.

1.3. STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
 - 1. Rigid Steel Conduit
 - a. U.L. Standard UL-6
 - b. A.N.S.I. C80-1
 - c. Federal Specification WW-C-581E
 - 2. Intermediate Metallic Conduit
 - a. U.L. Standard UL-1242
 - b. Federal Specification WW-C-581E
 - 3. Electrical Metallic Tubing
 - a. U.L. Standard UL-797
 - b. A.N.S.I. C80-3
 - c. Federal Specification WW-C-563
 - 4. Flexible Steel Conduit
 - a. U.L. Standard UL-1
 - 5. Liquid Tight Flexible Conduit
 - a. U.L. Standard UL-360
 - 6. Non-Metallic Conduit
 - a. U.L. Standard UL-651
 - b. A.N.S.I. Standard F512
 - c. N.E.M.A. Standard TC-2
 - d. Federal Specifications GSA-FSS and W-C-1094-A
 - 7. Wireways and Auxiliary Gutters
 - a. U.L. Standard UL-870
 - 8. Rigid Aluminum Conduit
 - a. A.N.S.I. C80.5

1.4. SUBMITTALS

- A. Provide manufacturer's catalog cuts of fittings.
- B. Where wireways and/or auxiliary gutters are employed full erection drawings must be submitted. Drawings to include plan views, elevations, size of wireways, type and quantity of conductors proposed to be installed therein, etc.
- C. Indicate duct banks or multi-trade coordinated shop drawings.
- D. Submit shop drawings or catalog descriptive data on boxes exceeding twenty-four (24") inches for any one dimension.
- E. Submit shop drawings or catalog descriptive for floor boxes and accessories.

PART 2 - PRODUCTS

2.1. RACEWAY TYPES

- A. Standard Threaded Rigid Steel Conduit.

1. Rigid conduit heavy wall galvanized.
 2. Threaded type fittings: "Erickson" couplings where threaded cannot be used.
- B. Intermediate Metallic Conduit
1. Light weight rigid steel conduit.
 2. Threaded type fittings: "Erickson" couplings where threaded cannot be used.
- C. Electrical Metallic Tubing
1. Continuous, seamless tubing, galvanized or sheradized on the exterior, coated on the interior with a smooth hard finish of lacquer, varnish, or enamel.
 2. Couplings and connectors:
 - a. Indoor and two (2") inches in size and smaller, shall be steel set-screw type fittings.
 - b. 2-1/2 inch size and larger must employ steel compression gland fittings.
 - c. Outdoor shall be raintight steel compression gland fittings.
 3. Indent type fittings shall not be used.
 4. All connectors shall have insulated throat.
 5. Where installed in slab or concrete work, provide approved concrete tight fittings.
- D. Flexible Steel Conduit
1. Single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming smooth internal wiring channel.
 2. Maximum length: (six 6) feet.
 3. Each section of raceway must contain an equipment grounding wire bonded at each end and sized as required. Provide connectors with insulating bushings.
 4. Steel squeeze-type or steel set screw type fittings.
- E. Liquid Tight Flexible Electrical Conduit
1. Same as flexible steel conduit except with tough, insert water-tight plastic outer jacket.
 2. Cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings which thread to interior of conduit. Spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat.
- F. Non-Metallic Raceway
1. Composed of polyvinyl chloride suitable for 90 degrees C. Provide rigid polyvinyl chloride (PVC) type EPC 40 heavy wall plastic conduit meeting current NEMA Standard TC-2. Conduit shall be listed UL 651 for underground and exposed use.
 2. Raceway, fittings, and cement must be produced by the same manufacturer who must have had a minimum of ten (10) years experience in manufacturing the products.
 3. Materials must have a tensile strength of 7,000-7,200 psi at 73.4 degrees F., flexural strength of 12,000 psi and compressive strength of 9,000 psi.
 4. All joints shall be solvent cemented in accordance with the recommendations of the manufacturer.
- G. Wireways and Auxiliary Gutters
1. Painted steel or galvanized steel.
 2. Of sizes and shapes indicated on the Drawings and as required.
 3. Provide all necessary elbows, tees, connectors, adapters, etc.
 4. Wire retainers not less than twelve (12") inches on center.
- H. Duct Banks
1. Provide duct banks and concrete encasements for both interior and exterior work as indicated on the Drawings and for all circuits in excess of 600 volts and as otherwise indicated.
 2. Concrete shall be minimum $f_c = 3,000$ pounds per square inch.
 3. Support raceways installed in duct banks every five (5) feet to assure correct alignment.
 4. Terminate raceways with flared bells to enable ease of pulling cable and to eliminate stress on the cable. Free bells and raceway terminations of burrs and rough edges.
 5. Provide concrete markers at grade where duct banks are stubbed out for future use.
 6. Install utility duct banks not less than thirty (30") inches below grade top elevation.
 7. Provide rigid steel elbows for vertical risers.
 8. Provide vinyl tracer ribbon twelve (12") inches above each duct bank buried in backfill.
- I. Aluminum Conduit

1. Do not use aluminum conduit unless specifically indicated on the drawings for special purposes.

2.2. LOCKNUTS AND BUSHINGS

- A. Locknuts shall be steel. Die cast locknuts shall not be used.
- B. All bushings shall be insulated. Use nylon insulated metallic bushings for sizes 1" and larger. Plastic bushings may be used in 1/2" and 3/4" sizes.

2.3. OUTLET BOXES

A. General

1. Recessed wall boxes shall be 2-1/2" deep.
2. Surface-mounted wall boxes shall be 1-1/2" or 2-1/2" deep as required.
3. Lighting Fixture Box
 - a. Four (4") inch octagon with 3/8" fixture stud.
 - b. For suspended ceiling work, four (4") inch octagon with removable backplate where required, and two (2) parallel bars for securing to the cross-furring channels and extend flexible conduit to each fixture.
4. Plug any open knockouts not utilized.

B. Cast Type Conduit Boxes, Outlet Bodies and Fittings

1. Use Ferrous Alloy boxes and conduit bodies with Rigid Steel or IMC.
2. Use Ferrous Alloy or cast aluminum boxes and conduit bodies with Electrical Metallic Tubing.
3. Covers: Cast or sheet metal unless otherwise required.
4. Tapered threads for hubs.

C. Masonry Outlet Boxes

1. Use for all devices recessed in concrete or masonry.
2. Galvanized steel construction.

D. Drawn Steel Boxes

1. Use for all interior exposed devices (where not required or indicated to be cast type).
2. Drawn construction, minimum 0.625" thick galvanized steel.
3. Raised ground connection.
4. Provide with raised, drawn galvanized steel covers.

E. Welded Steel Boxes

1. May be used for recessed devices only, or as a junction box where located above ceiling or on walls where same is located above 6'-0" A.F.F.
2. Minimum 1/16" thick steel construction.

F. Weatherproof Boxes

1. Use for all exterior exposed devices.
2. Cast aluminum construction.
3. Internal hub threads.
4. NEMA 3R listed.

G. Non-Metallic Boxes

1. May be used for wood-frame construction only.
2. Thermoplastic construction.
3. UL Listed to UL 514C
4. UL Classified for two hour or less fire wall assemblies
5. Meets NEMA OS-2

2.4. JUNCTION AND PULL BOXES

- A. Outlet boxes as listed above may be used as junction boxes where provided as a 2-gang box minimum.
- B. Steel Boxes

1. No. 12 USS gauge sheet steel for boxes with maximum side less than forty (40") inches, and maximum area not exceeding 1,000 square inches; riveted or welded 3/4 inch flanges at exterior corners.
2. No. 10 USS gauge sheet steel for boxes with maximum side forty (40") to sixty (60") inches, and maximum area 1,000 to 1,500 square inches; riveted or welded 3/4 inch flanges at exterior corners.
3. No. 10 USS gauge sheet steel riveted or welded to 1-1/2 by 1-1/2 by 1/4" welded angle iron

- framework for boxes with a maximum side exceeding sixty (60") inches and more than 1,500 square inches in area.
4. Covers
 - a. Same gauge steel as box.
 - b. Subdivided single covers so no section of cover exceeds fifty (50) pounds.
 - c. Machine bolts, machine screws threaded into tapped holes, or sheet metal screws as required; maximum spacing twelve (12") inches.
 5. Finish: Galvanized steel or paint with rust inhibiting primer and ANSI No. 61 light gray finish coat.
 6. Where size of box is not indicated, size to permit pulling, racking and splicing of cables.
 7. For Boxes over 600 Volts
 - a. Provide insulated cable supports and removable steel barriers to isolate each feeder. Stencil cable voltage class in red letters on the front cover of the box.
 - b. Braze a ground connector suitable for copper cables to the inside of the box.
- C. Exterior Pull / Junction boxes
1. NEMA 3R or 4X rated.
 2. Stainless steel or reinforced non-metallic construction.
- D. In-Grade Pull Boxes (Quazite or similar)
1. Polymer concrete box. Removable cover with stainless steel bolts.
 2. Box shall be traffic-rated where located in pavement or other areas subject to vehicle traffic.

2.5. FLOOR BOXES

- A. General
1. Class I, water-tight, normal depth cast iron construction Type I, fully adjustable, for use in concrete.
 2. Single Gang Round type.
 3. Multiple Gang or Combination.
 - a. Rectangular type partitions for separating power from communication sections.
- B. Floor Box Covers
1. Rugged construction, impervious to cleaning detergents.
 2. Compatible with floor covering.
 3. Brass or bronze for flush lid mounting with devices below floor level. Lid shall have hinged or guarded openings for wires to route through the closed lid.
 4. Providing continuous ground path to box.
 5. Provide carpet flange in carpeted areas.

2.6. FIRE-RATED POKE-THROUGHS

- A. General
1. 4, 6 or 8" fire rated poke throughs, UL listed for installation in fire rated concrete construction. Hubbell System One - Recessed Activation.
 2. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
 3. Comply with UL 514 scrub water exclusion requirements. Class I, water-tight, normal depth cast iron construction Type I, fully adjustable, for use in concrete.
 4. Partitions for separating power from communication sections.
- B. Covers
1. Rugged construction, impervious to cleaning detergents.
 2. Compatible with floor covering.
 3. Brass or bronze for flush lid mounting with devices below floor level. Lid shall have hinged or guarded openings for wires to route through the closed lid.
 4. Providing continuous ground path to box.
 5. Provide carpet flange in carpeted areas.

PART 3 - EXECUTION

3.1. APPLICATION OF RACEWAYS

- A. The following applications must be adhered to except as otherwise required by Code. Raceways not conforming to this listing must be removed by the Contractor and replaced with the specified material at the

Contractor's expense.

1. Rigid Steel - Application: Where exposed to mechanical injury, where specifically required, exterior exposed locations, and where required by codes and for all circuits in excess of 600 volts.
2. I.M.C. - Application: Same as standard threaded rigid steel conduit.
3. E.M.T. - Applications: Use in every instance except where another material is specified. EMT shall not be used underground or in slab on grade.
4. Flexible Steel - Applications: Use in dry areas for connections to lighting fixtures in hung ceilings, connections to equipment installed in removable panels of hung ceilings at bus duct takeoffs, at all transformer or equipment raceway connections where sound and vibration isolation is required.
5. Liquid-Tight Flexible Conduit - Applications: Use in areas subject to moisture where flexible steel is unacceptable at connections to all motors, and all raised floor areas.
6. Non-Metallic Conduit - Application: Schedule 40 - Where specifically indicated on the drawings and for raceways in slab or below grade. All bends shall be made with steel elbows and wrapped unless the bend is encased in concrete.
7. Wireways and Auxiliary Gutters - Application: Where indicated on the Drawings and as otherwise specifically approved.

3.2. RACEWAY SYSTEMS IN GENERAL

- A. Provide raceways for all wiring systems, including security, data transmission, paging, low voltage et. al. Where non-metallic raceways are utilized, provide sizes as required with the grounding conductor considered as an insulated additional conductor. Wiring of each type and system must be kept independent and installed in separate raceways – including, but not limited to:
 1. Wiring of different voltages (480/277V vs. 208/120V)
- B. Install capped bushings on raceways as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Lay out the work in advance to avoid excessive concentrations of multiple raceway runs.
- C. Locate raceways so that the strength of structural members is unaffected and they do not conflict with the services of other trades. Install one (1") inch or larger raceways, in or through structural members (beams, slabs, etc.) only when and in the manner accepted by the Architect/Engineer. Draw up couplings and fittings full and tight.
- D. Install no conduits or other raceways sized smaller than permitted in applicable NEC Tables. Where conduit sizes shown on drawings are smaller than permitted by code, Contractor shall include cost for proper size conduit in his base bid. In no case reduce conduit sizes indicated on drawings or specified without written approval of Architect-Engineer. Minimum conduit size shall be 3/4".
- E. Above-grade raceways to comply with the following:
 1. Install raceways concealed except at surface cabinets and for motor and equipment connection in electrical and mechanical rooms. Install a minimum of six (6") inches from flues, steam pipes, or other heated lines. Provide flashing and counter-flashing for waterproofing of raceways, outlets, fittings, etc., which penetrate the roof. Route exposed raceways parallel or perpendicular to building lines with right-angle turns and symmetrical bends. Run concealed raceways in a direct line and, where possible, with long sweep bends and offsets. Provide sleeves in forms for new concrete walls, floor slabs, and partitions for passage of raceways. Waterproof sleeved raceways where required.
 2. Raceways shall not be run on roofs or exposed on the outside of the buildings unless specifically noted as exposed on the drawings or approved by the Architect/Engineer.
 3. Provide raceway expansion joints for exposed and concealed raceways with necessary bonding conductor at building expansion joints and between buildings or structures and where required to compensate for raceway or building thermal expansion and contraction. Provide expansion fittings every 200 feet on outdoor conduit.
 4. Provide one (1) empty 3/4 inch raceway for each three (3) spare unused poles or spaces of each flush-mounted panelboard. Terminate empty 3/4 inch conduit in a junction box, which after completion, is accessible to facilitate future branch circuit extension.
 5. Provide raceway installation (with appropriate seal-offs, explosion-proof fittings, etc.) in special occupancy area, as required. Provide conduit seal-offs where portions of an interior raceway system pass through walls, ceiling, or floors which separate adjacent rooms having substantially different maintained temperatures, as in refrigeration or cold storage rooms.
 6. Provide pull string in spare or empty raceways. Allow five (5) feet of slack at each end and in each pull box. Tie each end of the string to a washer or equivalent that does not fit into the conduit. Tag both ends of string denoting opposite end termination location.
- F. Below Grade
 1. Below grade raceways to comply to the following:

- a. Do not penetrate waterproof membranes unless proper seal is provided.
 2. Protect steel raceway in earth or fill with two (2) coats of asphalt base paint. Touch up abrasions and wrench marks after conduit is in place.
 3. In lieu of the above, protect steel raceways with a minimum of ten (10) mil tape approved for the purpose and overlapped a minimum of one-half tape width to provide a minimum twenty (20) mil thickness.
- G. No raceway may be installed in a concrete slab or members except with the permission of the Structural Engineer and with the written consent of the Owner.
1. Conduits embedded in structural concrete slabs shall have an outside diameter less than one third of the thickness of the concrete slab and shall be installed entirely within the center one third of the concrete slab.
 2. Raceways embedded in concrete slabs shall be spaced not less than eight (8") inches on centers and as widely spaced as possible where they converge at panels or junction boxes.
 3. In no case will installation of raceways be permitted to interfere with the proper placement of principal reinforcement.
 4. Raceways running parallel to slab supports, such as beams, columns, and structural walls, shall be installed not less than twelve (12") inches from such supporting elements.
 5. To prevent displacement during concrete pour of lift slab, saddle supports for conduit, outlet boxes, junction boxes, inserts, etc., shall be secured with suitable adhesives.
- H. Non-metallic raceway installation shall conform to the following:
1. All joints are to be made by the solvent cementing method using the material recommended by the raceway manufacturer. To insure good joints, components shall be cleaned prior to assembly.
 2. Raceway cut-offs shall be square and made by handsaw or other approved means which does not deform the conduit. Raceway shall be reamed prior to solvent cementing to couplings, adapters, or fittings.
 3. Electrical devices which are served by PVC raceways shall be grounded by means of a ground wire pulled in the raceway.
 4. Bends shall be made by methods that do not deform or damage the conduit. The radii of field bends shall not be less than those established by the N.E.C.
 5. Raceway expansion fittings shall be provided where necessary. The position of the expansion fitting shall be adjusted proportional to the temperature at installation.
 6. Raceway supports shall be installed, in such a manner, to allow the PVC conduit to slide through the supports as the temperature changes.
 7. Elbows must be galvanized rigid steel, intermediate metallic conduit or concrete encased. Plastic conduit may only be used for exterior underground applications or circuits beneath slabs on grade. Provide galvanized rigid steel (GRS) radius bends and risers as conduits rise above grade or above floor slab.
 8. Provide exterior underground conduit with metal detection strip.
 9. Provide matching plastic fittings. Fittings shall meet the same standards and specifications as the conduit on which it is installed.
 10. Joining and bending of conduit and installation of fittings shall be done only by methods recommended.
 11. Provide conduit support spacing as recommended for the highest ambient temperature expected.
 12. Provide interlocking conduit spacers for multiple runs of underground conduits installed in same trench.
 13. Provide expansion couplings on long runs regardless of ambient temperatures. Determine amount of conduit expansion and contraction from published charts or tables.
 14. Test workmanship by conducting a low-pressure air (3.0-5.0 psi) test after system is installed and cemented joints are set. Plug and block ends to prevent movement prior to pressurization. Check for leaks at all joints with a soap solution. Even low-pressure air can cause high thrust loads and caution must be observed. The test shall be observed by the architect, engineer or owner's representative, prior to backfill. All below grade conduit that could potentially drain water into electrical equipment (ie. Main electrical service located in basement below utility transformer) must be watertight.
- I. Raceways in hung ceiling shall be run on and secured to slab or primary structural members of ceiling, not to lathing channels or T-bars, Z-bars, or other elements which are the direct supports of the ceiling panels. Secure conduit firmly to steel by clips and fittings designed for that purpose. Install as high as possible, but not less than 1'-0" above hung ceilings.
- J. Exposed raceways shall be run parallel or at right angles with building lines.
- K. Clear raceway of all obstructions and dirt prior to pulling in wires or cables. This shall be done with ball mandrel (diameter approximately 85% of conduit inside diameter) followed by close fitting wire brush and wad of felt, or similar material. This assembly may be pulled in together with, but ahead of, the cable being installed. All empty raceways shall be similarly cleaned. Clear any raceway which rejects ball mandrel.

3.3. OUTLET BOXES

- A. Fit outlet boxes in finished ceilings or walls with appropriate covers, set flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide Series "GW" (Steel City) tile box, or as accepted, or a four (4") inch square box with tile ring in masonry walls, which will not be plastered or furred. Where drywall material is utilized, provide plaster ring.
 - 1. Provide outlet boxes of the type and size suitable for the specific application.
 - 2. Where outlet boxes contain two (2) or more 277 volt devices, or where devices occur of different applied voltages, or where normal and emergency devices occur in same box, provide suitable barrier.
 - 3. Install all wall mounted switch and receptacle boxes with bracing between two adjacent studs where rigid conduit is not used for circuiting. Box and receptacle shall not deflect on operation or insertion of plugs.
- B. Install boxes and covers for wiring devices so that the wiring devices will be installed with a vertical orientation unless otherwise noted on the drawings.
- C. The exact location of outlets and equipment is governed by structural conditions and obstructions, or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to the room layout and will not interfere with other work or equipment. Verify final location of outlets, panels equipment, etc., with Architect.
- D. Back-to-back outlets in the same wall, or "thru-wall" type boxes not permitted. Provide twelve (12") inch (minimum) spacing for outlets shown on opposite sides of a common wall to minimize sound transmission.
- E. Provide twenty four (24") inch (minimum) horizontal spacing for outlets shown on opposite sides of a fire rated wall.
 - 1. Provide listed fire putty pads around the each box to maintain fire rating, where aggregate area of boxes in wall exceeds maximum per code.
- F. Install top of switch outlet boxes 48" above floor unless otherwise called for or required by wainscot, counter, etc. Install bottom of receptacle outlet boxes 16" above floor unless otherwise called for on drawings.
 - 1. Adjust mounting heights to nearest masonry joint for minimum cutting in case of flush outlets.

3.4. JUNCTION AND PULL BOXES

- A. Provide junction and pull boxes as indicated on the drawings and as required for the complete installation of the various electrical systems, and to facilitate proper pulling of wires and cables.
 - 1. J-boxes and pull boxes shall be sized per electrical code minimum.
 - 2. Boxes on empty conduit systems shall be sized as if containing conductors of #4 AWG.
 - 3. Wiring systems required to have separate/independent raceways (See Section 3.2 above) shall also be provided with separate junction and pull boxes. These wiring systems may occupy the same outlet box only if a divider is installed between the wiring that is listed for this purpose.
- B. Pull Box Spacing
 - 1. Provide pull boxes so no individual conduit run contains more than the equivalent of four (4) quarter bends (360 degrees total).
 - 2. Conduit Sizes 1-1/4" and Larger.
 - a. Provide boxes to prevent cable or wire from being excessively twisted, stretched, or flexed during installation.
 - b. Provide boxes for medium voltage cables so that maximum pulling tensions do not exceed cable manufacturer's recommendations.
 - c. Provide support racks for boxes with multiple sets of conductors do not rest on any metal work inside box.
 - 3. Conduit Sizes one (1") inch and smaller, low voltage wire and cable (maximum distances)
 - a. 200 feet straight runs.
 - b. 150 feet runs with one 90 degree bend or equivalent.
 - c. 125 feet runs with two 90 degree bends or equivalent.
 - d. 100 feet runs with three or four 90 degree bends or equivalent.

3.5. FLOOR BOXES

- A. Prior to Concrete Pour
 - 1. Firmly support boxes.
 - 2. Adjust leveling screws to insure box covers are flush with finished floor.

3. Plug unused opening with proper fittings and seal joints with compound for exclusion of concrete and moisture.
- B. After Concrete Pour
1. As soon as traffic is permitted on slab, remove any accumulation of water and foreign matter to avoid corrosion and rust.
 2. Insure covers are flush with finished floor.
 3. Install cover plates and accessories after floor finishing materials have been installed.

END OF SECTION 260533

SECTION 260553 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

- A. Provide identification on all equipment, raceways, boxes and conductors.

PART 2 - PRODUCTS

2.1. NAMEPLATES

- A. Nameplates shall be lamacoid plates with engraved upper-case letters and beveled edges.
 - 1. Stamped or embossed metal tags are not considered acceptable for this purpose.
- B. Color:
 - 1. Normal-power equipment shall have white nameplates with black letters, enclosed by a black border.
 - 2. Nameplates for short circuit ratings and calculations shall be yellow with black letters, enclosed by black border.
- C. All nameplates shall be engraved and must be secured with rivets, brass or cadmium plate screws. The use of Dymo tape or the like is unacceptable.
- D. Nameplate inscriptions shall bear the name and number of equipment to which they are attached as indicated on the Drawings. The engineer reserves the right to make modifications in the inscriptions as necessary.
 - 1. Inscription letters shall be 1/2" in size.

2.2. CABLE TAGS AND WIRE IDENTIFICATION LABELS

- A. Cable tags shall be flameproof secured with nylon ties.
- B. Wire markers shall be preprinted cloth tape type or approved equivalent.

2.3. IDENTIFICATION LABELS

- A. Acceptable Manufacturers
 - 1. W.H. Brady Company (Style A)
 - 2. Thomas & Betts Company (T&B), Style A.
 - 3. Seaton
- B. Plasticized Cloth
 - 1. Non-conductive.
 - 2. Waterproof.
 - 3. Capable of withstanding continuous temperatures of 235 degrees F and intermittent temperatures to 300 degrees F.
 - 4. Overcoating for protection against oil, solvents, chemicals, moisture, abrasion and dirt.
- C. Heavy, thermo-resistant industrial grade adhesive, for adhesion of label to any surface without curling, peeling or falling off.
- D. Label Designations, Nominal System Voltages Applied to the covers of all medium and low voltage pull, splice and junction boxes.
- E. Machine printed.
 - 1. Letters shall be 3/8" in size.

PART 3 - EXECUTION

3.1. INSTALLATION

- A. Service Entrance Equipment
 - 1. Where electrical equipment (switchboard, panelboard, disconnect switch, etc.) is installed as service entrance equipment, contractor shall furnish and install a nameplate listing the following:

- a. Equipment Short-Circuit Current Rating in amperes (RMS SYM), as indicated on the drawings.
- b. Whether or not the equipment is fully or series-rated.
- c. Available Fault Current in amperes. Contractor shall perform available fault current calculation (as outlined in Section 260520) to obtain available fault at Service Equipment.
- d. Date fault current calculations were performed.

i. Example:

EQUIPMENT FULLY-RATED AT 65,000 AMPERES RMS SYM AVAILABLE FAULT CURRENT: 61,603 AMPERES DATE CALCULATED: 12/06/2011

B. Switchboards/ Distribution Panelboards.

1. Furnish and install a nameplate for each switchboard or distribution panelboard. Nameplate shall be engraved with the following information:
 - a. Top Line: Equipment identification as indicated on the Drawings.
 - b. Middle Line: Specific device or equipment where feeder originates.
 - c. Bottom Line: Equipment voltage, size, and phase as indicated on the drawings.
 - d. Example:

SWITCHBOARD SWDP1 FED FROM UTILITY COMPANY TRANSFORMER 208/120V, 1200A, 3-PHASE

2. Nameplate shall be mounted at the top of the incoming section.
3. Each switch / circuit breaker shall be provided with an identifying nameplate.
 - a. Main devices shall be identified as such. Where multiple mains are employed each switch shall be numbered. Inscription shall be "MAIN SWITCH" or "MAIN SWITCH NO. 1" et al.
 - b. Branch/feeder devices shall be identified with either the load served or a number corresponding to the furnished circuit directory.

C. Panelboards and Load Centers.

1. Furnish and install a nameplate for each panelboard and load center. Nameplate shall be engraved with the following information:
 - a. Top Line: Equipment identification as indicated on the Drawings.
 - b. Middle Line: Specific device or equipment where feeder originates.
 - c. Bottom Line: Equipment voltage, size, and phase as indicated on the drawings.
 - d. Example:

PANELBOARD LN1 FED FROM SWITCHBOARD SWDP1 IN ROOM #332 208/120V, 200A, 3-PHASE

2. Nameplate shall be mounted at the top of the panel.
3. After installations are complete, provide and mount under sturdy transparent shield in the directory frame of each panel door, a neat, accurate, and carefully typed directory properly identifying the lighting, receptacles, outlets, and equipment each overcurrent device controls.
 - a. Include on directory the panel or load center identification, the cable and raceway size of panel feeder, and the feeder origination point.

D. Disconnect Switches.

1. Furnish and install a nameplate for each disconnect switch engraved with the equipment designation which the disconnect serves and the panel and circuit the switch is fed from.

E. Disconnect Switches.

1. Furnish and install a nameplate for each disconnect switch engraved with the equipment designation which the disconnect serves.
 - a. Example:

AHU – 1 FED FROM PANEL LP-1 – 32

2. Nameplate shall be mounted at the top of the disconnect.
- F. Motor Controllers.
1. Furnish and install a nameplate for each motor controller or combination motor controller for both individual motor controllers and those in a motor control center. Engraving must indicate the motor served and the type of service (e.g., AC-8-1st floor supply, EF-2 electric closet exhaust.)
- G. Feeder Switches.
1. Furnish and install for each feeder switch including, but not limited to those in switchboards, switch and fuse panelboards, take-offs at bus ducts, motor control centers, multiple meter centers, etc., two (2) nameplates as follows:
 - a. The first nameplate must be white background with red lettering. Engrave with the words "REPLACE ONLY WITH _____ FUSE." Engrave with proper fuse trade name and ampere rating (i.e. Bussman LPS-R 100).
 - b. The second nameplate shall indicate the load served, the size and type of cable and raceway example:
 - i. LP-4, LP-5, LP-6
 - ii. 4#500 KCMILS-THW-CU-3-1/2"C
- H. Remote Smoke Detector Lamps and Test Stations.
1. Furnish and install a nameplate on each remote smoke detector lamp and/or test station.
 2. Engraving must indicate the location of the device to which the lamp is connected, as approved by the Engineer.
- I. Switches.
1. Furnish and install an engraved nameplate for each switch, controlling loads that are not local to the switch. Engraving shall be as directed by the Engineer.
- J. Pullboxes, Enclosures, and Cable Terminations.
1. Circuits rated over 40 Amp and all cables over 600V:
 - a. Provide identification label with circuit numbers on enclosure cover.
 - b. Furnish and install cable tags on each cable that enters a pullbox, enclosure, switchboard, and at terminations. Mark tags with type written inscription noting the load served, type and size of cable, and the overcurrent device protecting the cable.
- K. Branch circuits:
1. Provide identification label with panel and circuit numbers on enclosure cover.
 2. Identify each circuit with wire markers when enclosure label and wire colors do not provide enough information to identify each circuit without tracing.
 3. Provide feeders and branch circuit home runs with plasticized wire marker indicating circuit number and power source. Provide feeders phase identification letter at each terminal point in addition to its circuit number.
 4. 4 square box covers hidden above lay-in ceilings may be marked with indelible ink marker in lieu of using printed labels.
- L. Fire Alarm Terminal Cabinets.
1. Furnish and install an approved nameplate on each fire alarm terminal cabinet.
 2. Nameplates shall indicate floor and where multiple terminal cabinets are installed a prime designation for each cabinet (e.g. FATC-1A, FATC-1B).
 3. Terminals shall be permanently identified in an approved manner.
 4. Label all wiring.
- M. Telecommunications System.
1. Each horizontal cable from a termination block or patch panel to a telecommunications outlet shall be labeled at both ends. Tags shall be consecutively numbered so that no two (2) cables have the same identification. In addition cable tag shall note the room number in which the data transmission outlet is

- located.
 2. Each backbone cable shall have a flameproof tag attached at both ends of the tag. Tags shall be consecutively numbered so that no two (2) cables have the same identification. Additional inscriptions shall be provided as directed by the Owner.
 3. Patch panel ports shall be consecutively numbered so that no two (2) ports have the same number.
 4. Furnish and install a clear typed label on each faceplate for each outlet and jack indicating cable per ANSI/TIA/EIA/606A standards and project nomenclature. Label materials and finish shall match style, font, color, etc as any adjacent receptacles.
 5. Label shall be mounted at the top of the faceplate.
- N. Warning Signs
1. Provide electrical equipment and accessible wiring enclosures operating at voltage above 240 volts with self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1-1964 and OSHA 19.0.144iii(2) Specifications "Danger High Voltage" warning sign and voltage marker applied to front door or cover of device or enclosure.
 2. Provide large equipment such as transformers and main distribution equipment with self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1-1964 and OSHA 19.0.144iii(2) Specifications indicating all electrical characteristics.
- O. Boxes
1. Provide identification labels for all low voltage and medium voltage pull, splice and junction boxes in main feeder and subfeeder runs, indicating nominal system voltage.
 2. Apply labels after painting of boxes, conduits, and surrounding areas have been completed.
 3. Clean surfaces before applying labels; clean aluminum surfaces with solvent wipe.
 4. Apply labels on cover and minimum of one (1) fixed side; one (1) label visible from floor where boxes are installed exposed.

END OF SECTION 260553

SECTION 260923 – LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1. SUMMARY

- A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor photoelectric switches.
3. Indoor occupancy sensors.
4. Lighting contactors.
5. Emergency shunt relay.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated.
B. Field quality-control test reports.
C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 PRODUCTS

2.1. TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE
2. Intermatic, Inc.
3. Leviton.
4. Lithonia Lighting.
5. Paragon Electric Co.
6. Square D.
7. TORK.
8. Watt Stopper.

- B. Electromechanical-Dial Time Switches: Type complying with UL 917.

1. Contact Configuration: SPST.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Five subparagraphs below describe optional features.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
5. Astronomic dial in first subparagraph below makes the time switch self-adjusting for seasonal changes and automatically adjusts on-off times as days grow shorter or longer.
6. Astronomic time dial.
7. Eight-Day Program: Uniquely programmable for each weekday and holidays.
8. Skip-a-day mode.
9. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2. OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE
2. Intermatic, Inc.
3. Leviton.
4. Lithonia Lighting.
5. Paragon Electric Co.
6. Square D.
7. TORK.
8. Watt Stopper.

- B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-

- off.
- 2. Time Delay: 15-second minimum, to prevent false operation.
- 3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
- 4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3. INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper (Greengate)
 - 2. Hubbell Lighting.
 - 3. Leviton Mfg. Company Inc.
 - 4. Philips Controls
 - 5. Sensor Switch, Inc.
 - 6. Steinel
 - 7. Watt Stopper.
- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
 - 1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 - 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 - 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 - 6. Bypass Switch: Override the on function in case of sensor failure.
 - 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.
- C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
 - 1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
 - 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 - 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

2.4. LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Products.
 - 2. GE.
 - 3. Hubbell Lighting.
 - 4. Square D.
 - 5. TORK.
 - 6. Watt Stopper.
- B. Description: Electrically operated and mechanically held, combination type with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
 - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 - 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.

3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as scheduled, matching the NEMA type specified for the enclosure. Provide with accessory module for 2-wire control as necessary for control.
5. The contactor shall have provisions for factory or field addition of:
 - a. Four (4) N.O. or N.C. auxiliary contacts rated 6 amperes continuous at 600 volts.
 - b. Single or double circuit, N.O. or N.C., 30 or 60 ampere 600 volt power-pole adder.
 - c. Control-circuit fuse holder, one or two fuses.
 - d. 0.2-60 second TDE or TDD timer attachment.
 - e. Transient-suppression module for control circuit of 120 volts.

2.5. EMERGENCY SHUNT RELAY

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Lighting Control and Design, Inc.
- B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
 1. Coil Rating: 120 or 277 V as required.

PART 3 EXECUTION

3.1. SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2. CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3. IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 1. Identify controlled circuits in lighting contactors.
 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.4. FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 260923

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.
- C. Field quality-control reports.
- D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.4. WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1. GENERAL

- A. Provide panelboards as indicated in the panelboard schedule and where shown on the plans. Panelboards shall be equipped with fusible switches or thermal-magnetic, molded case circuit breakers as indicated on the schedules.

2.2. MANUFACTURERS

- A. Equivalents by Eaton (Cutler-Hammer), Square D, GE, or ITE Siemens.
 - 1. Equivalent Panelboards to those specified on the plans shall be considered as follows:

Cutler Hammer	Square D	GE	Siemens
Pow-R-Line 1A	NQOD	AQ	P1
Pow-R-Line 2A	NQOD	AE	P2
Pow-R-Line 3A	NF* / I-Line	AE* / Spectra	P3
Pow-R-Line 4B	I-Line	Spectra	P4

* Submitted equipment must be able to accommodate ALL breakers shown in panelboard schedules as branch-mounted devices. If unable to do so, provide distribution panelboard as noted.

2.3. PANELBOARDS

- A. Bussing Assembly and Temperature Rise:

1. Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50 degrees C rise above ambient. Heat rise tests shall be conducted in accordance with Underwriters Laboratories Standard UL 67.
2. Provide tin-finished copper bars full length of panel with rating listed in schedule. Bus bar connection to branch circuit breakers shall be "Phase Sequence" type designed and assembled so circuit breakers can be replaced without disturbing adjacent breakers or removing main bus or branch circuit connectors. Provide bus bars with wire lugs suitable for copper or aluminum conductors. Provide each panel with equipment tin finished copper grounding bus grounded to box and tin finished copper neutral bus insulated from box.

B. Integrated Equipment Short Circuit Rating

1. Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the integrated equipment rating as indicated in the schedules. This rating shall be established by testing with the overcurrent devices mounted in the panelboard. The short circuit tests on the overcurrent devices and on the panelboard structure shall be made simultaneously by connecting the fault to each overcurrent device with the panelboard connected to its rated voltage source. Method of testing shall be per Underwriters Laboratories Standard UL 67. The source shall be capable of supplying the specified panelboard short circuit current or greater. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed.

C. Cabinet

1. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with UL Standard 67. Provide branch circuit panelboard cabinets with latch and tumbler-type lock on door of trim. Doors over 48" long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. Endwalls shall be removable. Fronts shall be of code gauge steel. Gray baked enamel finish electrodeposited over cleaned phosphatized steel. Fusible panelboards and large distribution circuit breaker panelboards shall not be provided with doors.

D. Safety Barriers

- a. The panelboard interior assembly shall be dead front type with panelboard front removed. Main lugs or main breakers shall have barriers on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall have barriers.

E. UI Listing

- a. Panelboards shall be listed by Underwriters Laboratories and shall bear the UL label. When required, panelboards shall be suitable for use as service equipment.

2.4. OVERCURRENT PROTECTIVE DEVICES

A. Main Overcurrent Protection Device

1. The main device shall be an electronic trip molded case standard function 80% rated circuit breaker(s) or thermal magnetic molded case circuit breaker(s).

B. Arc Energy Reduction Systems

1. Manufacturer shall provide an approved means of Arc Energy Reduction on all overcurrent protective devices rated 1200A or higher, or demonstrate the overcurrent protective device has a clearing time of 0.07 seconds or less at the available arcing current.
2. Manufacturer shall provide documentation showing the method chosen [above] is set to operate at a value below the available arcing current.

C. Branch Circuit Breakers

1. Branch circuit breakers shall be quick-make, quick-break with trip indication. Circuit breakers shall operate both manually for normal switch functions and automatically under overload and short circuit conditions. They shall provide circuit and self-protection when applied within their rating. Operating mechanisms shall be entirely trip free so that contacts cannot be held closed against a short circuit. Operating handle of circuit breaker shall open and close all poles of a multipole breaker simultaneously. Conforming to NEMA Standards Publications No. AB1-1964 and be approved by UL. Circuit breaker shall have a thermal magnetic trip unit for each pole for inverse time delayed overload protection and an instantaneous magnetic element for short circuit protection. Multiple pole trip elements shall operate a common internally connected trip bar to open all poles in case of overload or

- short circuit through any one pole.
- 2. Provide arc-fault protection circuit breakers for all sleeping rooms and other areas required by code.

2.5. LOAD CENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Load Centers: Comply with UL 67.
- C. Mains: Circuit breaker or main lugs, as scheduled.
- D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- E. Provide Arc Fault Circuit Interrupter circuit breakers for all branch circuits that supply 125-volt, single-phase, 15- and 20- ampere outlets installed in bedrooms, family rooms, dining rooms, closets, hallways, similar rooms or where otherwise required by Code. Breaker shall be listed to provide protection of the entire branch circuit.
- F. Provide combination GFCI/Arc Fault Circuit Interrupter circuit breakers as scheduled.
- G. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.6. METERING EQUIPMENT

- A. Residential metering equipment
 - 1. MULTI-METERING shall be furnished floor mounted and wall attached at locations as shown on the drawings.
 - 2. Metering shall be UL listed. Panelboards identified for use as service equipment are to be labeled for this application. Coordinate with local utility.
 - 3. Meter Units shall be EZ Meter Pak by Square D Company. Equivalent by G.E., Siemens, Cutler Hammer.
- B. Enclosures
 - 1. Enclosures shall be constructed of formed and welded code gauge galvanized steel NEMA Type 3R with baked enamel finish electrodeposited over cleaned phosphatized steel.
 - 2. No device disassembly is to be required before mounting.
 - 3. All devices must be bonded together with bolted connections.
 - 4. All compartments containing unmetered circuits shall be provided with a sealing means.
- C. Interior construction
 - 1. All components except for branch plug-in units shall be factory assembled and all current carrying parts shall be plated bus bars.
 - 2. Individual units shall be constructed with an integral sliding one bolt joint-pak assembly for a completely bussed meter center. This single bolt is to be a VISI-TITE bolt for tightening without a torque wrench.
 - 3. Meter Sockets shall be 7 jaw, 200A or 400A as shown on the drawings.
 - 4. Sockets shall be rated 200 or 320 ampere continuous duty.
 - 5. Meter sockets shall be field installable through 200A.
- D. Bussing
 - 1. The multi-metering equipment through bus shall be tin-plated aluminum. The bussing shall be of sufficient cross-sectional area to meet UL Standard 891 for temperature rise. The through bus shall extend the full length of the equipment and be 100% rated throughout the line-up. Tapered bus is not acceptable. There shall be provisions for future splicing of additional sections from either end. The neutral bus shall also be 100% rated. The ground bus shall be sized per UL Standard 891, and of the same material as the through bus. Bus connections shall be bolted with grade 5 bolts and conical spring washers.
- E. Main disconnect devices
 - 1. The main disconnect shall be an electronic trip circuit breaker.
- F. Branch molded case circuit breakers
 - 1. Circuit breakers shall be thermal magnetic trip, with an integral crossbar to provide simultaneous opening of all poles in multi-pole circuit breakers.
 - 2. Breakers shall have an overcenter, tripfree, toggle-type operating mechanism with quick-make, quick-

- break action and positive handle indication.
 - 3. Handles shall have "ON" and "OFF" and "Tripped" positions.
 - 4. Circuit breakers shall be UL listed in accordance with UL standard 489 with current ratings as noted on the plans. Interrupting ratings shall be selected to provide the required short circuit current rating.
- G. Short circuit current rating
- 1. 65,000 ampere rms symmetrical short circuit current ratings shall be provided. This rating shall be established by manufacturer testing of a representative meter center with branch overcurrent devices installed.
 - 2. The entire multi-metering equipment shall be suitable for operation at the specified available fault current. The equipment shall be labeled to indicate the maximum available fault current rating, taking into account the structure, bussing, main disconnects, and tenant main disconnects.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine panelboards before installation. Reject panelboards that are moisture damaged or physically damaged.
- B. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

- A. Store, handle, and install panelboards and accessories per manufacturer's recommendations.
- B. Secure the assembly in place.
- C. Provide 3½" housekeeping pad where two or more conduits penetrate floor or when equipment is floor/ground mounted.
- D. Wall-mounted equipment:
 - 1. Mount bottom of trim a minimum of 24" above finish floor. Maintain accessibility to overcurrent devices per NEC. Where both conditions cannot be met, consult with engineer on mounting height of equipment.
 - 2. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
 - 3. Where flushed mounted, the fire integrity of the wall in which it is installed must be maintained.
 - 4. Where flush mounted provide (2)2" conduits from the can to above an accessible ceiling and terminate with a minimum 8"x8" junction box located in a concealed manner.
- E. Neatly arrange branch circuit wires and tie together in each gutter with Thomas & Betts nylon "Ty-Raps", or approved equal at minimum 4 inch intervals.
- F. Plug all knockouts removed and not utilized.
- G. Install overcurrent protective devices and controllers not already factory installed.
- H. Install filler plates in unused spaces.

3.3. IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Panelboard Nameplates: Label each panelboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- D. For panelboards (and distribution panelboards where labeling of individual breakers is not possible or practical), provide a typed circuit directory for same as follows:
 - 1. Panels shall have branch circuit directory holders with clear plastic cover.
 - 2. Provide neatly typed list of branch circuit loads corresponding to branch circuit numbers. Handwritten directories are not acceptable.
 - 3. For remodel work or changes, trace circuits to determine loads and provide new updated directory.

3.4. FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, and feeder.
2. Test continuity of each circuit.

C. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5. ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated in the coordination study.

3.6. LOAD BALANCE

- A. 30 days after occupancy provide record ampacity loads for each panelboard by phase.
- B. Adjust circuit and phase loading so that each phase is within 25% of other phases if possible.
- C. Update circuit directory with new typewritten directory with any circuit changes for balance of loads.
- D. Update any labels on equipment, receptacles etc to any circuit changes due to balancing.

3.7. TOUCH UP AND CLEANING

- A. Vacuum all backboxes clean of debris after installation and prior to contract closeout.
- B. Touch up scratch marks, etc. with matching paint.

3.8. OBSERVATIONS

- A. All panel fronts shall be removed by the Contractor for observation of the panel interiors by the Engineers.
- B. Panel fronts shall be removed when directed by the Engineer/Architect for observation and reinstalled immediately after the observations.

END OF SECTION 262416

SECTION 262726 – WIRING DEVICES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 PRODUCTS

2.1. GENERAL

A. Manufacturers

- 1. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - a. Eaton Wiring Devices; (may be listed below and/or submitted as Eaton, Cooper, Arrow Hart, or Crouse-Hinds).
 - b. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - c. Leviton Mfg. Company Inc. (Leviton).
 - d. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
- 2. All devices shall be from the same manufacturer.

B. Finishes

- 1. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - a. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70 or device listing.
 - i. Color shall be coordinated and verified with Architect and owner.

2.2. STRAIGHT BLADE RECEPTACLES

A. General Requirements for Convenience Receptacles

- 1. Unless otherwise modified below, all receptacles shall comply with the following:
- 2. Commercial / Common Areas: 125 V, 20 A
- 3. Residential / Dwelling Unit Areas: 125 V, 15 A
- 4. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
- 5. Multiple types of receptacles may be required of a single device (Ex.: a Hospital-Grade GFCI receptacle), as indicated on the plans and in the execution section below. Where such a device is required, it shall meet the requirements of all applicable sections below.
- 6. Products: Subject to compliance with requirements, provide one of the following:
 - a. Refer to list of approved manufacturers in general section.
 - b. Receptacle model/series(all manufacturers): 5361 (single), 5362 (duplex).
- 7. Residential/Dwelling Unit Area Products: Subject to compliance with requirements, provide one of the following:
 - a. Eaton; TR270.
 - b. Hubbell; RR15TR.
 - c. Leviton; T5320.
 - d. Pass & Seymour; 3232TR.

B. GFCI Receptacles

1. Straight blade, feed or non-feed-through type.
2. Include indicator light that is lighted when device is tripped.
3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; SGF20.
 - b. Hubbell; GFRST20.
 - c. Leviton; G5362.
 - d. Pass & Seymour; 2097.
4. Where devices are shown labeled as GFI on drawings provide GFCI receptacle (feed-through devices are not acceptable unless otherwise noted, or with written permission from the engineer).
 - a. Devices labeled as GFIP on the drawings may be protected as a feed-through device.
 - b. Multiple GFCI receptacles within dwelling units, where shown on the plans to be on the same circuit, may be protected with a single GFCI receptacle.

C. Weather-Resistant Receptacles

1. Receptacles shall UL-listed as weather-resistant.
2. Receptacles shall be identified with an "WR" on the receptacle face.
3. Products: Refer to General Requirements for Convenience Receptacles. WR receptacles shall be of same series.

D. Tamper-Resistant Receptacles

1. Tamper-Resistant Receptacles shall be safety type, "childproof," duplex, 3 wire, ground type.
2. Products: Refer to General Requirements for Convenience Receptacles. TR receptacles shall be of same series.

2.3. SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide decorator rocker-style switches:
 - a. Cooper; 76_ Series, commercial spec grade switches. Single pole, two pole, three way and four way.
 - b. Equivalent Hubbell, Leviton, Pass & Seymour

C. Pilot Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide decorator rocker-style switches:
 - a. Cooper; 76_ Series, commercial spec grade switches. Single pole, two pole, three way and four way.
 - b. Equivalent Hubbell, Leviton, Pass & Seymour
2. Description: Wired to indicate when switch is "ON."

2.4. WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
 1. 600 W; dimmers shall require no derating when ganged with other devices.
 2. 2000 W; dimmers where required by load.
- D. Dimmer Switches for LED fixtures: Modular; compatible with dimming drivers in fixture(s); if other than 0-10V dimming is provided, verify dimmer is compatible with driver for full range of dimming (100-10%).

2.5. OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 6111 for 120 V, 6117 for 277 V.
 - b. Hubbell; WS1277.
 - c. Leviton; ODS 10-ID.

- d. Pass & Seymour; WS3000.
 - e. Steinel; IL WLS 1.
 - f. Watt Stopper (The); PW-101.
- 2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..
- B. Long-Range Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell; ATP1600WRP.
 - b. Leviton; ODWWV-IRW.
 - c. Pass & Seymour; WA1001.
 - d. Steinel; IL WLS 1
 - e. Watt Stopper (The); CX-100.
 - 2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft..

2.6. SPECIAL PURPOSE DEVICES

- A. Provide where indicated, specified or as required other appropriate NEMA configured devices appropriate for such equipment as thru-wall units manufactured by the same manufactures.

2.7. WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Vinyl, with color matching respective device.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable in-use cover.
- C. Damp-Location, Damp Location Cover Plates: NEMA 250, spring loaded and gasketed, die-cast aluminum.

2.8. FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable.

2.9. SINGLE AND MULTIPLE STATION (120V) DETECTORS

- A. Smoke Detectors:
 - 1. Detector shall comply with the following:
 - a. UL 217 (Standard for Single and Multiple Station Smoke Alarms)
 - b. Suitable for residential occupancies per NFPA 101
 - 2. Detector shall be a dual-sensor (combination photoelectric and ionization detection) model.
 - 3. Operate at 120V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
 - 4. Auxiliary Relays: Provide as required.
 - 5. Test Switch: Push to test; simulates smoke at rated obscuration.
 - 6. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
 - 7. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
 - 8. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
 - 9. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

10. Where indicated on plans, provide Audible (Sounder) and/or Visual Base(s) for detector(s).
- B. Combination Smoke/Carbon Monoxide Detectors:
 1. Same as above requirements for smoke detectors, except as modified below:
 2. Smoke detection may be by a photoelectric sensor only.
 3. Comply with UL 2034 (Standard for Single and Multiple Station Carbon Monoxide Alarms).
- C. Audible (Sounder) Bases:
 1. Listed to UL 268, 464, & 2075.
 2. Base shall include the following selectable tones (as required):
 - a. Smoke: ANSI Temporal 3
 - b. Carbon Monoxide: Temporal 4
- D. Visible Base:
 1. Shall include a 177-cd strobe.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
- D. Receptacle Types:
 1. The following receptacle types shall be furnished in lieu of "standard" 120V, 15 or 20 amp receptacles at all of the following locations, regardless of plan designation:
 - a. Refer to the National Electrical Code (NEC), for definitions of all locations listed below.
 2. GFCI Receptacles:
 - a. Within the following locations in dwelling units:
 - i. Bathrooms
 - ii. Garages
 - iii. Crawl Spaces and Unfinished Areas of Basements
 - iv. Above-counter receptacles in Kitchens
 - v. Where located within 6'-0" of a sink.
 - vi. Laundry Areas
 - vii. Where installed to serve a dishwasher.
 - b. Bathrooms / Locker Rooms
 - c. Kitchens (unless circuit is provided with GFCI protection at the circuit breaker)
 - d. Rooftops
 - e. Outdoors
 - f. Where located within 6'-0" of a sink.
 - g. Garages, Service Bays, etc.
 - h. Unfinished areas.
 3. Weather-Resistant Receptacles:

- a. In all damp or wet locations.
- 4. Tamper-Resistant Receptacles:
 - a. All devices within dwelling/resident units
 - b. Exceptions:
 - i. Receptacles located more than 7' above the floor.
 - ii. Receptacles located behind an appliance that is not easily moved.
- E. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
 - 10. Wall plates shall not support wiring devices. Provide wiring device with accessories as required to properly install devices and wall plates.
 - 11. All devices shall be flush-mounted except as otherwise noted on the drawings.
 - 12. Locations
 - a. Comply with layout drawings for general location; contact Owner's Representative for questions about locations and mounting methods.
 - b. Relocate outlets obviously placed in a location or manner not suitable to the room finish.
 - c. Avoid placing outlets behind open doors.
 - d. Align devices vertically and horizontally. Device plates shall be aligned vertically with tolerance of 1/16". All four edges of device plates shall be in contact with the wall surface.
 - 13. Mounting Heights as indicated on the Drawings and according to ADA requirements.
 - 14. Ganging of Switches - provide barriers between ganged 277 volt switches of different phases.
 - 15. Power Outlets - install power outlets complete with back boxes, where installed in existing buildings or extensions of existing buildings. Coordinate phase connections for rotating equipment with connections in existing building.
 - 16. Install device plates on all outlet boxes. Provide blank plates for all empty, spare and boxes for future devices.
 - 17. Caulk around edges of outdoor device plates and boxes when rough wall surfaces prevent a raintight seal. Use caulking material as approved by the Architect/Engineer.
 - 18. Emergency/normal power devices and/or 277V/120V devices are not to occupy the same box. Where same are shown on plans to be ganged, provide separate boxes immediately adjacent to each other.
- F. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles up.
- G. Device Plates:
 - 1. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
 - 2. Provide matching blank wall plates to cover outlet or junction boxes intended for future devices.
 - 3. Provide matching blank wall plates with 4 port knock outs at all telephone, data, and tele/data outlet locations. Also provide with matching blankouts in each port.
 - 4. Where wall plates for special devices are available only from manufacturer of device, provide designs and finishes equivalent to above specification.
 - 5. Verify with Architect finish of any plate where it may be apparent a special finish or color should have been specified.
- H. Switches
 - 1. Where switches are indicated to be installed near doors, corner walls, etc., mount same not less than 2

- inches and not more than 18 inches from trim. Verify exact locations with the Architect.
 - 2. Carefully coordinate the location of switches to insure locations at the strike side of doors.
 - 3. Furnish and install an engraved legend for each switch that controls exhaust fans, motors, equipment systems, etc., not located within sight of the controlling switch.
- I. Dimmers:
 - 1. Install dimmers within terms of their listing.
 - 2. Verify that dimmers used for fan speed control are listed for that application.
 - 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
 - J. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
 - K. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

3.2. IDENTIFICATION

- A. Comply with Division 26 Section "Identification for Electrical Systems."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3. FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Test Instruments: Use instruments that comply with UL 1436.
- B. Tests for Convenience Receptacles:
 - 1. Test for correct wire terminations (no open ground, neutral, or hot).
 - 2. Test for correct polarity (no hot/ground reverse or hot/neutral reverse).
 - 3. Verify GFCI devices are operating properly.
 - 4. Using the test plug, verify that the device and its outlet box are securely mounted.

END OF SECTION 262726

SECTION 262813 – FUSES

PART 1 GENERAL

1.1. SUBMITTALS

- A. First paragraph below is defined in Division 01 Section "Submittal Procedures" as an "Action Submittal."
- B. Product Data: For each type of product indicated.
- C. Paragraph below is defined in Division 01 Section "Submittal Procedures" as an "Informational Submittal."
- D. Operation and maintenance data.

1.2. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA FU 1 for cartridge fuses.
- C. Comply with NFPA 70.

PART 2 PRODUCTS

2.1. FUSES

A. PRODUCT

- 1. Provide fuses by Bussman or Gould Shawmut.
- 2. Provide fuses of same characteristics as scheduled to insure selective coordination of power system.
- 3. Fuses 601 amp and larger shall be U/L Class L with minimum four (4) seconds time delay at 500% rating.
- 4. Fuses 600 amp and below shall be U/L Class J, RK-1 or RK-5 as scheduled time delay sized as shown on drawings or schedules.
- 5. Special temperature conditions, motors, motor loads or other conditions requiring other types or sizes of fuses must be reviewed by the Contracting Officer. Fuse reducers are not permitted.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install fuses only after installation is complete and final tests and inspections have been made. Label fuses, switches and other fused devices with warning labels affixed in prominent location indicating type and size of fuse installed and fuse manufacturer's catalog number.
- B. Furnish Owner with spare fuses of each size and type installed on job as follows:
 - 1. 601 Amps or Larger - three (3) of each size and type
 - 2. 600 Amps or Less - 10% with minimum of three (3) of each size and type
- C. For fuse types and ampacities, see plans.
- D. Provide spare fuse cabinet with three shelves.
- E. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION 262813

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1. DISCONNECT SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton (Cutler-Hammer)
 - 2. General Electric Company
 - 3. Siemens
 - 4. Square D
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Lugs: Suitable for number, size, and conductor material.
 - 4. Service-Rated Switches: Labeled for use as service equipment.

2.2. FUSIBLE SWITCHES

- A. Refer to disconnect switches for all requirements in addition to the following.
- B. Switches shall be furnished with clips or bolt pads to accommodate indicated fuses.
- C. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.
- D. Accessories:
 - 1. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.3. MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton (Cutler-Hammer)
 - 2. General Electric Company
 - 3. Siemens
 - 4. Square D
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

- D. Electronic Trip Circuit Breakers (where indicated on drawings or elsewhere in this specification): Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I₂t response.
- E. Features and Accessories (where called for or required):
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 - 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.4. ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2. IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3. FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit

breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

SECTION 262913 – ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of enclosed controller.
- B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1. MOTOR STARTERS

- A. Provide motor starters rated in accordance with NEMA and as specified and shown on plans.
 - 1. Equivalents by: G.E., Cutler Hammer, or I.T.E. Siemens, Square D.
 - 2. Install starters in locations as shown on plans, installation shall be in strict accordance with NEC, and manufacturer's installation requirements.
- B. MANUAL MOTOR CONTROL (1 HP Maximum)
 - 1. Provide 300 volt, 60 cycle, AC manually operated motor starting switch meeting current NEMA Standards with proper NEMA enclosure required by starter location and environment.
 - 2. Starter shall have heavy silver alloy contacts with quick-make, quick-break mechanism manually operated by toggle switch.
 - 3. Thermal unit shall be melting alloy type, resettable, one-piece interchangeable construction.
 - 4. Provide starter with all accessories such as pilot light, H.O.A. or two speed switches required to provide control sequence shown on drawings or specified. Selector switches contact shall have same ampere rating as starter switch.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height, and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
- B. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- C. Comply with NECA 1.

3.2. IDENTIFICATION

- A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved nameplate.
 - 3. Label each enclosure-mounted control and pilot device.

3.3. CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers and remote devices[and facility's central control system]. Comply

with requirements in Division 26 Section "Control-Voltage Electrical Power Cables."

- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic-control selection devices where applicable.
 - 1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
 - 2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.4. FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 - 2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
 - 3. Test continuity of each circuit.
 - 4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
 - 5. Test each motor for proper phase rotation.
 - 6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed controllers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5. ADJUSTING

- A. Set field-adjustable switches and overload-relay pickup and trip ranges.
- B. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Architect before increasing settings.

3.6. DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

END OF SECTION 262913

SECTION 264300 – SURGE PROTECTION DEVICES

PART 1 GENERAL

1.1. SCOPE

- A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers. Refer to related sections for surge requirements in:

1.2. RELATED SECTIONS

- A. Reference Section 260010.
- B. Section 262413 – Switchboards
- C. Section 262416 – Panelboards

1.3. SUBMITTALS

- A. The following information shall be submitted to the Engineer:
 - 1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (In).
- B. Where applicable the following additional information shall be submitted to the engineer:
 - 1. Descriptive bulletins
 - 2. Product sheets
- C. The following information shall be submitted for record purposes:
 - 1. Final as-built drawings and information for items listed in Section 1.04 and shall incorporate all changes made during the manufacturing process

1.4. QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.
- E. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

1.5. DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.6. OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Eaton / Cutler-Hammer products
- B. Siemens
- C. Square D
- D. GE
- E. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not

named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2. VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	•	•	•	•

5. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.
6. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

Modes	208Y/120
L-N; L-G; N-G	700
L-L	1200

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
 - a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
 - i. For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
 - ii. For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
 - iii. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes.

Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

- b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
 - c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
 - d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of $50 \pm 20A$ occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.
 - i. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.
6. Overcurrent Protection
- a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.
8. Safety Requirements
- a. The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
 - b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.

2.3. SYSTEM APPLICATION

- A. The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.
- B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
Category	Application	Per Phase	Per Mode
B	Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

- C. SPD Type – all SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.4. LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

- A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

1. The SPD shall be included and mounted within the panelboard by the manufacturer of the panelboard.
2. The SPD shall be of the same manufacturer as the panelboard.
3. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
4. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
5. The panelboard shall be capable of re-energizing upon removal of the SPD.
6. The SPD shall be interfaced to the panelboard via a direct bus bar connection. Alternately, an SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.
7. The complete panelboard including the SPD shall be UL67 listed.

PART 3 EXECUTION

3.1. FACTORY TESTING

- A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.2. INSTALLATION

- A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.3. WARRANTY

- A. The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION 264300

SECTION 265000 – LIGHTING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data:
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include emergency lighting units, including batteries and chargers.
 - 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 - 6. Photometric data and adjustment factors based on laboratory tests
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.
- D. Field quality-control test reports.
- E. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

PART 2 - PRODUCTS

2.1. INSPECTION

- A. Prior to installation of luminaires Electrical Contractor shall inspect luminaire and verify unit meets or exceeds specifications, is new and unused without damage or defect and is suitable for the intended service.
- B. See architectural and electrical plans for luminaire locations, coordinate installation with other trades. At the completion of the project all luminaires shall be aligned, level and cleaned to the satisfaction of the A/E.

2.2. EQUIVALENT MANUFACTURERS

- A. The following light fixture manufacturers are generally approved equals to those manufacturers listed in the Lighting Fixture Schedule on the drawings. The approval herein no way relieves the contractor of meeting all specification requirements. All light fixtures substituted for fixtures specified on drawings must conform in materials, dimensions, appearance, performance, and be of equal quality to the fixture specified and described in the Lighting Fixture Schedule. Fixture manufacturers not listed here must be submitted and approved a minimum of 10 days prior to bid.
- B. Provide luminaires by the following manufacturers:
- C. Downlights:
 - 1. Category 1: (Only Category 1 fixtures may be substituted for Category 1 fixtures specified on the drawings). Calculite, Edison Price, Focal Point, Kirlin, Kurt Versen, Rambusch, RSA, USA Lighting, USAI Lighting
 - 2. Category 2: (Category 1 or Category 2 fixtures may be substituted for Category 2 fixtures specified on the drawings). Elite, Halo, Hubbell, Indy, Intense, Lightolier, Lithonia, Marko, Nulite, Pathway, Prescolite, Portfolio, Spectrum, Williams, Zumtobel
- D. LED/Fluorescent Troffer Type: Columbia, Cooper (Metalux), Daybrite, Elite, Finelite, Focal Point, Lithonia, Williams
 - 1. Equivalent troffers shall be considered the following: Columbia (PS Series), Cooper (Metalux GC Series), Daybrite (SP Series), Elite (OT Series), Finelite (HPR Series), Lithonia (SP Series), Williams (50 Series)
- E. Undercounter: Columbia, Color Kinetics, Daybrite, Elite, Fail-Safe, Lithonia, Metalux, Nulite, Viscor Lighting, WAC, Williams
- F. Strip Fluorescents: Birchwood, Columbia, Daybrite, Elite, ILP, Lithonia, Metalux, Paramount, Prudential,

- Utopia Lighting, Williams
- G. Linear/Tubes: A Light, Corelite, Finelite, Focal Point, Ledalite, Linear Lighting, LiteControl, Mercury Architectural Lighting, Metalumen, Peerless, PMC, Precision, Prudential, Utopia Lighting, Williams, Zumtobel
 - H. Specialty Lights: Advent, Baselite, Bega, Beta Calco, Casey Architectural, Cole, Crenshaw Lighting, Design Plan, Engineered Lighting Products, Focal Point, G Lighting, iGuzzini, Impact Lighting, Interlux, Juno, Justice Design, Kramer, Louis Poulson, Lighting Services Inc., Neoray, Prudential, Sharper, SPI, Manning, MP Lighting, Sistemalux, Sterner, Tivoli, Trend Lighting, Trimblehouse, Ultra Lights, Visa, Visual Lighting Technologies, WAC, Winona, Zaneen, Zumtobel
 - I. Indirect: Ametrix, Elliptipar, Engineered Lighting Products, Focal Point, LiteControl, SPI, Zumtobel
 - J. Industrial: ABS Lighting, Crouse Hinds, Daybrite, Gardco, G.E., Holophane, Hubbell, Lumark, Kim, Lithonia, SPI, Williams
 - K. Exit Signs and Emergency Lights: Beghelli, Chloride, Concealite, Devine, Dual-Lite, EELP, Elite, Emergi-Lite, Evenlite, Exitronix, Fail-Safe, Hubbell, Lithonia, Prescolite, Surelites, Crouse Hinds, Williams.
 - L. Security/Vandal Resistant: Daybrite, Eclipse, Failsafe, Holcor, Kenall, Kirlin, L.C. Doane, Moldcast.
 - M. Hazardous Locations: Appleton, Chloride, Cross-Hinds, Daybrite, Dialight, Dual-Lite, Halo, Hubbell, Kirlin, L.C. Doane, Paramount, Phoenix
 - N. Outdoor: ABS Lighting, Antique Street Lights, Architectural Area Lighting, Bega, Beta Calco, Daybrite, Devine, Excelsior, Gardco, G.E., Hadco, Hubbell, Holophane, Hydrel, Invue, Kim, King Luminaire, Lithonia, LSI Lighting Systems, Lumark, Lumec, Lumiere, Lumenton, McGraw-Edison, McPhilben, Ruud, Sterner, Stonco, Sun Valley Lighting, US Architectural, Vista Pro, Williams.
 - O. Track Lighting: Alfa, Bruck, Elite, Halo, Intense, Lithonia, Lightolier, Lighting Services Inc., Lite Lab, Marko, Prescolite
 - P. LED lamps and Modules: Philips, General Electric, Osram/Sylvania, Cree, Nichia.
 - Q. LED Power Supplies: Osram/Sylvania, General Electric, Philips.

2.3. LUMINAIRES

- A. Provide luminaires complete with lamps and accessories required for hanging. Contractor shall insure that lamps, reflector lens and trim are clean at time of final inspection. Mount recessed luminaires with trim flush to ceilings, free of gaps or cracks.
- B. Coordinate mounting of ceiling mounted luminaires with General Contractor. Where additional supports are required due to luminaire location or weight, electrical contractor shall provide supports, unless otherwise specified under ceiling specifications.
- C. Consult architectural plans and existing conditions where applicable for ceiling types and provide surface and recessed lighting fixtures with appropriate mounting components and accessories. Verify mounting requirements prior to ordering and shop drawing submission.
- D. All fixtures and components mounted in areas lower than 8'-0" or in mechanical, electrical or service type areas subject to circulation of staff or maintenance shall be coordinated prior to installation so as to minimize damage or injury. Any devices or fixtures mounted without coordination/notification with architect that become hazards to walk paths or subject to damage shall be moved at no expense to the owner at the satisfaction of the architect/engineer. (ie. if a fixture can be located a short distance away that avoids a beam or prevents it from being mounted 3" above a persons head that should be coordinated prior to installation)
- E. Fixtures mounted in fire rated ceilings shall be provided and installed with fire rated enclosures to maintain ceiling integrity. Provide engineered products by EZ-Barrier, Tenmat or similar products or provide enclosures fabricated in accordance with building code and UL requirements. Maintain all fixture required heat sink and other clearances.

2.4. LED LIGHTING SYSTEMS

- A. LED components, lamps, drivers, and fixtures shall comply with: PCC 47 CFR Part 15; UL 8750; ANSI/NEMA Standards C78.377, NEMA SSL-1, C82.77, IESNA Standards TM-16-05, RP-16, LM-79, LM-80 and TM-21.
- B. The LED module itself and all its components must not be subject to mechanical stress.
- C. Assembly must not damage or destroy conducting paths on the circuit board.
- D. Installation of LED modules (with power supplies) shall adhere to all applicable electrical and safety standards.
- E. Correct polarity shall be clearly identified.
- F. LED module must be protected from unbalanced voltage drop, and/or overload.
- G. Ensure that the power supply is of adequate power to operate the load.
- H. Install system according to manufacturer's heat sinking parameters.
- I. For applications involving exposure to humidity and dust, the module shall be protected by a fixture or housing with a suitable protection glass. The module shall be protected against condensation water by treatment with an appropriate circuit board conformal coating. The conformal coating should have the following features.
 - 1. Optical transparency
 - 2. UV resistance
 - 3. Thermal expansion properties matching those of the module (15-30 x 10⁻⁶cm/cm/K)

- 4. Low permeability of steam for all climate conditions
- 5. Resistance against corrosive environments
- J. The LED module shall be operated with an electronically stabilized power supply offering protection against short circuits overload and overheating.
- K. All drivers used for supplying power to LED arrays in lighting fixtures shall be by the light fixture manufacturer.
- L. Drivers shall be integral to the fixture unless otherwise shown or specified.

PART 3 - EXECUTION

3.1. LUMINAIRES

- A. All light fixtures shall be cleaned and free of all construction debris. Install units as shown and detailed on the plans and per manufacturers' directions.
- B. Reference luminaire schedule on plans for specific luminaire, lamp, and ballast requirements.
- C. Reinstall any fixtures called out for relocation or remounting in renovation areas as though they are new fixtures. Make all provisions to properly mount and support existing fixtures being reused.
- D. Luminaires submitted must meet or exceed specified luminaire in performance and construction and appearance. Provide luminaires at each location shown on drawings. Luminaires shall be in accordance with type designation on drawings.

3.2. ADJUSTMENTS

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
- B. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
- C. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
- D. Adjust the aim of luminaires in the presence of the Architect.

3.3. FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265000

SECTION 265100 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Reference Section 260500 for general requirements of all light fixtures.
- C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. LUMINAIRES

- A. Provide luminaires complete with lamps and accessories required for hanging. Contractor shall insure that lamps, reflector lens and trim are clean at time of final inspection. Mount recessed luminaires with trim flush to ceilings, free of gaps or cracks.
- B. Coordinate mounting of ceiling mounted luminaires with General Contractor. Where additional supports are required due to luminaire location or weight, electrical contractor shall provide supports, unless otherwise specified under ceiling specifications.
- C. Consult architectural plans and existing conditions where applicable for ceiling types and provide surface and recessed lighting fixtures with appropriate mounting components and accessories. Verify mounting requirements prior to ordering and shop drawing submission.
- D. Fixtures mounted in fire rated ceilings shall be provided and installed with fire rated enclosures to maintain ceiling integrity. Provide engineered products by EZ-Barrier, Tenmat or similar products or provide enclosures fabricated in accordance with building code and UL requirements. Maintain all fixture required heat sink and other clearances.
- E. Provide troffer luminaires with the following devices wherever possible and not specified otherwise on the luminaire schedule: cam latches, 100% door gasketing, post fabrication painted finish, t-bar clips, lens clips, suspension tabs, and a minimum of 0.125" lens.

2.2. LAMPS

- A. Lamps shall be lamp types recommended by luminaire manufacturer. Lamp no fixtures above manufacturers recommended maximum wattages.

2.3. EMERGENCY LED DRIVER

- A. Emergency LED driver specified herein is by Iota (CP Series). Approved equals by Bodine.
 - 1. The emergency driver shall accommodate an LED load with a forward voltage requirement ranging from 10 to 60 VDC.
 - 2. The output voltage sensing shall be automatic and instantaneous with a resulting, inversely-proportional current to maintain constant power to the LED array with an output tolerance of +/- 3%.
 - 3. The unit shall supply the rated load for a minimum of 1 1/2 hours or to 87 1/2% of rated battery terminal voltage.
 - 4. The output power to the LED load during emergency operation shall be held constant (refer to plans for wattage) from minute one throughout the entire emergency run time resulting in no loss or degradation of the light source during emergency operation.
 - 5. The unit shall be furnished with an electronic, AC-lockout circuit which will connect the battery when the AC circuit is activated, and an electronic brownout circuit which will enable a transfer to emergency operation when utility power dips below an acceptable level.
- B. Installation
 - 1. Emergency drivers shall be UL-listed for use with respective LED array and/or UL-listed for field installation. Where drivers are only listed for use with a respective LED array, they shall be installed integral to the fixture by the fixture manufacturer.
 - 2. Maximum remote mounting distance of the emergency driver shall be 50-feet
- C. Driver: Constant Power emergency LED driver system as indicated on the plans. The emergency driver system shall be UL class 2 certified in accordance with UL 1310 and shall be UL listed for use in damp locations with a temperature range of 0° to 55° C.
- D. AC input: Two-wire, universal voltage capable 120 thru 277 VAC, 50/60 Hz and be UL Classified to Category Control Number (CCN) FTBR, Emergency Lighting and Power Equipment, and FTBV, Emergency Light-Emitting-Diode Drivers for field installation.
- E. Battery: Self-contained, high-temperature, sealed, maintenance-free nickel cadmium battery rated for a 10-year service life.

- F. Charger: two-stage charging system which samples the battery in relation to its temperature, state of charge and input voltage fluctuations. The charger shall be current limited, temperature compensated, short-circuit protected with reverse polarity protection. The unit shall achieve a full recharge in 24-hours.
- G. Protection: A low voltage battery disconnect (LVD) circuit shall be provided and will disconnect the load and circuitry from the battery when it reaches approximately 80 to 85% of its nominal terminal voltage, preventing a non-recoverable, deep-discharge condition as well as equipment initialization failure when utility power is restored.
- H. Housing: NEMA 250, Type 1 enclosure.
- I. Test Push Button: Illuminated push-to-test switch.
- J. Provide 5-year warranty.

PART 3 - EXECUTION

3.1. LUMINAIRES

- A. Luminaire supports shall comply with the latest edition of the NEC Sections 410-30 and 410-36. Provide luminaire securing clips or otherwise securely fasten fixtures to ceiling grid. At least two support wires shall be connected from the structure above to each troffer style light fixture.

3.2. INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. All light fixtures shall be cleaned and free of all construction debris. Install units as shown and detailed on the plans and per manufacturers' directions.
- C. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.
 - 1. Install a minimum of two ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
 - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 - 4. Install at least two independent support rods or wires from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
 - 5. Fixtures shall not be supported by the ceiling structure only without being installed in a ceiling listed, designed and installed for proper support of fixtures. Cables, clips, etc may not be omitted without documentation of ceiling capacity and design and installation is listed for such use and as applied for the project.
- D. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- E. Air-Handling Lighting Fixtures: Install with dampers open and ready for adjustment.
- F. Adjust aimable lighting fixtures to provide required light intensities
- G. Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and labeled as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E 283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.
- H. Recessed luminaires installed in rated assemblies shall be installed per UL listing requirements to maintain the rating of the construction. Provide sheet rock enclosures or other UL listed manufactured assemblies to maintain rating of construction and listing of fixtures for heat dissipation and clearances.

END OF SECTION 265100

SECTION 265600 – EXTERIOR LIGHTING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260010.
- B. Reference Section 265000 for general requirements of all light fixtures.
- C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4.
 - 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
 - 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - 1. Materials: Shall not cause galvanic action at contact points.
 - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
 - 3. Anchor-Bolt Template: Plywood or steel.
- D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

2.2. STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; 1-piece construction up to 40 feet in height with access handhole in pole wall.
 - 1. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Steel Mast Arms: [Single-arm] [Truss] [Davit] type, continuously welded to pole attachment plate. Material and finish same as pole.
- C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 - 1. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
 - 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
 - 3. Match pole material and finish.
- D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.
- F. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- G. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- H. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Color shall be as selected by Architect.

2.3. POLE ACCESSORIES

- A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

PART 3 - EXECUTION

3.1. EXTERIOR POLE AND GROUND MOUNTED FIXTURE INSTALLATIONS

A. POLE INSTALLATION

1. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
2. See Evaluations for structural- and soil- engineering coordination.
3. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.
4. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 - a. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 - b. Install base covers, unless otherwise indicated.
 - c. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
5. Raise and set poles using web fabric slings (not chain or cable).

B. BOLLARD LUMINAIRE INSTALLATION

1. Align units for optimum directional alignment of light distribution.
2. Install on concrete base with top 4 inches above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth.

C. INSTALLATION OF GROUND-MOUNTED FLOODLIGHT LUMINAIRES

1. Floodlights shall be mounted by stanchion or other similar accessory furnished with fixture – see fixture schedule and details for same.
 - a. Mounting of floodlights supported from grade by conduit only (may also be referred to as "junction box" method) is not acceptable.
2. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit and mounting provisions into base, and finish by troweling and rubbing smooth.

D. CORROSION PREVENTION

1. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
2. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

E. GROUNDING

1. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
 - a. Install grounding electrode for each pole, unless otherwise indicated.
 - b. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
2. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
 - a. Install grounding electrode for each pole.
 - b. Install grounding conductor and conductor protector.
 - c. Ground metallic components of pole accessories and foundations.

END OF SECTION 265600

SECTION 270500 – COMMON WORK FOR COMMUNICATIONS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Division 26 specifications govern the construction methods, materials and other aspects related to electrical work contained in these Division 27 specifications.
- B. Reference
 - 1. Section 260010 - Electrical Provisions
 - 2. Section 260011 - Basic Electrical Materials And Methods
 - 3. Section 260013 - Project Coordination
 - 4. As well as other Division 26 Sections for any other electrical requirements and provisions.
- C. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 270500

SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 GENERAL

1.1. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies, and location and size of each field connection.
 - 2. Equipment racks and cabinets: Include workspace requirements and access for cable connections.
 - 3. Grounding: Indicate location of grounding bus bar and its mounting detail.
- C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

1.2. QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- D. Grounding: Comply with ANSI-J-STD-607-A.

1.3. PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.4. COORDINATION

- A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
 - 1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings and distribute them to other participants.
 - 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 PRODUCTS

2.1. PATHWAYS

- A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
 - 1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 - 2. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 3. Lacing bars, spools, J-hooks, and D-rings.
 - 4. Straps and other devices.
- B. Cable Trays:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cable Management Solutions, Inc.
 - b. Cablofil Inc.
 - c. Cooper B-Line, Inc.
 - d. Cope - Tyco/Allied Tube & Conduit.
 - e. GS Metals Corp.
 - 2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inch thick.

- a. Basket Cable Trays: 6 inches wide and 2 inches (50 mm) deep. Wire mesh spacing shall not exceed 2 by 4 inches (50 by 100 mm).
 - b. Ladder Cable Trays: Nominally 18 inches wide, and a rung spacing of 12 inches.
- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems"
1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2. BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96.

2.3. GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Telecommunications Main Bus Bar:
1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
 3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- C. Comply with ANSI-J-STD-607-A.

2.4. LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 EXECUTION

3.1. ENTRANCE FACILITIES

- A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.
- B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.
- C. Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems."

3.2. INSTALLATION

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- C. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3. FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4. GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.5. IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

- B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
- C. Labels shall be preprinted or computer-printed type.

END OF SECTION 271100

SECTION 271300 - COMMUNICATIONS CABLING AND EQUIPMENT

PART 1 GENERAL

1.1. SCOPE OF WORK

- A. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation as required to make a complete working communication cabling system installation as specified and indicated
- B. Provide a complete telecommunications infrastructure cabling system including:
 - 1. Support systems in the IT Room/Computer Room.
 - 2. Inside plant UTP station cabling, terminations, and outlets.
 - 3. Cable identification tags and system labeling.
 - 4. Conduits and boxes.
 - 5. Telecommunications grounding system.
 - 6. Submittals.
 - 7. Testing.
 - 8. As-built Documents.
 - 9. Warranty.

1.2. REFERENCES

- A. Conform to the following:
 - 1. National Electrical Code.
 - 2. National, State, Local and any other binding building and fire codes.
 - 3. Underwriter's Laboratories (UL): Applicable listing and ratings.
 - 4. ANSI/TIA/EIA-568 Commercial Building Telecommunications Cabling Standard – latest current edition.
 - 5. ANSI/TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces – latest current edition.
 - 6. ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings – latest current edition.
 - 7. NECA/BICSI 568-2006 Installing Commercial Building Telecommunications Cabling.

1.3. SYSTEM DESCRIPTION

- A. General
 - 1. The telecommunication cabling encompasses the communications infrastructure, and horizontal cabling systems.
- B. IT Room/Computer Room
 - 1. Provide LAN (network) equipment racks and modular patch panels in LAN (network) rack to support the cable terminations.
- C. Horizontal Distribution
 - 1. Provide horizontal cabling from the IT Room to wall mounted outlets, stand-alone workstations, floor outlets, and modular workstations. Provide each data outlet indicated with one Category 6 cable.

1.4. SUBMITTALS

- A. Refer to Section 26 for additional submittal requirements
- B. Submit detailed drawings of the IT Room if the proposed installation layout differs from the construction documents. Minimum scale: 1/4" = 1'-0". Revised telecommunication equipment layouts must be approved prior to release of order for equipment and prior to installation.
- C. Submit detailed drawings of the cable routing, labeling and device locations. Minimum scale: 1/8" = 1'-0". Layouts must be approved prior to release of order for equipment and prior to installation.
- D. Submit the following information for review and approval prior to start of construction.
 - 1. Catalog information for all cables and connectors indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
 - 2. Catalog information for all support equipment and systems, e.g. cable tray, patch panels, etc., showing proof of conformance with relevant NEC, UL, & TIA/EIA listings, certifications and specifications.
 - 3. Catalog information for cable identification tags.

E. Submit the following information for review and approval at the completion of construction:

1. Test reports.
2. As-built drawings.
3. O & M manuals.

1.5. QUALITY ASSURANCE

A. General

1. Install complete system in a neat, high quality manner acceptable to the district and in conformance with applicable codes and data standards.
2. Provide new materials of current manufacturer, of highest grade, and without defects of any kind.
3. Only products and applications listed in this Division may be used on the project.

1.6. PRODUCT DELIVERY AND HANDLING

A. Delivery

1. Do not deliver telecommunication cabling system components to the site until protected space is available.
2. Replace and return damaged equipment to manufacturer at no cost to the Owner.

B. Handling

1. Handle in accordance with manufacturer's written instructions.
2. Prevent component damage, breakage, denting and scoring. Do not install damaged equipment.

1.7. COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 PRODUCTS

2.1. GENERAL

A. Provide a continuous single cable, homogeneous in nature for every cable run. Splices are not permitted.

2.2. CABLE

A. Horizontal Category 6 Unshielded Twisted Pair (UTP) Cable

1. Provide cable suitable for indoor installation.
2. Provide cable with 4 twisted pairs of insulated copper conductors per cable, 24 AWG solid copper, fully insulated with retardant low-smoke thermoplastic material, plenum NEC rated and UL listed as such.
3. Color code twisted pairs individually, within color coded bundles, to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230).
4. Comply with TIA/EIA-568, Revision C, 2009 performance requirements for Category 6 UTP cabling.
5. Provide cable with blue jacket.
6. Manufacturer
 - i. AMP: Category 6 UTP cable
 - ii. Belden: Datatwist 2400
 - iii. Berk-Tek: LANmark-6
 - iv. Commscope: Media 6 cable
 - v. Mohawk: 6 LAN cable
 - vi. Superior Essex: Series 77

2.3. LAN EQUIPMENT RACK

- A. Provide LAN equipment rack(s) and accessories from one manufacturer.
- B. Provide LAN equipment rack(s) conforming to TIA/EIA standards with the following features and characteristics and accessories:
 - 1. 19-inch wide, wall-mounted, as indicated, high strength aluminum construction, EIA – 310-D.
 - 2. Loading capacity: 1,400 pounds (635 kg).
 - 3. 19" rack mounting rails with TIA/EIA hole pattern.
 - 4. Equipment mounting hardware: 20 sets for each rack.
 - 5. Vertical cable management.
 - 6. Horizontal cable management, top and bottom.
 - 7. Equipment shelves: None.
 - 8. Grounding lug.
 - 9. Baked-polyester powder coat finish, black.
 - 10. Manufacturers (two-post rack)
 - i. Chatsworth CPI:
 - ii. Hoffman:
 - iii. Hubbell Premise:
 - iv. Panduit:

2.4. PATCH PANELS

- A. Horizontal Cabling Patch Panel (DCR)
 - 1. One-piece steel construction, modular or punch-down type, suitable for rack mounting, with factory-applied black baked enamel finish, with devices, junction fittings and other matching accessories as required for a complete Category 6 system and per UL 1863.
 - 2. 48-port in 568A configuration. Quantity as required to terminate all data cable runs to data jacks.

2.5. PATCH CABLES

- A. Provide two (2) 7' Cat 6 patch cables for each data jack installed.

2.6. CONNECTORS

- A. Category 6 Modular Connectors
 - 1. 8 position modular connector, Category 6 certified, universal label coded for T568A and T568B wiring schemes.
 - 2. Manufacturer
 - a. AMP: SL Series, gray.
 - b. Panduit: Mini-Com TX6 Series, gray.
 - c. Or as approved.

2.7. DATA OUTLETS

- A. Provide outlet box, minimum 63-mm (2-1/2 inches) deep and faceplate with number of connection ports as indicated for wall mounted applications.
- B. Provide thermoplastic faceplates for wall mounted applications.
- C. Provide faceplates for millwork and furniture mounted applications, color as directed by Architect.
- D. Faceplate Manufacturer
 - 1. Wall Mounted: Ortronics faceplate, or as approved.
- E. Wall Phones
 - 1. Provide a stainless steel keystone wall mount telephone plate with Category 6 jack as specified.

2.8. STRUCTURED MEDIA CABINET

- A. Provide structured media cabinet. Typical each unit. Leviton or equal.
- B. Media cabinet to include:
 - 1. 1 x 8 telephone splitter
 - 2. 1 x 6 video distribution module for coaxial cable.

3. Surge suppression
4. Fiber termination.
5. Flush cover.
6. All necessary mounting hardware and brackets.
- C. Provide 20" wide enclosure for recess mounting in standard 4" wall. Height of panel as required to accommodate necessary components and cabling.

2.9. CABLE TELEVISION

- A. Provide and install coaxial cable, wall outlets, splitters and connectors as required for cable television.
 1. Cable shall be RG-6/U 75-Ohm Coaxial cable with 95 percent braided copper shield and 18 AWG solid copper center conductor. Belden # 9290 or approved equal.
 2. Cable shall be plenum rated where installed in return air plenum.

2.10. CABLE MANAGEMENT AND SUPPORT

- A. J-Hook Cable Support System
 1. Provide J-hooks rated to support Category 6 cable and optical fiber cable, mounted 1500-mm (5-feet) on-center for support of horizontal cabling. Do not exceed 40 percent fill ratio.
 2. Provide J-hooks with galvanized steel construction and 90 degree rolled safety edges.
 3. Provide latched retainers to contain cables within the hook area.
 4. Provide J-hooks with a static load capacity of 30 pounds per hook and fastener hole that accepts 6-mm (1/4-inch) bolts.
 5. Manufacturer
 - i. ERICO: CADDY Cablecat
 - ii. B-Line: Cable Hook System

2.11. BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches.

2.12. GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Telecommunications Main Bus Bar:
 1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 2 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
 3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- C. Comply with ANSI-J-STD-607-A.

2.13. LABELS

- A. Horizontal Cables
 1. Provide self-laminating adhesive labels on both ends of cables, machine printable with a laser printer suitable for cable diameters installed.
 2. Printable Area: 50-mm (2-inch) by 12-mm (1/2-inch).
 3. Color: White.
 4. Manufacturer:
 - i. Panduit #PLL-40-Y3-1, ivory
- B. Faceplates
 1. Provide faceplate labels for all outlet faceplates, machine printable with a laser printer.
 2. Color: Gray
 3. Manufacturer:
 - i. Panduit #CPPLF-5
- C. Outlets and Patch Panel

1. Provide labels for data cable termination locations, machine printable with a laser printer.
2. Color: Gray
3. Manufacturer:
 - i. Panduit #PLL-22-PO-1W

2.14. MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties

1. Provide Velcro cable ties, plenum or non-plenum rated as appropriate for the installation, in the same color as the cable to which it is being applied, 18-mm (¾-inch) with a minimum 50-mm (2-inch) overlap.
2. Manufacturers:
 - i. Panduit HLSP Series (Plenum rated)
 - ii. Panduit HLS Series (Non-plenum rated).

PART 3 EXECUTION

3.1. GENERAL

- A. Install work in a neat, high quality manner and conform to applicable federal, state and local codes.
- B. Repair or replace work completed by others that is defaced or destroyed.
- C. Install cables in a manner to protect the cable from physical interference or damage.
- D. Do not exceed manufacturer's minimum allowance for bend radius of the cable.
- E. Do not exceed manufacturer's maximum allowance for pulling tension on cable.
- F. Ground all racks and other such components per manufacturer's requirements.

3.2. ENTRANCE FACILITIES

- A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.
- B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.
- C. Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems."

3.3. INSTALLATION

A. Horizontal Cable

1. Terminate cables with T568A wiring configuration. All terminations must be the same wiring configuration.
2. Terminate data cable in accordance to manufacturer's instructions and TIA/EIA-568 standard installation practices.
3. Support station cables outside the DCR at 1500-mm (5-feet) on-center using J-hook cable hangers.
4. Do not exceed 90 meters (300-feet) in length from the termination at the user's faceplate to the termination at the IT room.
5. Enter LAN rack from the top.
6. Provide a minimum of 150-mm (six-inches) of slack sheathed cable behind each station outlet faceplate. Coil the slack cable inside the junction box or raceway as per the cabling manufacturer's installation standards.
7. Route data cables in cable tray in the IT room and from cable tray to the LAN rack and terminate with specified jack into patch panel. Do not support cables to the outside of the cable tray
8. Coil any excess cable in the IT room in an extended loop or figure-8 in the cable tray.
9. Route cables a minimum of 150-mm (6-inches) away from power sources to reduce interference from EMI.
10. Install cables with sufficient bending radius so as not to break or kink, shear or damage binders, or to interfere with transmission in any way.
11. Neatly dress and organize cables in the cable tray. Bundle cables sequentially into groups of 12. Wrap every 600-mm (24-inches) with Velcro cable ties. Do not tightly bundle cables together. Fasten cable to cable tray via Velcro-type straps.
12. Route cable homeruns, parallel and perpendicular to building structure allowing for bending radius, and along corridors for ease of access. Do not route cables through an adjacent space if a corridor borders

at least one wall of the room.

13. Provide permanent machine generated labels on each end of the cable no more than 100-mm (4-inches) from the edge of the cable jacket.

14. Terminate cables in patch panels with Category 6 modular connectors.

B. LAN Equipment Racks

1. Install rack in a secure manner per manufacturer's recommendations and as indicated.
2. Install seismic restraints for LAN racks in accordance with manufacturer's recommendations for seismic zones 3 and 4 or as required by local building code.

C. Patch Panels

1. Install Category 6 patch panels into LAN equipment rack.

D. Outlets and Connectors

1. Provide station outlets with connectors.
2. Provide permanent machine generated clear laminated labels on the front of each faceplate or surface box.

3.4. FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5. GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6. RECORDS

A. Labeling

1. Label the telecommunications system components in conformance with TIA/EIA-606 Administration Standards, including, but are not limited to, the following:
 - i. Cables (both ends)

- B. Permanently mark cable ends with machine-generated or stenciled (not handwritten) wrap-around labels with a self-laminating feature.
- C. Permanently mark components, such as racks and patch panels, with machine-generated labels.

3.7. TESTING

- A. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check for proper tightness of all electrical connections and in accordance with manufacturer's recommended values.
- B. Local Area Network:
 1. Testing and Acceptance:
 - a. Contractor shall provide a thorough testing program for the cabling system. The testing shall be done in accordance with TIA/EIA TSB-95, Level II E performance. All cables shall be tested.
 - b. All cable lengths shall be recorded as part of the test records.
 - c. All testing shall be tested with a Category 6 rated cable tester. Contractor shall provide, as part of the system documentation, the type and manufacturer of the test equipment used.
 - d. All test faults shall be corrected and re-tested.
 - e. Two (2) copies of the test results shall be provided to the Owner as part of the project documentation. Test results shall be recorded on a floppy disk in a format determined by the Owner.
 - f. The Owner may choose to randomly check testing results for a sample number of cables. This final acceptance testing shall be conducted by the Contractor and the Owner. Prior to this testing, Contractor shall provide procedures and operating instructions for the test equipment.

3.8. PROJECT CLOSE-OUT

A. Submit prior to final acceptance of System:

- 1. Test results**
 - i. Provide test results as herein before specified.
- 2. Manuals for testing, operation and training including:**
 - i. 11"x17" prints of record drawings as described above.
 - ii. Manufacturer's original catalog information sheets for each component provided under this Section.
 - iii. Provide manuals in a white, 3-ring binder with front cover and spine clear pockets for insertion of the manual name and project information. Manual shall be indexed with individual dividers.

END OF SECTION 271300

SECTION 271500 - TELEPHONE/DOOR ENTRY SYSTEM

PART 1 GENERAL

1.1. SCOPE

- A. The telephone entry controller shall be designed to communicate over ordinary, voice-grade telephone lines or no phone line/bill system. A visitor shall be able to call a resident's telephone via a directory and keypad to gain access through a locked gate or door. The tenant shall be able grant access to the visitor by pressing a key on the tenant's telephone. The controller shall have nonvolatile memory to manage 140 user telephone numbers and store event transactions.
 - 1. The controller can operate either as a single access point or be fully integrated within an access control network consisting from one to 256 access points.
 - 2. Up to ten telephone entry controllers shall be able to share one telephone line.
 - 3. Field programmable via the keypad
 - 4. The controller shall be equipped with a two-wire, half duplex, RS-485 communication protocol for communicating with access control entry points within the network.
 - 5. The controller shall use a LCD screen for a tenant directory and message indicator. Paper directory for up to 140 names.
 - 6. The controller shall utilize a touch-tone dialing method.
 - 7. Hands-free voice communication shall be standard with the option to equip the controller with a standard telephone handset.
 - 8. The controller enclosure construction shall be weather resistant.
 - 9. Package design will allow surface or flush mounting or mounting within a hooded back box.
 - 10. If the controller is using a modem, the modem shall communicate at 9600 BPS.

1.2. SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for system components. Include dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and equipment.
- C. Wiring diagrams from manufacturer differentiating between factory- and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Indicate components for both field and factory wiring.
- D. System operation description covering this specific Project including method of operation and supervision of each type of circuit and sequence of operations for all system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- E. Operating instructions for mounting at the controller
- F. Operation and maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1. Include data for each type product, including all features and operating sequences. Include recommendations for spare parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.
- G. Product certification signed by the manufacturer of the access control system components certifying that their products comply with indicated requirements.
- H. Record of field tests of system.

PART 2 PRODUCT

2.1. EQUIPMENT

- A. Telephone/Door Entry System shall be Mircom MUS-3140K or equivalent Entraguard.
- B. Overall Specifications: The telephone entry controller shall comply with the following specifications and offer selected options.
- C. A. Controller Specifications - Controller enclosure dimensions and specification shall be for semi-flush mounting. Furnish with back box and trim ring. Maximum dimensions to be 20"H x 14"W x 4"D. Hooded Mount, 16-gauge metal back box. Lockable and vandal resistant. Finish as directed by Architect.
- D. B. Controller Power and Environmental Specifications - Controller shall meet the following power and environmental requirements:
 - 1. Voltage Input: 24 VAC transformer with optional standby power) +/- 10%
 - 2. Current Draw: Less than 1 amp.

3. Power Consumption: Nominal 12 watts.
4. Operating Temperature: 0° - 140° F (-18° - 60° C).
- E. C. Input and Output Specifications - Controller shall meet the following minimum Input and Output specifications:
 1. Outputs:
 - a. Two nonprogrammable SPDT Dry Circuit Closures.
 - b. Two auxiliary programmable SPDT Dry Circuit Closures.
 - c. Closure contact Rating: 1 amp at 24 Volts.
 2. Inputs:
 - a. Normally Closed (NC) Door Switch Input.
 - b. Normally Open (NO) Request To Exit Input.
 - c. Normally Open (NO) Auxiliary Input.
- F. Keypad Specifications – Keypad design shall be a mechanical, vandal resistant, impact resistant and weatherproof water sealed 4 X 4 keypad designed for use in the most demanding public and outdoor environments. Operational life of the keypad shall be a minimum of four million cycles per key. Specification must meet the following minimum standards and features:
 1. Weatherproof, water sealed to class IP-67 standard.
 2. Ten numeric push-button keys.
 3. Scroll key (2) for directional scrolling of the LCD display of the tenant enrollment list.
 4. Audio volume control key.
 5. A call keys for initiating calls to the tenant.
 6. Clear (Clr) key to re-start a command.
 7. An asterisk (*) function key
 8. Solid-state illumination---no incandescent lighting.
 9. Built-in ESD (voltage surge) protection.
- G. Operational Specifications - The telephone entry controller shall have, as a minimum requirement, a visual message and directory display with a directory scrolling and an audio volume control.
 1. LCD Display:
 - a. Two line, 20 character, back-lit display.
 - b. Three programmable 80 character, 20 character per line revolving message screen.
 - c. Up and down scrolling keys with cursor indicator for pointing to tenant name.
 - d. Tenant name displayed by scrolling or direct dial code input with option to block tenant name display.
 - e. Fifteen-character name truncated to 13 characters with a six-digit dial code.
 2. Audio Control:
 - a. Adjustable, linear volume control
 - b. Circular control volume key.
 - c. Speaker vandal protection hole grid.
 - d. Mylar speaker with superior sound quality.
- H. Feature Set - The telephone entry controller shall have as standard the minimum feature set:
 1. Field programmable via the keypad
 2. Nonvolatile memory for storing events on a first-in, first-out basis.
 3. Capacity to manage 140 tenant dial codes.
 4. Programmable dial codes from one to four digits.
 5. Programmable telephone numbers up to 15-digit numbers.
 6. PBX operation.
 7. Built-in surge protection.
 8. Code breaking protection.
 9. Tone dialing.
 10. Alarm shunt and alarm output.
 11. Two Programmable Form C relay outputs
- I. Optional Features - The telephone entry controller must offer the following optional features:
 1. Postal Lock provision.
 2. TDD option.

3. Braille keypad provision.
4. Local or Wide area network communication (LAN or WAN) with adapter.
5. Flush or hooded mounting option.
6. Hands free or handset audio communication.

PART 3 EXECUTION

3.1. WARRANTY

- A. The manufacturer shall ensure that the equipment is free from defects in design, material, manufacturing and operation.
- B. The factory shall provide a warranty to repair or replace its equipment that fails as the result of normal usage.
- C. Warranty period is two years from the purchase date.
- D. User is responsible for freight costs to the factory.
- E. For items under warranty, the manufacturer will bear the cost for freight to return the equipment to the user.
- F. The manufacturer is not responsible for damage due to shipping or user mishandling.

3.2. EQUIPMENT INSTALLATION

- A. Furnish and install a complete Telephone/Door Entry System as described herein and as shown on the plans; to be wired, connected, and left in first class operating condition. Include sufficient control unit(s), annunciator(s), power supplies, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

END OF SECTION 271500

SECTION 311000 SITE CLEARING

PART 1 - GENERAL

1.01 Site Clearing shall conform to "Section 4 – Obstructions and Incidental Construction" of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

- A. Large Trees as designated in Section 4 will not be measured or quantified separately and shall be included in and subsidiary to CLEARING AND GRUBBING (LUMP SUM).

1.02 CLEARING AND GRUBBING

- A. General. This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the construction limits shown on the Project Drawings or other trees as may be indicated in the Project Documents. Disposal of all materials shall be accomplished as specified in Subsection 3.13.
- B. Construction Requirements. Trees designated on the Drawings "To Be Removed" and other trees, hedges, brush, and shrubs which are wholly within the excavation areas shall be removed to a minimum depth of 2 feet below the ground surface and disposed of as approved by the Engineer. Where hedges and trees have limbs and branches which overhang and interfere with the construction, these limbs and branches may be trimmed by sawing and coating the cut with an approved pruning sealer, or they may be removed with the written approval of the property owner and Engineer. Trees, shrubs, and other vegetation specifically indicated in the Project Documents to be saved or protected shall not be removed and shall be protected from the Contractor's construction activities to the extent necessary to prevent damage thereto.

END OF SECTION 31 10 00

**SECTION 312000
EARTHWORK**

PART 1 - GENERAL

- 1.01 Earthwork shall conform to "Section 3 – Earthwork and Grading" of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

END OF SECTION 31 20 00

**SECTION 312113
RADON MITIGATION**

PART 1 GENERAL

1.01 SUMMARY

- A. Provide all work necessary to reduce and maintain radon concentration levels below 4.0 PicoCuries per liter (pCi/L) in various buildings specified herein. Perform pre-mitigation diagnostic testing and analysis, provide mitigation system design and installation, and perform post-mitigation testing and monitoring for radon.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
 - 1. ACI INTERNATIONAL (ACI)
 - a. ACI 301(2005; Errata 2008) Specifications for Structural Concrete
 - 2. AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
 - a. AMCA 210(2007) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
 - 3. ASTM INTERNATIONAL (ASTM)
 - a. ASTM B 209(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - b. ASTM B 209M(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
 - c. ASTM C 1002(2007) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 - d. ASTM C 1047(2010) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
 - e. ASTM C 36/C 36M(2003e1) Gypsum Wallboard
 - f. ASTM C 475/C 475M(2002; R 2007) Joint Compound and Joint Tape for Finishing Gypsum Board
 - g. ASTM C 514(2004; R 2009e1) Standard Specification for Nails for the Application of Gypsum Board
 - h. ASTM C 645(2009a) Nonstructural Steel Framing Members
 - i. ASTM C 834(2010) Latex Sealants
 - j. ASTM C 840(2008) Application and Finishing of Gypsum Board
 - k. ASTM C 920(2010) Standard Specification for Elastomeric Joint Sealants
 - l. ASTM D 2665(2009) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
 - 4. GYPSUM ASSOCIATION (GA)
 - a. GA 216(2010) Application and Finishing of Gypsum Panel Products
 - 5. INTERNATIONAL CODE COUNCIL (ICC)
 - a. ICC IMC(2009) International Mechanical Code
 - b. ICC UMC(1997; Errata 2 & 3 1997) Uniform Mechanical Code
 - 6. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
 - a. NEMA MG 1(2009) Motors and Generators
 - 7. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
 - a. NFPA 70(2011) National Electrical Code
 - 8. NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)
 - a. NELMA Grading Rules(2006) Standard Grading Rules for Northeastern Lumber
 - 9. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
 - a. SMACNA 1378(1995) Thermoplastic Duct (PVC) Construction Manual, 2nd Edition
 - 10. SOUTHERN PINE INSPECTION BUREAU (SPIB)

- a. SPIB 1003(2002) Standard Grading Rules for Southern Pine Lumber
- 11. U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
 - a. EPA 402-R-92-004(1992) Indoor Radon and Radon Decay Product Measurement Device Protocols
 - b. EPA 402-R-92-014(1993) Radon Measurement in Schools
 - c. EPA 402-R-93-003(1993) Protocols for Radon and Radon Decay Product Measurements in Homes
 - d. EPA 402-R-93-078(1993; R 1994) Radon Mitigation Standards
 - e. EPA 625-R-92-016(1993; Am 1994) Radon Prevention in Design and Construction of Schools and Other Large Buildings
 - f. EPA 625-R-93-011(1993) Radon Reduction Technique for Existing Detached Houses: Technical Guidance for Active Soil Depressurization Systems
- 12. U.S. GENERAL SERVICES ADMINISTRATION (GSA)
 - a. CID A-A-2246(Rev B) paint, Latex
 - b. FS TT-P-650(Rev D) Primer Coating, Latex Base, Interior, White (for Gypsum Wallboard, or Plaster)
- 13. WEST COAST LUMBER INSPECTION BUREAU (WCLIB)
 - a. WCLIB 17(2000) Standard Grading Rules
- 14. WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)
 - a. WWPA G-5(1998) Western Lumber Grading Rules

1.03 DEFINITIONS

- A. Design
- B. Design Drawings
 - 1. Documentation showing in graphic and quantitative form the extent, design, arrangement, location, relationships, and dimensions of the construction to be provided by the Contractor.
- C. Designer
 - 1. USEPA RCP listed mitigation contractor associated with the Contractor who is responsible for the design and has the qualifications and experience specified.
- D. Contract Documents
 - 1. Documents furnished to prospective bidders/proposers containing information and specifying criteria and project requirements for diagnostic testing, design, construction and monitoring of multiple radon mitigation systems. The documents include this specification and the drawings listed in and accompanying this specification.
- E. Long Term Radon Detectors
 - 1. Alpha track, electretion chamber, or approved equivalent. Devices capable of sensing and recording the presences of radon during a time period of 91 days to 12 months which when analyzed provide a numeric value, measured in pCi/L, for radon concentrations during the time exposed.
- F. Short Term Radon Detectors
 - 1. Charcoal, electretion chamber, or approved equivalent. Devices capable of sensing and recording the presences of radon during a time period of 48 hours to 90 days which when analyzed provide a numeric value, measured in pCi/L, for radon concentrations during the time exposed.
- G. Suction Hole
 - 1. Location at which vacuum is created for sub-slab communication testing.
- H. Suction Point
 - 1. Vertical standpipe penetrating into the soil gas environment containing radon and serving as the conduit to exhaust radon gas to the atmosphere.
- I. Test Hole

1. Location at which pressure readings are taken during sub-slab communication testing. Readings are used to evaluate potential effectiveness of a sub-slab depressurization system.

1.04 SYSTEM DESCRIPTION AND REQUIREMENTS

- A. Performance Requirements
 1. Radon mitigation systems shall reduce and maintain radon concentration levels below 4.0 pCi/L in various buildings specified herein. Test, design and construct radon mitigation systems in accordance with EPA 402-R-93-078, EPA 402-R-93-003, and EPA 402-R-92-004 and as specified herein. Additional guidance for testing, designing and constructing radon mitigation systems is contained in EPA 625-R-92-016 and EPA 625-R-93-011.
- B. Criteria for Diagnostic Testing and Suction Points
 1. Test locations, suction point locations, pipe sizes, number of fans and discharge points to the building exterior, routing of the radon mitigation systems piping, provision of associated enclosures, and all other work necessary to achieve the desired results specified are the Contractor's responsibility and shall be based on the requirements and restrictions, if any, specified herein.

1.05 SUBMITTALS

- A. Shop Drawings
 1. Radon mitigation
 2. Radon mitigation systems enclosures
- B. Product Data
 1. Radon mitigation systems components
 2. Radon mitigation systems enclosure components
 3. Radon diagnostic testing devices
- C. Design Data
 1. Radon mitigation systems design narrative
- D. Test Reports
 1. Pre-mitigation testing
 2. Post mitigation testing
- E. Certificates
 1. Contractor qualifications
 2. Contractor experience
 3. Worker protection plan
- F. Manufacturer's Instructions
 1. Radon mitigation systems components
 2. Radon mitigation systems enclosure components
- G. Operation and Maintenance Data
 1. Radon Mitigation Systems, Data Package 2
- H. Closeout Submittals
 1. Radon Detector Location Log
 2. Testing laboratory certification
 3. Proof of current calibration for testing devices

1.06 DESIGN REQUIREMENTS

- A. Prepare designs in accordance with the requirements of EPA 402-R-93-078 except that when the contract specification requirements are more stringent, the contract specification shall take precedence. The Contractor shall:
 1. Prepare design drawings and assemble and provide product data for construction of multiple radon mitigation systems;
 2. Prepare design narrative supporting the design shown;

3. Coordinate all elements of the design to ensure there are no conflicts;
 4. For each building, present information 100 percent complete in a single submission and in sufficient detail to permit a complete review by the Architect. The Architect's review is to check the design for conformance with the requirements contained in the contract documents. Design review shall not be construed as a waiver from performing requirements contained in the contract which may have been omitted from the Contractor prepared design documents.
 5. Provide three copies of the complete design documents.
- B. Design Drawing Requirements
1. Prepare, organize, and present drawings in the format considered standard industry practice for radon mitigation work and as described herein. Provide drawings complete, accurate and explicit enough to show compliance with the contract requirements and to permit construction. Drawings illustrating systems proposed to meet the requirements of the contract specification shall reflect proper detailing for each system to assure appropriate use, proper fit, compatibility of components and coordination with the design narrative and the contract specification. Coordinate drawings to ensure there are no conflicts between design disciplines and between drawings and the contract specification. Each Contractor prepared drawing shall bear the certification number and signature of the RCP listed individual responsible for the work portrayed on that drawing and proposed to meet the contract requirements.
 - a. Radon Mitigation Systems(Format and Content)
 - 1) On copies of the building floor plans, locate and identify each diagnostic test performed using alpha numeric designations. Prepare a separate drawing for each type of diagnostic test performed in each building. Provide grab sample (GS) data. Provide sub-slab communication (SSC) test data on. Provide short term detector (STD) data on copies of the "Device Placement Log" contained in EPA 402-R-92-014.
 - 2) On copies of the building floor plans, show suction point(s) and routing of the radon mitigation system(s) piping to the building exterior. Indicate pipe size, length of piping in the network, number and nature of flow obstructions, such as fittings, and fan characteristics for each system. Supplement the floor plan information with additional drawings keyed to each floor plan location showing riser diagrams, utility connections and routing, component installations, elevations, sections and details of the radon mitigation system(s). Also, provide construction and installation details such as supporting systems, attachment methods and surface penetration and sealing methods.
 - 3) Drawings shall not be smaller than A4 - 8 1/2 by 11 inch.
 - b. Radon Mitigation Systems Enclosures(Format and Content)
 - 1) Prepare drawings not smaller than A4 - 8 1/2 by 11 inch portraying the proposed method for enclosing each radon mitigation system in occupied spaces. All spaces shall be considered to be occupied spaces except for mechanical and electrical rooms, warehouses, storerooms, janitor closets, crawl spaces, and attic spaces. Enclosures are not required for portions of systems installed above suspended acoustical ceilings.
 - 2) Drawings shall indicate methods and materials to be used in constructing the enclosures and accesses for all operating components. Drawings showing typical enclosures and installations are acceptable (i.e. corner installation, mid-wall installation, etc.).
- C. Design Narrative
1. Format
 - a. The design narrative shall include a cover page indicating the project title, location, construction contract number and preparer, a table of contents and tabbed or colored page separations for quick reference. Submit design narrative prepared on A4 - 8 1/2 by 11 inch white paper. The design narrative shall be bound in one volume.

2. Content

- a. The design narrative shall include a basis of design and calculations. Specific requirements relative to the technical content to be provided are specified in this specification section. The design narrative shall be a presentation of facts to demonstrate that the project requirements are fully understood and that the design is based on sound engineering. The design narrative shall include and address the following:
- 1) Executive summary.
 - 2) Scope of work.
 - 3) Building description.
 - 4) Diagnostic testing performed and results of the testing (include Attachments C and D and the Device Placement Logs for the short-term detectors).
 - 5) Diagnostic test devices and equipment used.
 - 6) Locations where readings were recorded (include floor plans).
 - 7) Suspected or confirmed entry points of radon into the buildings (narrative or show on floor plans).
 - 8) Potential problems which may be caused by active (fan-powered) radon mitigation systems, if any.
 - 9) Conclusions and recommendations.
 - 10) Radon mitigation method chosen to reduce radon concentrations levels below 4.0 pCi/L and reasons for choosing the method.
 - 11) Data and calculations to verify negative pressure exists throughout the soil gas environment containing radon sufficient to exhaust the soil gas to the atmosphere under all weather and building operating conditions.
 - 12) Statement of compliance with applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional and local authorities regarding radon mitigation.
 - 13) Appendices (to include design drawings, forms and logs, laboratory analysis sheets, etc.).

D. Design Review and Approval

1. The design will be reviewed by the Architect prior to start of construction. The Architect's review is to check the design for conformance with the contract requirements. Design review does not relieve the Contractor of the responsibility of meeting the requirements of the contract and providing radon mitigation systems which, while active, reduce and maintain radon concentration levels below 4.0 pCi/L. The design of the radon mitigation systems and enclosures shall be approved prior to submission of construction submittals for the materials to be used in the construction of the systems and enclosures.

1.07 RADON DETECTOR LOCATION LOG

- A. Prepare and provide to the Owner a Radon Detector Location Log for each building detailing the identity and location of each short-term radon detector. Prepare the log using copies of the "Device Placement Log" contained in EPA 402-R-92-014 and provide the appropriate information as line items. In addition to the log, on a copy of the building floor plans, locate and identify each short-term detector.

1.08 WORKER HEALTH AND SAFETY

- A. Provide in accordance with EPA 402-R-93-078. Prepare a worker protection plan in accordance with EPA 402-R-93-078.

1.09 QUALITY ASSURANCE

- A. Contractor Qualifications and Experience
1. Within 15 days after award, submit written evidence or data demonstrating that the Contractor and/or one or more subcontractors employed by the Contractor possess the qualifications and experience specified below.
- B. Contractor Qualifications

1. The person responsible for diagnostic testing, design, construction and on-site supervision, as required by the specifications, shall have successfully completed the requirements of and shall be maintaining a current listing in the USEPA RCP Program. Alternatively, in a State with legislation requiring mandatory credentialing for this work, compliance with the State legislation is acceptable. Evidence showing successful completion of the requirements of the USEPA National RCP Program shall include copy of current, valid USEPA RCP photo identification card or equivalent documentation issued by the State.
2. Contractor Experience
 - a. Submit written evidence demonstrating that the Contractor has successfully designed and installed at least two radon mitigation systems of the same or similar to the type required herein. Experience proof shall include but not be limited to:
 - 1) The contract name and number, completion dates of the project and the total cost of the project;
 - 2) The names, telephone numbers and fax number of the facility or installation for whom the radon mitigation system design, construction and/or testing were performed;
 - 3) The name, telephone number and fax number of a supervisory level point of contact at each facility or installation who has knowledge of the Contractor's performance.
- C. Testing Laboratory
 1. Submit testing laboratory certification as proof that the testing laboratory performing radon detector analysis has successfully completed the requirements of the USEPA Radon Measurement Proficiency (RMP) Program and is qualified and authorized to perform such analysis. Alternatively, in a State with legislation requiring mandatory credentialing for this work, compliance with the State legislation is acceptable.
- D. Diagnostic Testing Equipment
 1. Submit proof of current calibration for testing devices used in performing diagnostic testing.
- E. On-Site Supervision
 1. No work at the site will be permitted without the presence of a person possessing the qualifications specified elsewhere in this section, namely USEPA RCP listing or the State equivalent, where applicable.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Delivery of Products
 1. Deliver materials to the site in an undamaged condition. Deliver proprietary items in manufacture's original unopened and undamaged containers of packages with manufacture's name and brand and other pertinent data such as specification number, type, and class, date of manufacture. Schedule deliveries of materials to coincide with scheduled installation.
- B. Storage and Handling
 1. Carefully store materials off the ground to provide proper ventilation, drainage and protection against weather and dampness. Protect materials from marring, staining, rust, damage and overload and from contaminants such as grease, oil and dirt. Store materials at temperatures recommended by the manufacturer. Handle material to avoid damage such as chipping and breaking. Replace damaged material.

PART 2 PRODUCTS

2.01 RADON MITIGATION SYSTEMS

- A. System Performance
 1. Radon mitigation systems shall reduce and maintain radon concentration levels below 4.0 pCi/L after activation of the mitigation systems.
 - a. System Piping

- 1) Route radon mitigation systems piping so as not to interfere with the daily operations and functions of the building occupants. Keep visibility of the systems to a minimum. Enclose each radon mitigation system in occupied spaces, however, all operating components shall be accessible for maintenance and repair. All spaces shall be considered to be occupied spaces except for mechanical and electrical rooms, warehouses, storerooms, janitor closets, crawl spaces, and attic spaces. Enclosures are not required for portions of systems installed above suspended acoustical ceilings.
- b. System Outlet Location
 - 1) Mitigation system discharge points shall be as specified in EPA 402-R-93-078. Prevent foreign objects from entering the outlet. Maintain water tight seal through all penetrations to the building exterior.
- c. System Failure Warning Monitor
 - 1) Provide a means to detect and announce each radon mitigation system failure. System failure is defined as:
 - (a) System blockage: foreign debris.
 - (b) Mechanical failure: fan or other mechanical failure.
 - (c) System leakage: pipe breakage or crack.
 - 2) Provide an audio or visual annunciator device to indicate system failure and locate the annunciator device in an occupied space. Conform to the requirements of EPA 402-R-93-078.
- d. Air Cleaners
 - 1) Air cleaners shall NOT be used as a radon reduction method.
- e. Ventilation Devices
 - 1) Devices which reduce radon solely by increasing ventilation to the occupied space shall NOT be used.
- f. Back Drafting
 - 1) Radon mitigation system shall NOT cause back drafting of building chimneys.
- B. Radon Mitigation Systems Components
 1. Mechanical and electrical materials, fabrication, construction and installation shall conform to the following industry standards:
 - a. Poly(vinyl chloride) (PVC) Piping: ASTM D 2665, Schedule 40.
 - b. In-line Tubular Centrifugal Fans: AMCA 210 and UL listed.
 - c. Electrical Work: NFPA 70, NEMA MG 1 and EPA 402-R-93-078, No. 12 AWG minimum wire size, solid copper installed in EMT or surface metal raceway.
 - d. Mechanical Work: ICC IMC, ICC UMC, SMACNA 1378 and EPA 402-R-93-078.
 - e. Sealants: ASTM C 920, polyurethane, Type S, Grade P for horizontal application, Grade NS for vertical application, Class 25, Use T.
 - f. Crawl space soil-gas retarder membrane shall be minimum 40 mils thick.

2.02 RADON MITIGATION SYSTEMS ENCLOSURES

- A. Radon mitigation systems enclosure components, materials, fabrication, construction and installation for concrete, wood studs and furring, metal studs and furring, gypsum wallboard, sealants and painting shall conform to the requirements specified in the respective specification sections addressing this work contained in the project specification.

PART 3 EXECUTION

3.01 RADON TESTING

- A. Perform radon testing in accordance with EPA 402-R-93-003 and EPA 402-R-92-004. The Contractor shall arrange that all laboratory test results are sent from the testing laboratory directly to the Owner with one copy to the Contractor.
- B. Site investigation data and results obtained from diagnostic testing shall be used to design the radon mitigation systems.

- C. Each sub-slab communication test shall include a suction hole and at least four test holes. Use non-shrink grout to repair all holes resulting from diagnostic testing and restore floor and wall finishes to match existing adjacent surfaces.

3.02 DESIGN RADON MITIGATION SYSTEMS AND SYSTEMS ENCLOSURES

- A. Design radon mitigation systems as required to achieve radon detection test results below 4.0 pCi/L based on radon diagnostic test results, EPA 402-R-93-078 and the information provided herein. Design the systems enclosures to accommodate the radon mitigation systems configurations and the adjacent or surrounding walls, partitions, ceilings and roof construction.

3.03 RADON MITIGATION SYSTEMS INSTALLATION

- A. Installation
 - 1. Provide radon mitigation systems as indicated in the approved design drawings, as specified in EPA 402-R-93-078 and as required by the specifications and standards referenced herein for the respective materials using workmen skilled in the trades involved. Install piping plumb and parallel to existing walls, partitions and ceilings as appropriate, slope horizontal runs to drain, and secure in place in a rigid and substantial manner.
 - 2. Seal new and existing floor slab penetrations in accordance with EPA 402-R-93-078 and as specified herein. Prevent entry of soil gas into the building and exhausting of conditioned air via the radon mitigation system. Seal cracks and openings around floor slab penetrations with polyurethane sealant. Provide backer rod or comparable filler material as required. Insure that all penetrations to the building exterior are weathertight.
 - 3. Lay work out in advance. Exercise care where cutting, channeling, chasing or drilling floors, walls, partitions, ceilings or other surfaces as necessary for proper installation, support or anchorage. Patch and repair damage to buildings, piping and equipment using workmen skilled in the trades involved.
 - 4. As part of the site investigation, the Contractor shall identify furniture, carpeting or other portable materials and equipment which must be relocated to provide for the installation of the radon mitigation systems, if any. The Owner will work with the Contractor to coordinate relocations.
 - 5. Coordinate all work with the Owner.
- B. Supervision
 - 1. Installation of the radon mitigation systems shall be supervised by the RCP listed individual responsible for the design of the systems.
- C. Electrical Work
 - 1. NFPA 70 and EPA 402-R-93-078, No. 12 AWG minimum wire size, solid copper installed in EMT or surface metal raceway. A source of electric power should be available within 50 feet of each fan installation.
- D. Mechanical Work
 - 1. ICC IMC, ICC UMC, SMACNA 1378 and EPA 402-R-93-078.
- E. System Identification
 - 1. Label all components of the radon mitigation systems including, but not limited to, piping (every ten feet), enclosures, fans, electrical conduit (every ten feet) and circuit breakers. Labels shall read:
 - a. Radon Reduction System. Do Not Turn Off.

3.04 RADON MITIGATION SYSTEM ENCLOSURES INSTALLATION

- A. Provide enclosures as indicated in the approved design drawings and as required by the specifications and standards referenced herein for the respective materials using workmen skilled in the trades involved. Install enclosures plumb, level and parallel to existing walls, partitions and ceilings as appropriate, and secure in place in a rigid and substantial manner.

3.05 FIELD QUALITY CONTROL

- A. Radon Mitigation System Inspection

1. Each system shall be inspected and approved in writing by the RCP listed individual responsible for the design of the system. Verify the presence of fire stops. Deficiencies shall be corrected by the Contractor at no additional cost to the Owner.
- B. Post Mitigation Testing and Monitoring
 1. Perform post mitigation radon testing in the buildings as specified in EPA 402-R-93-078 and herein.
 - a. Short Term
 - 1) Test each radon mitigation system for effectiveness no sooner than 24 hours nor later than 15 days after activation of the radon mitigation system. Provide short term radon detectors (charcoal, electret ion chamber or approved equivalent) at the rate of one detector per 2,000 square feet but not less than one detector per enclosed space, except for closets. On copies of the building floor plans, locate and identify each short-term detector and provide short term detector data on copies of the "Device Placement Log" contained in EPA 402-R-92-014.
 - 2) At the end of the testing period, the Contractor shall collect the detectors and send the detectors to the testing laboratory for analysis. Provide radon test results of the effectiveness of the mitigation systems not later than 30 days after collecting the detectors. Radon test results shall be sent from the testing laboratory directly to the Owner with one copy to the Contractor. Complete the line item information on the "Device Placement Log."
 - 3) Radon test results above 4.0 pCi/L shall require system redesign and installation modifications as necessary to achieve radon test results below 4.0 pCi/L. Submit design modifications to the Government for review and approval. After approval of the design modifications, provide installation modifications to the radon mitigation system and retest for effectiveness. Repeat this short-term test procedure until test results below 4.0 pCi/L are achieved.
 - 4) System modifications (as-built systems installations) shall be reflected in the Contractor's design documents (drawings and design narrative).

END OF SECTION 312113

**SECTION 313116
TERMITE CONTROL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Soil-applied chemical treatment.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.
- B. Manufacturer's Instructions: Indicate caution requirement.
- C. Executed warranty.

1.03 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MATERIALS

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen and dry to absorb toxicant, ready to receive treatment.
- B. Verify final grading is complete; see Section 312200.
- C. Verify utility trenches are wide enough to receive application.

3.02 APPLICATION

- A. Comply with manufacturer's written instructions.

3.03 PROTECTION

- A. Do not permit soil grading over treated work.
- B. Protect applications from damage after completion. Repair disturbances according to manufacturer's written instructions.

END OF SECTION

**SECTION 321216
ASPHALT PAVING**

PART 1 - GENERAL

- 1.01 Asphalt Paving shall conform to “Section 7 – Asphaltic Concrete Surfacing” of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

END OF SECTION 32 12 16

**SECTION 321313
CONCRETE PAVING**

PART 1 - GENERAL

- 1.01 Concrete Paving shall conform to “Section 7 – Asphaltic Concrete Surfacing” of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

END OF SECTION 32 13 13

**SECTION 329200
TURF AND GRASSES**

PART 1 - GENERAL

- 1.01 Turf and Grasses shall conform to “Section 4 – Obstructions and Incidental Construction” of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

END OF SECTION 32 92 00

**SECTION 330561
CONCRETE MANHOLES**

PART 1 - GENERAL

- 1.01 Concrete Manholes shall conform to "Section 6 – Storm Sewers and Culverts" and "Section 9 – Sanitary Sewers" of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php
- 1.02 Sanitary Sewer Manholes shall have ConMicShield and ConTint additive according to the manufacturer's recommendations.

END OF SECTION 33 05 61

SECTION 331416
SITE UTILITY AND DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 Site Utility and Distribution Piping shall conform to "Section 8 – Water Mains, Fire Lines, and Water Service Laterals" of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

END OF SECTION 33 14 16

**SECTION 333113
SANITARY SEWER**

PART 1 - GENERAL

- 1.01 Sanitary Sewer shall conform to "Section 9 – Sanitary Sewers" of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php
- 1.02 Sanitary Sewer Manholes shall have ConMicShield and ConTint additive according to the manufacturer's recommendations.

END OF SECTION 33 31 13

**SECTION 334211
STORMWATER GRAVITY PIPING**

PART 1 - GENERAL

1.01 Stormwater Gravity Piping shall conform to "Section 6 – Storm Sewers and Culverts" of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

END OF SECTION 33 42 11

**SECTION 334231
STORMWATER AREA DRAINS AND INLETS**

PART 1 - GENERAL

1.01 Stormwater Area Drains and Inlets shall conform to "Section 6 – Storm Sewers and Culverts" of the City of Topeka Standard Technical Specification Manual available at https://topeka.gov/business/design_right_of_way/index.php

END OF SECTION 33 42 31

