SECTION 00 0107
SEALS PAGE

STRUCTURAL ENGINEER:

MARK MILLER, PE

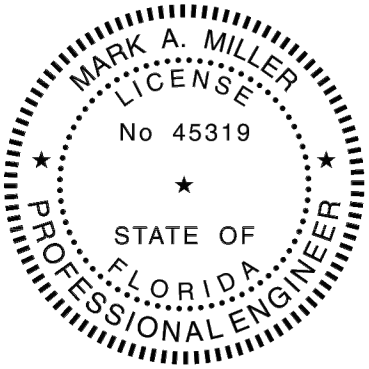
FL PROFESSIONAL ENGINEER LICENSE NO: 45319

MILLER ENGINEERING, LLC

546 SE 3RD AVENUE

MELROSE, FL 32666

FL REGISTRATION NO: 33399



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03 6030
04 0500
04 2300
05 1200
05 2200
05 3300
31 2000

SECTION 00 0107
SEALS PAGE

ARCHITECT:

JOE WALKER, AIA

FL ARCHITECTURAL LICENSE NO: AR0017272

RESPONSIBLE FOR DIVISIONS 01-14 SECTIONS EXCEPT WHERE INDICATED AS PREPARED BY OTHER DESIGN PROFESSIONALS OF RECORD.

STRUCTURAL ENGINEER:

MARK MILLER, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 45319

RESPONSIBLE FOR SECTIONS:

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03 6030

04 0500

04 2300

05 1200

05 2200

05 3300

31 2000

PLUMBING ENGINEER:

S. ANDREW MITCHELL, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 75609

RESPONSIBLE FOR DIVISION 22 SECTIONS

HVAC ENGINEER:

S. ANDREW MITCHELL, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 75609

RESPONSIBLE FOR DIVISION 23 SECTIONS

ELECTRICAL ENGINEER:

ANDREW P. MCCADDIN, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 83318

RESPONSIBLE FOR DIVISION 26 SECTIONS

END OF SECTION

SECTION 00 0107
SEALS PAGE

ARCHITECT:

JOE WALKER, AIA

FL ARCHITECTURAL LICENSE NO: AR0017272

RESPONSIBLE FOR DIVISIONS 01-14 SECTIONS EXCEPT WHERE INDICATED AS PREPARED BY OTHER DESIGN PROFESSIONALS OF RECORD.

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RESPONSIBLE FOR DIVISION 23 SECTIONS

ELECTRICAL ENGINEER:

ANDREW P. MCCADDIN, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 83318

RESPONSIBLE FOR DIVISION 26 SECTIONS

END OF SECTION

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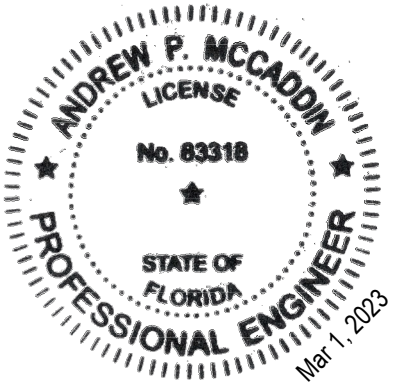
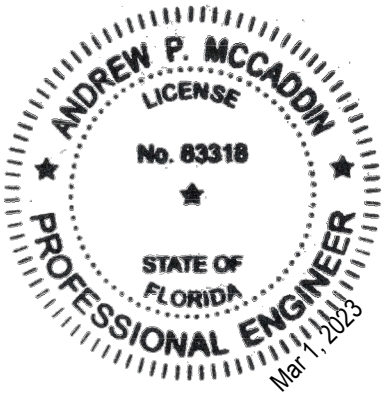


SECTION 00 00 00
TABLE OF CONTENTS



END OF SECTION

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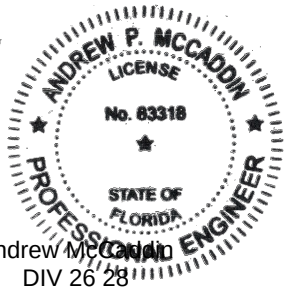

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Mar 1, 2023

SECTION 26 00 00
ELECTRICAL GENERAL

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the electrical work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This is a Basic Requirements Section. Provisions of this section apply to work of all Division 26 sections.

C. Review all other contract documents to be aware of conditions affecting work herein.

D. Definitions:

1. Provide: Furnish and install, complete and ready for intended use.
2. Furnish: Supply, deliver to project site, and store ready for installation.
3. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.3 Permits and Fees: Contractor shall obtain all necessary permits and inspections required for his work and pay all fees and charges incidental thereto.

1.4 Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data in these plans and specifications and as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer such that responses and adjustments can be made in a timely fashion. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions, or inaccuracies of the said data.

1.5 Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

1.6 Extent of Work: Scope is indicated by the drawings, schedules, and the requirements of the specifications.

1.7 Field Measurements and Coordination:

A. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

B. Verify all field dimensions and locations of equipment to ensure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

C. Coordinate work in this division with all other trades in proper sequence to ensure that the total work is completed within contract-time schedule and with minimum cutting and patching.

D. Locate all apparatus symmetrical with architectural elements. Install to exact height

and locations when shown on architectural drawings. When locations are shown only on electrical drawings, be guided by architectural details and conditions existing at job site and coordinate this work with that of others.

E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings, and passageways. Cut no structural members without written approval.

F. Carefully examine any existing conditions, wiring, devices, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.

G. Because of the small scale of the drawings, it is not possible to indicate all precise locations for all devices and equipment. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate devices, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or raceway cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use or to code required clearance.

1.8 Guarantee:

A. The Contractor shall guarantee labor, materials, and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.

B. Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9 Approval Submittals:

A. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

1. Shop drawings, product-data literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following.

a. Submittals shall be properly organized in accordance with the approved submittal control log.
b. Provide cover page with required information as shown on sample submittal cover page in Appendix A below.
c. Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
d. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers

in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.

e. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.

f. Submittals that include a series of fixtures or devices (such as lighting or panelboards) shall be organized by the device name or type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether those items are used on other fixtures.

g. Do not include pages in submittal which do not apply to the project. If submittal includes products not intended for installation, clearly indicate all materials in the submittal which are intended for installation.

h. The electrical design shown on the drawings supports the equipment basis of design specifications at the time of design. If equipment by any division is submitted with different electrical requirements, it is the responsibility of the submitting contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the proposed electrical configuration in the relevant submittal with a written statement that this change will be provided at no additional cost. Submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

B. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

C. Engineer’s review of shop drawings, product-data literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

D. Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations, details to scale not smaller than 1/4” with dimensions clearly showing the installation, and system calculations where applicable. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.10 Test Reports and Verification Submittals: Submit test reports, certifications, and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports, and take corrective action within the scheduled contract time.

1.11 O&M Data Submittals: Submit Operation and Maintenance data as called for in other sections. When a copy of approval submittals is included in the O&M Manual, only the final "Approved" or "Approved as Noted" copy shall be used. Contractor shall organize

these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection.

PART 2 - PRODUCTS

2.1 All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

2.2 Equipment and Materials:

A. All equipment and materials shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a minimum period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

B. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings, and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated, or painted.

C. The label of the approving agency, such as UL, by which a standard has been established for the particular item, shall be in full view.

D. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

E. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

F. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

G. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material, and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

H. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.3 Requests for Substitution:

A. Where a particular system, product, or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product, or material specified.

B. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

1. Required product cannot be supplied in time for compliance with Contract time requirements.
2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.
3. Substantial cost advantage is offered to Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation, and other necessary services and similar considerations.

C. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

1. Principal of operation.
2. Materials of construction or finishes.
3. Thickness of gauge of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other work caused by the substitution.
8. Electrical ratings and properties.
9. If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

PART 3 - EXECUTION

3.1 Workmanship: All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any installation which is not orderly and reasonably neat, or does not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

3.2 Coordination:

A. The Contractor shall be responsible for complete coordination of the electrical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for raceway or other appurtenances passing through slabs or walls.

B. Any additional steel supports required for the installation of any electrical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.

C. It shall be the Contractor's responsibility to see that all equipment such as terminal cabinets, fire alarm components, control panels, and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

D. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

E. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

G. Start of work will be construed as acceptance of suitability of work of others.

3.3 Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

3.4 Phasing: Provide all required temporary wiring, lighting, fire alarm, equipment, and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

3.5 Cutting and Patching: Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

3.6 Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts, and washers. Level equipment.

3.7 Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 26. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.8 Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

3.9 Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.10 Record Drawings:

A. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all switches, receptacles, devices, equipment, and other systems which are not installed exactly as shown on the contract drawings.

B. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

3.11 Acceptance:

A. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

B. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.
C. Operation and Maintenance Manuals: Provide O&M manual as dictated by Division 1.

   Manuals shall contain:

   1. Detailed operating instructions and instructions for making minor adjustments.
   2. Complete wiring, control, and single line diagrams.
   3. Routine maintenance operations.
   4. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
   5. Copies of approved submittals.
   6. Copies of all manufacturer's warranties.
   7. Copies of test reports and verification submittals.

D. Record Drawings: Submit record drawings.
E. Acceptance will be granted on the basis of tests and inspections of job. A representative of firm that performed test and balance work shall be in attendance to assist. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.
F. Control Diagrams: Frame under clear plastic and mount on equipment room wall.
G. Single Line Diagrams: Frame under clear plastic and mount on equipment room wall.
H. All conductors and electrical equipment of 480V or more shall be tested for proper operation by a NETA certified third party acceptable to the Owner and hired by the contractor.

APPENDIX A

PROJECT NAME

PROJECT NUMBER

ARCHITECT: Company Name

ENGINEER: Mitchell Gulledge Engineering

CONTRACTOR: Contractor Name

SUBCONTRACTOR: Sub Name

SUPPLIER: Supply Company

MANUFACTURER: Manufacturer

DATE: mm/dd/yyyy

SECTION: 26 XX XX/Section Name

1. Product 1: Manufacturer, Model

2. Product 2: Manufacturer, Model

3. Product 3: Manufacturer, Model

4. Product 4: Manufacturer, Model

5. Product 5: Manufacturer, Model

SAMPLE

Any standard heading is acceptable.

List each product individually. Include manufacturer name and model.

Include GC or CM Approval stamp indicating review and acceptance by responsible contractor.

END OF SECTION

SECTION 26 05 01
ELECTRICAL CODES AND STANDARDS

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the fire protection work as herein called for and shown on the drawings.

1.2 This is a Basic Electrical Requirements section. Provisions of this section apply to work of all Division 26 sections.

PART 2 - CODES

2.1 All work under Division 26 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the Contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the Architect/Engineer's attention any drawings or specifications that are not in conformance with these or other codes prior to ordering equipment or installing work.

2.2 Comply with regulations and codes of utility suppliers.

2.3 Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with code requirements when carrying out such work.

2.4 Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.

2.5 Additional codes or standards applying to a specific part of the work may be included in that section.

2.6 The following codes and standards shall govern all work:

A. Florida Building Code – Seventh Edition (2020)
B. Florida Building Code – Seventh Edition (2020) – Energy Conservation
C. Florida Building Code – Seventh Edition (2020) – Mechanical
D. Florida Building Code – Seventh Edition (2020) – Plumbing
E. Florida Building Code – Seventh Edition (2020) – Fuel Gas
F. Florida Building Code – Seventh Edition (2020) – Accessibility
G. Florida Fire Prevention Code Seventh Edition
    1. Fire Code (NFPA 1 – 2018 Edition)
    2. Life Safety Code (NFPA 101 – 2018 Edition)
H. National Electric Code (NFPA 70 – 2017)
I. Fire Alarm and Signaling Code (NFPA 72 – 2016)

PART 3 - STANDARDS

3.1 All materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:

A. Underwriters' Laboratories (UL)
B. American National Standards Institution (ANSI)
C. American Society of Testing Materials (ASTM)
D. National Fire Protection Association (NFPA)
E. National Electrical Manufacturers Association (NEMA)
F. Institute of Electrical and Electronics Engineers (IEEE)

G. National Electrical Contractors Association (NECA)
H. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
I. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
J. Illuminating Engineering Society of North America (IESNA)
K. Telecommunications Industry Association (TIA)
L. Electronics Industry Alliance (EIA)
M. Lightning Protection Institute (LPI)

END OF SECTION

SECTION 26 05 02
ELECTRICAL RELATED WORK

PART 1 - DIVISION 1 - GENERAL REQUIREMENTS

1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 This is a Basic Electrical Requirements section. Provisions of this section apply to work of all Division 26 sections.

1.3 Coordinate with the General Contractor for all cutting and patching. Contractors performing Division 26 work shall inform the General Contractor of all cutting and patching required prior to bidding and shall coordinate installation.

1.4 Divisions listed in this section are based on CSI 2004 Master Format. Where architectural or other engineering documents do not have written specifications for referenced divisions, contractor refer to architectural drawings, notes and details associated with the referenced division. Where no architectural or other engineering documents exist, contractor shall refer to owners' published standards and Florida Building Code requirements associated with the referenced division.

PART 2 - DIVISION 3 - CONCRETE

2.1 Refer to Division 3, Concrete for:

A. Rough grouting in and around electrical work.
B. Patching concrete cut to accommodate electrical work.

2.2 The following is part of Division 26 work, complying with the requirements of Division 3:

A. Curbs, foundations, and pads for electrical equipment.
B. Manholes, hand holes, and vaults for electrical work.
C. Underground structural concrete to accommodate electrical work.
D. Concrete encasement of electrical conduits and cables.

PART 3 - DIVISION 4 - MASONRY

3.1 Refer to Division 4, Masonry for:

A. Installation of access doors in walls.

PART 4 - DIVISION 5 - METALS

4.1 Refer to Division 5, Metals for:

A. Framing openings for electrical equipment.

4.2 The following is part of Division 26 work:

A. Supports for electrical work.

PART 5 - DIVISION 6 - WOOD AND PLASTIC

5.1 Refer to Division 6, Wood for:

A. Framing openings for electrical equipment.

PART 6 - DIVISION 7 - THERMAL AND MOISTURE PROTECTION

6.1 Refer to Division 7, Thermal and Moisture Protection for:

A. Installation of all roof curbs and roof supports for electrical work.
B. Caulking and waterproofing of all wall and roof mounted electrical work.
C. Providing all roof curbs and all flashing for metal roofs.

6.2 The following is part of Division 26 work, complying with the requirements of Division 7.

A. Fire barrier penetration seals.

PART 7 - DIVISION 9 - FINISHES

7.1 Refer to Division 9, Finishes for:

A. Painting piping, and equipment.
B. Painting structural metal and concrete for electrical work.
C. Painting access panels.
D. Painting color-coded electrical work indicated for continuous painting. See color schedule in Division 26 section, "Electrical Identification".
E. Installation of access doors in gypsum drywall.

7.2 Colors shall be selected by the Architect for all painting of exposed electrical work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.

7.3 Perform the following as part of Division 26 work:

A. Touch up painting of factory finishes.
B. Painting of all hangers.

PART 8 - DIVISION 10 - SPECIALTIES

8.1 Refer to Division 10 - Specialties for:

A. Fire extinguishers and fire extinguisher cabinets and accessories.

PART 9 - DIVISION 11 - EQUIPMENT

9.1 Refer to Division 11 - Equipment for all food service equipment to be provided. This includes the cooking hoods with fire suppression.

9.2 Refer to Division 11 - Equipment for all laboratory equipment including cabinets, casework, student stations, demonstration desks, fume hoods, snorkel exhausts, canopy hoods, safety stations, eyewashes, and all related fixtures, fittings, and trim.

PART 10 - DIVISION 21 - FIRE PROTECTION

10.1 Fire Protection and Electrical Contractors shall coordinate the exact electrical requirements of all fire protection equipment being provided. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the fire protection equipment basis of design. If fire protection equipment is submitted with different electrical requirements, it is the responsibility of the fire protection contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the fire protection submittal with a written statement that this design will be provided at no additional cost. Fire Protection submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost to the Owner.

10.2 Electrical Contractor is expected to be familiar with the entirety of the fire protection scope. Review fire protection sheets, specifications, and other portions of the Contract

Documents prior to bidding. Electrical Contractor is responsible for all line voltage (greater than 100V) work unless otherwise noted. Electrical Contractor shall coordinate with Fire Protection Contractor, and shall make themselves available as necessary to support the fire protection scope.

10.3 Electrical contractor shall provide disconnect switches, starters, and contactors for fire protection equipment unless specifically noted as being furnished as part of fire protection equipment.

10.4 Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all fire protection equipment, switches, starters, contactors, controllers, and similar equipment.

PART 11 - DIVISION 22 - PLUMBING

11.1 Plumbing and Electrical Contractors shall coordinate the exact electrical requirements of all plumbing equipment being provided. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the plumbing equipment basis of design. If plumbing equipment is submitted with different electrical requirements, it is the responsibility of the plumbing contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the plumbing submittal with a written statement that this design will be provided at no additional cost. Plumbing submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost to the Owner.

11.2 Electrical Contractor is expected to be familiar with the entirety of the plumbing scope. Review plumbing sheets, specifications, and other portions of the Contract Documents prior to bidding. Electrical Contractor is responsible for all line voltage (greater than 100V) work unless otherwise noted. Electrical Contractor shall coordinate with Plumbing Contractor, and shall make themselves available as necessary to support the plumbing scope.

11.3 Electrical contractor shall provide disconnect switches, starters, and contactors for plumbing equipment unless specifically noted as being furnished as part of plumbing equipment.

11.4 Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all plumbing equipment, switches, starters, contactors, controllers, and similar equipment.

PART 12 - DIVISION 23 - HVAC

12.1 Mechanical and Electrical Contractors shall coordinate the exact electrical requirements of all mechanical equipment being provided. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the mechanical equipment basis of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this design will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost to the Owner.

12.2 Mechanical contractor shall provide all HVAC control wiring including the Energy Management Control system sensors, alarms, and input/output signals and all relays, interlocks, warning lights, and control devices, complying with the requirements of Division 26. The intent is for the mechanical contractor to be responsible for the entire HVAC control system, including point-to-point wiring, and associated raceway and boxes. Electrical contractor shall notify mechanical contractor upon discovery of any mechanical controls installation which does not meet Division 26 requirements.

12.3 Electrical Contractor is expected to be familiar with the entirety of the mechanical scope. Review mechanical sheets, specifications, and other portions of the Contract Documents prior to bidding. Electrical Contractor is responsible for all line voltage (greater than 100V) work unless otherwise noted. Electrical Contractor shall coordinate with Mechanical Contractor, and shall make themselves available as necessary to support the mechanical scope.

12.4 Electrical contractor shall provide disconnect switches, starters, and contactors for mechanical equipment unless specifically noted as being furnished as part of mechanical equipment.

12.5 Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all mechanical equipment, switches, starters, contactors, controllers, and similar equipment.

PART 13 - DIVISION 27 - COMMUNICATIONS

13.1 Electrical and Communications Contractors shall coordinate the exact Communications requirements of all electrical equipment being provided. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The Communications design shown on the drawings supports the electrical equipment basis of design. If electrical equipment is submitted with different Communications requirements, it is the responsibility of the electrical contractor to resolve all required Communications design changes (e.g. input/output voltage) and clearly show the new Communications design on the electrical submittal with a written statement that this design will be provided at no additional cost. Electrical submittals made with no written reference to the Communications design will be presumed to work with the Communications design. Any corrections required will be at no additional cost to the Owner.

13.2 Electrical Contractor is expected to be familiar with the entirety of the communications scope. Review communications sheets, specifications, and other portions of the Contract Documents prior to bidding. Electrical Contractor is responsible for all line voltage (greater than 100V) work unless otherwise noted. Electrical Contractor shall coordinate with Communications Contractor, and shall make themselves available as necessary to support the communications scope.

13.3 Unless otherwise instructed by Construction Manager or General Contractor, Division 26 shall be responsible for Division 27.

PART 14 - DIVISION 28 - ELECTRONIC SAFETY AND SECURITY (ESS)

14.1 Electrical and ESS Contractors shall coordinate the exact electrical requirements of all ESS equipment being provided. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the ESS equipment basis of design. If ESS equipment is submitted with different electrical requirements, it is the responsibility of the ESS contractor to resolve all required electrical design changes (e.g., input/output voltage) and clearly show the new electrical design on the ESS submittal with a written

statement that this design will be provided at no additional cost. Electrical submittals made with no written reference to the ESS design will be presumed to work with the electrical design. Any corrections required will be at no additional cost to the Owner.

14.2 Electrical Contractor is expected to be familiar with the entirety of the fire alarm scope. Review fire alarm sheets, specifications, and other portions of the Contract Documents prior to bidding. Electrical Contractor is responsible for all line voltage (greater than 100V) work unless otherwise noted. Electrical Contractor shall coordinate with Fire Alarm Contractor, and shall make themselves available as necessary to support the fire alarm scope.

14.3 ESS contractor shall provide ESS modules, detectors, and other appurtenances for unless specifically noted as being furnished as part of electrical equipment.

14.4 ESS contractor shall provide all ESS wiring, raceway and devices, and make final ESS connections to all electrical equipment, detectors, modules, contacts, controllers, and similar equipment.

14.5 Unless otherwise instructed by Construction Manager or General Contractor, Division 26 shall be responsible for Division 28.

PART 15 - DIVISION 31 - EARTH WORK

15.1 Refer to Division 31, Sitework for:

A. Coordination with work of other trades.
B. Site domestic water piping.
C. Additional site electrical work.

15.2 The following work is part of Division 26:

A. All site electrical conduit, wiring, boxes, lights, and other appurtenances, except where provided by Utility.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 Related Documents:

A. Conform to Division 1 and other sections of this division.
B. Division 26 Basic Materials and Methods sections apply to work of this Section.

1.2 Summary:

A. The extent of electrical grounding and bonding work is indicated by drawings and schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.
B. The type of electrical grounding and bonding work specified in this Section includes the following:

1. Solidly grounded.

C. Applications of electrical grounding and bonding work in this Section include the following:

1. Electrical power systems.
2. Grounding electrodes.
3. Separately derived systems.
4. Raceways.
5. Service equipment.
6. Enclosures, pull boxes, junction boxes, etc.
7. Equipment.
8. Lighting standards.
9. Landscape lighting.
10. Signs.
11. Transformers.

D. Refer to other Division 26 sections for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work.

1.3 Submittals:

A. Submit in accordance with General, Supplementary, and Special Conditions.
B. Product Data: Submit manufacturer's data on grounding and bonding products and associated accessories.

1.4 Codes and Standards:

A. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and current NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits, and equipment.
2. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", and 869, "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits, and

equipment. In addition, comply with UL Std. 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors". Provide grounding and bonding products which are UL listed and labeled for their intended usage. Solder lugs are not acceptable.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

A. All products shall be the produce of reputable and reliable manufacturers.
B. The following manufacturers are recognized as being reputable and reliable:

1. Burndy, Inc.
2. Erico, Inc.
3. Harger, Inc.
4. Thermoweld, Inc.

C. Additional manufacturers shall be considered reputable and reliable only if they verifiably satisfy the following requirements:

1. History: Acceptable manufacturers shall have a history of producing similar products at least the past ten years. Such products shall have been sold in the state of Florida for at least the past five years.
2. Volume: Acceptable manufacturers shall have produced and sold similar products in excess of one hundred (100) times annually the amount of product projected for used in this project. This requirement shall apply to each of the past ten years.
3. Similar projects: Acceptable manufacturers shall have sold similar products which have been used in at least five similar projects in the past five years. Similar projects must be of a similar use, overall cost, and overall size.

D. Documentation of the above manufacturer requirements shall be provided to Engineer upon request but is otherwise unnecessary. If documentation is required, it shall consist of a signed statement from Manufacturer's representative on Manufacturer's letterhead (or the letterhead of Manufacturer's approved representative). Additional documentation may be required in rare cases.
E. Any submittal by Contractor shall be considered indication by Contractor that Contractor stands behind for the suitability of a manufacturer, and that the manufacturer satisfies of the above requirements.
F. Contact Engineer prior to bid with any questions regarding acceptable manufacturers.

2.2 Grounding and Bonding:

A. Provide complete grounding and bonding assemblies, including, but not limited to,

1. Cables/Wires,
2. Connectors,
3. Solderless Lug Terminals,
4. Grounding Electrodes and Plate Electrodes,
5. Bonding Jumper Braid,
6. Surge Arresters, and
7. Additional accessories needed for a complete installation.

B. Where more than one type component product meets indicated requirements, selection is Contractor's option.
C. Where materials or components are not indicated, provide products which comply with

NEC, UL, and applicable industry standards.

D. Conductors:

1. Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.

E. Bonding Plates, Connectors, Terminals, and Clamps:

1. Provide electrical bonding plates, connectors, terminals, lugs, and clamps as recommended by bonding plate, connector, terminal, and clamp manufacturers for indicated applications.

F. Grounding Electrodes:

1. Grounding Electrodes shall consist of minimum three 3/4"x 20'-0" long copper clad rods arranged in a triangle configuration with ground rods placed at least ten feet apart.

a. Provide concrete box (flush in grade) with cast iron cover. Concrete box to house each individual ground rod for testing. Cast iron cover to have the words "GROUND ROD" inscribed on top.

PART 3 - EXECUTION

3.1 Examination:

A. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Engineer in writing of any condition detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer and Owner.

3.2 Installation of Electrical Grounding and Bonding Systems:

A. General: Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of current NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.

B. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.

C. Provide all circuits with an insulated equipment grounding conductor. Under no circumstances shall raceways be the sole equipment grounding conductor.

D. Terminate insulated equipment grounding conductors with grounding lug, bus, or bushing. Conductors shall not be looped under screw or bolt heads.

E. Grounding Electrode System and Grounding Electrode Conductor:

1. Grounding electrode system for main service and separately derived systems: Grounding electrode conductors shall be sized according to NEC 250.66 and shall be connected to the following electrodes: Metal cold water pipe, concrete encased electrodes, building steel, and three rod electrodes.

2. Grounding electrode system for separate buildings: The connection of the grounded circuit conductor (neutral) to the grounding electrode at each separate building shall not be made. An equipment grounding conductor shall be installed with the circuit conductors and shall be connected to an equipment ground bar located in each building's panel. Grounding electrode conductors shall be sized according to NEC 250.66 excluding exceptions and shall be installed unspliced

from the panel equipment ground bar to the following electrodes: Metal cold water pipe, building steel, and three-rod electrode.

3. Prior to substantial completion, Contractor shall perform the following tests in the presence of Engineer or Owner:
    a. Grounded conductor (neutral) has a low-impedance path to equipment grounding system.
    b. Removal of bonding conductor at main service disconnects grounded conductor (neutral) from equipment grounded system.
    c. Removal of bonding conductor at each separately derived system disconnects grounded conductor (neutral) from equipment grounded system.
    d. Grounded conductor maintains low-impedance equipment grounding system connection regardless of ATS state.
4. Grounding electrode requirements:
    a. Metal underground water piping shall be in direct contact with the earth for a minimum of twenty feet.
    b. Concrete encased electrodes shall be encased in at least three inches of concrete footing or foundation that is in direct contact with the earth, consisting of a continuous 5/8"x20'-0" rebar with a 20'-0" section of bare 4/0 copper wire connected to the rebar by exothermic welding and extended 4'-0" above the slab and sleeved with Sch 40 PVC at slab penetration. This size wire is constant; it is not to be sized by NEC 250.66. The exposed conductor above the slab shall be protected from concrete, paint, dirt, etc.
    c. Rod electrodes shall consist of three (minimum) 3/4"x20'-0" (minimum) copper clad rods with threaded connections, placed at least ten feet apart in a triangular configuration. No aluminum rods are permitted.
5. Grounding electrode conductors shall be spliced only by means of:
    a. listed exothermic welding process, or
    b. listed irreversible crimp connection. Note: irreversible crimp connections shall not be utilized except where applied with the indicated listing tool, where such tool contains an embossing die which leaves UL mark.
6. Building steel shall be effectively grounded through direct connections from footer reinforcing to I-beam or bar joists with 4/0 copper conductors.
7. Connections shall be made to the interior metal water piping within 5'-0" of entry into building. Piping shall be one-inch minimum.
8. Grounding electrode conductors shall be protected with schedule 40 PVC where exposed to damage.
9. Underground electrode connections shall be accessible by way of concrete box enclosure.
10. Underground electrode connections shall be made by exothermic welding process.

F. Connect together service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

1. Provide minimum #12 AWG equipment grounding conductor in each conduit unless otherwise indicated. Equipment grounding conductor shall have

continuous green insulation if #6 or smaller, green marking tape if #4 or larger.

2. Equipment grounding conductor shall be connected to ground buses in equipment enclosures.
3. Equipment grounding conductor bonded to all outlet, pull, and junction boxes by a lug or screw approved for the purpose before installation of the boxes. Ground pigtails and/or ground clips are not acceptable.

G. Grounding type bushings shall be installed on all feeder and subfeeder conduits entering panelboards, pull boxes and transformers and all conduit entering oversized, concentric, and eccentric knock-outs.

H. Tighten grounding and bonding connectors and terminal, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torqueing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.

I. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity. All ground clamps and lugs shall be listed for application and shall be made completely of bronze or brass.

3.3 Field Quality Control:

A. Ground Resistance Test:

1. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester while the ground conductor disconnected from the equipment.
2. Where tests show resistance to ground is over five (5) ohms:

    a. Reduce resistance to five (5) ohms or less by driving additional ground rods.
    b. Retest after mitigation to demonstrate compliance.
    c. Any necessary additional ground rods shall be provided at no cost to Owner.

3. Provide Owner and Engineer 72-hour notice prior to ground resistance testing. Coordinate with Owner and/or Engineer if Owner and/or Engineer indicate a desire to observe the testing.

END OF SECTION

SECTION 26 05 31
WIRES AND CABLES

PART 1 - GENERAL

1.1 Related Documents:

A. Conform to Division 1 and other sections of this division.
B. This Section is a general Division 26 materials and methods section and applies to all other Division 26 sections involving materials and methods specified herein.

1.2 Description of Work:

A. Extent of electrical wire and cable work is indicated by drawings and schedules.
B. Types of electrical wire, cable, and connectors specified in this Section include the following:

1. Copper conductors.
2. Fixture wires.
3. Split bolt connectors.
4. Wirenut connectors.

C. Applications of electrical wire, cable, and connectors required for project are as follows:

1. For power distribution circuits.
2. For lighting circuits.
3. For appliance and equipment circuits.
4. For motor branch circuits.
5. For control circuits.

1.3 Codes and Standards:

A. NEC Compliance: Comply with NEC requirements as applicable to construction, installation, and color coding of electrical wires and cables.
B. IEEE Compliance: Comply with applicable requirements of IEEE Stds. 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring systems.
C. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D 753.

1.4 Submittals:

A. Submit in accordance with General, Supplementary, and Special Conditions.
B. Product Data: Submit manufacturer's data.

PART 2 - PRODUCTS

2.1 General Wiring Products:

A. Unless otherwise noted, all wiring shall be copper, with conductivity of not less than 98% at 20°C (68°F).

2.2 Acceptable Manufacturers:

A. All products shall be the produce of reputable and reliable manufacturers.
B. The following manufacturers are recognized as being reputable and reliable:

1. Cerro Wire
2. Encore Wire Corporation
3. General Cable
4. Southwire Company

C. Additional manufacturers shall be considered reputable and reliable only if they satisfy the following requirements:

1. History: Acceptable manufacturers shall have a history of producing similar products at least the past ten years. Such products shall have been sold in the state of Florida for at least the past five years.
2. Volume: Acceptable manufacturers shall have produced and sold similar products in excess of one hundred (100) times annually the amount of product projected for use in this project. This requirement shall apply to each of the past ten years.
3. Similar projects: Acceptable manufacturers shall have sold similar products which have been used in at least five similar projects in the past five years. Similar projects must be of a similar use, overall cost, and overall size.

D. Documentation of the above manufacturer requirements shall be provided to Engineer upon request but is otherwise unnecessary. If documentation is required, it shall consist of a signed statement from Manufacturer's representative on Manufacturer's letterhead (or the letterhead of Manufacturer's approved representative). Additional documentation may be required in rare cases.

E. Any submittal by Contractor shall be considered indication by Contractor that Contractor stands behind for the suitability of a manufacturer, and that the manufacturer satisfies of the above requirements.

F. Contact Engineer prior to bid with any questions regarding acceptable manufacturers.

2.3 Building Wires: Provide factory fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated.

A. Dual-listed THHN/THWN-2, 600V rated: For dry, damp, and wet locations.

B. All wiring for conventional devices shall be stranded wire with the exceptions as noted on the electrical drawings.

C. MC cable and other prefabricated cables are not permitted, except as called for in writing by Engineer. Prefabricated light fixture whips shall be permitted.

2.4 Color Coding: The following systems of color coding shall be strictly adhered to. There shall be no color change for switch legs. Switch legs shall be marked at all junctions with colored tape on each wire with tape of contrasting color. Three-way travelers shall be purple. In cases where more than one set of travelers are in the same conduit, travelers shall be marked with circuit number and colored tape. Colored tape shall be same color as corresponding switch leg marking.

A. All wiring shall be the indicated color. Tape is not an acceptable method of indicating phase legs.

B. 208Y/120V:

1. Phase A: Black
2. Phase B: Red
3. Phase C: Blue
4. Neutral: White
5. EGC (Ground): Green

C. The color code assigned to each phase wire shall be consistently followed throughout.

PART 3 - EXECUTION

3.1 Delivery, Storage, and Handling:

A. Deliver wire and cable properly packaged in factory fabricated type containers or wound on NEMA specified type wire and cable reels.
B. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris, and traffic.
C. Handle wire and cable carefully to avoid abrading, puncturing, and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

3.2 Installation of Wires and Cables:

A. General: Install electrical cables, wires, and wiring connectors in compliance with applicable requirements of NEC, NEMA, UL, and NECA's "Standard of Installation" and in accordance with recognized industry practices.
B. Unless otherwise noted, all branch circuit conductors shall be 12 AWG CU minimum.
C. Install all line voltage wiring in conduit, unless otherwise indicated in writing by Engineer.
D. Pull conductors simultaneously where more than one is being installed in same raceway.
E. Use lubricant for pulling conductors. Use only products indicated for the purpose by the manufacturer.
F. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceway.
G. Minimize conductor splices.
H. Install splices and taps which possess equivalent or better mechanical strength and insulation ratings than conductors being spliced. Use splice and tap connectors which are compatible with conductor material.
I. Provide a 6" loop in each conductor in all joint boxes and pull boxes.
J. Conductors of systems of different voltages or types shall not enter the same conduit or junction box. The number of current carrying conductors and total number of conductors to be installed in conduits shall be as noted below.

    1. Single phase 120V circuits: Limit three per raceway.
    2. All other circuits: Dedicated raceway.
    3. Deviation of installation as identified above requires prior written approval from Engineer.

K. Circuits shall be installed such that the continuity of the ground, neutral, and hot circuits shall not be interrupted by the removal of any device or fixture.
L. For the purposes of thermal derating calculations, neutrals shall be considered current carrying except for balanced three-phase linear loads.
M. Multiwire branch circuits are prohibited. All 120V circuits shall be provided a dedicated neutral conductor.

3.3 Field Quality Control:

A. Prior to energization of circuitry, check installed feeder wires and cables with megohmmeter to determine insulation resistance levels to ensure requirements are fulfilled. A list of feeders tested shall be submitted to the Engineer indicating the

insulation resistance level for each cable. Owner shall be given the option to witness all tests.

B. Prior to energization, test wires and cables for electrical continuity and for short circuits.

C. Subsequent to wire and cable hook ups, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION

SECTION 26 05 33
RACEWAYS

PART 1 - GENERAL

1.1 Related Documents:

A. Conform to Division 1 and other sections of this division.
B. This Section is a general Division 26 materials and methods section, and applies to all other Division 26 sections involving materials and methods specified herein.

1.2 Description of Work:

A. Extent of raceway work is indicated by drawings and schedules.
B. Types of raceways specified in this section include the following:

1. Electrical metallic tubing (EMT)
2. Rigid metal conduit, galvanized (RMC)
3. Rigid nonmetallic conduit (RNC)
4. Liquid tight flexible metal conduit (LFMC)
5. Flexible metal conduit, steel only (FMC)

1.3 Submittals:

A. Submit in accordance with General, Supplementary, and Special Conditions.
B. Product Data: Submit manufacturer's data.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

A. All products shall be the produce of reputable and reliable manufacturers.
B. The following manufacturers are recognized as being reputable and reliable:

1. Allied Tube & Conduit
2. Carlon
3. Cantex
4. Wiremold
5. Wheatland Tube

C. Additional manufacturers shall be considered reputable and reliable only if they verifiably satisfy the following requirements:

1. History: Acceptable manufacturers shall have a history of producing similar products at least the past ten years. Such products shall have been sold in the state of Florida for at least the past five years.
2. Volume: Acceptable manufacturers shall have produced and sold similar products in excess of one hundred (100) times annually the amount of product projected for used in this project. This requirement shall apply to each of the past ten years.
3. Similar projects: Acceptable manufacturers shall have sold similar products which have been used in at least five similar projects in the past five years. Similar projects must be of a similar use, overall cost, and overall size.

D. Documentation of the above manufacturer requirements shall be provided to Engineer upon request but is otherwise unnecessary. If documentation is required, it shall consist of a signed statement from Manufacturer's representative on Manufacturer's

letterhead (or the letterhead of Manufacturer's approved representative). Additional documentation may be required in rare cases.

E. Any submittal by Contractor shall be considered indication by Contractor that Contractor stands behind for the suitability of a manufacturer, and that the manufacturer satisfies of the above requirements.

F. Contact Engineer prior to bid with any questions regarding acceptable manufacturers.

2.2 UL Listed Materials:

A. Provide raceway products and components which have been UL listed and labeled for the intended use.

B. Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems.

2.3 Products – Metal Conduit and Tubing:

A. General: Provide metal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thicknesses) for each indicated use.

B. Where types and grades are not indicated, provide proper selection determined by Contractor to fulfill wiring requirements, and comply with applicable portions of NEC for raceways.

C. Minimum size conduit shall be 1/2" for all systems.

D. Minimum size flexible conduit shall be 1/2" for all systems (3/8" for pre-assembled light fixture whips). Maximum length shall be 6 feet. Minimum length shall be 4 feet.

E. Cast zinc conduit fittings are prohibited. Any cast zinc fitting installed by this project shall be replaced at Contractor's expense.

F. All fittings shall be provided with insulated throats or plastic bushings prior to pulling wires or cables.

G. Electrical Metallic Tubing (EMT):

1. Conduit: Shall be mild steel, electrically welded, galvanized, and produced to ANSI Specification C80.3 and Federal Specification WW-C-563, latest revisions and shall be labeled with the Underwriter's Laboratories marking.
2. Fittings: Couplings and connectors for conduit shall be set screw type, steel, or malleable iron.

H. Rigid Steel Conduit (RGS or RMC):

1. Conduit: Shall be mild steel, manufactured, hot-dipped galvanized, and produced to ANSI specifications C80.1 and Federal Specification WW-C 581, latest revisions, and shall be labeled with the Underwriters' Laboratories marking.
2. Fittings: Cast malleable iron, galvanized, or cadmium plated.
    a. Use Type 1 fittings for rain-tight connections.
    b. Use Type 2 fittings for concrete tight connections.

I. Flexible Metal Conduit (FMC):

1. Conduit: UL 1. Formed from continuous length of spirally wound, interlocked zinc coated strip steel.
2. Fittings: Flexible Metal Conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type. Inside type fittings are not allowed.
    a. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end

provided with locknut.

b. 45° or 90° Terminal Angle Connectors: Two piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

J. Liquid Tight Flexible Metal Conduit (LFMC):

1. Conduit: Provide liquid tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double wrapped steel; galvanized inside and outside; coat with liquid tight jacket of flexible polyvinyl chloride (PVC).
2. Fittings: Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or noninsulated throat.

K. No ENT, corrugated flexible conduit, or MC cable shall be installed or reused.

L. No intermediate metal conduit (IMC) shall be installed.

M. Conduit Bodies: Provide galvanized cast-metal conduit bodies of types, shapes, and sizes as required to fulfill job requirements and NEC requirements. Construct conduit bodies with threaded conduit-entrance ends, removable covers, either cast or of galvanized steel, and corrosion-resistant screws. SLB type are not permitted.

2.4 Products – Nonmetallic Conduit and Ducts:

A. General: Provide nonmetallic conduit, ducts, and fittings of types, sizes, and weights for each indicated use. Where types and grades are not indicated, provide proper selection determined by Contractor to fulfill wiring requirements which comply with provisions of NEC and Specifications for raceways.

B. 90°C, UL rated, constructed of polyvinyl chloride. For direct burial, UL listed and in conformity with NEC Article 352.

C. Conduit and Tubing Accessories: Provide conduit, tubing, and accessories of types, sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing.

2.5 Pathways for Telecom Cables:

A. General:

1. Any pathway that is not accessible or does not provide a clear and workable pathway will be rejected.
2. All components of pathway systems in contact with telecom cables shall be listed and indicated for the use. This includes Category 6 ratings, etc.

B. Cable Trays:

1. Default cable tray type is ladder tray in telecom rooms, and basket tray throughout the rest of the building.
2. Size cable trays for the number of cables called for on the plans. Where no cable quantities are called for, assume three outlets per telecom outlet box.

a. Cable trays shall have a minimum 50% spare capacity.
b. Capacity requirements shall be met at all points, including at corners and other locations where tray capacity is reduced.
c. Minimum cable tray width is 12".
d. Minimum cable tray height is 4".
e. Verify cable tray capacities prior to submittal. Notify Engineer of any conflicts found during verification.

3. Center-supported cable tray is not acceptable.

C. Conduits for Telecom Cables:

1. Conduit intended for telecom cables shall be a minimum 1" trade size unless otherwise indicated.
2. Conduits terminating not into a box shall be capped with a bushing.
3. Conduits terminating at cable trays shall be bonded to the cable tray with a bonding jumper or a clip listed for the purpose.

D. J-Hooks:

1. Provide J-Hooks suitable for the intended use, as indicated by manufacturer.

PART 3 - EXECUTION

3.1 Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify Owner and Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in acceptable manner.

3.2 Provide raceways for each installation location as follows:

A. Below grade: PVC
B. Within concrete: PVC
C. Exterior above-grade locations: rigid galvanized steel
D. Damp and wet locations: rigid galvanized steel
E. Interior locations subject to physical abuse: rigid galvanized steel
F. Interior locations not subject to physical abuse: EMT
G. Whips to light fixtures: 48" to 72" FMC or prefabricated whip.
H. Connections to any vibrating or mechanically active equipment: FMC

1. Exception: Utilize LFMC in exterior locations, or where subject to moist or humid atmosphere, or where subject to water, oil, or grease exposure.

I. Connection to any equipment subject to movement: FMC

1. Exception: Utilize LFMC in exterior locations, or where subject to moist or humid atmosphere, or where subject to water, oil, or grease exposure.

J. FMC, LFMC, and LFNC shall not be used for any other applications without written consent from Engineer.

3.3 Raceway Size:

A. Sizes of raceways shall be not less than NEC requirements using THHN/THWN2 for sizing and shall not in any case be less than indicated on the drawings.
B. Larger size raceways and/or pull boxes shall be installed if there is excessive length of unbroken run or excessive number of bends.

3.4 General Requirements:

A. Install conduits without damaging or penetrating structural members.
B. Metallic conduit in contact with concrete, grout, mortar, or other cementitious products such as grouted cells, headers, lintels, etc. shall be provided a bituminous coating before installation.
C. All conduit installed in walls and above ceilings shall be 100% complete and approved by inspectors before covering is installed. Such coverings include drywall, insulation, ceiling tiles, and any other material which obscures the installation.

D. Conduit installed above accessible ceilings shall be supported from the building structure and shall not be supported from or attached to the suspended ceiling suspension system.
E. Where feasible, avoid conduit runs within partitions and walls.
F. Mechanically assemble metal enclosures, and raceways for conductors to form a continuous conductive system.
G. Connect to electrical boxes, fittings, and cabinets to provide effective electrical continuity and rigid mechanical assembly.
H. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat all surfaces with corrosion inhibiting compound before assembling.
I. Install expansion fittings in all raceways wherever structural expansion joints are crossed.
J. Raceway penetrations of fire rated walls and/or floors shall be sealed to maintain the rating(s). All relevant materials and methods shall be per a UL detail satisfying NFPA rating requirements.
K. Fire rating of construction assemblies are specified under architectural section of the Contract Documents. Any ratings indicate within other portions of the Contract Documents is purely intended for the Contractor's convenience, and is not meant to replace a careful review of architectural life safety plans.
L. Submit complete data on fire stopping materials and construction methods for review by Architect prior to proceeding with work.
M. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.
N. Use Manufacturer-provided dimensions to lay out all equipment electrical connections. Set conduit and boxes for connection to units only after receiving review of dimensions and coordinating with other trades.
O. Provide nylon pull cord in empty conduits.
P. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.
Q. Field bend conduit with benders designed for the purpose.
R. Any conduit with kinks, tears, or other material damage shall be replaced at Contractor's expense.
S. Conduits are not to cross utility shafts or duct openings.
T. Keep conduits a minimum distance of six inches (6") from parallel runs of flues, hot water pipes, or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.
U. Support riser conduit at each floor level with clamp hangers.
V. Use of running threads at conduit joints and terminations is prohibited.
W. Complete installation of electrical raceways before starting installation of cables/wires within raceways.
X. Under no circumstances shall PVC or PVC-coated conduit be utilized within an air plenum. In particular, Contractor is to avoid LFMC within air handler plenums, etc.
Y. Cap off all spare or unused conduits.

3.5 Flexible Conduit:

A. Flexible conduit shall not pass through walls or ceilings. Provide a junction box at the point of transition.
B. Flexible conduit shall not be used within walls, except where written permission is

given by Engineer and Owner.

3.6 Conduits Installed in Exterior, Wet, or Damp Locations:

A. Metallic raceways exterior, wet, or damp locations shall have conduit threads painted with cold galvanizing paint. Remove oil and clean prior to painting. Draw up coupling and conduit sufficiently tight to ensure water tightness.
B. All wall penetrations entering wet locations shall be sloped downward at least 1/2".

3.7 Special EMT Requirements:

A. EMT shall not be installed below 8" AFF.
B. EMT shall not be installed exposed below 72" AFF.
C. EMT shall be installed in dry and indoor locations only.

3.8 Conduits Installed Below Grade:

A. All underground wiring and ductbanks shall have metalized warning tape installed above conduit, ductbank, or electrical line that identifies the specific system buried below. Tape shall consist of a minimum 3.5 mil solid foil core encased in a protective plastic jacket (total thickness 5.5 mils) and be 6" wide with black lettering imprinted on a color coded background that conforms to APWA color code specifications. Tape shall be installed from 18" to 30" above a conduit, ductbank, or electrical line, and in no case less than 6" below grade. No additional tracer wire is required.
B. All rigid metal conduit below grade shall be provided a bituminous coating.
C. Metallic raceways installed below grade shall have conduit threads painted with cold galvanizing paint. Remove oil and clean prior to painting. Draw up coupling and conduit sufficiently tight to ensure water tightness.
D. Install all underground conduits a minimum of 42" below finished grade (to top of conduit), except where below building foundation. Underground conduit shall be inspected and approved prior to backfilling. Primary raceway shall be buried 48" to top of conduit.
E. Conduit below concrete slabs and footers under or inside building foundations shall be minimum of 6" below bottom of concrete and/or at an adequate depth to conceal radius of bends.

3.9 Conduits within Concrete Slabs or Encased in Concrete:

A. No conduit shall be installed within slabs without prior written approval from Structural Engineer. Provide Structural Engineer with whatever description and drawings of the proposed installation which Structural Engineer may require.
B. All of the following are subject to the alteration by Structural Engineer:

1. Place conduits between bottom reinforcing steel and top reinforcing steel. Place conduits either parallel, or at 90 degrees, to main reinforcing steel.
2. Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond.
3. Conduits crossing in slab must be reviewed for proper cover by Engineer, Architect, and Owner.
4. Embedded conduit diameter is not to exceed one-third (1/3) of slab thickness.

3.10 Coatings:

A. Apply any coatings in accordance with manufacturer's instructions and recommendations.
B. Reapply bituminous coating locally after making threaded connections.

C. Any conduit requiring bituminous coating shall be coated without holidays. Inspect coating prior to burial or pouring, and touch up as needed.
D. In lieu of bituminous coatings, raceways with factory-applied polyethylene or PVC protective coatings may be utilized. Install per manufacturer's instructions and recommendations. Seal all joints.

3.11 Conduits Above Grade:

A. Install exposed conduits and all conduit above grade and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls and building structure.
B. Install exposed conduit work as not to interfere with ceiling inserts, lights, or ventilation ducts or outlets.
C. Securing and Supporting:
    1. Secure conduits within three feet of fittings, boxes, etc., and on spacing not to exceed ten feet.
        a. Conduits may be supported in lieu of securing, where permitted by Code.
    2. Support conduits by use of hangers, clamps, or clips.
    3. Conduit shall not be supported from suspended ceiling supports or grid systems.
D. Limit penetrations of vapor- and water-barriers. Utilize curbs, etc. wherever possible. Seal any penetrations of vapor- and water-barriers with approved methods.
E. Conduit shall not be installed on roof tops or walkway covers.
F. Conduit penetrating concrete floors not within 12" of walls shall have couplings installed flush with top slab.
G. Flexible metal conduit shall not be installed in damp or wet locations, through walls, or used as a raceway in concealed or inaccessible areas. It shall be supported within 12" of connectors and at least once every 54".

3.12 PVC Conduits:

A. PVC subject to physical damage shall be Schedule 80. All other PVC shall be heavy wall type (Schedule 40) conduit.
B. PVC conduit shall be installed with rigid steel elbows and risers. (Exception: low voltage with inner ducts may be PVC.)
C. Make solvent cemented joints in accordance with recommendations of manufacturer.
D. Install PVC conduits in accordance with NEC and in compliance with local utility practices.
E. Conduit and elbows shall be installed on the secondary side at power company's transformers. Wire and cable installation shall be such that wire pulling rope or cable will not damage elbows.
F. Conduit, elbows, and risers shall be installed for all primary services per Utility and Owner requirements.
G. All elbows shall be RMC, except where required otherwise by Utility.
H. All risers shall be RMC, except where required otherwise by Utility.

3.13 General Conduit Fitting Requirements:

A. Grounding type bushings shall be installed on all feeder and subfeeder conduits entering panelboards, pull boxes, and transformers and all conduit entering oversized, concentric, and eccentric knock-outs.
B. Miscellaneous fittings such as reducers, chase nipples, 3 piece unions, split couplings, and plugs shall be designed and listed for the specific use.

C. Provide either plastic bushings or plastic insulating throats for all fittings prior to pulling wire.
D. Install insulated-type bushings for terminating conduits 1" and larger. Bushings are to have flared bottom and ribbed sides. Upper edge shall have phenolic insulating ring molded into bushing. Bushings shall be installed during rough-in and before installing conductors.
E. Snap-on bushings are prohibited.

3.14 Threaded Conduit Fitting Requirements:

A. Provided locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.
B. Bushings for threaded conduits smaller than 1" shall have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation. Bushings shall be installed during rough-in and before pulling wire.
C. Bushing of standard or insulated type shall have screw type grounding terminal. Bushings shall be installed on all threaded conduit.

3.15 Pathways for Telecom Cables:

A. Cable Trays:

1. Cable trays shall have devices installed at all corners and bends to protect cables and prevent minimum bend radius from being violated.
2. Cable tray shall be trapeze- or wall-hung. Center-supported cable tray is not acceptable. Wall hung cable trays shall additionally be supported by threaded rod on the side of the cable tray farther from the wall.

B. Conduits for Telecom Cables:

1. Conduits intended for telecom cables shall not exceed the following:

a. Two 90° bends, turns, sweeps, etc. between pull boxes,
b. A total of 270° of bends, turns, sweeps, offsets, etc. between pull boxes,
c. 100' length between pull boxes, or
d. 200' total length.

2. Changes in direction shall be made with sweeps, elbows, etc. Changes in direction shall not be made in pull boxes.
3. Conduit bodies are not acceptable for telecom conduits, regardless of whether they may be used elsewhere in the project. This is not intended to indicate that conduit bodies are acceptable for other purposes.
4. Ream and bush all conduits intended for telecom cables.
5. Provide a 200lb nylon pull cord in each conduit intended for telecom cables.
6. Provide a minimum of one dedicated 1" conduit from each work area outlet (telecom outlet box), including floor boxes and poke throughs, to the nearest cable tray. Where no cable tray is within 30 feet, route conduit to nearest above accessible ceiling.

C. J-Hooks:

1. Provide J-hooks per manufacturer's instructions. Follow instructions regarding cable counts. Where cable counts are not indicated on the plans, assume three cables per telecom outlet box.
2. Provide sleeves for penetrating walls where necessary.
3. Where penetrating rated partitions, provide pathway according to a UL detail.

Submit UL detail for approval prior to proceeding.

D. Penetrations of Partitions:

1. Coordinate route of telecommunications pathways to ensure pathways are provided through partitions as needed to support the telecommunications scope.
2. Maintain ratings of any partitions penetrated by telecommunications cabling.
    a. Provide rated collar assemblies in quantities sufficient to match capacity of associated pathway (cable tray, j-hooks, etc.).

END OF SECTION

SECTION 26 05 34
BOXES AND FITTINGS

PART 1 - GENERAL

1.1 Related Documents:

A. Conform to Division 1 and other sections of this division.
B. This Section is a general Division 26 materials and methods section, and applies to all other Division 26 sections involving materials and methods specified herein.

1.2 Description of Work:

A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.
B. Types of electrical boxes and fittings specified in this Section include the following:

1. Outlet boxes.
2. Junction boxes.
3. Pull boxes.

1.3 Codes and Standards:

A. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
B. UL Compliance: Comply with applicable requirements of UL 50, UL 514 Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL listed and labeled.

1.4 Submittals:

A. Submit in accordance with General, Supplementary, and Special Conditions.
B. Product Data: Submit manufacturer's data.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

A. All products shall be the produce of reputable and reliable manufacturers.
B. The following manufacturers are recognized as being reputable and reliable:

1. CDR
2. Hubbell-Raco
3. MacLean Highline
4. Republic Steel
5. Square D
6. Thomas & Betts
7. Quazite
8. Wiremold
9. Legrand

C. Additional manufacturers shall be considered reputable and reliable only if they verifiably satisfy the following requirements:

1. History: Acceptable manufacturers shall have a history of producing similar products at least the past ten years. Such products shall have been sold in the state of Florida for at least the past five years.

2. Volume: Acceptable manufacturers shall have produced and sold similar products in excess of one hundred (100) times annually the amount of product projected for used in this project. This requirement shall apply to each of the past ten years.
3. Similar projects: Acceptable manufacturers shall have sold similar products which have been used in at least five similar projects in the past five years. Similar projects must be of a similar use, overall cost, and overall size.

D. Documentation of the above manufacturer requirements shall be provided to Engineer upon request, but is otherwise unnecessary. If documentation is required, it shall consist of a signed statement from Manufacturer's representative on Manufacturer's letterhead (or the letterhead of Manufacturer's approved representative). Additional documentation may be required in rare cases.

E. Any submittal by Contractor shall be considered indication by Contractor that Contractor stands behind for the suitability of a manufacturer, and that the manufacturer satisfies of the above requirements.

F. Contact Engineer prior to bid with any questions regarding acceptable manufacturers.

2.2 Products – Fabricated Materials:

A. Outlet Boxes:

1. Outlet wiring boxes shall be galvanized coated flat rolled sheet steel, of shapes, volumes, and dimensions as indicated, suitable for installation at respective locations.
2. Outlet boxes shall be constructed with mounting holes, and with cable and conduit size knockout openings in bottom and sides.
3. Minimum dimensions for device boxes, junction boxes, pull boxes, and other boxes in walls shall be 2-gang square. Depth shall be

    a. as recommended by fire alarm device manufacturer,
    b. two and one-eight inches (2-1/8”) deep for IT (telecom, AV, access controls, etc.),
    c. one and one-half inches (1-1/2”) for other locations.

4. Dimensions of ceiling boxes shall be a minimum 2-gang square or octagonal. Depth shall be

    a. as recommended by fire alarm device manufacturer,
    b. three inches (3") for concrete work,
    c. two and one-eight inches (2-1/8”) deep for IT (telecom, AV, access controls, etc.),
    d. one and one-half inch (1-1/2") deep for exposed work or furred ceiling work, and
    e. one and one-half inches (1-1/2”) for other locations.

5. Plaster rings and/or fixture studs shall be provided where required.
6. Flush-mounted boxes shall be provided with extension rings and/or covers with sufficient depth to bring the covers flush with the finished wall.
7. Outlet boxes for exposed wall mounting shall be cast metal type "FS" or "FD" boxes with suitable cast aluminum covers.
8. Exterior boxes:

    a. All exterior boxes shall be appropriately listed or indicated for the use.
    b. Boxes for exterior receptacles shall be provided with in-use weatherproof

receptacle covers. Such covers shall have spring hinged lids.

c. Weatherproof covers shall meet code requirements for covers intended for use with attachment plugs.

9. Sectional or gangable boxes shall not be installed.
10. Through-wall boxes shall not be installed.
11. Box extensions or "goof rings" shall not be installed.
12. "Handy" boxes, etc. shall not be permitted.

B. All pull boxes used outside and underground shall be pre-cast concrete polymer, with concrete polymer cover. Such boxes shall be of sufficient size to make all entrances and exits from box in one horizontal plane.

C. Junction and Pull Boxes: Provide galvanized code gauge sheet steel junction and pull boxes, with screw on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.

D. Cover Plates

PART 3 - EXECUTION

3.1 General:

A. Install all electrical boxes and fittings as indicated, in accordance with manufacturer's instructions, applicable code, and recognized industry practices, to fulfill project requirements.

B. The location of any pull box shall be approved by Architect and Owner before installation, unless said pull box is installed in an accessible above-ceiling space, or a dedicated mechanical or electrical room.

C. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.

D. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.

E. Provide knockout closures to cap unused knockout holes where blanks have been removed.

F. All outlet and device boxes shall be independently supported from structure.

G. Install electrical boxes only in accessible locations.

H. Orient all boxes for ease of accessibility. Install overhead boxes cover-down unless otherwise directed.

I. Coordinate all boxes with other trades.

1. Any box without a minimum 6" front clearance will be adjusted or reinstalled at Contractor's expense.
2. Any box installed such that access is effectively blocked by other trades shall be adjusted or reinstalled at Contractor's expense.

J. Secure electrical boxes firmly and rigidly to structure, or solidly embed electrical boxes in concrete or masonry.

K. Protect installed boxes from construction debris and damage.

L. All outside, above grade pull boxes shall be galvanized.

M. All flush mounted boxes, regardless of system or voltage, shall be installed flush within 1/8" of wall finish or finished face of tackboards, sound boards, cabinets, etc. Box extension or goof rings shall not be installed.

N. Boxes shall not be installed back-to-back.

O. Boxes within the same stud cavity shall be separated by a minimum of 12".

P. Boxes for flush mounting in concrete block:

1. Boxes for flush mounting in concrete block shall be provided covers with square corners on the raised portion of the cover.
2. Such covers shall be of sufficient depth to be flush with the face of the block.
3. The bottom side of the covers or boxes shall be installed at the masonry course nearest to the dimension specified or noted, but not more than applicable code.
4. Boxes installed in block walls shall be secured in place with mortar.
5. Boxes shall be flush with any combustible surface including black splash, tack board or sound board.

Q. Exterior Boxes:

1. Unless otherwise noted, exterior boxes on walls shall be installed flush with wall. Coordinate with masonry as required.
2. Provide suitable installation for each application, including face plate gaskets and corrosion resistant plugs and fasteners.

3.2 Boxes in Rated Partitions:

A. Maintain all fire and heat ratings by installing boxes in rated partitions according to a UL detail for an acceptable product. No UL rating detail shall be used prior to approval by Architect.
B. All boxes installed in rated walls shall be rigidly secured to structure.
C. All voids between boxes and surrounding wall surfaces shall be completely filled with an approved material.

3.3 Outlet Boxes:

A. Position recessed outlet boxes accurately to allow for surface finish thickness.
B. Set floor boxes level and flush with finish flooring material.
C. Outlet Box Accessories: Provide compatible outlet box accessories as required for installation, including:

1. box supports,
2. bonding accessories,
3. mounting ears and brackets,
4. wallboard hangers,
5. box extension rings,
6. fixture studs,
7. cable clamps, and
8. metal straps for supporting outlet boxes.

D. Rigidly support all outlet boxes from both sides, or from back, such that box cannot move or deflect into the wall when devices are installed or modified.

3.4 Identification:

A. Box lids and conduit couplings shall be color coded as follows:

1. 120/208V Wye: Black, with hand written white labels.
2. Fire Alarm: Red
3. Telecom: Blue
4. All others: Paint a unique color.
5. Exception: Coordinate color coding requirements with Architect and Owner where boxes are visible in public spaces.

B. Covers of all junction boxes, pull boxes, etc. shall be marked by circuit number using indelible ink, 3/4" minimum height. Locate marker so it can be readily identified without removal of the cover plate.

1. Exception: Where box covers are visible in public spaces, marker label shall be on the inside of the box cover.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 Related Documents:

A. Conform to Division 1 and other sections of this division.
B. This Section is a Division 26 Basic Electrical Materials and Methods section, and is part of each Division 26 section making reference to wiring devices specified herein.

1.2 Description of Work:

A. Extent of electrical identification work is indicated by drawings, schedules, and other specification sections.
B. Types of electrical identification work specified in this Section include the following:
    1. Equipment/System identification signs.
C. See other specification sections for additional identification requirements for specific equipment and system components. Where electrical system signage is called for elsewhere in the Contract Documents, but not described in detail, provide signage per the requirements of this section.

1.3 Submittals:

A. Submit in accordance with General, Supplementary, and Special Conditions.
B. Product Data: Submit manufacturer's data.

PART 2 - PRODUCTS

2.1 Electrical Identification Materials:

A. Engraved Plastic Laminate Signs:
    1. Provide engraving stock melamine plastic laminate, in sizes and thicknesses indicated.
    2. Engrave with engraver's standard letter style, of sizes and wording indicated.
    3. Default color shall be white face with black core plies, resulting in black letters on a field of white. Provide alternative colors as indicated on plans or in other specification sections.
    4. Signs for Fire Alarm warning systems shall be red face and white core plies, resulting in white letters on a field of red.
    5. Thickness: Minimum one-sixteenth inch (1/16"), except as otherwise indicated.
    6. Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate substrate.

2.2 Lettering and Graphics:

A. General: Coordinate names, abbreviations, and other designations used in electrical identification work with corresponding designations shown, specified or scheduled.
B. Provide numbers, lettering, and wording as indicated, or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.1 Application and Installation:

A. General Installation Requirements:

1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NEC.
2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Equipment/System Identification:

1. Provide engraved plastic laminate signs with text matching terminology and numbering of the contract documents. Provide signs for each unit of the following categories of electrical work:

    a. Panelboards,
    b. Electrical cabinets,
    c. Disconnect enclosures,
    d. Starters,
    e. Time clocks,
    f. Contactors,
    g. Access panels/doors to electrical facilities,
    h. Transformers,
    i. Terminal cabinets,
    j. Fire alarm control panels,
    k. Fire alarm extender panels,
    l. Access control system panels,
    m. Any other enclosure housing active components.

2. Unless otherwise noted, install signs and labels to maximize visibility and readability without interference with operation and maintenance of equipment.
3. All power junction box covers shall be marked with panel name and circuit numbers. All other (Fire Alarm, intercom, etc.) junction box covers shall be marked according to system type. These markings shall be made with a permanent type marker.
4. Panel schedules shall be typed, and shall indicate room numbers and load information.
5. Above ceiling identification: to electrical equipment installed above finished ceiling, identification shall be placed:

    a. on access panel,
    b. next to access panel, or
    c. on to a permanent part of the ceiling system, such as a tee-bar of a lay-in type ceiling.

6. Secure all labels and signs to substrate with approved fasteners, unless fasteners would violate listings or create an unsafe condition. Where fasteners cannot be used, utilize approved permanent adhesive means of attachment.

END OF SECTION

SECTION 26 05 90
ELECTRICAL EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 This section is a Division 26 Basic Electrical Materials and Methods section, and is part of each Division 26 section making reference to or requiring excavation and backfill specified herein.

1.3 Existing Utilities: Any depicted underground utilities were taken from old drawings. The exact location of these utilities and irrigation branches and abandoned services are not known. Use extreme caution when excavating.

1.4 Refer to other Division 26 sections and/or drawings for specific requirements of the particular conduit system being installed. Where another Division 26 section or the drawings conflict with requirements of this section, the other Division 26 section or the drawings shall take precedence over the general requirements herein.

1.5 OSHA: Contractor employee worker protection for all trenching and excavation operations shall comply with 29 CFR 1926.650 Subpart P and all current OSHA requirements.

1.6 Trench Safety Act: Contractor shall comply with all requirements of Florida Statutes Chapter 553, including the requirement to provide a separate line item to identify the cost to comply on a per lineal foot of trench and per square foot of shoring.

PART 2 - PRODUCTS

2.1 Sand: Clean, hard, uncoated grains free from organic matter or other deleterious substances. Sand for backfill shall be of a grade equal to mortar sand.

2.2 Gravel: Clean, well graded hard stone or gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".

2.3 Earth: Fill free of clay, muck, stones, wood, roots or rubbish.

2.4 Identification Tape: See Electrical Identification specification.

PART 3 - EXECUTION

3.1 Ditching and Excavation: Shall be performed by hand wherever there is a possibility of encountering obstacles or any existing utility lines of any nature whatsoever. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavators within the limits of the building lines.

3.2 Bedding: Excavate to bottom grade of conduits to be installed, and shape bed of undisturbed earth to contour of conduit for a width of at least 50% of conduit diameter. If earth conditions necessitate excavation below grade of the conduit, such as due to the presence of clay, muck, or roots, subcut and bring bed up to proper elevation with clean, new sand (as described in paragraph 2.1), deposited in 6" layers and tamped. Notify Architect/Engineer if subcut exceeds 12", or if bed is of an unstable nature. In this case a 6" minimum layer of gravel will be required before sand bedding begins. Submit cost proposal if the earth conditions require subcut in excess of 12" or if gravel is required to achieve proper bedding.

3.3 Placing: Conduit shall be carefully handled into place. Avoid knocking loose soil from the banks of the trench into the conduit bed. Rig heavier sections with nylon slings in lieu of wire rope to avoid crushing or chipping.

3.4 Backfilling: Deposit clean new sand (as described in paragraph 2.1) to 6" above the conduit and tamp. Then deposit sand or earth carefully in 6" layers, maintaining adequate side support, especially on nonferrous conduit materials. Compact fill in 6" layers, using mechanical means, up to the top elevation of the conduit, and in 12" layers to rough or finish grade as required. Fine grade and restore surface to original condition.

3.5 Special: Excavations shall be installed and maintained in satisfactory condition during the progress of the work. Subsurface structures are to be constructed in adequately sized excavations. De-watering equipment shall be installed and properly maintained where required. Shoring shall be employed in the event of unstable soil condition, and in all cases where required by OSHA regulations and necessary to protect materials and personnel from injury.

3.6 Identification: Install identification tape directly above all underground conduit. See Electrical Identification specification.

3.7 Depth of Cover: Minimum cover for underground conduit is three feet unless indicated otherwise.

3.8 Existing Pavement: Where new conduit passes below existing streets, driveways, parking lots, or other paved areas, the pavement shall be saw cut. Backfill shall be compacted to 95% density and the pavement shall be patched to match existing pavement. Provide compaction tests and reports as required.

3.9 Landscape Restoration:

A. Lawn or Unpaved Areas: The soil shall be replaced according to the original profile. Compact the top 6" of subgrade and each 6" layer of backfill or fill material at 85% maximum density for cohesive soils and 90% relative density for cohesionless soils.

1. If additional soil is required, the Contractor shall supply weed free topsoil of a type to match existing topsoil.

B. Grass: Fine grade and solid sod with the type of grass to match the existing species and cultivar.

C. Landscape Maintenance: Contractor shall be responsible for watering and other grounds maintenance in the area of construction until the project is accepted.

END OF SECTION

SECTION 26 24 20
PANELBOARDS

PART 1 - GENERAL

1.1 Summary:

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for panelboards as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, the following:

1. Provide lighting and appliance panelboards as specified herein and where shown and scheduled on the Drawings.

1.2 Submittals:

A. General: See submittal procedures in Division 1.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Clearly indicate all variations and options proposed for installation.

C. Configuration: Submit panelboard configuration information, including the physical locations and connections of all active and conductive components.

D. Shop Drawings: Submit scaled shop drawings depicting the intended installation location for each panelboard, relevant clearance requirements, and all other equipment intended for installation nearby. Indicate all relevant dimensions, and document that installation is feasible as proposed.

E. Include panelboards in dimensioned electrical room shop drawings.

1.3 Operation and Maintenance:

A. Operation and Maintenance Data: Prior to substantial completion, submit operation and maintenance data for panelboards. Submit as indicated in Section 26 00 00 and Division 1.

1.4 Quality Assurance:

A. Qualifications:

1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of panelboards of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years.
2. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing panelboards similar in type and scope to that required for this Project and shall be approved by the manufacturer.
3. Documentation of qualifications, examples of past projects, and references, shall be provided to Owner and/or Engineer upon request, but are not required as part of the standard submittal procedure.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

1. Without limiting the generality of other requirements of this Section, all work specified herein shall conform to or exceed the applicable requirements of the following standards; provided, that wherever the provisions of said publications are in conflict with the requirements specified herein, the more stringent requirements shall apply:

    a. FS W-C-375.
    b. FS W-P-115 (Type I, Class 1).
    c. NEMA AB 1.
    d. NEMA PB 1.
    e. NEMA PB 1.1.
    f. NEC.
    g. UL 50.
    h. UL 67.
    i. UL 489.
    j. UL 924 (for emergency panels).

C. Pre-Installation Conference: Prior to commencing the installation, meet at the Project site to review the material selections, installation procedures, and coordination with other trades. Pre-installation conference shall include, but shall not be limited to, the Contractor, the Installer, manufacturer's representatives, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Architect.

D. Single Source Responsibility: Obtain panelboards and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer.

1.5 Delivery, Storage, and Handling:

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 Warranty:

A. General: See closeout procedures in Division 1.

B. Special Warranty: Submit a written warranty executed by the manufacturer, the Installer, and the Contractor, agreeing to repair or replace panelboards that fail in materials or workmanship within the specified warranty period.

1. Warranty Period: Warranty period shall be one year from the date of substantial completion.

PART 2 - PRODUCTS

2.1 Manufacturers:

A. Approved Manufacturers: All panelboard products shall be the produce of one of the following:

1. Square D (Schneider Electric)

2. ABB Panelboards (General Electric)
3. Cutler Hammer (Eaton)
4. Siemens

B. Basis of Design:

1. Items specified are to establish a standard of quality for design, function, materials, and appearance.
2. Equivalent products by other manufacturers are acceptable.
3. The Design Professional will be the sole judge of the basis of what is equivalent.
4. Any adjustments required to meet equivalency requirements shall be at Contractor's expense.
5. See Drawings for schedules indicating additional Basis of Design information.

2.2 Materials and Components:

A. General:

1. Minimum voltage rating shall be for the voltage indicated and scheduled on the Drawings.
2. Minimum per-phase continuous current ratings shall be as indicated and scheduled on the Drawings.
3. Minimum neutral continuous current ratings shall be as indicated and scheduled on the Drawings.
4. Minimum short circuit current rating shall be as indicated and scheduled on the Drawings, in RMS symmetrical amperes at the AC voltage indicated for the panelboard.
5. Enclosure NEMA rating shall be as indicated and scheduled on the Drawings.
6. Panelboards shall be suitable for use as service equipment when application requirements comply with UL 67 and NEC Article 230.

B. Feeder Connection(s):

1. Interiors shall be field convertible for top or bottom incoming feed.
2. Main circuit breakers shall be vertically mounted.
3. Sub-feed circuit breakers shall be vertically mounted.
4. Main lug interiors up to 400 amperes shall be field convertible to main circuit breaker.

C. Buses:

1. Provide one continuous bus bar per phase.
2. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers.
3. The busing shall be fully rated.
4. Busing shall be plated copper.
5. Bus bar plating shall run the entire length of the bus bar.
6. Solid neutral(s) shall be plated and located in the mains compartment up to 225 amperes so incoming neutral cable may be of the same length.
7. Interior phase bus shall be pre-drilled to accommodate field installable options (i.e., sub-feed lugs, sub-feed circuit breakers, thru-feed lugs, etc.).

D. Circuit Breakers:

1. Circuit breakers shall be UL-listed with amperage ratings, interrupting ratings, and number of poles as indicated and scheduled on the Drawings.

2. Two-pole and three-pole circuit breakers shall have common tripping of all poles. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that shall allow the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
3. Circuit breakers shall have an overcenter, trip-free, toggle mechanism which shall provide quick-make, quick-break contact action.
4. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole.
5. Main circuit breaker thermal elements shall be true rms sensing and shall be factory calibrated to operate in a 40°C ambient environment.
6. Circuit breaker handle and faceplate shall indicate rated ampacity.
7. Standard construction circuit breakers shall be UL-listed for reverse connection without restrictive line or load markings.
8. Circuit breaker escutcheon shall have international I/O markings, in addition to standard on/off markings.
9. Circuit breaker handle accessories shall provide provisions for locking handle in the on or off position.
10. Circuit breakers shall be UL-listed for use with the following accessories, and shall be provided such accessories as indicated and scheduled on the Drawings:
    a. Shunt trip.
    b. Under voltage trip.
    c. Ground fault shunt trip.
    d. Auxiliary switch.
    e. Alarm switch.
    f. Compression lug kits.
11. The exposed faceplates of branch circuit breakers shall be flush with one another.
12. Molded case branch circuit breakers shall have bolt-on type bus connectors.
13. Breaker shall be UL Listed with the following ratings: (15-125A) Heating, Air Conditioning, and Refrigeration (HACR), (15-30A) High Intensity Discharge (HID), (15-20A) Switch Duty (SWD), (15-50A) Equipment Protection Device (EPD) (480Y/277Vac maximum).

E. Enclosures:

1. Type 1 Boxes:
    a. Boxes shall be hot-dip zinc galvanized steel constructed in accordance with UL 50 requirements. Unpainted galvannealed steel is not acceptable.
    b. Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
    c. Boxes in fire and/or temperature rated walls shall be provided with a listed mat or wrap installed per an applicable UL detail. 3M Interam Endothermic Mat or equal.
2. Type 1 Fronts:
    a. Front shall meet strength and rigidity requirements per UL 50 standards.
    b. Front shall have grey enamel electrodeposited over cleaned phosphatized steel.

c. Fronts shall be hinged one-piece with door, or door-in-door.
d. Mounting shall be flush or surface as indicated and scheduled on the Drawings.
e. Panelboards shall have mono-flat fronts with concealed door hinges and mounted with trim screws.
f. Front shall not be removable with the door locked.
g. Doors on front shall have rounded corners and edges shall be free of burrs.
h. Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull.
i. Lock assemblies shall be keyed alike.
j. One key shall be provided with each lock.
k. A clear plastic directory cardholder shall be mounted on the inside of door.

F. Grounding:

1. A solidly bonded copper equipment ground bar shall be provided.

G. Identification:

1. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL-listed label, and short circuit current rating shall be displayed on the interior or in a booklet format.

H. Safety:

1. Current carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
2. Interior trim shall be of deadfront construction to shield user from energized parts. Deadfront trim shall have filler plates covering unused mounting spaces.

I. Miscellaneous:

1. Interior leveling provisions shall be provided for flush-mounted applications.
2. The entire panelboard shall be listed as a system, including all breakers, buses, enclosure, cover, etc.
3. Lugs shall be UL-listed to accept solid or stranded copper conductors.
4. Lugs shall be suitable for 90°C rated wire, sized according to the 75°C temperature rating per NEC Table 310-15(B)(16). Branch circuit breakers rated 30 amperes and below may be UL-listed to accept 60°C rated wire.
5. Lug body shall be bolted in place. Snap-in designs are not acceptable.

2.3 Arc Energy Protection:

A. All circuit breakers set, or capable of being set, to 1200A or higher continuous trip rating shall be provided with arc energy reduction and documentation in accordance with NEC 240.87.
B. Provide documentation to relevant parties with location of all such circuit breakers.
C. Each such circuit breaker shall be LSIG-type unless specifically indicated otherwise.
D. Provide one of the following for each such circuit breaker:

1. Zone-selective interlocking,
2. Differential relaying,
3. Energy-reducing maintenance switching with local status indicated,
4. Energy-reducing active arc flash mitigation system

5. An approved equivalent means, approved in writing by Engineer, Owner, and AHJ.

PART 3 - EXECUTION

3.1 Examination:

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 Installation:

A. General: Install panelboards and accessories in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.

1. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1, and NEC standards.
2. Install and configure software in accordance with manufacturer's written instructions.

B. Labeling:

1. Provide accurate, printed panelboard directories prior to substantial completion. Directory shall account for all addenda, field orders, and field modifications.
2. Provide engraved laminated melamine label for equipment, in accordance with specification section 26 05 53 Electrical Identification.
3. Permanently label all adjustable trip circuit breakers with the designed trip ratings. Provide engraved laminated melamine label with this information, in accordance with specification section 26 05 53 Electrical Identification.

3.3 Field Quality Control:

A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.
B. Measure steady state load currents at each panelboard feeder. Rearrange circuits in the panelboard to balance the phase loads within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
C. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

3.4 Demonstration:

A. Provide the services of a factory-authorized service representative of the manufacturer to provide start-up service and to demonstrate and train the Owner's personnel.

1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
2. Train the Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in operation and maintenance manuals with the Owner's personnel.
4. Schedule training with the Owner, through the Architect, with at least seven day's advanced notice.
5. Provide at least two hours of training for equipment covered by this section.

3.5 Protection:

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the panelboards shall be without damage at time of Substantial Completion.

END OF SECTION

SECTION 26 27 26
GENERAL WIRING DEVICES

PART 1 - GENERAL

1.1 Related Documents:

A. Conform to Division 1 and other sections of this division.
B. This Section is a general Division 26 materials and methods section, and applies to all other Division 26 sections involving materials and methods specified herein.

1.2 Description of Work:

A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.
B. Types of electrical wiring devices in this Section include the following:

1. Receptacles
2. Ground Fault Circuit Interrupters
3. Switches
4. Wall Plates
5. Timers
6. Time Clocks
7. Photocells

1.3 Codes and Standards:

A. NEC Compliance: Comply with NEC as applicable to installation and wiring of electrical wiring devices.
B. UL Compliance: Comply with applicable requirements of UL 20, 486A, 498, and 943 pertaining to installation of wiring devices. Provide wiring devices which are UL listed and UL-labeled.

1.4 Submittals:

A. Submit in accordance with General, Supplementary, and Special Conditions.
B. Product Data: Submit manufacturer's data on electrical wiring devices.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

A. Manufacturers: Subject to compliance with requirements, manufacturers providing wiring devices which may be incorporated in the work include, but are not limited to, the following (for each type and rating of wiring device):

1. Hubbell, Inc.
2. Leviton Manufacturing Co., Inc.
3. Intermatic
4. Tork

2.2 Fabricated Wiring Devices:

A. General: Provide factory fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds. Pub/No. WD.

1. Normal Power: Provide white color devices except as otherwise indicated.

B. Receptacles:

1. Duplex Receptacles shall be 20A, 120V tamper resistant specification grade, with back and/or side wiring connections. BOD: Leviton G5362 or equivalent.
2. Weatherproof: All receptacles marked 'WP' on plans shall be weatherproof-type, and shall be marked 'WP'. Such receptacles shall also be GFCI type unless otherwise indicated.
3. GFCI: All receptacles marked 'G' or 'WP' on plans shall be GFCI type, self testing, conforming to current UL requirements. Base model shall be Leviton G5362-WTW or equivalent.
4. USB: Provide device with two 20A NEMA 5-20R, one USB-C and one USB-A. Where such a receptacle is required to be GFCI protected, provide GFCI circuit breaker.

C. Switches:

1. Snap: Provide toggle switches, rated 20 amps at 120/277 volts, quiet type, UL l without derating for tungsten lamp loads or inductive loads. The following catalog numbers are Leviton. "Slim" series (e.g. 1221S) are forbidden.

Type	**Catalog No.**
Single Pole	1221
Two Pole	1222

D. Time Clocks:

1. Provide 120/277V 365-day digital astronomical time clock. Basis of Design: Intermatic ET2725C (ET2725CR for damp or wet locations)

E. Photocell:

1. Intermatic EK4236S, or equal by Tork.

F. Lighting Contactor:

1. Enclosed, 30A, 8 pole, Class 8903, by Square D or equal. Provide integral Hand-Off-Auto (HOA) switch.

2.3 Wiring Device Accessories:

A. Wall Plates:

1. Unless otherwise indicated, wall plate material shall be as follows:

   a. Interior finished spaces: Nylon.
   b. Interior unfished spaces: Galvanized.
   c. Exterior: Cover as part of weatherproof assembly.

2. Provide commercial specification grade wall plates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as indicated. Select plates which mate and match wiring devices. Construct with metal screws for securing plates to devices: screw heads to match finish of plates.

PART 3 - EXECUTION

3.1 Installation of Wiring Devices:

A. Install wiring devices as indicated, in accordance with manufacturer's written

instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.
C. Install wiring devices after wiring work is completed and inspected.
D. Install wall plates after painting work is completed.
E. Rear wire all wiring device connections. Side terminations are forbidden.
F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B. Use properly scaled torque indicating hand tool.
G. Orient all receptacles with the ground pin up, except:

1. Where receptacle serves equipment which may have a 90° plug, orient receptacle ground pin down.
2. Orient horizontally installed receptacles (e.g. receptacles in surface raceway) with the neutral pin up.

3.2 Protection of Wallplates and Receptacles:

A. At time of substantial completion, replace any wall plates and/or receptacles which have been damaged during construction, including those burned and scored by faulty plugs.

3.3 Grounding:

A. Provide equipment grounding connections for all wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds. Grounding conductor shall be bonded to all boxes with a separate screw. Screws used to support boxes are not to be used for grounding. Bonding screws shall be installed in box during rough-in installation. Bonding screws shall be green hexagonal type.

3.4 Identification:

A. Switches: Each light switch shall be marked by circuit number using a numbered vinyl cloth adhesive marker, 1/4" minimum height. Locate marker behind cover plate so it can be readily identified by removal of the cover plate. Thomas and Betts E-Z Code Markers are acceptable.
B. Receptacles: Each receptacle shall be marked by circuit number using a numbered vinyl cloth adhesive marker, 1/4" minimum height. Locate marker behind cover plate so it can be readily identified by removal of the cover plate. Thomas and Betts E-Z Code Markers are acceptable.

3.5 Testing:

A. Prior to energizing circuitry, test wiring for electrical continuity, and for short circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements.

END OF SECTION

SECTION 26 28 16
DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 Summary:

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for safety switches as required for the complete performance of the work, and as shown on the drawings and as herein specified.

B. Section Includes: the work specified in this section includes, but shall not be limited to, the following:

1. Switches shall be furnished and installed at locations as shown on the drawings. Switches shall be of the type approved, indicated, and specified herein.

1.2 Submittals:

A. General: See submittal procedures in Division 1.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the drawings and specifications. Clearly indicate all variations and options proposed for installation.

C. Shop Drawings: Submit scaled shop drawings depicting the intended installation location for each safety switch, relevant clearance requirements, and all other equipment intended for installation nearby. Indicate all relevant dimensions, and document that installation is feasible as proposed.

D. Include safety switches in dimensioned electrical room shop drawings.

1.3 Operation and Maintenance:

A. Operation and Maintenance Data: Prior to substantial completion, submit operation and maintenance data for safety switches. Submit as indicated in Section 26 00 00 and Division 1.

1.4 Quality Assurance:

A. Qualifications:

1. Manufacturer qualifications: Manufacturer shall be a firm engaged in the manufacture of safety switches of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years.
2. Installer qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing safety switches similar in type and scope to that required for this project and shall be approved by the manufacturer.
3. Documentation of qualifications, examples of past projects, and references, shall be provided to owner and/or engineer upon request, but are not required as part of the standard submittal procedure.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of federal, state, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

1. Without limiting the generality of other requirements of this section, all work specified herein shall conform to or exceed the applicable requirements of the

following standards; provided, that wherever the provisions of said publications are in conflict with the requirements specified herein, the more stringent requirements shall apply:

a. Switches shall be manufactured in accordance with the following standards:

1. UL 98 - enclosed and dead front switches
2. NEMA KS 1 - enclosed switches
3. NEMA 250 - enclosures for electrical equipment

1.5 Delivery, Storage, and Handling:

A. Deliver materials to the project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.
B. Store materials in their original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 Warranty:

A. General: See closeout procedures in Division 1.
B. Special Warranty: Submit a written warranty executed by the manufacturer, the installer, and the contractor, agreeing to repair or replace safety switches that fail in materials or workmanship within the specified warranty period.

1. Warranty period: Warranty period shall be one year from the date of substantial completion.

1.7 Operation and Maintenance:

A. Operation and Maintenance Data: Prior to substantial completion, submit operation and maintenance data for light fixtures. Submit as indicated in Section 26 00 00 and Division 1.

PART 2 - PRODUCTS

2.1 Manufacturers:

A. Approved Manufacturers: All safety switch products shall be the produce of one of the following:

1. Square D (Schneider Electric)
2. Bussmann (Eaton)
3. General Electric
4. Siemens

B. Basis of Design:

1. Items specified are to establish a standard of quality for design, function, materials, and appearance.
2. Equivalent products by other manufacturers are acceptable.
3. The design professional will be the sole judge of the basis of what is equivalent.
4. Any adjustments required to meet equivalency requirements shall be at contractor's expense.
5. See drawings for additional basis of design information.

2.2 Materials and Components:

A. General:

1. Minimum voltage rating shall be for the voltage indicated and scheduled on the drawings.
2. Minimum horsepower ratings shall be as indicated and scheduled on the drawings.
3. Minimum per-phase continuous current ratings shall be as indicated and scheduled on the drawings.
4. Fuses shall be provided as indicated on the drawings. Fuse clip current rating shall match equipment rating. Fuse current ratings shall be as indicated and scheduled on the drawings.
5. Minimum neutral continuous current ratings shall be as indicated and scheduled on the drawings.
6. Minimum short circuit current rating shall be as indicated and scheduled on the drawings, in RMS symmetrical amperes at the AC voltage indicated for the safety switch.
7. Enclosure NEMA rating shall be as indicated and scheduled on the drawings.
8. Safety switches shall be suitable for use as service equipment when application requirements comply with UL 67 and NEC articles 230.

B. Switch Interior:

1. All switches shall have switch blades which are visible when the switch is off and the cover is open.
2. Lugs shall be front removable and UL listed for 75°C conductors.
3. All current carrying parts shall be plated to resist corrosion.
4. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.
5. Switches shall have provisions for a field installable electrical interlock.

C. Grounding:

1. A solidly bonded copper equipment ground bar shall be provided.

D. Identification:

1. Nameplates shall contain product information and catalog number or factory order number. UL-listed label, and short circuit current rating shall be displayed on the interior.

E. Switch Mechanism:

1. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
2. The operating handle shall be an integral part of the box, not the cover.
3. Provisions for padlocking the switch in the off position with a padlock shall be provided.
4. The handle position shall travel at least 90° between off and on positions to clearly distinguish and indicate handle position.
5. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is on and prevent turning the switch on when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the

interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

F. Switch Enclosure:

1. General:

a. All switches shall have provisions to accept up to three 3/8 in hasp padlocks to lock the operating handle in the off position.
b. The enclosure shall have on and off markings stamped into the cover.
c. The operating handle shall be provided with a dual colored, red/black position indication.

2. Type 1:

a. Type 1 switch covers shall be attached with welded pin-type hinges.
b. Type 1 enclosures shall be finished with grey baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel.
c. Type 1 enclosures for switches rated 30-200A shall be provided with tangential knockouts to facilitate ease of conduit entry.

3. Type 3R:

a. NEMA 3R switch covers shall be top hinged, attached with removable screws and securable in the open position (type 3R).
b. Type 3R enclosures shall be finished with grey baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel.
c. Type 3R enclosures for switches rated 30-200A shall be provided with tangential knockouts to facilitate ease of conduit entry.
d. Type 3R enclosures through 200 ampere shall have provisions for interchangeable bolt-on hubs in the top endwall.

PART 3 - EXECUTION

3.1 Examination:

A. Verification of Conditions: examine areas and conditions under which the work is to be installed, and notify the contractor in writing, with a copy to the owner and the architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the installer.

3.2 Installation:

A. General: install safety switches and accessories in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the drawings.

1. Install safety switches in accordance with manufacturer's written instructions, NEMA PB 1.1, and NEC standards.
2. Install and configure software in accordance with manufacturer's written instructions.

3.3 Field Quality Control:

A. Inspect complete installation for physical damage, proper alignment, anchorage, and

grounding.

B. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

3.4 Demonstration:

A. Provide start-up service and train the owner's personnel.

1. Train the owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.
2. Review data in operation and maintenance manuals with the owner's personnel.
3. Schedule training with the owner, through the architect, with at least seven day's advanced notice.
4. Provide at least one hour of training for equipment covered by this section.

3.5 Protection:

A. Provide final protection and maintain conditions in a manner acceptable to the installer, that shall ensure that the safety switches shall be without damage at time of substantial completion.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 Summary:

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for interior lighting as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, the following:

1. Provide interior lighting fixtures as specified herein and where shown and scheduled on the Drawings.
2. Provide all necessary accessories and appurtenances as required for a functional installation of the interior lighting system.

1.2 Submittals:

A. General: See submittal procedures in Division 1.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Clearly indicate all variations and options proposed for installation.

1.3 Operation and Maintenance:

A. Operation and Maintenance Data: Prior to substantial completion, submit operation and maintenance data for light fixtures. Submit as indicated in Section 26 00 00 and Division 1.

1.4 Quality Control:

A. Qualifications:

1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of light fixtures of types, sizes, and performance required, and whose products have been in satisfactory use in similar service for a minimum of five years.
2. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing light fixtures similar in type and scope to that required for this Project and shall be approved by the manufacturer.
3. Documentation of qualifications, examples of past projects, and references, shall be provided to Owner and/or Engineer upon request, but are not required as part of the standard submittal procedure.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

1. Without limiting the generality of other requirements of this Section, all work specified herein shall conform to or exceed the applicable requirements of the following standards; provided, that wherever the provisions of said publications are in conflict with the requirements specified herein, the more stringent

requirements shall apply:

a. NFPA 70, National Electrical Code
b. ANSI/UL 1598-08 NMX-J-307/1-ANCE/C22.2 NO.250.0-08, Luminaires
c. ANSI/UL 8750-2015 - Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products
d. UL 924 10th Edition - Standard for Emergency Lighting and Power Equipment

C. Pre-Installation Conference: Prior to commencing the installation, meet at the Project site to review the material selections, installation procedures, and coordination with other trades. Pre-installation conference shall include, but shall not be limited to, the Contractor, the Installer, manufacturer's representatives, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Architect.

D. Single Source Responsibility: Obtain each type of light fixture and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer. This is not meant as a requirement that all light fixtures come from a single source. All parts and accessories for each individual light fixture shall meet this requirement.

1.5 Delivery, Storage, and Handling:

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 Warranty:

A. General: See closeout procedures in Division 1.

B. Special Warranty: Submit a written warranty executed by the manufacturer, the Installer, and the Contractor, agreeing to repair or replace light fixtures that fail in materials or workmanship within the specified warranty period.

1. Warranty Period: Warranty period shall be one year from the date of substantial completion.

C. Provide additional Manufacturer's warranty information, as applicable.

PART 2 - PRODUCTS

2.1 Manufacturers:

A. Basis of Design:

1. Items specified are to establish a standard of quality for design, function, materials, and appearance.
2. Unless specifically noted otherwise, all Basis of Design light fixtures are open to submission of equivalent products.
3. The Design Professional will be the sole judge of the basis of what is equivalent.
4. Equivalency will be decided on quality, performance, aesthetics, and

maintainability.

5. Owner will be given the opportunity to reject specific manufacturers of equivalent materials based on negative past experience.
6. Any adjustments required to meet equivalency requirements shall be at Contractor's expense.
7. See Drawings for schedules indicating additional Basis of Design information.

2.2 Materials and Components:

A. General:

1. Color temperature shall be as indicated on the Light Fixture Schedule.
2. Luminous output shall be as indicated on the Light Fixture Schedule. Alternate fixtures within 5% do not require justification.
3. Fixture or lamp life rating in hours shall be per the Basis of Design. Life rating for LED fixtures shall be to 70% or 90% intensity per the Basis of Design.
4. CRI shall be per the Basis of Design.
5. Where not specified elsewhere, Color Rendering Index (CRI) [Ra] ≥ 80.
6. R9 value shall be per the Basis of Design. (Note: R9 is a color rendering criterion providing additional information beyond CRI.)
7. Where not specified elsewhere, R9 value shall be positive.
8. TM-30 data shall be comparable to the Basis of Design, as determined by the Design Professional. (Note: TM-30 are color rendering criteria providing additional information beyond CRI.)
9. Where not specified elsewhere, TM-30 ratings: 'Rf≥75, Rg≥95, and Rcs,h1≥-8%.
10. Minimum rated life shall be comparable to Basis of Design, as determined by the Design Professional.
11. Where not specified elsewhere, minimum rated life shall be 68,000 hours at L70.
12. Materials (steel, aluminum, acrylic, polycarbonate, etc.) shall be per the basis of design.
13. Environmental ratings shall be per the Basis of Design.
14. Additional considerations shall be per notes on the Light Fixture Schedule and on the Drawings.
15. Confirm all finishes with Owner and Architect prior to ordering.

B. Environmental Considerations:

1. All exterior fixtures shall be indicated for use in wet locations, even where installed in damp or dry locations.
2. Interior fixtures subject to high humidity or moisture shall be suitable for use in wet locations. This includes light fixtures for showers.

C. Construction/Finish:

1. No visible welding, no plane-protruding screws, latches, springs, hooks, rivets or plastic supports viewed from the occupied (room) side are allowed.

D. Maintainability:

1. Power supplies/drivers/ballasts, LED arrays, boards or light engines shall be easily field replaceable using common hand tools (e.g., screwdrivers, pliers, etc.) and without uninstalling the luminaire.

E. Maintenance Materials:

1. Furnish extra materials that match products installed and that are packaged with

protective covering for storage and identified with labels describing contents.

a. Fixtures: One for every thirty of each type and rating installed. Furnish at least one spare fixture for any type of fixture with at least ten units being installed by this project.
b. Lamps: One for every ten of each type and rating installed, rounded up. Furnish at least one of each type.
c. Track Heads: One for every ten of each type and rating installed, rounded up. Furnish at least one spare head for any type of head with at least ten units being installed by this project.
d. Diffusers and Lenses: One for every twenty of each type and rating installed, rounded up. Furnish at least one of each type.
e. Globes and Guards: One for every thirty of each type and rating installed, rounded up. Furnish at least one of each type.

PART 3 - EXECUTION

3.1 Examination:

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
B. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 Temporary Lighting:

A. If approved by the Architect, use selected permanent luminaires for temporary lighting.
B. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.
C. Contractor is responsible for replacing any light fixtures damaged over the course of construction.

3.3 Installation:

A. Comply with NECA 1.
B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
C. Provide lamps in each luminaire.
D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
5. Fixtures larger than 24"x24" shall be supported by all four corners.
6. Fixtures 24"x24" and smaller shall be supported by two corners.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around

circumference of luminaire.
3. Trim ring flush with finished surface.
4. Do not use ceiling system as support for pendant luminaires.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Utilize back plates and/or other support methods were recommended by the manufacturer.
3. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Do not support fixture from gypsum board.
2. Support fixture from structure, as required by the assembly.
3. Install per manufacturer's recommendations.

H. Suspended Luminaire Support:

1. Provide architectural finish items (escutcheons, etc.) at all ceiling penetrations. Coordinate finish with Architect.
2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Coordinate method of suspension with Architect.
5. Do not use ceiling system as support for suspended luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.4 Identification:

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Electrical Identification".

3.5 Field Quality Control:

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and

inspections.

C. Prepare test and inspection reports.

3.6 Adjusting:

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.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

3.7 Protection:

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the light fixtures shall be without damage at time of Substantial Completion.

3.8 Cleaning:

A. Clean fixture surfaces of dirt, cement, plaster, and debris. Utilize cleansers compatible with fixture finishes and materials.

3.9 Training:

A. Provide up to four hours of training from a factory authorized-representative, up to two sessions.
B. Schedule training with Owner.
C. Provide DVD recording of all training sessions. Ensure that audio is clear and intelligible.

END OF SECTION

SECTION 26 56 00
SITE LIGHTING

PART 1 - GENERAL

1.1 Summary:

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for site lighting as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, the following:

1. Provide site lighting fixtures as specified herein and where shown and scheduled on the Drawings.
2. Provide all necessary accessories and appurtenances as required for a functional installation of the site lighting system.

1.2 Submittals:

A. General: See submittal procedures in Division 1.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Clearly indicate all variations and options proposed for installation. Show EPA compliance with FBC wind load protection requirements. Provide mounting details.

C. Photometric Calculations: If alternate fixtures are submitted, prior to purchase of fixtures provide site photometric calculations plan using approved industry-standard software, and submit the plan to Engineer of Record for approval.

1.3 Operation and Maintenance:

A. Operation and Maintenance Data: Prior to substantial completion, submit operation and maintenance data for light fixtures. Submit as indicated in Section 26 00 00 and Division 1.

1.4 Quality Control:

A. Qualifications:

1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of light fixtures of types, sizes, and performance required, and whose products have been in satisfactory use in similar service for a minimum of five years.
2. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing light fixtures similar in type and scope to that required for this Project and shall be approved by the manufacturer.
3. Documentation of qualifications, examples of past projects, and references, shall be provided to Owner and/or Engineer upon request, but are not required as part of the standard submittal procedure.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

1. Without limiting the generality of other requirements of this Section, all work specified herein shall conform to or exceed the applicable requirements of the following standards; provided, that wherever the provisions of said publications are in conflict with the requirements specified herein, the more stringent requirements shall apply:

    a. NFPA 70, National Electrical Code
    b. ANSI/UL 1598-08 NMX-J-307/1-ANCE/C22.2 NO.250.0-08, Luminaires
    c. ANSI/UL 8750-2015 - Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products
    d. UL 924 10th Edition - Standard for Emergency Lighting and Power Equipment

C. Pre-Installation Conference: Prior to commencing the installation, meet at the Project site to review the material selections, installation procedures, coordination with other trades and existing and finished site features to avoid conflicts. Pre-installation conference shall include, but shall not be limited to, the Contractor, the Installer, manufacturer's representatives, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Architect.

D. Single Source Responsibility: Obtain each type of light fixture and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer. This is not meant as a requirement that all light fixtures come from a single source. All parts and accessories for each individual light fixture shall meet this requirement.

1.5 Delivery, Storage, and Handling:

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 Warranty:

A. General: See closeout procedures in Division 1.

B. Special Warranty: Submit a written warranty executed by the manufacturer, the Installer, and the Contractor, agreeing to repair or replace light fixtures that fail in materials or workmanship within the specified warranty period.

    1. Warranty Period: Warranty period shall be one year from the date of substantial completion.

C. Provide additional Manufacturer's warranty information, as applicable.

PART 2 - PRODUCTS

2.1 Manufacturers:

A. Basis of Design:

    1. Items specified are to establish a standard of quality for design, function,

materials, and appearance.

2. Unless specifically noted otherwise, all Basis of Design light fixtures are open to submission of equivalent products.
3. The Design Professional will be the sole judge of the basis of what is equivalent.
4. Equivalency will be decided on quality, performance, aesthetics, and maintainability.
5. Owner will be given the opportunity to reject specific manufacturers of equivalent materials based on negative past experience.
6. Any adjustments required to meet equivalency requirements shall be at Contractor's expense.
7. See Drawings for schedules indicating additional Basis of Design information.
8. If proposing any alternate fixtures, contractor shall provide site photometric plans:
    a. Such photometric plans shall include all required calculations, including any local dark skies, light trespass, or other requirements.
    b. Photometric plans shall include calculation zones to match the Basis of Design photometric plans, to allow for easy comparison to the Basis of Design performance.
    c. Statistical photometric report shall be provided, including the following items for each zone: Maximum Illuminance, Minimum Illuminance, Average Illuminance, Maximum/Minimum Ratio, Average/Minimum Ratio.
    d. All results shall be in footcandles, calculated to at least two decimal places.
    e. Calculation point spacing shall match Basis of Design photometric plans. By default, exterior points shall be spaced in a 5’ by 5’ grid, except for pedestrian walking areas, which shall be spaced in a 2'x2' grid.

2.2 Materials and Components:

A. General:

1. Color temperature shall be as indicated on the Light Fixture Schedule.
2. Luminous output shall be as indicated on the Light Fixture Schedule. Alternate fixtures within 5% do not require justification.
3. Fixture or lamp life rating in hours shall be per the Basis of Design. Life rating for LED fixtures shall be to 70% or 90% intensity per the Basis of Design.
4. Minimum rated life shall be comparable to Basis of Design, as determined by the Design Professional.
5. Where not specified elsewhere, minimum rated life shall be 50,000 hours at L70.
6. Materials (steel, aluminum, acrylic, polycarbonate, etc.) shall be per the basis of design.
7. Environmental ratings shall be per the Basis of Design.
8. Additional considerations shall be per notes on the Light Fixture Schedule and on the Drawings.
9. Confirm all finishes with Owner and Architect prior to ordering. Engineering review or approval of product-data submittals does not relieve the contractor from obligation to confirm finishes and obtain approval from the Architect.

B. Environmental Considerations:

1. All fixtures shall be listed for use in Wet Locations by a Nationally Recognized Testing Laboratory (NRTL), such as UL and ETL.
2. All components in contact with environment including screws shall be made of rust-proof materials.

3. Site lighting fixtures shall be rated for -5°F to 104°F operation.
4. Fixtures shall have IP rating suitable for the required level of water, impact, and dust protection.
5. Effective Projected Area (EPA) of the fixtures mounted on poles shall be selected for Ultimate Design Wind Speed for Risk Category II per figure 1609.3(1) of the Florida Building Code.

C. Construction/Finish:

1. No visible welding, no plane-protruding screws, latches, springs, hooks, rivets or plastic supports viewed from the occupied (room) side are allowed.
2. All housing finishes must be baked-on enamel, anodized, or powder-coated, unless otherwise specified.
3. Luminaire optical enclosures (lens/window) shall be constructed of clear and UV-resistant polycarbonate, or acrylic. Only impact-resistant polycarbonate shall be utilized in fixtures below 10' AFG.

D. Maintainability:

1. Power supplies/drivers/ballasts, LED arrays, boards or light engines shall be easily field replaceable using common hand tools (e.g., screwdrivers, pliers, etc.) and without uninstalling the luminaire.

E. Maintenance Materials:

1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    a. Fixtures: One for every thirty of each type and rating installed. Furnish at least one spare fixture for any type of fixture with at least ten units being installed by this project.
    b. Lamps: One for every ten of each type and rating installed, rounded up. Furnish at least one of each type.
    c. Diffusers and Lenses: One for every twenty of each type and rating installed, rounded up. Furnish at least one of each type.
    d. Globes and Guards: One for every thirty of each type and rating installed, rounded up. Furnish at least one of each type.

F. Emergency Egress Application:

1. Site lighting that is installed in locations that the local authority has determined to be part of an outdoor path of egress shall meet applicable emergency requirements.
2. Emergency lighting provisions shall be provided at the nearest fixture within 10' of an exit door (as indicated by exit signage on plans), regardless of whether such are indicated as emergency fixtures on lighting plans.
3. Emergency fixtures shall be suitable for standby and operation in the 50-year extreme minimum temperature for the local, as reported by ASHRAE. Provide heated batteries, etc., as required. (See www.ashrae-meteo.info, or consult with mechanical contractor for additional information.)

PART 3 - EXECUTION

3.1 Examination:

A. Verification of Conditions: Examine areas and conditions under which the work is to

be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

B. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 Installation:

A. Comply with NECA 1.
B. Install fixtures level, plumb, and square on poles.
C. Provide lamps if needed in each luminaire.
D. Supports:

1. Attachment to poles shall be sized and rated to support fixture's weight and withstand wind load per FBC.
2. Supporting and securing means shall maintain fixture's position after cleaning, and relamping where applicable.

E. Pole-Mounted Luminaire Support:

1. Provide poles as indicated on plans and in pole specification.

F. Deviations in Fixture locations:

1. Where deviations from shown fixture locations are required due to field conditions or other requirements, provide dimensioned shop drawings showing distances to curbs and site features for proposed new location of the fixture. Provide photometrics calculations and plans for Engineer's review in accordance with subsection 2.1(A)(8) above.

3.3 Control:

A. Site lighting fixtures shall all be controlled by integral photocell and integral security dimming in afterhours to 50% output for 7 hours.
B. Timers where specified shall be furnished with integral manual override control. See plans for location of timers, contactor and contactor requirements.

3.4 Identification:

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 Electrical Identification.

3.5 Field Quality Control:

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.
C. Prepare test and inspection reports.

3.6 Adjusting:

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.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

3.7 Protection:

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the light fixtures shall be without damage at time of Substantial Completion.

3.8 Cleaning:

A. Clean fixture surfaces of dirt, cement, plaster, and debris. Utilize cleansers compatible with fixture finishes and materials.

END OF SECTION

SECTION 26 56 13
LIGHT POLES AND STANDARDS

PART 1 - GENERAL

1.1 Related Documents:

A. Drawings and general provisions of the Contract, including General Conditions, Division 1 General Requirements, Section 26 00 00 Electrical General, and other applicable specification sections in the Project Manual apply to the work specified in this Section.

1.2 Summary:

A. Scope: Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation as required for the complete performance of the work, and as shown on the Drawings and as herein specified for the following:

1. Steel poles
2. Aluminum poles
3. Concrete poles
4. Anchorage
5. Fixture attachments
6. Concrete in-grade bases

1.3 References:

A. Steel: Supply material complying with the most recent revision of the following standards:

1. Cold-formed Welded or Seamless Carbon Steel Tubing ASTM A500
2. Metal Finishes “NAAMM Metal Finishes Manual”

B. Aluminum: Supply material complying with the most recent revision of the following standards:

1. Seamless Extruded Structural Tubing ASTM B429
2. Metal Finishes “NAAMM Metal Finishes Manual”

C. Concrete and prestressed concrete: Supply material complying with the most recent revision of the following ASTM standards:

1. Portland Cement ASTM C105
2. Admixtures ASTM C494
3. Aggregates ASTM C33 of C330
4. Reinforcing Bars ASTM A615
5. Cold Drawn Spiral Wire ASTM A82
6. Pre-stressing Strand 270K ASTM A

D. General:

1.4 Description of Work:

A. Furnish and install light poles as shown on the plans. The term, " Light Poles" means the complete assemblage of poles, including storing, parts, anchors, bases, excavation, backfill, electrical connections, and miscellaneous components to erect

and install the poles as shown on the plans and in accordance with these specifications.

B. Install light fixtures on poles as specified on drawings and in Site Lighting specifications.

1.5 Submittals:

A. General: See Division 1 General Requirements and Section 26 00 00 Electrical General.

B. Product Data: Prior to purchasing or manufacturing poles, submit product data for Engineer's approval showing proposed products. Submit sufficient information to determine compliance with the Drawings and Specifications, including, but not limited to, the following:

1. Pole dimensions.
2. Concrete strength information.
3. Any openings, raceways, and accessories.
4. Total weight and center of gravity of each pole.
5. Calculations of cracking and ultimate moment capacities at maximum 5 ft. intervals.
6. Dunnage and pickup points, including both one-point and two-point pickup locations.
7. Detail of cross section and all points where reinforcing changes.
8. Details and data for required anchors and anchor bases and attachment means and methods.
9. Selected attachment means for light fixtures.
10. Wind load table from 100 mph to 200 mph for maximum allowed fixture EPA, prepared by the manufacturer or structural engineer.

C. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data, such as.

1. Direct burial depth and fill requirements as set by manufacturer recommendations.
2. Reinforced concrete base design for each type, prepared by civil or structural engineer for the proposed anchor base, and soil and site conditions.
3. Dimensioned location of poles on site where proposed locations differ from the plans.
4. Photometric calculations plan using industry standard software for if pole locations differ from the plans.
5. If proposing custom, non-standard fabricated concrete poles, prior to fabricating prepare and submit shop drawings and design calculations for the proposed pre-stressed concrete pole and fixture for approval prepared by a structural engineer.
6. If proposing custom, non-standard fabricated poles, prior to fabricating prepare and submit shop drawings and design calculations for wind load protection in accordance with FBC table 1603(1).

1.6 Quality Assurance:

A. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

1.7 Delivery, Storage, and Handling:

A. Support and protect poles during site storage, lifting, and setting, to prevent damage to the pole. Spalls or other damage incurred during these operations will be repaired to restore the pole to "as new" condition, at no expense to the Department.
B. Retain factory wrapping on poles until just before pole installation.

1.8 Warranty:

A. General: Submit warranty information in accordance with Division 1 General Requirements and Section 26 00 00 Electrical General.
B. Manufacturer's Warranty: Provide complete 12-month manufacturer's warranty.
C. Contractor's Warranty: Contractor shall provide 12-month warranty for all materials and labor not covered by Manufacturer's warranty. This warranty shall cover all materials and labor which deviate from the Manufacturer-defined normal functionality due to flaws or defects in materials, workmanship.

PART 2 - PRODUCTS.

2.1 Manufacturers:

Provide products by one of the following manufacturers:

A. Steel poles:

1. Gardco
2. Hapco
3. United Lighting Standards
4. Lithonia
5. Cooper

B. Aluminum poles:

1. Gardco
2. Hapco
3. United Lighting Standards
4. Lithonia
5. Cooper

C. Concrete poles:

1. Dura-Stress
2. StressCrete
3. Ameron
4. Seminole Poles

2.2 Poles, General:

A. Design:

1. Poles shall comply with AASHTO LTS, latest edition.
2. Wind-load strength shall be adequate for indicated height, burial, and ultimate wind speeds in accordance with
3. Steel poles shall be cold-rolled weldable grade steel tubing.
4. Aluminum poles shall be seamless extruded aluminum tube.
5. Concrete poles shall be prestressed, with compressive forces of 6000 psi at 28 days of curing.
6. Base of metal poles shall have cast or welded anchor flange for concrete base mounting.

7. Poles shall be factory furnished with handholes accessible from grade level. Handholes shall be listed for fuse placement, splicing, and grounding.
8. Poles shall have listed inner raceways for electrical circuit, and a separate raceway for lightning protection cable.

B. Shape and Length:

1. Shape and length of the pole including the mounting height of the fixture shall be as specified on the plans.
2. Cross dimensions of the pole shall be as minimally required to meet structural and wind load requirements for the type of pole.
3. Anchor base size and shape shall be as required for the structural integrity of the pole mounting.
4. Decorative bases shall be provided in shapes ad types as specified on the plans.
5. Concrete poles shall be square with chamfered edges.
6. Metal poles shall be square or round, not tapered, with rounded edges.
7. Tolerances and variations from nominal sizes shown in product data submittals shall not very more than 1/16”.

C. Finish:

1. Steel poles:

   a. Factory finishes shall be provided in satin, matte, or glossy finish and color to be chosen by the Architect.
   b. Interior surface shall be factory coated against rust and corrosion.
   c. Exterior coating shall be electrostatically applied powder coat with 2 mil minimum thickness.
   d. All poles on site shall be of same color unless noted otherwise on plans. If color between different manufacturers cannot be matched exactly, color shall be matched as closely as possible.
   e. Finish warranty shall be minimum 1 year.

2. Aluminum poles:

   a. Factory finishes shall be provided in satin, matte, or glossy finish and color to be chosen by the Architect.
   b. Coating shall be electrostatically applied powder coat with 2 mil minimum thickness.
   c. All poles on site shall be of same color unless noted otherwise on plans. If color between different manufacturers cannot be matched exactly, color shall be matched as closely as possible.
   d. Finish warranty shall be minimum 5 years.

3. Concrete poles:

   a. Finish shall be natural color of concrete aggregate blasted and then polished, furnished without stains.
   b. Alternate finishes as chosen by the Architect shall be either aggregate colors impregnated during concrete spinning or after the manufacture, pole shall be polished for final finish, and graffiti-resistant coating applied.

4. Defects in finishes may be repaired on site only upon authorization and using the prescribed method as directed by the manufacturer.

D. Anchorage:

1. Steel and Aluminum poles shall be furnished with factory anchorage including anchor bolts, bolt templates, hex nuts, washers, and cover. Bolt templates shall be steel or plywood.
2. Finishes shall match the pole finish.
3. Materials shall be galvanized, non corrosive. Cadmium plated materials shall not be used.
4. Concrete poles shall be direct buried in accordance with manufacturer's installation instructions, or in accordance with civil or structural engineer's recommendations for the load and forces acting on the pole. Minimum depth of burial shall be 6'-0" below grade. Provide shop drawings for review and approval before proceeding with work.

E. Fixture attachments shall be factory provided, either:

1. Open Top, or
2. Tenon to match the serving fixture, or
3. Drill mounting to match fixture requirements.

F. Concrete in-grade bases for anchoring of poles shall be:

1. Designed by a civil engineering or structural engineer for the required weight and acting forces to support the pole in the fixed place and plumb without deformations to the base or the pole.
2. Round, 18" diameter minimum and 36" deep minimum, with chamfered or rounded exposed edge.
3. Made of reinforced concrete.
4. Provided with anchor bolts required to support the pole.
5. Provided with rough-in for electrical circuits and grounding wire. Minimum, 1 incoming ¾"C, one outgoing ¾"c and one ¾"c for grounding wire.
6. Top of the concrete base shall be flat and plumb.

PART 3 - EXECUTION

3.1 General:

A. Install concrete bases in accordance with civil drawings
B. Install metal poles in accordance with manufacturer's instructions using factory provided anchors and bases.
C. Direct bury concrete poles in accordance with shop drawings.
D. All installation shall be plumb, firm and level. Use leveling nuts before tightening and securing to manufacturer's torque recommendations.
E. Use web-fabric slings to raise and set poles. Do not use chains or cables.
F. Cap off unused open tops of fixtures using factory caps.
G. Do not use aluminum in direct contact with concrete or earth.
H. When dissimilar metals are in contact (steel and aluminum for example), insulate the two materials using factory methods of either treatment or insulating fittings.
I. Install grounding conductor pigtails for electrical circuit in handhole.
J. Install fuses as recommended by manufacturer.
K. Where lightning protection is specified on plans or required by owner, provide grounding air terminal at the top of the pole connected to grounding rod installed next to the pole in accordance with Grounding and Bonding section. Route lightning protection cable in interior raceways of the pole to be furnished by manufacturer and dedicated for lightning protection.

L. Install lighting fixtures on poles in accordance with plans at specified mounting height, and in accordance with attachment method provided by manufacturer.
M. Erect poles and luminaires located near any overhead or underground utilities using established industry and utility practices. Consult with the appropriate utility company before beginning such work. Erect and align the concrete light poles and fixtures carefully. For fixture information see special specification "Pole Mounted Light Fixtures".
N. All fixtures shall be identified inside of hand hole cover with name of fixture, manufacturer, and model number. Where poles belong to an institution or governmental body, all new light poles shall receive a number assigned the institution or governmental body. Provide the marking tag on each pole as required.
O. Connect fixtures and poles for operation to electrical systema and test for operation and defects.
P. Repair defects and clean poles before turning over to owner.

END OF SECTION

SECTION 00 0107
SEALS PAGE

ARCHITECT:

JOE WALKER, AIA

FL ARCHITECTURAL LICENSE NO: AR0017272

RESPONSIBLE FOR DIVISIONS 01-14 SECTIONS EXCEPT WHERE INDICATED AS PREPARED BY OTHER DESIGN PROFESSIONALS OF RECORD.

STRUCTURAL ENGINEER:

MARK MILLER, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 45319

RESPONSIBLE FOR SECTIONS:

03 3000

03 6030

04 0500

04 2300

05 1200

05 2200

05 3300

31 2000

PLUMBING ENGINEER:

S. ANDREW MITCHELL, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 75609

RESPONSIBLE FOR DIVISION 22 SECTIONS

HVAC ENGINEER:

S. ANDREW MITCHELL, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 75609

RESPONSIBLE FOR DIVISION 23 SECTIONS

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY STEVEN ANDREW MITCHELL, PE, ON THE DATE ADJACENT TO THE SEAL. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

MITCHELL GULLEDGE ENGINEERING, INC. 204 SW 4TH AVE, GAINESVILLE, FL 32601, 352-745-3991 FL

Steven A Mitchell
2023.03.01 15:00:20 -05'00'

ELECTRICAL ENGINEER:

ANDREW P. MCCADDIN, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 83318

RESPONSIBLE FOR DIVISION 26 SECTIONS

END OF SECTION

SECTION 00 00 00
TABLE OF CONTENTS

END OF SECTION

SECTION 23 00 00
HVAC GENERAL

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Basic Mechanical Materials and Methods section. Provisions of this section apply to work of all Division 23 sections.

C. Review all other contract documents to be aware of conditions affecting work herein.

1.3 Definitions:

A. Provide: Furnish and install, complete and ready for intended use.

B. Furnish: Supply and deliver to project site, ready for subsequent requirements.

C. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.4 Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.5 Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions, or inaccuracies of the said data.

1.6 Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

1.7 Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be construed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.8 Field Measurements and Coordination:

A. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

B. Verify all field dimensions and locations of equipment to ensure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

C. Coordinate work in this division with all other trades in proper sequence to ensure that the total work is completed within contract time schedule and with a minimum cutting and patching.
D. Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.
E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings, and passageways. Cut no structural members without written approval.
F. Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.
G. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment, and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

1.9 Guarantee:

A. The Contractor shall guarantee labor, materials, and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.
B. Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.10 Approval Submittals:

A. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

1. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and the following.

a. Submittals shall be properly organized in accordance with the approved submittal control log.
b. Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
c. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number,

specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.

d. Submittals shall have been reviewed and approved by the Builder. Evidence of this review and approval shall be an “Approved” stamp with a signature and date on the cover sheet.

e. Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or valve type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.

f. The electrical design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

B. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

C. Review of shop drawings, product literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

D. Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations, and details to scale (not smaller than 1/4” per foot), with dimensions clearly showing the installation. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.11 Test Reports and Verification Submittals: Submit test reports, certifications, and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports, and take corrective action within the scheduled contract time.

1.12 O&M Data Submittals: Submit Operation and Maintenance (O&M) data as called for in other sections. When a copy of approval submittals is included in the O&M Manual, only the final “Approved” or “Approved as Noted” copy shall be used. Contractor shall

organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required and as described herein. Submit manuals at the Substantial Completion inspection.

PART 2 - PRODUCTS

2.1 All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

2.2 Equipment and Materials:

A. Shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

B. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings, and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated, or painted.

C. The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be in full view.

D. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

E. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

F. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

G. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material, and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

H. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.3 Requests for Substitution:

A. Where a particular system, product, or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product, or material specified.

B. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances:

1. Required product cannot be supplied in time for compliance with Contract time requirements.
2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted, or insured, or has other recognized disability as certified by Contractor.
3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation, and other necessary services and similar considerations.

C. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

1. Principal of operation.
2. Materials of construction or finishes.
3. Thickness of gauge of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other work caused by the substitution.
8. Performance curves.
9. If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

PART 3 - EXECUTION

3.1 Workmanship: All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

3.2 Coordination:

A. The Contractor shall be responsible for full coordination of the mechanical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls.

B. Any additional steel supports required for the installation of any mechanical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.

C. It shall be the Contractor's responsibility to see that all equipment such as valves, dampers, filters, and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

D. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

E. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

3.3 Start of work will be construed as acceptance of suitability of work of others.

3.4 Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

3.5 Phasing: Provide all required temporary valves, piping, ductwork, equipment, and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

3.6 Cutting and Patching: Notify Builder to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

3.7 Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts, and washers. Level equipment.

3.8 Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 23. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.9 Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials, and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

3.10 Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.11 Climate Control: Operate heating and cooling systems as required after initial startup to maintain temperature and humidity conditions to avoid freeze damage and warping or sagging of ceilings and carpet.

3.12 Record Drawings:

A. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.

B. Upon completion of the work, record drawings shall be prepared as described in the General Conditions and Supplementary Conditions.

3.13 Acceptance:

A. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.
B. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.
C. Operation and Maintenance Manuals: Furnish four complete manuals bound in ring binders with Table of Contents, organized, and tabbed by specification section. Manuals shall contain:

    1. Detailed operating instructions and instructions for making minor adjustments.
    2. Complete wiring and control diagrams.
    3. Routine maintenance operations.
    4. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
    5. Copies of approved submittals.
    6. Copies of all manufacturer's warranties.
    7. Copies of test reports and verification submittals.

D. Record Drawings: Submit record drawings.
E. Test and Balance Report: Submit four electronic certified copies. The Report shall be submitted for review prior to the Substantial Completion Inspection.
F. Acceptance will be made on the basis of tests and inspections of job. A representative of firm that performed test and balance work shall be in attendance to assist. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.
G. Control Diagrams: Provide laminated 11"x17" controls diagrams and sequences inside controls panel.

PROJECT NAME
PROJECT NUMBER

ARCHITECT: Company Name

ENGINEER: Mitchell Gulledge Engineering

CONTRACTOR: Contractor Name

SUBCONTRACTOR: Sub Name

SUPPLIER: Supply Company

MANUFACTURER: Manufacturer

DATE: mm/dd/yyyy

SECTION: 23 XX XX/Section Name

1. Product 1: Manufacturer, Model

2. Product 2: Manufacturer, Model

3. Product 3: Manufacturer, Model

4. Product 4: Manufacturer, Model

5. Product 5: Manufacturer, Model

SAMPLE

Any standard heading is acceptable.

List each product individually. Include manufacturer name and model.

Include GC or CM Approval stamp indicating review and acceptance by responsible contractor.

END OF SECTION

SECTION 23 05 01
HVAC CODES AND STANDARDS

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Basic Mechanical Materials and Methods section. Provisions of this section apply to work of all Division 23 sections.

1.3 Code Compliance:

A. All work under Division 23 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the Contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the Architect/Engineer's attention any drawings or specifications that are not in conformance with these or other codes prior to ordering equipment or installing work.

B. The following codes and standards shall govern all work:

1. Florida Building Code – Seventh Edition (2020)
2. Florida Building Code – Seventh Edition (2020) – Energy Conservation
3. Florida Building Code – Seventh Edition (2020) – Mechanical
4. Florida Building Code – Seventh Edition (2020) – Plumbing
5. Florida Building Code – Seventh Edition (2020) – Accessibility
6. National Electric Code (NFPA 70 – 2017)
7. Fire Alarm and Signaling Code (NFPA 72 – 2016)
8. Standard for Air Conditioning and Ventilating Systems (NFPA 90A – 2018)
9. Florida Fire Prevention Code Seventh Edition
    a. Fire Code (NFPA 1 – 2018)
    b. Life Safety Code (NFPA 101 – 2018)

1.4 Standards:

A. All mechanical materials, installation, and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:

1. Radiant Credit Union construction standards
2. Underwriters' Laboratories (UL)
3. American National Standards Institution (ANSI)
4. American Society of Testing Materials (ASTM)
5. National Fire Protection Association (NFPA)
6. National Electrical Manufacturers Association (NEMA)
7. Air Conditioning and Refrigeration Institute (ARI)
8. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

9. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
10. Air Movement and Control Association (AMCA)

PART 2 - PRODUCTS

2.1 None.

PART 3 - EXECUTION

3.1 Comply with regulations and codes of utility suppliers.

3.2 Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with code requirements when carrying out such work.

3.3 Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.

3.4 Additional codes or standards applying to a specific part of the work may be included in that section.

END OF SECTION

SECTION 23 05 02
HVAC RELATED WORK

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
B. This section is a Basic Mechanical Materials and Methods section. Provisions of this section apply to work of all Division 23 sections.
C. Review all other contract documents to be aware of conditions affecting work herein.

PART 2 - DIVISION 3 - CONCRETE

2.1 Refer to local building codes and owner construction standard as well as Division 3 - Concrete for:

A. Rough grouting in and around mechanical work.
B. Patching concrete cut to accommodate mechanical work.

2.2 The following is part of Division 23 work, complying with the following requirements of local building codes and owner construction standards as well as Division 3.

A. Curbs, foundations, and pads for mechanical equipment.

PART 3 - DIVISION 4 - MASONRY

3.1 Refer to local building codes and owner construction standard as well as Division 4 - Masonry for:

A. Installation of access doors in walls.

PART 4 - DIVISION 5 - METALS

4.1 Refer to local building codes and owner construction standards as well as Division 5, Metals for:

A. Framing openings for mechanical equipment.

4.2 Perform the following is part of Division 23 work, complying with local building codes and owner construction standards as well as Division 5.

A. Supports for mechanical work.

PART 5 - DIVISION 6 - WOOD AND PLASTIC

5.1 Refer to local building codes and owner construction standard as well as Division 6 - Wood for:

A. Framing openings for mechanical equipment.

PART 6 - DIVISION 7 - THERMAL AND MOISTURE PROTECTION

6.1 Refer to local building codes and owner construction standard as well as Division 7 – Thermal and Moisture Protection for:

A. Installation of all roof curbs and roof supports for mechanical work.
B. Caulking and waterproofing of all wall and roof mounted mechanical work.
C. Providing all roof curbs.

6.2 Perform the following is part of Division-23 work, complying with local building codes and owner construction standards as well as Division 7 - Thermal and Moisture Protection:

A. Fire barrier penetration seals.

PART 7 - DIVISION 8 - DOORS AND WINDOWS

7.1 Refer to local building codes and owner construction standard as well as Division 8 – Doors and Windows for:

A. Installation of all door grilles.
B. Providing all undercuts.

PART 8 - DIVISION 9 - FINISHES

8.1 Refer to local building codes and owner construction standard as well as Division 9 - Finishes for:

A. Painting exposed ductwork, piping, and equipment.
B. Painting structural metal and concrete for mechanical work.
C. Painting door grilles and access panels.
D. Painting color-coded mechanical work indicated for continuous painting.
E. Installation of access doors in gypsum drywall.

8.2 Colors shall be selected by the Architect for all painting of exposed mechanical work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.

8.3 Perform the following is part of Division-23 work, complying with local building codes and owner construction standards as well as Division 9 - Finishes:

A. Touch up painting of factory finishes.
B. Painting of all hangers.

PART 9 - DIVISION 10 - SPECIALTIES

9.1 Refer to local building codes and owner construction standard as well as Division 10 - Specialties for:

A. Fire extinguishers and fire extinguisher cabinets and accessories.

PART 10 - DIVISION 26 - ELECTRICAL

10.1 Mechanical contractor shall coordinate the exact electrical requirements of all mechanical equipment being provided with the electrical contractor. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the mechanical equipment basis of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this design will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

10.2 Mechanical contractor shall provide all HVAC control wiring including the Energy Management Control system sensors, alarms, and input/output signals and all relays, interlocks, warning lights, and control devices, complying with the requirements of Division 26. The intent is for the mechanical contractor to be responsible for the entire HVAC control system, including point-to-point wiring.

10.3 Electrical contractor shall provide disconnect switches, starters, and contactors for mechanical equipment unless specifically noted as being furnished as part of mechanical equipment.

10.4 Electrical contractor shall provide all power wiring, raceway, and devices, and make final electrical connections to all mechanical equipment, switches, starters, contactors, controllers, and similar equipment.

10.5 All duct-mounted smoke detectors shall be furnished and wired by the electrical contractor and installed by the mechanical contractor.

END OF SECTION

SECTION 23 05 15
HVAC IDENTIFICATION

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Division 23 Basic Mechanical Materials and Methods section and is a part of each Division 23 section making reference to or requiring identification specified herein.

C. Extent of identification required by this section is indicated on drawings and/or specified in other Division 23 sections.

D. Refer to Division 26 sections for identification requirements of electrical work; not work of this section.

E. Refer to Division 25 sections for identification requirements of building automation work; not work of this section.

1.3 Codes and Standards: Comply with applicable codes pertaining to product materials and installation of identification. Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.4 Quality Assurance:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

PART 2 - PRODUCTS

2.1 General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-23 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.2 Painted Identification Materials:

A. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-1/4" high letters for ductwork and not less than 3/4" high letters for access door signs and similar operational instructions.

B. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

C. Identification Paint: Standard identification enamel.

D. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with name as shown or specified.

2.3 Engraved Plastic-Laminate Signs:

A. General: Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style a minimum of 3/4" tall and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 3/32" for larger units.
C. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.4 Stamped Nameplates: Provide equipment manufacturer's standard stamped nameplates for motors, AHUs, etc.

PART 3 - EXECUTION

3.1 Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 Ductwork Identification:

A. General: Identify air supply, return, exhaust, intake and relief ductwork with stenciled signs and arrows, showing ductwork service and direction of flow, in black or white.
B. Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures, and at 50' spacings along exposed runs.
C. Access Doors: Provide stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate and procedural information.

3.3 Mechanical Equipment Identification: Install engraved plastic laminate sign on a vertical surface on or near each major item of mechanical equipment and each operational device. Label shall indicate type of system and area served. Install clear self adhesive labels on ceiling grid at serviceable locations for above ceiling equipment. Provide signs for the following general categories of equipment and operational devices:

A. Fans
B. Air conditioning units.

3.4 Stamped Nameplates: Equipment manufacturers to provide standard stamped nameplates on all major equipment items such as motors, pumps, AHUs, etc. Where motors are hidden from view (within equipment casing, or otherwise not easily accessible, etc.), the equipment supplier shall furnish a duplicate motor data nameplate to be affixed to the equipment casing in an easily visible location, unless data is already included on the equipment nameplate.

3.5 Adjusting and Cleaning:

A. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.

END OF SECTION

SECTION 23 05 48
VIBRATION ISOLATION

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Division 23 Basic Mechanical Materials and Methods section and is a part of each Division 23 section making reference to or requiring vibration isolation specified herein.

C. Extent of vibration isolation required by this section is indicated on drawings and/or specified in other Division 23 sections.

1.3 Codes and Standards: Comply with applicable codes pertaining to product materials and installation of vibration isolation.

1.4 Quality Assurance:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration isolation, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

B. All equipment provided under this division shall operate under all conditions of load, free of objectionable sound and vibration. Sound and vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner.

1.5 Approval Submittals:

A. Product Data: Where other Division 23 sections require vibration isolation, submit vibration isolation only for that section and not under this section. Submit vibration isolation schedule showing manufacturer's figure number, equipment operating weight, supported loads, static deflections, isolator sizes and type of each item of supported equipment for each of the following:

1. Equipment support isolators. Type EM.
2. Hangers. Type HA.
3. Bases and frames. Type BF.

B. O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts list. Include this date in O&M Manual.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

A. All vibration isolation materials and systems shall be supplied by a single, approved manufacturer. Acceptable suppliers are VMC Amber/Booth Co., Vibro-Acoustics Inc., Kinetics Noise Control, Inc., Metraflex, Inc., Mason Industries, Inc. (MI), Wheatley.

2.2 Equipment Support Isolators:

A. Spring Isolators, Free-Standing (EM1): Provide vibration isolation spring between top and bottom loading plates, and with pad-type isolator bonded to the bottom loading

plate. Spring diameter shall not be less than eighty percent of the compressed height of the spring at the design load. Springs shall have a minimum additional travel to solid equal to fifty percent of the actual deflection. Springs shall have a horizontal to vertical stiffness ratio of approximately one. The spring element shall be set in the neoprene cup to ensure centering of spring on plate and have a steel washer to distribute the load evenly over the neoprene. All mounts shall have leveling bolts. Include holes in bottom plate for bolting to substrate.

1. If isolators are to be travel limited, all mounts shall have vertical travel limit stops to control extension when weight is removed. The travel limit stops shall be capable of serving as blocking during erection of the equipment. A minimum clearance of 1/4 inch shall be maintained around restraining bolts and between the limit stops and the spring to avoid interference with the spring action.

B. Spring Isolators, Housed (EM2): Provide vibration isolation spring between telescoping steel housings with top and bottom loading plates, and with pad-type isolator bonded to bottom of loading plate. Springs shall have a minimum additional travel to solid equal to fifty percent of the actual deflection. Springs shall have a horizontal to vertical stiffness ratio of approximately one. Include resilient inserts to separate and guide telescoping housings.

1. Equip top loading plate with equipment anchorage as indicated or required for support and attachment.
2. Include pad-type isolator bonded to top of top loading plate, except on units with leveling bolts.
3. Include holes in bottom plate for bolting unit to substrate.

C. Floor Neoprene (EM3): Neoprene isolators shall be neoprene-in-shear type with steel reinforced top and base. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed. Bolt holes shall be provided in the base and the top shall have a threaded fastener. The mounts shall include leveling bolts that may be rigidly connected to the equipment.

D. Double Neoprene Pad (EM4): Neoprene pad isolators shall be formed by two layers of 5/16 inch thick ribbed or waffled neoprene, separated by a stainless steel or aluminum plate. These layers shall be permanently adhered together. Neoprene shall be forty to fifty durometer. The pads shall be sized so that they will be loaded between forty and fifty psi.

2.3 Hangers:

A. Hanger Spring and Neoprene (HA1): Vibration isolation hangers shall consist of a free standing, laterally stable steel spring and a neoprene element in series, contained within a steel housing. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. Spring diameters and hanger housing lower hole sizes shall be large enough to permit the hanger rod to swing through a 30˚ arc before contacting the housing. Spring elements shall have a minimum additional travel to solid equal to fifty percent of the actual deflection at design load. The neoprene element shall be designed to have a 0.3 inch minimum static deflection.

B. Hanger Neoprene (HA2): Vibration isolation hangers shall consist of a neoprene-in-shear element contained in a steel housing. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. The diameter of the hole in the housing

shall be sufficient to permit the hanger rod to swing through a 30˚ arc before contacting the hanger housing.

2.4 Equipment Bases and Frame Types:

A. Vibration Isolation Curb for Rooftop Equipment (BF2): Provide coated steel spring isolation curb with cadmium or zinc electroplated steel springs on 1/4" thick neoprene pads to support the upper frame. The upper frame must provide continuous support for the equipment and must be held captive by 1/4" thick neoprene snubber bushings. Minimum spring deflection is 2-1/2". Provide galvanized steel counter-flashing and EPDM bellows for the corners. Provide access covers for all springs. The entire assembly shall be waterproof. Curbs shall be a minimum of 12" high and shall include 2" thick insulation. Provide curbs designed to accommodate for roof pitch so that equipment is set level. Provide perimeter angle and cross members provisions for two layers of 5/8" waterproof sheetrock at the floating member of the curb. Where the mechanical arrangement prevents attaching to the floating member, the barrier shall be attached as high as possible on the fixed curb with 1" thick closed cell neoprene flexible seals around the metal ductwork. A 4" layer of 1.5 pcf fiberglass shall cover the entire solid roof surface under the unit. Basis of Design: Mason Industries RSC.

PART 3 - EXECUTION

3.1 Application:

A. Unless otherwise shown or specified, all floor-mounted major equipment items shall be set on four inch high housekeeping type concrete pads. All equipment having moving parts shall be vibration isolated from the building structure. Electrical connections to vibration isolated equipment shall be flexible.

B. Vibration isolation devices shall be installed for all piping, sheet metal ducts, and plenums as recommended by the manufacturer at the vibration products, and in accordance with recognized industry standards.

3.2 Installation:

A. Location of all vibration isolation equipment shall be selected for ease of inspection and adjustment as well as for proper operation. Installation of vibration isolation equipment shall be in accordance with the manufacturer's written instructions.

B. Sealed resilient penetration sleeves shall maintain an airtight seal around the penetrating element and shall prevent rigid contact of the penetrating element and the building structure.

C. All vibration isolators shall be aligned squarely above or below mounting points of the supported equipment. Hanger rods for vibration isolated support shall be connected to structural beams or joists, not from the floor slab between beams and joist. Provide intermediate support members as necessary.

D. Vibration isolation hanger elements shall be positioned so that the hanger housing may rotate a full 360˚ about the rod axis without contacting the building structure or any object.

E. No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by the equipment manufacturer. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, a base frame recommended by the equipment manufacturer shall be provided at no additional expense.

F. Unless otherwise indicated, there is to be a minimum operating clearance of 1-1/2” between inertia bases or structural steel frames and the concrete housekeeping pad or floor beneath the equipment.

G. Metal ductwork equipment connections: Ducts shall be connected to fan intakes and discharged by means of a flexible connection per Division 23 Ductwork Accessories specification section so that all equipment is fully isolated.

END OF SECTION

SECTION 23 06 93
TESTING ADJUSTING BALANCING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Division 23 Basic Mechanical Materials and Methods section and is a part of each Division 23 section making reference to or requiring testing, adjusting, and balancing as specified herein.

C. Extent of testing, adjusting, and balancing by this section is indicated on drawings and/or specified in other Division 23 sections.

1.3 Codes and Standards: Comply with applicable codes and standards pertaining to testing, adjusting, and balancing.

1.4 Quality Assurance:

A. Testing, adjusting, and balancing shall be performed by a licensed firm who regularly engages in facilities of similar size and scope, with satisfactory use in similar service for not less than five years. The qualified testing, adjusting, and balancing firm shall have an office within 2 hours travel time to the jobsite and provide emergency service capabilities.

1.5 Description of Work:

A. Extent of testing, adjusting, and balancing work (TAB) is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required.

B. Coordination: Coordinate with the General Contractor and Mechanical Contractor responsible for the HVAC system installation as required to complete the TAB work.

1.6 The intent of this specification is to balance HVAC systems within the tolerances listed, maintaining the pressure relationships indicated, with a minimum of noise.

A. Airflow Tolerances:

1. Air Handling: The supply air, return air, and outdoor air quantities shall be balanced within +/-5% of design values.
2. Exhaust Fans: The exhaust fan quantities shall be set as required to maintain the design exhaust terminal flows within +/-5% of design values. If no exhaust terminals exist, exhaust fan air quantities shall be balanced within +/-10% of design values.
3. Ceiling Diffusers, Supply Registers, Return and Exhaust Inlets: Balance to an air quantity within +/-10% of the design values.

B. Temperature Tolerances:

1. Air Handling Temperatures: The controlled temperatures at AHUs shall be verified to be under control within +/-1°F of design values.
2. Room Temperatures: Balance systems and controls within +/-2°F of indicated settings.

1.7 Quality Assurance: The TAB Contractor shall be certified as follows:

A. Tester: A firm certified by National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, who is not the Installer of the systems to be tested and is otherwise independent of the project. Comply with NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" as applicable to this work.
B. Tester: A firm certified by Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project. AABC-certified firms are independent by definition. Comply with AABC's Manual MN-1 "AABC National Standards", as applicable to this work.
C. Industry Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

1.8 Job Conditions:

A. Do not proceed with testing, adjusting, and balancing work until HVAC work (including Controls) has been completed and is operable. Ensure that there is no residual work still to be completed.
B. Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt, and discarded building materials.
C. Do not proceed until architectural work that would affect balancing (walls, ceiling, windows, doors) have been installed.
D. Testing may proceed system by system, but each HVAC system must be complete as describe herein.
E. The mechanical contractor shall make any changes in pulleys, belts, and dampers, and/or add dampers as required for correct balancing.

1.9 Approval Submittals:

A. Submit the name of the proposed test and balance company for the Engineer's approval within thirty (30) days after awarding of contract. Provide blank templates for all tests specified and proof of certification/qualifications.
B. O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts list. Include this data in O&M Manual.

1.10 Test Reports and Verification Submittals:

A. Submit an electronic copy of the dated test and balance report upon completion of TAB work. The report shall include a list of instruments used for the work. The report shall be signed by the supervisor who performed the TAB work.

PART 2 - PRODUCTS

2.1 Patching Materials: Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork, and housings which have

been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

2.2 Test Instruments: Utilize test instruments and equipment of the type, precision, and capacity as recommended in the referenced standard. All instruments shall be in good condition and shall have been calibrated within the previous six (6) months (or more recently if required by standard).

PART 3 - EXECUTION

3.1 General:

A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with TAB work until unsatisfactory conditions have been corrected in manner acceptable to Tester.
B. Test, adjust, and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards, and as modified or detailed herein.
C. Test, adjust, and balance systems during summer season for air conditioning systems and during winter season for heating systems, including at least a period of operation at outside conditions within 5°F wet bulb temperature of maximum summer design condition, and within 10°F dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring final temperatures, then take final temperature readings when seasonal operation does permit. The Contractor shall return for a change of seasons test at no additional cost to the Owner and submit the revised TAB report.
D. Punch List: Prepare a deficiency (punch)list for the Contractor with a copy of the Engineer that lists all items that are incorrectly installed or are functioning improperly. Provide a retest after all items are corrected.
E. Prepare TAB report of test results, including instrumentation calibration reports, in format recommended by applicable standards, modified as required to include all data listed herein.
F. Patch holes in insulation, ductwork, and housings, which have been cut or drilled for test purposes, in manner recommended by original Installer.
G. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.
H. Include in the TAB report recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
I. Include an extended warranty of ninety (90) days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck, or resetting of any component as listed in test report. The TAB company shall provide technicians and instruments and make any tests required by the Engineer during this time period.

3.2 Controls:

A. Check all HVAC controls for proper location, calibration, and sequence of operation.
B. Check operation of all controllers and controlled devices to verify proper action and direction. Check the operation of all interlocks.
C. Check all motorized damper motors for leakage when in closed position. If leakage is more that 5%, mechanical contractor shall reset damper linkages.

3.3 Air Balancing:

A. Leakage tests on ductwork must have been completed before air balancing.
B. Set dampers, volume controls, and fan speeds to obtain specified air delivery with minimum noise level. Rebalance as required to accomplish this. Simulate fully loaded filters during test.
C. Set grille deflections as noted on plans. Modify deflections if required to eliminate drafts or objectionable air movement.
D. Record air terminal velocity after completion of balance work.
E. Record final grille and register deflection settings if different from that specified on contract drawings.
F. Record all fan speeds.

3.4 Data Collection:

A. In addition to the data required for any specified performance tests, measure and record the temperatures, pressures, flow rates, and nameplate data for all components listed herein.
B. It is the intent of this section to record data on balanced systems, under normal operating or design conditions.
C. Temperatures:

1. Outside dry and wet bulb temperatures.
2. Dry bulb temperature in each room and at least one wet bulb temperature in each zone.
3. Refrigerant liquid and suction temperatures.

D. Pressures:

1. Suction and discharge static pressure of each fan.
2. Each refrigerant suction and discharge pressure.

E. Flow Rates:

1. Flow rate through each fan.

F. Nameplate Data:

1. Complete nameplate data for all equipment.
2. Motor data to include horsepower, phase, voltage, RPM, full load nameplate current, fuse rating in disconnect switch, number or manufacturer's size designation, and ampere rating of overcurrent and low voltage protection devices in starters.

3.5 All test openings in ductwork shall be resealed in an approved manner.

END OF SECTION

SECTION 23 07 13
EXTERIOR DUCTWORK INSULATION

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Approval Submittals:

A. Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1. Flexible duct insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Knauf, Owens-Corning, Johns Manville, Certainteed.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, coverings, sealers, mastic, and adhesive) with a flame spread rating of 25 or less, and a smoke-developed rating of 50 or less as tested by ANSI/ASTM 84.

2.3 Flexible Fiberglass Insulation: ASTM C553, Type I, Class B-3 (temperature less than 350°F). Duct wrap shall be 1 pcf density with UL rated aluminum foil vapor barrier (FSK).

2.4 General Purpose Mastic: Benjamin Foster 35-00 Series, Childers CP-10, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.5 Vapor Barrier Sealant: Benjamin Foster 30-35, 3M EC-1378, Childers CP-30, or approved equal. Provide "Low Odor" type. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2.6 Adhesive: Benjamin Foster 85-20, 3M EC-35, Childers CP-82, Childers CP-89, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

PART 3 - EXECUTION

3.1 Insulate all supply, return, and outdoor air ductwork exposed in mechanical rooms, mezzanines, fan lofts or in any finished spaces with 1-1/2" thick rigid fiberglass insulation with vapor barrier.

3.2 Insulate all supply, return and outdoor air ductwork concealed above ceilings, in chases, or elsewhere, and the backs of all ceiling supply outlets with 2" thick fiberglass blanket insulation with vapor barrier.

3.3 Installation of Flexible Insulation:

A. Insulate round elbows and fittings with wrap such that thickness is equal to adjoining duct covering. Clean and dry ductwork prior to insulating.
B. Adhere insulation to duct with 50 percent coverage using approved insulation adhesive applied in 6” wide swaths with 6” spaces between swaths. Additionally, secure insulation with perforated pins and Tuff-Bond or by self-sticking pins with a 3/8” self-tapping screw. Space on 12” centers and 3” from all edges. Ducts up through 24” wide only require one row of pins. Ducts over 24” wide shall have pins spaced as described herein. Screwed pins are not acceptable.
C. Lap all joints 2” and seal joints with 4” wide strips of open mesh glass fabric embedded in two coats of general purpose mastic.
D. Seal all punctures and breaks in aluminum vapor barrier with open mesh glass fabric and vapor barrier sealant.

END OF SECTION

SECTION 23 07 17
EQUIPMENT AND PIPING INSULATION

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods Sections apply to work of this section.

1.3 Approval Submittals:

A. Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1. Flexible unicellular piping insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armstrong, Johns Manville, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2.3 Pipe Insulation Materials:

A. Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200˚F.)
B. Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.
C. Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.

PART 3 - EXECUTION

3.1 General:

A. Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
C. Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".
D. Do not apply insulation to surfaces while they are hot or wet.
E. Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.

F. Do not install insulation on pipe systems until acceptance tests have been completed. Do not install insulation until the building is “dried-in”.

3.2 Flexible Unicellular Pipe Insulation:

A. Insulate the following piping systems:

1. Condensate drains from air conditioning units: 1/2” thick.

B. Apply insulation in accordance with the manufacturer’s recommendations and instructions. Mitre cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.

C. Insulation outside the building shall be protected by a smooth 0.016” thickness aluminum jacket secured with aluminum bands on 12” centers.

END OF SECTION

SECTION 23 08 05
START-UP REQUIREMENTS FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 Intent: It is the intent of this section to require that the startup requirements and report noted herein be performed prior to starting TAB work on each system. Work can be phased with permission of the Engineer.

1.2 Coordination:

A. The Contractor shall furnish to the TAB Contractor a complete set of plans, specification, addenda, shop drawings, equipment performance data sheets, change orders, etc. as requested by the TAB Contractor.

B. The Contractor shall participate in a TAB coordination meeting to discuss interface requirements with the TAB Contractor and to establish a schedule for TAB work prior to start of TAB work.

1.3 Test Reports and Verification Submittals:

A. Submit Startup Report as described herein for each system. Attach Factory Startup Report for equipment as required by other Division-23 sections.

PART 2 - PRODUCTS: None

PART 3 - EXECUTION:

3.1 The TAB work shall not commence until the Engineer has received written notice from the Contractor that HVAC systems are 100% complete and are fully operational. Submit Startup Report as described herein.

3.2 The Contractor shall place all HVAC systems and equipment into complete operation during each working day of TAB work.

3.3 The Contractor shall provide access to HVAC systems and equipment by supplying ladders and/or scaffolding, and opening access panels and equipment room doors.

3.4 The TAB Contractor will provide to the Contractor TAB punch lists of non-complying HVAC work as they are discovered. The Contractor shall replace or repair non-complying work as soon as possible in order not to delay completion of TAB work.

3.5 Airside Systems: The Contractor shall provide the following information to the Engineer to substantiate proper start-up and preliminary adjustments of air handler units, belt driven fans, and duct systems.

A. Verify that air grilles (supply, return, exhaust, transfer, outdoor, etc.) are installed and connected to the duct system.

B. Verify that duct systems are clean of debris.

C. Verify that ducts attached with flexible connectors are aligned within 1/2” and have a uniform gap between ducts of 1”-1.5”. Flexible connectors shall not leak and shall be insulated.

D. Verify that filters are clean and filter spacers are installed.

E. Verify that balancing dampers at grilles and branch ducts are operational and are fully opened.

F. Verify that fan discharges are appropriate for the outlet ductwork with regards to the “system effect” per AMCA Publication 201. Inappropriate fan discharges will not be accepted.

G. Verify proper fan rotation.

H. Verify proper belt drive alignment.

I. Verify fan motor overload elements are correctly sized.
J. Adjust fan sheave until CFM is at or above design CFM. Provide additional sheaves and belts as required.
K. Verify that motor is not overloaded.
L. Verify that HVAC control systems are fully operational.

3.6 Startup Report: The Contractor shall submit the startup information required by this section to the Engineer in a typed report organized as outlined herein. The Startup Report is required to meet the written notice described herein prior to starting TAB work. TAB work will not start until the Startup Report has been submitted in a complete manner acceptable to the Owner and the Owner's agent.

END OF SECTION

SECTION 23 31 00
METAL DUCTWORK

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods Sections apply to work of this section.

1.3 Extent of HVAC metal ductwork is indicated on drawings and in schedules, and by requirements of this section.

1.4 Refer to other Division-23 sections for exterior insulation of metal ductwork.

1.5 Refer to other Division-23 sections for ductwork accessories.

1.6 Codes and Standards:

A. SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" Latest Edition for fabrication and installation of metal ductwork, unless otherwise noted.

B. NFPA 90A Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.7 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data and installation instructions for the following.

1. Factory-fabricated ductwork
2. Sealants
3. Flexible duct
4. Spin-in fittings
5. Side take-off fittings

B. Shop Drawings: Submit scaled layout drawings of HVAC metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.

PART 2 - PRODUCTS

2.1 Ductwork Materials:

A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

B. Galvanized Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A653, lockforming quality; with G 90 zinc coating in accordance with ASTM A653; and mill phosphatized for exposed locations. Stamp gauge and manufacturer's identification on each sheet. Break sheets so that identification is exposed.

2.2 Miscellaneous Ductwork Materials:

A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
B. UL listed low VOC non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Sealant shall be NFPA 90A and 90B compliant.
C. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim, and angles for support of ductwork.
D. Flexible Ducts: Provide flexible ductwork with an R-value of R-6 unless the ductwork is in a ceiling return plenum. The use of flexible ductwork for connection of supply air and return air devices is acceptable only where shown on the drawings.

1. Construction: Provide reinforced metalized polyester jacket that is tear and puncture resistant, air tight inner core with no fiberglass erosion in the air stream and an encapsulated wire helix. Flexible ductwork shall have a recommended operating pressure of 6" w.g. for sizes 4" through 12" diameter and 4" w.g. for sizes 14" through 20" diameter. All diameters shall be suitable for a negative operating pressure of 0.75" w.g. Flexible ductwork shall meet the requirements of UL-181, the Florida Energy Code, SBCC, NFPA 90A, and NFPA 90B.
2. Acceptable Manufacturers: Subject to compliance with requirements, provide R-6 flexible ductwork by: Atco 36, Flexmaster 9M, Flexmaster 1M, or Thermaflex M-KE R6.

E. Spin-in and Side Take-off Fittings: Provide round branch run-outs as follows.

1. Supply air diffuser connections shall be conical with damper and one-inch high insulation stand-off equal to Crown 3210 DS or Flexmaster CBD-BO3 2000G.
2. Return air grille connections shall be straight sided with damper and one-inch high insulation standoff equal to Crown 724-D5 or Flexmaster FLD-BO.
3. Exhaust air grille connections shall be straight sided with damper equal to Crown 724 or Flexmaster FLD.
4. Where duct height does not permit the use of conical spin-in fittings, use low profile side take-off fittings equal to Crown 3300-DS or Flexmaster STOD-BO3 2000G.

F. Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15° change of direction per section. Unless specifically detailed otherwise, use 45° laterals and 45° elbows for branch takeoff connections. Where 90° branches are indicated, provide conical type tees.

2.3 Fabrication:

A. Shop fabricate ductwork in 4, 8, 10, or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
B. Shop fabricate ductwork of gauges and reinforcement complying with SMACNA "HVAC Duct Construction Standards", except provide sealant at all joints. Supply duct

from air conditioning units and all return and exhaust duct shall be minimum 2" pressure class unless otherwise noted.

C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1-1/2 times associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.

D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-23 section "Ductwork Accessories" for accessory requirements.

2.4 Factory-Fabricated Low Pressure Ductwork (Maximum 2" W.G.):

A. Material: Galvanized sheet steel complying with ASTM A 527, lockforming quality, with ASTM A 525, G90 zinc coating, mill phosphatized.

B. Gauge: 28-gauge minimum for round ducts and fittings, 4" through 8" diameter. 26-gauge minimum 9" through 14", 24-gauge minimum 15" through 26".

C. Elbows: One-piece construction for 90° and 45° elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.

D. Divided Flow Fittings: 90° tees, constructed with saddle tap spot welded and bonded to duct fitting body.

E. Acceptable Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork by Semco Mfg., Inc. or United Sheet Metal Div., United McGill Corp, or approved equal.

F. Optional Ducts and Fittings: At Installer's option, provided that certified tests by Manufacturer show that rigidity and performance is equivalent to SMACNA standard gauge ductwork, provide ducts and fittings as follows:

1. Ducts: Construct of Manufacturer's standard gauge, with spiral lock seam and intermediate standing rib.
2. Fittings: Construct by fabricating with spot welding and bonding with neoprene-base cement in lieu of continuous weld seams.
3. Acceptable Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork Semco Mfg., Inc. or United Sheet Metal Div., United McGill Corp., or approved equal.

PART 3 - EXECUTION

3.1 General: Examine areas and conditions under which HVAC metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation of Metal Ductwork:

A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

B. Supports: Install concrete inserts for support of ductwork in coordination with formwork, as required to avoid delays in work. Install self-drilling screw anchors in prestressed concrete or existing work.

C. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements. Seal joints in round or oval ductwork with hard cast or shrink bands, and sheet metal screws, or by welding.

D. Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally. Avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. In finished and occupied spaces, conceal ductwork from view by locating in mechanical shafts, hollow wall construction or above suspended ceilings, unless specifically noted as "Exposed". Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

E. Electrical Equipment Spaces: Do not route ductwork through transformer vaults or other electrical equipment spaces and enclosures.

F. Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.

G. Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

H. Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards. Fan discharge outlet ducts shall be installed correctly with regard to "system effect" per AMCA Publication 201.

3.3 Installation of Flexible Ducts:

A. Maximum Length: For any duct run using flexible ductwork, do not exceed 6'-0" extended length. Flexible duct shall only be allowed as detailed on the drawings.

B. Installation: Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible". Support flexible ducts to eliminate pinching and kinking which would restrict flow. Provide 2" side metal straps to support each flexible duct at transitions.

C. Seal all exposed edges of fiberglass insulation with glassfab and mastic.

3.4 Leakage Tests: After each duct system is completed, test for duct leakage in accordance with Sections 3 and 5 of the SMACNA HVAC Air Duct Leakage Test Manual. Test pressure shall be equal to pressure class of duct, less 0.5" static pressure. Repair leaks and repeat tests until total leakage is less than 5% of system design air flow for low pressure systems and less than 1% for systems rated over 3".

3.5 Equipment Connections: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

3.6 Clean ductwork internally free of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration. Keep ducts closed with poly during construction to prevent contamination by construction dust and debris.

3.7 Balancing: Refer to Division-23 section “Testing, Adjusting, and Balancing” for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

3.8 System Adjustment: Adjust the system to provide functional operation to the extent possible, and leave ready for Testing and Balancing work. It is not the intent of this section to provide final testing and balancing, but to leave the system operational with a minimum of noise.

END OF SECTION

SECTION 23 33 00
DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.

1.4 Refer to other Division-23 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.5 Codes and Standards:

A. SMACNA Compliance: Comply with applicable portions of both SMACNA "HVAC Duct Construction Standards, Metal and Flexible".

B. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems" pertaining to installation of ductwork accessories.

1.6 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions as follows:

1. Low pressure manual dampers
2. Control dampers
3. Counterbalanced relief dampers
4. Backdraft damper
5. Duct access doors
6. Flexible connections

B. O&M Data Submittals: Submit manufacturer's maintenance data including parts lists. Include this data, product data, and a copy of approval submittals in O&M manual.

PART 2 - PRODUCTS

2.1 Dampers:

A. Low Pressure Manual Dampers: Provide 20 gauge dampers of single-blade type (12" maximum blade width) or provide 16 gauge dampers of multi-blade type. Damper blades to be gang-operated from a single shaft with acetal bearings on each end. Provide indexed locking quadrant. Parallel or opposed blade style is acceptable. Provide 2" standoff on locking quadrant for externally insulated duct.

B. Control Dampers: Provide AMCA Standard 500-D certified dampers with parallel blades for 2-position control or opposed blades for modulating control. Construct blades of 16 gauge steel. Provide heavy-duty molded self-lubricating nylon bearings and 1/2" diameter steel axles spaced on 9" centers. Provide TPE blade seals. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16 gauge channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up. Actuators (motors) are provided by control contractor.

C. Counterbalanced Relief Dampers: Provide AMCA Standard 500-D certified dampers with parallel blades, counterbalanced and factory-set to relieve at static pressure of

0.10 in. wg. Provide field adjustment by test, adjust, and balance contractor. Construct blades of aluminum, provide 3/8" diameter ball bearings, 3/8" diameter steel axles spaced on 9" centers. Provide EPDM blade seals. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16 gauge channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame. Basis of design: Greenheck BR-10.

D. Backdraft Dampers: Provide AMCA Standard 500-D certified dampers with parallel blades, spring operated with a maximum pressure drop of 0.1 in wg at 750 fpm. Construct blades of aluminum, provide synthetic axle bearings, 3/16" diameter 304 stainless steel axles spaced on 9" centers. Provide vinyl blade seals. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16 gauge channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame. Basis of design: Greenheck WD-400.

E. Acceptable Manufacturers: Subject to compliance with requirements, provide dampers by Air Balance, American Warming & Ventilating, Arrow Louver and Damper, Greenheck, or Ruskin Mfg. Co.

2.2 Turning Vanes: Provide manufactured or fabricated single wall turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

2.3 Duct Access Doors:

A. General: Provide duct access doors of size indicated, or as required for duty indicated.

B. Construction: Construct of same or greater gauge as ductwork served. Provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

C. Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Air Balance, Inc., Duro Dyne Corp., Ruskin Mfg. Co., or Ventfabrics, Inc.

2.4 Flexible Connections:

A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

B. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following: Duro Dyne Corp., Flexaust (The) Co., or Ventfabrics, Inc.

PART 3 - EXECUTION

3.1 Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation of Ductwork Accessories:

A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install balancing dampers at all main ducts adjacent to units in return air, outside air and where indicated.
C. Install control dampers in the outside air duct for each air handler. Damper Motor provided by control contractor.
D. Install turning vanes in square or rectangular 90° elbows in supply, return, and exhaust air systems, and elsewhere as indicated.
E. Install flexible connections in ductwork such that the clear length of the connector is approximately two inches. Provide thrust restraints as required. Flexible material shall not be so slack as to take a definite concave or convex shape during fan operation.
F. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.3 Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories as required to obtain proper operation and leakproof performance.

3.4 Adjusting and Cleaning:

A. Adjusting: Adjust ductwork accessories for proper settings.
B. Final positioning of manual dampers is specified in Division-23 section “Testing, Adjusting, and Balancing”. However, the system shall be left functional with all dampers open or throttled.
C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer’s touch-up paint.

END OF SECTION

SECTION 23 34 00
FANS

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of fan work required by this section as indicated on drawings and schedules, and by requirements of this section.

1.4 Coordination:

A. Refer to Division-23 section “Testing, Adjusting, and Balancing” for balancing of fans.

B. Refer to Division-26 sections for power supply wiring from power source to power connection on fans. Division-26 work will include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.5 Codes and Standards:

A. AMCA Compliance: Provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.

B. UL Compliance: Provide fans which are listed by UL and have UL label affixed.

1.6 Approval Submittals:

A. Product Data: Submit manufacturer’s technical data for fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions. Submit assembly-type drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details.

1. Fans

1.7 O&M Data Submittals: Submit maintenance data and parts list for each type of fan, accessory, and control. Include these data, a copy of approved submittals, and wiring diagrams in O&M Manual.

PART 2 - PRODUCTS

2.1 General: Except as otherwise indicated, provide standard prefabricated fans of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation. Provide accessories as listed in the schedule on the drawings and as described herein. Motors shall be high efficiency per Division-23 section “Motors”.

2.2 Acceptable Manufacturers: Subject to compliance with requirements provide fans manufactured by Acme, Greenheck, Loren Cook or approved equal unless otherwise noted herein.

2.3 Centrifugal Ceiling Exhausters:

A. Fan Assembly: Provide steel housing, plastic or aluminum grille, backdraft damper, statically and dynamically balanced fan wheel, permanently lubricated motor with internal thermal overloads, vibration isolation, and all required mounting hardware and brackets. Provide acoustically treated housing for all fans larger than 60 cfm. Mounting type shall be as indicated on the drawings or on the schedule.

B. Connectors: Provide adaptors, connectors, and eave elbows as required to connect fan discharges to outlets.

C. Outlets: Provide where shown on the drawings (or required by the installation) wall caps, vent caps, or roof jacks, each with birdscreen, to match fans and surrounding construction.

2.4 Fan Accessories and Features: Where indicated on the schedule or drawings provide accessories and features listed herein.

1. Belt Drive: Belt drives shall include cast iron, variable pitch sheaves, heavy duty belts, and 1750 rpm motors. The drive shall be adjustable to plus or minus 20% of scheduled flow. Provide fixed sheaves after balancing is complete.
2. Direct Drive: Direct drives shall have multispeed motors or speed controllers to achieve scheduled flow.
3. Curbs: Furnish 12-inch high, roofed over type, prefabricated aluminum curbs with treated wood nailer and 1-1/2" fire resistant fiberglass insulation sized to match the fans. For deck slopes of 1/4" per foot and more, fabricate curbs to form level top edge.
4. Bird Screens: Provide bird screens of 1/2" mesh aluminum or galvanized steel hardware cloth.
5. Backdraft Dampers: Provide where indicated aluminum louvered dampers with felt-edged blades and nylon bearings.
6. Disconnect Switches: Provide factory installed local disconnecting means.
7. Thermal Overloads: Provide internal thermal overloads.
8. Speed Controller: Provide where indicated solid state speed controller for remote mounting.
9. Motorized Dampers: Provide where indicated aluminum louvered dampers with felt-edged blades and nylon bearings with 120-volt motors wired to operate with the fan. Provide limit switch to prevent fan starting until damper is at least half open.
10. Explosion-proof Motor: Provide where indicated explosion proof motors.
11. Timeclock: Provide where indicated a dedicated UL listed 120V astronomic programmable electronic time switch installed in accessible location above ceiling for maintenance use. Program to operate 7AM-7PM. Basis of design: Marktime 42E724A.

PART 3 - EXECUTION

3.1 General: Except as otherwise indicated or specified, install fans in accordance with manufacturer's installation instructions and recognized industry practices to ensure that fans serve their intended function.

3.2 Coordinate fan work with work of roofing, walls, and ceilings as necessary for proper interfacing. Framing of openings, caulking, and curb installation is not work of this section.

3.3 Ductwork: Refer to Division-23 section "Ductwork". Connect ducts to fans in accordance with manufacturer's installation instructions. Provide flexible connections in ductwork at fans.

3.4 Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Verify

proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.5 Remove shipping bolts and temporary supports within fans. Adjust dampers for free operation.

3.6 Testing: After installation of fans has been completed, test each fan to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.7 Cleaning: Clean factory-finished surfaces. Remove all tar and soil. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 23 37 00
GRILLES REGISTERS AND DIFFUSERS

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.

1.4 Refer to other Division-23 sections for ductwork and duct accessories required in conjunction with air outlets and inlets and for balancing of air outlets and inlets; not work of this section.

1.5 Codes and Standards:

A. ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 “Certification, Rating and Test Manual”. Provide air outlets and inlets bearing ADC Certified Rating Seal.

B. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A “Standard for the Installation of Air Conditioning and Ventilating Systems”.

1.6 Approval Submittals:

A. Product Data: Submit manufacturer’s technical product data for air outlets and inlets indicating construction, finish, and mounting details.

B. Performance Data: For each type of air outlet and inlet furnished, provide aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections and data as required.

1.7 O&M Data Submittals: Submit cleaning instructions for finishes and spare parts lists. Include this data and a copy of approval submittals in O&M manual.

PART 2 - PRODUCTS

2.1 General:

A. Except as otherwise indicated, provide manufacturer’s standard grilles, registers, and ceiling diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Manufacturers not listed in the following specification will not be considered for approval unless accepted by addendum prior to bid.

C. Performance: Provide grilles, registers, and ceiling diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device equal to the basis of design.

D. Ceiling and Wall Compatibility: Provide grilles, registers, and diffusers with border styles that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into ceiling module or wall with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems and walls which will contain each type of ceiling diffuser, grille, or register.

E. Appearance: All grilles and registers shall be aluminum construction and all diffusers shall be aluminum construction, unless otherwise noted, with uniform matching

appearance for each type of outlet. Ceiling mounted grilles and registers shall be set to be sight tight from the predominant exposure.

F. Finish: All ceiling mounted grilles, registers, and diffusers shall be finished with baked white enamel. Wall and door mounted grilles and registers shall be finished with white enamel.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products by Titus, Price, or Metal Aire.

2.3 Square Ceiling Diffusers (CD1): Provide square face, adjustable, 360-degree pattern diffusers with one-piece stamped cones, no corner joints, round necks. Provide factory insulated supply diffuser. Provide lay-in panel as required. Provide trim ring for diffusers in hard ceilings to allow opening to be used for access. Diffusers with 24 x 24 face: Titus TMSA-AA, Price ASCD-4C or Metalaire 5700 A-A. Diffusers with 12 x 12 face: Titus TMS-AA, Price ASCD-4C, or Metalaire 5800-A.

2.4 Return Grilles (RAG1): Provide return grilles with one set of 35° fixed louvers, parallel to the long dimension. Provide factory insulation kit. Provide mounting frame for all wall and plaster ceiling installations. Titus 350 FL, Price 630L, or Metalaire RHE.

2.5 Return Registers (RAR1): Provide return registers with one set of 35° fixed louvers, parallel to the long dimension. Provide opposed blade damper, screwdriver operated from the face. Provide mounting frame for all wall and plaster ceiling installations. Titus 350 FL, Price 630L, or Metalaire RHE.

2.6 Sidewall Supply Registers (SR): Provide supply registers with two sets of individually adjustable airfoil registers, spaced at 3/4”, with the front set parallel to the long dimension. Provide opposed blade damper, screwdriver operated from the face. Provide mounting frame. Titus 272-FL or Metalaire 4000-1.

2.7 Diffusajets (DJ): Provide combination long throw/diffused pattern diffusers with aperture damper. Metalaire MPK Aluminum Punkah or similiar.

PART 3 - EXECUTION

3.1 Coordinate installation with ceiling and light fixture installation. Locate ceiling outlets as indicated on architectural Reflected Ceiling Plans. Unless otherwise indicated, locate ceiling outlets in the center of acoustical ceiling modules with sides parallel to the grid.

3.2 Install air outlets and inlets in accordance with manufacturer’s written instructions and in accordance with recognized industry practices to ensure that products serve intended functions.

3.3 Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

3.4 Set air volumes to values shown on the drawings so that the system is functional. Leave ready for test and balance contractor.

END OF SECTION

SECTION 23 41 00
AIR FILTRATION EQUIPMENT

PART 1 - GENERAL

1.1 Related Documents:

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

1.2 Description of Work:

A. Extent of air cleaning work required by this Section is indicated on drawings and schedules, and by requirements of this Section. Types of air cleaning equipment specified in this Section include air filters.

1.3 Quality Assurance:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air cleaning equipment of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
B. NFPA Compliance: Comply with applicable portions of NFPA 90A and 90B pertaining to installation of air filters.
C. ASHRAE Compliance: Comply with provisions of ASHRAE Standard 52 for method of testing, and for recording and calculating air flow rates.

1.4 Submittals:

A. Product Data: Submit manufacturer's technical product data including, dimensions, weights, required clearances and access, flow capacity including initial and final pressure drop at rated air flow, efficiency and test method, fire classification, and installation instructions.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

A. Manufacturers offering air cleaning equipment which may be incorporated in the work include American Air Filter Co., Cambridge Filter Corp., Continental Filter Corp., Camfil Farr Co., Flanders Filters, Inc., and Columbus Industries, Inc.

2.2 Air Filters:

A. Ring Panel Filters (Moisture Resistant): Provide polyester antimicrobial self-sealing, ring and link 2-ply filter with unitized construction and fully sealed perimeter and at points on the face such that the inner wire frame supports the filter through the full range of rated velocity and filter loading. Initial filter resistance shall be less than 0.30" w.g. at 500 fpm and 70% efficient for particles greater than 5 um. Filters shall require no fasteners or clips. Basis of design: American Air Filter AmerSeal.
B. Pleated Replaceable Filters: Provide factory-fabricated, dry, supported, extended surface filters with holding frames; where shown, in sizes indicated. Equip with UL Class 1 water resistant dual layer fibrous media material formed into 1" deep V-shaped pleats and held by self-supporting wire frames. Construct ductwork-holding frames of 18-gauge galvanized steel, capable of holding media and media frame in place, and gasketed to prevent unfiltered air by-passing between media frames and holding members. Provide filters with rated face velocity of 500 fpm, initial resistance of not greater than 0.30" w.g. final rated resistance of 0.5" w.g. Filter media shall have an

average of 90-95% on the ASHRAE Test Standard (52-76). Filters shall be Underwriters' Laboratories Standard 900 approved. Basis of Design: Columbus

C. Panel Extended Surface Pleated Filters: Provide medium efficiency factory-fabricated, dry, supported, extended surface filters with holding frames; where shown, in sizes indicated. Equip with UL Class 1 water resistant dual layer fibrous media material formed into 2" deep V-shaped pleats and held by self-supporting frames. Construct ductwork-holding frames of 18-gauge galvanized steel, capable of holding media and media frame in place, and gasketed to prevent unfiltered air by-passing between media frames and holding members. Provide filters with rated face velocity of 500 fpm, initial resistance of not greater than 0.35" w.g., final rated resistance of 1.2" w.g. Filter media shall have an average of 90-95% on the ASHRAE Test Standard (52-76). Filters shall be Underwriters' Laboratories Standard 900 approved. Basis of Design: Columbus Industries, Inc CI Micro Shield Zero-Bypass.

PART 3 - EXECUTION

3.1 Installation:

A. Install air filters and holding devices in accordance with air filter manufacturer's written instructions and with recognized industry practices. Install filters in proper position to prevent passage of unfiltered air. Locate each filter unit accurately in position indicated. Position unit with sufficient clearance for normal service and maintenance. Anchor filter holding frames securely to substrate. Coordinate as necessary to interface installation of filters properly with other work.

B. Install air filter gauge pressure tips upstream and downstream of filters to indicate air pressure drop through air filter. Mount filter gauges on outside of filter housing or filter plenum, in accessible position. Adjust and level inclined gauges if any, for proper readings

3.2 Field Quality Control:

A. Operate installed air filters to demonstrate compliance with requirements. Test for air leakage of unfiltered air while system is operating. Correct malfunctioning units at site, then retest to demonstrate compliance; otherwise remove and replace with new units and proceed with retesting.

3.3 Extra Stock:

A. Provide one complete extra set of filters for each air handling unit. Install new filters at completion of air handling system work, and prior to testing, adjusting, and balancing work. Obtain receipt from Owner that new filters have been installed, and the extra set has been received.

END OF SECTION

SECTION 23 81 25
PACKAGED AIR CONDITIONING UNITS (DX)

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.3 Refer to other Division-23 sections for testing, adjusting, and balancing of air conditioning units.

1.4 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data, including dimensions, ratings, electrical characteristics, weight, capacities, materials of construction, and installation instructions.

1. Packaged air conditioning units
2. Vibration Isolation

1.5 O&M Data Submittals: Submit manufacturer's maintenance data including parts lists. Include these data, a copy of approval submittals, product data, and wiring diagrams in O&M manual.

PART 2 - PRODUCTS

2.1 Quality Assurance:

A. Provide units tested by UL, ARL, or ETL.
B. Construct refrigeration system in accordance with ASHRAE 15 (ANSI B 9.1) "Safety Code for Mechanical Refrigeration".
C. Provide units with an EER that meets the Florida Energy Efficiency Code and the schedules on the drawings.
D. Acceptable Manufacturers: Subject to compliance with requirements provide units by: Aaon, Trane, TempMaster, Lennox, York.

2.2 General:

A. Units shall be factory-assembled, wired, and tested. All controls shall be factory-adjusted and preset to the design conditions.
B. Short Circuit Rating: Provide factory installed and listed rating of 65,000A.
C. Casings: Construct of heavy gauge steel (or aluminum) formed panels rigidly reinforced and braced. Each unit shall be provided with removable panels to permit the unit (including fans and compressors) to be properly maintained and serviced. Entire casing shall be painted with factory-applied finish. Casing for outdoor units shall be provided with weatherproof construction with all seams bolted. Units shall be sealed to minimize leakage.
D. Base: The base pan of the entire unit shall be sealed against moisture leakage after fabrication.
E. Curb: Provide 18" high (above roof surface) continuous-welded, full perimeter supports of galvanized steel construction, insulated with 1" thick fiberglass.

2.3 Condensing Section:

A. Condenser Fans and Drives: Fan shall of rustproof construction: hot-dipped galvanized steel, stainless steel, or aluminum. Unit shall have a variable speed motor suitable for the duty indicated. Provide a close fretwork galvanized steel or non-ferrous fan and guard. Motors shall be the permanently lubricated type, resiliently mounted.
B. Condenser Coil: Construct of copper tubes and aluminum fins. Provide inlet guard to protect condenser fins.
C. Hot Gas Reheat Coil: Construct of copper tubes and aluminum fins.
D. Compressor: Shall be scroll design for R410a refrigerant with vibration isolation. Each compressor shall have separate refrigerant circuit. Motors shall be ball bearing, high starting torque, low starting current type for compressor service. Compressors shall not produce objectionable noise or vibration inside the building. Compressors shall have five (5) year warranty.
E. Service Valves: Provide for high and low pressure readings.

2.4 Evaporator Section:

A. Interior of unit shall be thermally and acoustically insulated with minimum R=4.2 insulation. Provide metal inner liner. Provide removable panels to permit the unit to be properly serviced and maintained.
B. The evaporator shall include centrifugal fan, fan motor, direct drive, lubricated bearings. Motors shall be high efficiency type. Provide cooling coils constructed of copper tubes and aluminum fins. Filters and coils shall be selected for a maximum face velocity of 500 fpm. Provide thermal expansion valve, sight glass, refrigerant drier, strainer, controls, and other necessary devices for a completely automatic unit.
C. Each unit shall be equipped with sloped IAQ drain pans under the entire evaporator coil to prevent condensate carry-over.

2.5 Provide 2” metal mesh filters.

2.6 Electric Heater Section:

A. Provide electric heating coils controlled by one or more magnetic contactors. Three phase coils shall be wired for balanced current in each wire, if possible. Furnish and install necessary overheating and air flow controls to meet the requirements of the National Electric Code. Provide built-in air flow switch and heater interlock relay.
B. Heaters shall be factory mounted and wired with all required fuses and contactors to provide single point connection.

2.7 Hot Gas Reheat:

A. Provide a factory-installed hot gas reheat (HGRH) coil. The HGRH coil shall be available on the lead circuit only or on both refrigerant circuits. Units with HGRH will have variable speed low ambient head pressure control.

2.8 Unit Controls:

A. All safety and operational controls shall be factory wired and preset in a control panel in a separate compartment. Provide all necessary operational controls to heat, cool, and dehumidify scheduled outside air in accordance with the control diagrams on the drawings and the sequence of operation.
B. Provide unit mounted digital controller interface with multi-line display.
C. Safety and Operational Control Features:

1. Internal compressor overtemperature protection.

2. Crankcase heaters.
3. Individual motor overcurrent protection.
4. High pressure cutout.
5. Low pressure cutout.
6. Anti-recycle timer (5 minute).
7. Phase failure and low voltage protection.
8. Liquid line solenoid.
9. Hot gas reheat (HGRH).

D. Room thermostat shall be low voltage, remote-mounted with sub-base and thermometer for controlling heating and cooling cycles. The fan selector shall include "AUTO-ON" controls. The system selector shall include "OFF-COOL-HEAT-EM HT" controls. /The room thermostats shall be manually adjustable by occupants and shall indicate setting and temperature in degrees Fahrenheit. Provide two heating stages.

E. Emergency heat switch shall allow operation of all electric heat.

2.9 Basic Vibration Isolation: Provide vibration isolation products complying with Division-23 section "Vibration Isolation" and the following list:

A. Bases and Frames: Type BF2.

PART 3 - EXECUTION

3.1 Installation: Install in accordance with producer's printed instructions. Brush out fins on all coils.

3.2 Rooftop Equipment: Anchor rooftop units to curbs with cadmium-plated self-tapping screws, lag screws, or bolts, as directed by curb construction. Secure unit to withstand 125 mph wind velocity. The curb shall be installed by the roofing contractor. Mechanical contractor shall provide delegated design services for wind load calculations and attachments between curb, curb adapter and unit base utilizing a clip or cleat system. Guy wires and straps will not be accepted.

3.3 Controls: Set up controls as described by the sequence of operations.

3.4 Cleaning: Clean tar and all other soil from housing exterior. Leave ready for Division 7, Caulking Work.

3.5 Brush out fins on all coils.

3.6 Condensate Drain: Pipe trapped condensate drain (full size of unit outlet) to the nearest floor/roof system drain or as shown on the drawings. Refer to Division-23 section "Insulation" for pipe insulation.

3.7 Construction Filters: Provide 1" thick filters in all units during construction. After construction (but prior to the test and balance being performed) install clean final filters.

3.8 Startup: Startup by a factory-trained representative. Check entire assembly for correctness of installation, alignment, and control sequencing. Start all component parts in proper sequence. Make all adjustments required to insure proper control and smooth quiet operation. Submit Startup Report.

END OF SECTION

SECTION 00 0107
SEALS PAGE

ARCHITECT:

JOE WALKER, AIA

FL ARCHITECTURAL LICENSE NO: AR0017272

RESPONSIBLE FOR DIVISIONS 01-14 SECTIONS EXCEPT WHERE INDICATED AS PREPARED BY OTHER DESIGN PROFESSIONALS OF RECORD.

STRUCTURAL ENGINEER:

MARK MILLER, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 45319

RESPONSIBLE FOR SECTIONS:

03 3000

03 6030

04 0500

04 2300

05 1200

05 2200

05 3300

31 2000

PLUMBING ENGINEER:

S. ANDREW MITCHELL, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 75609

RESPONSIBLE FOR DIVISION 22 SECTIONS

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY STEVEN ANDREW MITCHELL, PE, ON THE DATE ADJACENT TO THE SEAL. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

MITCHELL GULLEDGE ENGINEERING, INC. 204 SW 4TH AVE. GAINESVILLE, FL 32601, 352-745-3991 FL EB# 31501

Steven A Mitchell
2023.03.01 14:59:39-05'00'

HVAC ENGINEER:

S. ANDREW MITCHELL, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 75609

RESPONSIBLE FOR DIVISION 23 SECTIONS

ELECTRICAL ENGINEER:

ANDREW P. MCCADDIN, PE

FL PROFESSIONAL ENGINEER LICENSE NO: 83318

RESPONSIBLE FOR DIVISION 26 SECTIONS

END OF SECTION

SECTION 00 00 00
TABLE OF CONTENTS

END OF SECTION

SECTION 22 00 00
PLUMBING GENERAL

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the plumbing work as herein called for and shown on the drawings.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This is a Basic Requirements Section. Provisions of this section apply to work of all Division 22 sections.

C. Review all other contract documents to be aware of conditions affecting work herein.

D. Definitions:

1. Provide: Furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for subsequent requirements.
3. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.3 Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.4 Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions, or inaccuracies of the said data.

1.5 Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

1.6 Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be construed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.7 Field Measurements and Coordination:

A. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

B. Verify all field dimensions and locations of equipment to ensure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

C. Coordinate work in this division with all other trades in proper sequence to ensure that the total work is completed within contract time schedule and with a minimum cutting and patching.
D. Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on plumbing drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.
E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings, and passageways. Cut no structural members without written approval.
F. Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.
G. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

1.8 Guarantee:

A. The Contractor shall guarantee labor, materials, and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.
B. Owner reserves right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9 Approval Submittals:

A. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

1. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following.

a. Submittals shall be properly organized in accordance with the approved submittal control log.
b. Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.

c. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.
d. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.
e. Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or valve type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.
f. The electrical design shown on the drawings supports the plumbing equipment basis of design specifications at the time of design. If plumbing equipment is submitted with different electrical requirements, it is the responsibility of the plumbing contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the plumbing submittal with a written statement that this change will be provided at no additional cost. Plumbing submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

B. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

C. Review of shop drawings, product literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

D. Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations, and details to scale (not smaller than 1/4" per foot), with dimensions clearly showing the installation. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.10 Test Reports and Verification Submittals: Submit test reports, certifications, and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports, and take corrective action within the scheduled contract time.

1.11 O&M Data Submittals: Submit Operation and Maintenance data as called for in other sections. When a copy of approval submittals is included in the O&M Manual, only the

final "Approved" or "Approved as Noted" copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection.

PART 2 - PRODUCTS

2.1 All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

2.2 Equipment and Materials:

A. All equipment and materials shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

B. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings, and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated, or painted.

C. The label of the approving agency, such as UL or FM, by which a standard has been established for the particular item shall be in full view.

D. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

E. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

F. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

G. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material, and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

H. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.3 Requests for Substitution:

A. Where a particular system, product, or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product, or material specified.

B. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

1. Required product cannot be supplied in time for compliance with Contract time requirements.
2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.
3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services, and similar considerations.

C. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

1. Principal of operation.
2. Materials of construction or finishes.
3. Thickness of gauge of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other work caused by the substitution.
8. Performance curves.
9. If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

PART 3 - EXECUTION

3.1 Workmanship: All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

3.2 Coordination:

A. The Contractor shall be responsible for full coordination of the plumbing systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping or other equipment passing through slabs or walls.

B. Any additional steel supports required for the installation of any plumbing equipment or piping shall be furnished and installed under the section of the specifications requiring the additional supports.

C. It shall be the Contractor's responsibility to see that all equipment such as valves, filters, and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

D. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

E. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

G. Start of work will be construed as acceptance of suitability of work of others.

3.3 Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

3.4 Phasing: Provide all required temporary valves, piping, equipment, and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

3.5 Cutting and Patching: Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

3.6 Equipment Setting: Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts, and washers. Level equipment.

3.7 Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 22. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.8 Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

3.9 Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.10 Record Drawings:

A. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, equipment, and other systems which are not installed exactly as shown on the contract drawings.

B. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

3.11 Acceptance:

A. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

B. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.

C. Operation and Maintenance Manuals: Furnish complete manual Table of Contents, organized, and tabbed by specification section. Manuals shall contain:

1. Detailed operating instructions and instructions for making minor adjustments.
2. Complete wiring and control diagrams.
3. Routine maintenance operations.
4. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
5. Copies of approved submittals.
6. Copies of all manufacturer's warranties.
7. Copies of test reports and verification submittals.

D. Record Drawings: Submit record drawings.

E. Acceptance will be made on the basis of tests and inspections of job. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.

PROJECT NAME
PROJECT NUMBER

ARCHITECT: Company Name

ENGINEER: Mitchell Gulledge Engineering

CONTRACTOR: Contractor Name

SUBCONTRACTOR: Sub Name

SUPPLIER: Supply Company

MANUFACTURER: Manufacturer

DATE: mm/dd/yyyy

SECTION: 22 XX XX/Section Name

1. Product 1: Manufacturer, Model

2. Product 2: Manufacturer, Model

3. Product 3: Manufacturer, Model

4. Product 4: Manufacturer, Model

5. Product 5: Manufacturer, Model

SAMPLE

Any standard heading is acceptable.

List each product individually. Include manufacturer name and model.

Include GC or CM Approval stamp indicating review and acceptance by responsible contractor.

END OF SECTION

SECTION 22 05 01
PLUMBING CODES AND STANDARDS

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment, and materials and performing all operations necessary for the installation of the plumbing work as herein called for and shown on the drawings.

1.2 This is a Basic Plumbing Requirements section. Provisions of this section apply to work of all Division-22 sections.

PART 2 - CODES

2.1 All work under Division 22 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the Contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the Architect/Engineer's attention any drawings or specifications that are not in conformance with these or other codes prior to ordering equipment or installing work.

2.2 Comply with regulations and codes of utility suppliers.

2.3 Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with code requirements when carrying out such work.

2.4 Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.

2.5 Additional codes or standards applying to a specific part of the work may be included in that section.

2.6 The following codes and standards shall govern all work:

A. Florida Building Code - Seventh Edition (2020)
B. Florida Building Code - Seventh Edition (2020) - Energy Conservation
C. Florida Building Code - Seventh Edition (2020) - Mechanical
D. Florida Building Code - Seventh Edition (2020) - Plumbing
E. Florida Building Code - Seventh Edition (2020) - Fuel Gas
F. Florida Building Code - Seventh Edition (2020) - Accessibility
G. Florida Fire Prevention Code Seventh Edition

1. Fire Code (NFPA 1 - 2018 Edition)
2. Life Safety Code (NFPA 101 - 2018 Edition)

H. National Electric Code (NFPA 70 - 2017).

PART 3 - STANDARDS

All materials, installation, and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:

3.1 Underwriters' Laboratories (UL)
3.2 American National Standards Institution (ANSI)
3.3 American Society of Testing Materials (ASTM)
3.4 Air Conditioning and Refrigeration Institute (ARI)
3.5 National Fire Protection Association (NFPA)
3.6 National Electrical Manufacturers Association (NEMA)
3.7 Standards of the Hydronic Institute (IBR)

END OF SECTION

SECTION 22 05 02
PLUMBING RELATED WORK

PART 1 - DIVISION 01 - GENERAL REQUIREMENTS

1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This is a Basic Plumbing Requirements section. Provisions of this section apply to work of all Division-22 sections.

1.3 Coordinate with the General Contractor for all cutting and patching. Contractors performing Division-22 work shall inform the General Contractor of all cutting and patching required prior to bidding and shall coordinate installation.

1.4 Divisions listed in the is section are based on CSI 2004 Master Format. Where architectural or other engineering documents do not have written specifications for referenced divisions, contractor refer to architectural drawings, notes and details associated with the referenced division. Where no architectural or other engineering documents exist, contractor shall refer to owners' published standards and Florida Building Code requirements associated with the referenced division.

PART 2 - DIVISION 03 - CONCRETE

2.1 Refer to Division 03, Concrete for:

A. Rough grouting in and around plumbing work.
B. Patching concrete cut to accommodate plumbing work.

2.2 The following is part of Division-22 work, complying with the requirements of Division 03:

A. Curbs, foundations, and pads for plumbing equipment.
B. Basins, sumps, and vaults of plumbing work.
C. Underground structural concrete to accommodate plumbing work.
D. Inertia bases.

PART 3 - DIVISION 04 - MASONRY

3.1 Refer to Division 04, Masonry for:

A. Installation of access doors in walls.

PART 4 - DIVISION 05 - METALS

4.1 Refer to Division 05, Metals for:

A. Framing openings for plumbing equipment.

4.2 The following is part of Division-22 work:

A. Supports for plumbing work.

PART 5 - DIVISION 06 - WOOD AND PLASTIC

5.1 Refer to Division 6, Wood for:

A. Framing openings for plumbing equipment.

PART 6 - DIVISION 07 - THERMAL AND MOISTURE PROTECTION

6.1 Refer to Division 07, Thermal and Moisture Protection for:

A. Installation of all roof curbs and roof supports for plumbing work.
B. Caulking and waterproofing of all wall and roof mounted plumbing work.
C. Providing all roof curbs and all vent flashing for metal roofs.

6.2 The following is part of Division-22 work, complying with the requirements of Division 07:

A. Fire barrier penetration seals.

PART 7 - DIVISION 09 - FINISHES

7.1 Refer to Division 09, Finishes for:

A. Painting exposed piping and equipment.
B. Painting structural metal and concrete for plumbing work.
C. Painting access panels.
D. Painting color-coded plumbing work indicated for continuous painting. See color schedule in Division-22 section, "Plumbing Identification".
E. Installation of access doors in gypsum drywall.

7.2 Colors shall be selected by the Architect for all painting of exposed plumbing work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.

7.3 Perform the following as part of Division-22 work:

A. Touch up painting of factory finishes.
B. Painting of all hangers.

PART 8 - DIVISION 26 - ELECTRICAL

8.1 Plumbing contractor shall coordinate the exact electrical requirements of all plumbing equipment being provided with the electrical contractor. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the plumbing equipment basis of design. If plumbing equipment is submitted with different electrical requirements, it is the responsibility of the plumbing contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the plumbing submittal with a written statement that this design will be provided at no additional cost. Plumbing submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

8.2 Electrical contractor shall provide disconnect switches, starters, and contactors for plumbing equipment unless specifically noted as being furnished as part of plumbing equipment.

8.3 Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all plumbing equipment, switches, starters, contactors, controllers, and similar equipment.

PART 9 - DIVISION 33 - SITE WORK

9.1 Refer to Division 33, Sitework for:

A. All water, sewer, and storm water piping greater than five feet from the building.
B. Manholes and catch-basins.
C. Underground tanks and enclosures.
D. Septic tanks and drainfields.

END OF SECTION

SECTION 22 05 19
PLUMBING METERS AND GAUGES

PART 1 - GENERAL

1.1 Related Documents:

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

1.2 Description of Work:

A. Extent of meters and gauges required by this Section is indicated on drawings and/or specified in other Division 22 sections. Types of meters and gauges specified in this Section include the following:

1. Calibrated Balancing Valves.

1.3 Quality Assurance:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of meters and gauges, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

B. Comply with ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

1.4 Submittals:

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of meter and gauge. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gauge schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gauge.

PART 2 - PRODUCTS

2.1 Calibrated Balancing Valves:

A. Provide as indicated, calibrated balance valves equipped with readout valves to facilitate connecting of differential pressure meter to balance valves. Each readout valve shall have an integral EPT check valve designed to minimize system fluid loss during monitoring process. Provide calibrated nameplate to indicate degree of closure of precision machined orifice. Construct balancing valve with internal EPT o-ring seal to prevent leakage around rotating element. Provide balance valves with pre-formed polyurethane insulation suitable for use on both heating and cooling systems. Acceptable manufacturers include Bell & Gossett, Taco, and Trush products.

PART 3 - EXECUTION

3.1 Inspection:

A. Examine areas and conditions under which meters and gauges are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Installer.

3.2 Installation:

A. Install all meters and gauges in accessible locations, positioned so as to be easily read by an observer standing on the floor.

3.3 Adjusting and Cleaning:

A. Adjust faces of meters and gauges to proper angle for best visibility.
B. Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 22 05 23
PLUMBING VALVES

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

1.2 This section is a Division-22 Basic Materials and Methods section, and is part of each Division-22 section making reference to or requiring valves specified herein.

1.3 Extent of valves required by this section is indicated on drawings and/or specified in other Division-22 sections.

1.4 Quality Assurance:

A. Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding-end valve bodies, comply with ANSI B16.10.

B. Valve Types: Provide valves of same type by same manufacturer.

1.5 Approval Submittals: When required by other Division-22 sections, submit product data, catalog cuts, specifications, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valves with Division-22 section using the valves, not as a separate submittal. For each valve, identify systems where the valve is intended for use.

A. Check Valves: Type CK.

B. Ball Valves: Type BA.

PART 2 - PRODUCTS

2.1 General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with specifications and installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide valves of one of the producers listed for each valve type. The model numbers are listed for contractor's convenience only. In the case of a model number discrepancy, the written description shall govern.

2.3 Check Valves:

A. Construction: Construct valves of castings free of any impregnating materials. Construct valves with a bronze regrinding disc with a seating angle of 40° to 45°, unless a composition disc is specified. Provide stop plug as renewable stop for disc hanger, unless otherwise specified. Disc and hanger shall be separate parts with disc free to rotate. Support hanger pins on both ends by removable side plugs.

B. Comply with the following standards:

1. Cast Iron Valves: MSS SP-71. Cast Iron Swing Check Valves, Flanged and Threaded Ends.
2. Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.
3. Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.

C. Types of check (CK) valves:

1. Threaded Ends 2" and Smaller (CK1): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-319. Nibco T-413-BY. Crane 1707. Milwaukee 509.
2. Soldered Ends 2" and Smaller (CK2): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-309. Nibco S-413-B. Crane 1707S. Milwaukee 1509.
3. Flanged Ends 2-1/2" and Larger (CK3): Class 125, iron body, bronze-mounted, bolted cap, horizontal swing, cast-iron or composition disc. Stockham G-931 or G-932 as applicable. Nibco F918-B. Crane 373. Milwaukee F2974 as applicable.
4. Threaded Ends 2" and Smaller (CK4): 200 WWP, bronze body, screwed cap, horizontal swing, regrinding type bronze disc, for fire sprinkler use. Nibco KT-403-W.
5. Flanged Ends 2-1/2" and Larger (CK5): 175 WWP, iron body, bolted cap, bronze mounted, composition disc, UL listed, with ball drip if required. Stockham G-940. Nibco F-908-W.
6. Threaded Ends 2" and Smaller (CK6): Class 200, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-345. Nibco T-453-B. Crane 36. Milwaukee 518/508.
7. Flanged Ends 2-1/2" and Larger (CK7): Class 250, iron body, bronze mounted, bolted cap, cast-iron disc. Stockham F-947. Nibco F-968-B. Crane 39E. Milwaukee F2970.
8. Threaded Ends 2" and Smaller (CK8): Class 300, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-375. Nibco T-473-B. Crane 76E. Milwaukee 517/507.
9. Flanged Ends 2-1/2" and Larger (CK9): Class 300, cast steel body, bolted cap, horizontal swing, seal welded seat rings, chromium stainless disc. Stockham 30-SF. Crane 159.

2.4 Ball Valves:

A. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

B. Construction: Ball valves shall be rated for 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blow-out proof bottom loaded stem constructed of ASTM B-371 alloy 694 or other approved low zinc material. Provide TFE packing, TFE thrust washer, chrome-plated ball and reinforced teflon seats. Valves 1" and smaller shall be full port design. Valves 1-1/4" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds 1/2" thickness.

C. Comply with the following standards:

1. MSS SP-72. Ball Valves with Flanged or Butt Welding Ends for General Service.
2. MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

D. Types of ball (BA) valves:

1. Threaded Ends 2" and Smaller (BA1): Bronze two-piece full port body with adjustable stem packing. Nibco T-585-70. Stockham S216-BR-R-T. Milwaukee UPBA100. Apollo 77-100.

2. Soldered Ends 2" and Smaller (BA2): Bronze three-piece full port body with adjustable stem packing. Nibco S-595-Y-66. Milwaukee UPBA350S. Apollo 82-200.
3. Threaded Ends 1" and Smaller (BA3): Bronze two-piece full port body, UL listed (UL 842) for use with flammable liquids and LP gas. Nibco T-585-70-UL, Milwaukee UPBA10.
4. Flanged Ends 2-1/2" and Larger (BA7): Class 150, carbon steel full bore two-piece body with adjustable stem packing. Nibco F515-CS series. Apollo 88-240.

2.5 Valve Features:

A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.
B. Valve features specified or required shall comply with the following:

1. Flanged: Provide valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).
2. Threaded: Provide valve ends complying with ANSI B2.1.
3. Solder-Joint: Provide valve ends complying with ANSI B16.18.
4. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry unless otherwise specified.
5. Non-Metallic Disc: Provide non-metallic material selected for service indicated in accordance with manufacturer's published literature.
6. Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.
7. Extended Stem: Increase stem length by 2" minimum, to accommodate insulation applied over valve.

PART 3 - EXECUTION

3.1 Installation:

A. General: Install valves where required for proper operation of piping and equipment, including valves in branch lines to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward below horizontal plane.
B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
C. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator.
D. Mechanical Actuators: Install mechanical actuators as recommended by valve manufacturer.

3.2 Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:

A. Tube Size 2" and Smaller: Threaded valves. Soldered-joint valves may also be used.
B. Pipe Size 2" and Smaller: Threaded valves.
C. Pipe Size 2-1/2" and Larger: Flanged valves.

3.3 Non-Metallic Disc: Limit selection and installation of valves with non-metallic disc to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

3.4 Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.

3.5 Installation of Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction flow.

END OF SECTION

SECTION 22 05 29
PLUMBING SUPPORTS ANCHORS AND SEALS

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-22 Basic Materials and Methods section, and is a part of each Division-22 section making reference to or requiring supports, anchors, and seals specified herein.

1.3 Extent of supports, anchors, and seals required by this section is indicated on drawings and/or specified in other Division-22 sections.

1.4 Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors, and seals.

1.5 MSS Standard Compliance:

A. Provide pipe hangers and supports of which materials, design, and manufacture comply with ANSI/MSS SP-58.
B. Select and apply pipe hangers and supports, complying with MSS SP-69.
C. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
D. Terminology used in this section is defined in MSS SP-90.

1.6 UL Compliance: Provide products which are Underwriters Laboratories listed.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide supports and hangers by Grinnel, Michigan Hanger Company, B-Line Systems, or approved equal.

2.2 Horizontal-Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

A. Adjustable Steel Clevises: MSS Type 1.
B. Steel Double Bolt Pipe Clamps: MSS Type 3.
C. Adjustable Steel Band Hangers: MSS Type 7.
D. Steel Pipe Clamps: MSS Type 4.
E. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.
F. Single Pipe Rolls: MSS Type 41.
G. Adjustable Roller Hanger: MSS Type 43.
H. Pipe Roll Stands: MSS Type 44 or Type 47.

2.3 Vertical-Piping Clamps: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical

piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

A. Two-Bolt Riser Clamps: MSS Type 8.
B. Four-Bolt Riser Clamps: MSS Type 42.

2.4 Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

A. Steel Turnbuckles: MSS Type 13.
B. Malleable Iron Sockets: MSS Type 16.

2.5 Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

A. Center Beam Clamps: MSS Type 21.
B. C-Clamps: MSS Type 23.
C. Malleable Beam Clamps: MSS Type 30.
D. Side Beam Brackets: MSS Type 34.
E. Concrete Inserts: MSS Type 18.

2.6 Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

A. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
B. Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation matching adjoining insulation.

2.7 Miscellaneous Materials:

A. Metal Framing: Provide products complying with NEMA STD ML 1.
B. Steel Plates, Shapes, and Bars: Provide products complying with ANSI/ASTM A 36.
C. Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance with AWS standards.

PART 3 - EXECUTION

3.1 Preparation:

A. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct

inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

B. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.2 Installation of Building Attachments:

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through openings at top of inserts.

B. In areas of work requiring attachments to existing concrete, use self-drilling rod inserts, Phillips Drill Co., “Red-Head” or equal.

3.3 Installation of Hangers and Supports:

A. General: Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69 or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

Horizontal steel pipe and copper tube 1-1/2” diameter and smaller: support on 6 foot centers.

1. Horizontal steel pipe and copper tube over 1-1/2” diameter: support on 10-foot centers.
2. Vertical steel pipe and copper tube: support at each floor.
3. Plastic pipe: support in accordance with manufacturer’s recommendations.
4. Vertical cast iron pipe: support at each floor and at the base.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

C. Paint all black steel hangers with black enamel. Galvanized steel and copper clad hangers do not require paint.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

E. Provision for movement:

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

F. Insulated Piping: Comply with the following installation requirements.

1. Shields: Where low-compressive-strength insulation or vapor barriers are indicated, install coated protective shields.
2. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

G. Do not support plumbing piping from hangers used to support fire protection piping. Fire protection piping to be supported independently of other piping.

3.4 Installation of Anchors:

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
B. Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
C. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and elbows. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.
D. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

3.5 Equipment Bases:

A. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands. Prime and paint with black enamel.

END OF SECTION

SECTION 22 05 53
PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-22 Basic Plumbing Materials and Methods section, and is part of each Division-22 section making reference to or requiring identification devices specified herein.

1.3 Extent of plumbing identification work required by this section is indicated on drawings and/or specified in other Division-22 sections.

1.4 Refer to Division-26 sections for identification requirements of electrical work; not work of this section. Refer to other Division-22 sections for identification requirements for controls; not work of this section.

1.5 Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2.1 General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-22 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.2 Painted Identification Materials:

A. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 3/4" high letters for access door signs and similar operational instructions.

B. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

C. Identification Paint: Standard identification enamel.

2.3 Plastic Pipe Markers:

A. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers.

1. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with name as shown or specified.
2. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.4 Valve Tags:

A. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener. Provide 1-1/2" diameter tags, except as otherwise indicated.

B. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4" high letters and

sequenced valve numbers 1/2" high, and with 5/32" hole for fastener. Provide 1-1/2" square black tags with white lettering, except as otherwise indicated.

2.5 Engraved Plastic-Laminate Signs:

A. General: Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style a minimum of 3/4" tall and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.6 Stamped Nameplates: Provide equipment manufacturer's standard stamped nameplates for motors, pumps, etc.

PART 3 - EXECUTION

3.1 Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 Piping System Identification:

A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

1. Plastic pipe markers.
2. Stenciled markers, black or white for best contrast.

B. Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces, and exterior non-concealed locations.

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and equipment; mark each pipe at branch, where there could be question of flow pattern.
3. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
4. At access doors, manholes, and similar access points which permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.3 Valve Identification: Provide coded valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. Coordinate code with operating instructions.

3.4 Plumbing Equipment Identification: Install engraved plastic laminate sign on a vertical surface on or near each major item of plumbing equipment and each operational device. Label shall indicate type of system and area served. Provide signs for the following general categories of equipment and operational devices:

A. Fuel-burning units including water heaters.
B. Pumps and similar equipment.
C. Tanks and pressure vessels.

3.5 Stamped Nameplates: Equipment manufacturers to provide standard stamped nameplates on all major equipment items such as motors, pumps, etc. Where motors are hidden from view (within equipment casing, or otherwise not easily accessible, etc.), the equipment supplier shall furnish a duplicate motor data nameplate to be affixed to the equipment casing in an easily visible location, unless data is already included on the equipment nameplate.

3.6 Adjusting and Cleaning:

A. Adjusting: Relocate any plumbing identification device which has become visually blocked by work of this division or other divisions.
B. Cleaning: Clean face of identification devices.

END OF SECTION

SECTION 22 05 60
PLUMBING ACCESS DOORS

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-22 Basic Materials and Methods section, and is part of each Division-22 section making reference to or requiring access panels specified herein.

1.3 Approval Submittals:

A. Product Data: When required by other Division-22 sections, submit product data for access doors. Submit with Division-22 section using access doors, not as a separate submittal. Include rating data.

B. O&M Data Submittals: Submit a copy of approval submittal. Include this data in O&M Manuals.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Milcor, Jay R. Smith, Zurn, BOICO, Elmdor, or approved equal.

2.2 General: Where floors, walls, and ceilings must be penetrated for access to plumbing work, provide types of access doors indicated. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.

2.3 Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16-gauge frames and 14-gauge flush panel doors; 175° swing with concealed spring hinges; flush screw-driver-operated cam locks; factory-applied rust-inhibitive prime-coat paint finish.

2.4 Locks: Provide 5-pin or 5-disc type cylinder locks, individually keyed unless otherwise indicated, 2 keys.

PART 3 - EXECUTION

3.1 Access doors shall be installed to operate and service all plumbing equipment including valves, water hammer arrestors, trap primers, and other items requiring maintenance that are concealed above or behind finished construction. Access doors shall be installed in walls, chase, and floors as necessary, but are not required in accessible suspended ceiling systems. Access doors shall have factory applied protective phosphate coating and baked enamel primer suitable for field painting.

3.2 Access doors shall be installed by the Division installing the substrate construction. However, responsibility for furnishing and determining location of access doors is part of this Division's work. The style of access door shall be suitable for construction into which installed.

3.3 Access doors shall be sized and located as required to provide proper maintenance and service access in accordance with the manufacturer's recommendations and code authority requirements for all devices and equipment.

END OF SECTION

SECTION 22 06 93
TESTING ADJUSTING AND BALANCING OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-22 Basic Plumbing Materials Sections apply to work of this section.

1.3 Description of Work:

A. Extent of testing, adjusting, and balancing work (TAB) is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, domestic hot water and hot water recirculating systems. The work consists of setting volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required.

B. Pretesting: Where required by the drawings as directed, report findings prior to start of demolition work or any other modifications to the existing systems. Results of pretesting shall be reported to the Engineer in a timely manner. Comply with standards for final TAB reports described herein.

C. Coordination: Coordinate with the General Contractor and Plumbing Contractor responsible for plumbing system installation as required to complete the TAB work.

D. Temperature Tolerances:

1. Hot Water Temperatures: The domestic hot water controlled temperatures from water heaters thermostatic mixing valves shall be under control within 5°F but not outside of the building code required temperature range by any deviation.

E. Water Flow: Balance domestic water flow rates to within 10% of design values.

1.4 Job Conditions:

A. Do not proceed with testing, adjusting, and balancing work until plumbing work (including Controls) has been completed and is operable. Ensure that there is no residual work still to be completed.

B. Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt, and discarded building materials.

1.5 Test Reports and Verification Submittals:

A. Submit an electronic copy of the dated test and balance report upon completion of TAB work. The report shall include a list of instruments used for the work. The report shall be signed by the supervisor who performed the TAB work.

PART 2 - PRODUCTS

2.1 Test Instruments: Utilize test instruments and equipment of the type, precision, and capacity as recommended in the referenced standard. All instruments shall be in good condition and shall have been calibrated within the previous six (6) months (or more recently if required by standard).

PART 3 - EXECUTION

3.1 General:

A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with TAB work until unsatisfactory conditions have been corrected in a manner acceptable to Tester.
B. Punch List: Prepare a deficiency (punch)list for the Contractor with a copy of the Engineer that lists all items that are incorrectly installed or are functioning improperly. Provide a retest after all items are corrected.
C. Prepare TAB report of test results, including instrumentation calibration reports, in format recommended by applicable standards, modified as required to include all data listed herein.

3.2 Water Balancing:

A. Verify proper operation of all domestic water system devices to ensure the proper flowrate, flow direction, and pressure are maintained.
B. Set balancing cocks and flow control devices to obtain specified water flow rates to all domestic hot water return legs of piping.

END OF SECTION

SECTION 22 07 00
INSULATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-22 Basic Materials and Methods Sections apply to work of this section.

1.3 Approval Submittals:

A. Product Data: Submit a producer's data sheets and installation instructions on each insulation system including insulation, coverings, adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated. Submit for:

1. Fiberglass pipe insulation

1.4 O&M Data Submittals: Submit a copy of all approval submittals. Include in O&M Manual.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers: Subject to compliance with requirements, provide insulation products by Armstrong, Johns Manville, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos-free.

2.2 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame-spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2.3 Pipe Insulation Materials:

A. Fiberglass Pipe Insulation: ASTM C547, Class 1 unless otherwise indicated. (Preformed sleeving with white all-service jacket, suitable for temperatures up to 450°F.)

B. Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for applications indicated.

C. Adhesives, Sealers, and Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.

D. Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at installer's option.

PART 3 - EXECUTION

3.1 General:

A. Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

C. Maintain integrity of vapor-barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE".

D. Do not apply insulation to surfaces while they are hot or wet.

E. Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.

F. Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in".

3.2 Fiberglass Pipe Insulation:

A. Insulate the following piping systems (indoor locations):

1. Domestic Cold Water:

a. Cold water piping in unconditioned spaces: 1/2" thick

2. Domestic hot water and hot water return, 140°F - 180°F:

a. 1/2" - 1-1/4" pipe: 1-1/2" thick
b. 1-1/2" pipe or greater: 2" thick

3. Domestic hot water and hot water return, Under 140°F:

a. Any location other than in walls:

1) 1/2" - 3" pipe: 1-1/2" thick
2) 3" pipe or greater: 2" thick

b. In interior or insulated walls:

1) 1/2" – 2” pipe: 1" thick

B. Apply insulation to pipe with all side and end joints butted tightly. Seal longitudinal lap by pressurizing with plastic sealing tool. Apply 3-inch wide self-sealing butt strips to joints between insulation sections. Insulate all fittings, flanges, valves, and strainers with premolded insulation. Apply coat of insulating cement to fittings and wrap with glass cloth overlapping each wrap 1" and adjacent pipe 2". Finish with heavy coat of general purpose mastic. Premolded PVC covers may also be used, but no flexible inserts are allowed.

C. Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over the insulation which extends halfway up the pipe insulation cover and at least 6" on each side of the hanger.

D. Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainer blowoffs, flexible connections, and expansion joints.

END OF SECTION

SECTION 22 10 00
PIPES AND FITTINGS

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-22 Basic Plumbing Materials and Methods section, and is part of each Division-22 section making reference to pipes and pipe fittings specified herein.

1.3 Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division-22 sections.

1.4 Codes and Standards:

A. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundations (NSF).

PART 2 - PRODUCTS

2.1 Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade, or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

2.2 Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve, or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.3 Piping Materials/Products:

A. Soldering Materials:

1. Tin-Antimony (95-5) Solder: ASTM B-32, Grade 95TA.
2. Silver-Phosphorus Solder: ASTM B-32, Grade 96TS.

B. Pipe Thread Tape: Teflon tape.

C. Protective Coating: Koppers Bitumastic No. 505 or equal.

D. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast iron flanges; raised-face for steel flanges, unless otherwise noted.

2.4 Copper Tube and Fittings:

A. Copper Tube:

1. Copper Tube: ASTM B88; Type K or L as indicated for each service; hard-drawn temper unless specifically noted as annealed.
2. ACR Copper Tube: ASTM B280.
3. DWV Copper Tube: ASTM B306.

B. Fittings:

1. Wrought-Copper Solder-Joint Fittings: ANSI B16.22.
2. Copper Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.
3. Wrought-Copper Solder-Joint Drainage Fittings: ANSI B16.29.

4. Cast-Copper Flared Tube Fittings: ANSI B16.26.

2.5 Plastic Pipes and Fittings:

A. Pipes:

1. PVC DWV Pipe: ASTM D-2665, Schedule 40.
2. CPVC Pressure Pipe: ASTM F441, Schedule 40 or 80.

B. Fittings:

1. PVC Solvent Cement: ASTM D-2564.
2. PVC DWV Socket: ASTM D-2665.
3. CPVC Schedule 80 Socket: ASTM F-439-13.
4. CPVC Schedule 80 Threaded: ASTM F-437-15.

PART 3 - EXECUTION

3.1 Installation:

A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings, not bushings. Align piping accurately at connections, within 1/16" misalignment tolerance.

B. Comply with ANSI B31 Code for Pressure Piping.

C. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation.

D. Concealed Piping: Unless specifically noted as "Exposed" on the drawings, conceal piping from view in finished and occupied spaces, by locating in column enclosures, chases, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.

E. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical, communications, or data equipment spaces and enclosures unless shown. Install drip pan under piping that must run through electrical spaces.

F. Cut pipe from measurements taken at the site, not from drawings. Keep pipes free of contact with building construction and installed work.

3.2 Piping System Joints: Provide joints of the type indicated in each piping system.

A. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply non-acid type solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.

B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed. Paint exposed threads to retard rusting.

C. Plastic Pipe Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.

1. Solvent-cemented joints shall be made in accordance with ASTM D-2235 and ASTM F-402.
2. PVC sewer pipe bell/gasket joints shall be installed in accordance with ASTM D-2321.
3. Provide factory adapter at transitions between piping components of differing materials. Threaded adapters are not acceptable.

3.3 Piping Installation:

A. Install piping to allow for expansion and contraction.

B. Isolate all copper tubing from steel and concrete by wrapping the pipe at the contact point, and for one inch on each side, with a continuous plastic sleeve. Isolate all copper tubing installed in block walls with a continuous plastic sleeve.

END OF SECTION

SECTION 22 10 19
PLUMBING PIPING SPECIALTIES

PART 1 - GENERAL

1.1 Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-22 Basic Plumbing Materials and Methods section, and is part of each Division-22 section making reference to or requiring piping specialties specified herein.

1.3 Approval Submittals:

A. Product Data: Submit product data with installation instructions and UL listing for:

1. Fire barrier sealants.

PART 2 - PRODUCTS

2.1 General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 Escutcheons:

A. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

2.3 Dielectric Unions or Waterways: Provide standard products recommended by manufacturer or Victaulic Style 47 dielectric waterways for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action and stop corrosion.

2.4 Fire Barrier Penetration Seals:

A. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for plumbing components such as piping in accordance with the requirements of Division 7.

2.5 Fabricated Piping Specialties:

A. Drip Pans: Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

B. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.
2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.

C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:

1. Caulking and Sealant: Provide foam or caulking and sealant compatible with piping materials used.

2.6 Low Pressure Y-Type Pipeline Strainers:

A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Provide Type 304 stainless steel screens.

1. Water Strainers: Select for 200 psi working pressure (water, oil, or gas). Provide 20 mesh screens through 2" size and 1/16" perforations for 2-1/2" size and larger.

B. Select from the following types:

1. Threaded Ends, 2" and Smaller: Bronze body, screwed screen retainer with centered blowdown fitted with pipe plug.
2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

PART 3 - EXECUTION

3.1 Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

3.2 Dielectric Unions or Waterways: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

3.3 Fire Barrier Penetration Seals: Provide pipe sleeve as required. Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions. Refer to Division 7.

3.4 Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

3.5 Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor

finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

A. Install sleeves in fire-rated assemblies in accordance with the listing of the assembly and the fire barrier sealant.
B. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings. Fill annular space with caulking or fire barrier sealant as required.
C. Install steel-pipe sleeves at floor penetrations. Fill annular space with caulking or fire barrier sealant as required.
D. Install iron-pipe sleeves at all foundation wall penetrations and at exterior penetrations; both above and below grade. Fill annular space with caulking or mechanical sleeve seals.

3.6 Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 3/4" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

3.7 Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:

A. Pumps
B. Reduced pressure backflow preventers
C. Temperature control valves
D. Pressure reducing valves
E. Temperature or pressure regulating valves

END OF SECTION

SECTION 22 11 13
POTABLE WATER SYSTEM

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.

1.3 Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.

1.4 Refer to other Division-22 sections for site water distribution system; not work of this section unless noted.

PART 2 - PRODUCTS

2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with Referenced Codes in Specification Section 22 05 01 – Plumbing Codes and Standards where applicable. Provide sizes and types matching pipe materials used in potable water systems. Where more than one type of materials or products is indicated, selection is Installer's option.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.

2.3 Identification: Provide identification complying with Division-22 Basic Plumbing Materials and Methods section "Plumbing Identification"

2.4 Refer to appropriate Division-33 sections for exterior potable water system; not work of this section unless noted.

2.5 Insulation for potable water piping is specified in other Division-22 sections, and is included as work of this section. Insulation requirements include:

A. Domestic hot water piping

2.6 Excavation and backfill required in conjunction with water piping is specified in other Division-22 sections, and is included as work of this section.

2.7 Code Compliance: Comply with applicable portions of Standard Plumbing Code pertaining to selection and installation of plumbing materials and products. Comply with local utility requirements.

2.8 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data and installation instructions for:

1. Valves
2. Strainers
3. Wall hydrants
4. Water hammer arresters
5. Meters and gauges
6. Relief valves
7. Trap primers
8. Access doors

2.9 Test Reports and Verification Submittals:

A. Backflow Preventer Test Report: Submit Test Report for each backflow preventer.
B. Disinfection: Submit report by Health Department.

2.10 O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists for valves, backflow preventers, pressure regulating valves, trap primers. Include these data in O&M manual.

2.11 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

A. Interior Water Piping:

1. Above Grade: Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.
2. Below Grade Supply: Copper tube; Type L, soft-annealed temper; no joints below floor.
3. Below Grade Trap Primer Discharge: Copper ACR Tubing.
4. Chlorinated Polyvinyl Chloride pipe (CPVC), Schedule 80; CPVC socket fittings, solvent cement joints.

B. Solder joints shall be made with 95-5 solder.

2.12 Piping Specialties: Provide piping specialties complying with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".

2.13 Supports and Anchors: Provide supports and anchors complying with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

2.14 Interior Valves: Provide valves complying with Division-22 Basic Plumbing Materials and Methods section "Valves", in accordance with the following listing:

A. Sectional and Shutoff Valves: BA1, BA2.
B. Drain Valves: BA1, BA2.
C. Throttling Valves: BA1, BA2.
D. Check Valves: CK1, CK2, CK3.

2.15 Exterior Valves: Provide as indicated, gate valves, AWWA C500, 175 psi working pressure. Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connections. Provide inside screw type for use with curb valve box, iron body, bronze-mounted, double disc, parallel seat, non-rising stem. Clow Corp., Dresser Mfg., Fairbanks Co., Kennedy, Stockham.

2.16 Hose Bibbs: Provide rough nickel plated hose bibbs with lock shield compression stop and removable handle, solid flange, female connection with 3/4" male threaded hose end, and straight line type non-removable vacuum breaker with 3/4" male threaded hose end. Acorn 8121 RCP or equal model by Woodford.

2.17 Non-freeze Wall Hydrants: Provide 3/4" anti-syphon, non-freeze wall hydrant with bronze casing, satin bronze box, straight inlet connection, and integral vacuum breaker-backflow preventer, Wade W-8625 or approved equal.

2.18 Water Hammer Arresters: Provide bellows or piston type water hammer arresters with stainless steel casing, pressure rated for 250 psi, tested and certified in accordance with PDI Standards. Precision Plumbing Products, Josam, Zurn, Amtrol, Wade, Jay R. Smith, or approved equal.

2.19 Meters and Gauges: Provide meters and gauges complying with Division-22 Basic Plumbing Materials and Methods section "Meters and Gauges", in accordance with the following listing:

1. Calibrated balancing valves

2.20 Combined Pressure-Temperature Relief Valves: Provide relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code. Provide bronze body, test lever, and thermostat complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F, and pressure relief at 150 psi. Watts, Cash, Zurn, or approved equal.

2.21 Trap Primers: Provide brass trap primers and distribution units to seal floor drains indicated on drawings. Trap primer valves shall be automatic, self contained type with no springs or diaphragms and shall not require adjustment. Trap primer valves shall be the type that can be installed anywhere on cold water piping. Distribution units shall supply 1-4 floor drains. Trap primer valves shall comply with ASSE 1018. Precision Plumbing Products PR-500, or approved equal. Where P-trap primers are indicated use "Prime-Eze" by Jay R. Smith, or approved equal.

2.22 Access Doors: Provide access doors to service all valves and other devices as required in accordance with Division-22 Basic Materials and Methods Section "Access Doors".

PART 3 - EXECUTION

3.1 General: Examine areas and conditions under which potable water systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Install plumbing identification in accordance with Division-22 Basic Plumbing Materials and Methods section "Plumbing Identification".

3.3 Install water distribution piping in accordance with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings".

A. Install piping with 1/32" per foot (1/4%) downward slope towards drain point.
B. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.4 Install piping specialties in accordance with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".

3.5 Install supports and anchors in accordance with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

3.6 Install valves in accordance with Division-22 Basic Plumbing Materials and Methods section "Valves".

A. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.
B. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
C. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain potable water system.
D. Check Valves: Install where indicated.

E. Calibrated Balancing Cocks: Install in each leg of hot water recirculating loop, and elsewhere as indicated. Balance all valves for equal flow.

3.7 Wall Hydrants: Install on concealed piping where indicated with vacuum breaker. Mount 18 inches above grade or finished floor.

3.8 Install meters and gauges in accordance with Division-22 Basic Plumbing Materials and Methods section "Meters and Gauges".

3.9 Install relief valves on each water heater, and where indicated in accordance with the manufacturer's instructions. Pipe full size outside or to floor drain. Cut the end of the pipe at a 45° angle and terminate 6 inches above the floor or grade.

3.10 Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Standard Plumbing Code.

3.11 Install water hammer arresters in upright position, in locations and of sizes indicated in accordance with PDI Standard WH-201.

3.12 Install trap primers as indicated, and in accordance with manufacturer's installation instructions. Provide access panels to all trap primers unless accessible through a lay-in ceiling.

3.13 Locate and coordinate installation of access doors for all valves and devices in accordance with Division-22 Basic Plumbing Materials and Methods section "Access Doors".

3.14 Piping Tests: Test, clean, and sterilize potable water piping in accordance with testing requirements of Division-22 Basic Plumbing Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".

END OF SECTION

SECTION 22 13 16
SOIL WASTE AND VENT SYSTEM

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.

1.3 Extent of soil waste and vent systems work is indicated on drawings and schedules, and by requirements of this section.

1.4 Refer to appropriate Division-33 sections for exterior sanitary sewer system required in conjunction with soil and waste systems; not work of this section.

1.5 Insulation for soil and waste systems is specified in other Division-22 sections, and is included as work of this section. Insulation requirements include:

A. Horizontal above grade waste pipes receiving discharge from ice machines, coolers, freezers, or similar units to points of connection receiving waste from 4 or more fixtures.

B. Horizontal above grade waste pipes receiving condensate from air conditioning equipment to point of connection receiving waste from 4 or more fixtures.

1.6 Excavation and backfill required in conjunction with soil, waste, and vent piping is specified in other Division-22 sections and is included as work of this section.

1.7 Refer to Division-7 section "Flashing and Sheet Metal" for flashings required in conjunction with soil and waste systems; not work of this section.

1.8 Code Compliance: Comply with applicable portions of Standard Plumbing Code pertaining to plumbing materials, construction and installation of products. Comply with local utility requirements.

1.9 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data for:

1. Cleanouts
2. Floor drains

1.10 O&M Data Submittals: Submit a copy of all approval submittals. Submit maintenance data and parts lists forproducts. Include these data in O&M manual.

PART 2 - PRODUCTS

2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste systems. Where more than one type of materials or products is indicated, selection is Installer's option.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.

2.3 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

A. Above Ground Soil, Waste, and Vent Piping:

1. Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fitting, solvent cement joints. Do not use in fire-rated assemblies or return air plenums.

B. Underground Building Drain Piping (within 5 feet of the building):

1. Polyvinyl chloride sewer pipe (PVC); Type DWV; PVC plastic type DWV socket-type.

2.4 Pipe Specialties: Provide piping specialties complying with Division-22 Basic Materials and Methods section "Piping Specialties".

2.5 Supports and Anchors: Provide supports and anchors complying with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

2.6 Cleanouts: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations. Josam, Jay R. Smith, Wade, Zurn.

A. Install cleanout in the vent riser for each fixture above the flood rim level of the fixture.
B. Cleanout for PVC Systems:

1. Floor Cleanouts: Cast-iron body with adjustable head, brass plug, and scoriated nick-brass cover. Furnish with carpet flange style for carpeted floors. Furnish with recessed cover for tile floors. Furnish with clamping ring for floors with membrane. Wade W-6030 hub outlet for push-on.
2. Cleanouts in Piping: PVC cleanout adaptor with threaded PVC plug.
3. Wall Cleanouts: PVC cleanout adaptor with tapped, countersunk, threaded brass plug and round stainless steel access cover with screw. Wade W-8304-75.
4. Grade Cleanouts: PVC cleanout adaptor with countersunk, threaded brass plug. Wade W-8590-D plug. In sidewalks and other finished concrete, provide access cover frames with a non-tilting cover. Wade W-7035-Z or equal.
5. Cleanouts in Paved Areas: Cast iron body, adjustable housing, ferrule with plug and round loose scoriated tractor cover. Wade W-8300-MF. Coordinate concrete depth at site with adjustable flange.

2.7 Floor Drains: Provide floor drains of size as indicated on drawings; and type, including features, as specified herein. Acceptable Manufacturers: Josam, Jay R. Smith, Wade, Zurn.

A. Floor Drains: Provide inside caulk bottom outlet or TY-Seal hub outlet with adaptor for cast iron trap installation and a 4" deep trap seal. Provide clamping rings for floors with membrane.
B. Strainer: Provide 5" satin-nickel bronze strainer.
C. Trap Primer Connection: Provide 1/2" trap primer tapping.
D. Funnel: Provide funnel where shown on the drawings.
E. Basis of Design: Wade Series 1100.

PART 3 - EXECUTION

3.1 Examine substrates and conditions under which soil and waste systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 Piping Installation:

A. Install above grade soil and waste piping in accordance with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", and with Standard Plumbing Code.
B. Install underground soil and waste pipes as indicated and in accordance with Standard Plumbing Code. Lay underground piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
C. Install building soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

3.3 Install piping specialties in accordance with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".

3.4 Install supports and anchors in accordance with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

3.5 Installation of Cleanouts: Install in above ground piping and building drain piping as indicated, as required by Standard Plumbing Code; and at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

A. Size: Cleanouts shall be full size up to 4". Piping over 4" shall have a reducing fitting to accommodate a 4" cleanout unless indicated otherwise on drawings.
B. Install cleanouts to allow adequate clearance for rodding.
C. Protect all finished surfaces of cleanouts with a suitable adhesive covering until construction is completed.
D. Cleanouts to Grade: Provide an 18" x 18" x 8" thick concrete pad around the cleanout. Set the cleanout ferrule, adapter, or access cover frame in the concrete as required. The cleanout shall be extended to the finished grade. The concrete pad shall slope away from the cleanout in all directions approximately one inch. Cover pad with fill to finished grade.
E. Cleanouts in Paved Areas: Provide concrete pad similar to cleanout to grade and coordinate concrete depth at site with adjustable flange. Access cover frames are required.

3.6 Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.

3.7 Vent Flashing Sleeves: Install on stack passing through roof, secure to stack flashing in accordance with manufacturer's instructions.

3.8 Installation of Floor Drains: Install in accordance with manufacturer's written instructions and in locations indicated.

A. Coordinate flashing work with work of waterproofing and adjoining substrate work.
B. Install at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
C. Install flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
D. Position drains so that they are accessible and easy to maintain.

3.9 Connection of Trap Primers: Connect trap primers as indicated, and in accordance with manufacturer's installation instructions. Pitch piping towards drain trap, minimum of 1/8" per foot (1%). Adjust trap primer for proper flow.

3.10 Piping Runouts to Fixtures: Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but in no case smaller than required by Standard Plumbing Code.

3.11 Install backwater valves in sanitary building drain piping as indicated, and as required by Standard Plumbing Code. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover, and of adequate size to remove valve cover to service. For exterior installation, provide concrete valve box with cleanout cover.

3.12 Test, clean, flush, and inspect soil and waste piping in accordance with requirements of Division-22 Basic Plumbing Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".

END OF SECTION

SECTION 22 14 00
STORM WATER SYSTEM

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.

1.3 Extent of Storm water work is indicated on drawings and schedules, and by requirements of this section.

1.4 Refer to appropriate Division-33 sections for exterior storm system required in conjunction with storm systems; not work of this section.

1.5 Insulation for storm systems is specified in other Division-22 sections, and is included as work of this section. Insulation requirements include:

A. Body of roof drains.
B. Storm Water piping above ceilings.

1.6 Refer to Division-7 section "Flashing and Sheet Metal" for flashings required in conjunction with storm systems; not work of this section.

1.7 Code Compliance: Comply with applicable portions of Standard Plumbing Code pertaining to plumbing materials, construction and installation of products. Comply with local utility requirements.

1.8 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data for:

1. Cleanouts
2. Roof drains
3. Inlet Drains
4. Trench Drains
5. Backwater Valves

1.9 O&M Data Submittals: Submit a copy of all approval submittals. Include these data in O&M manual.

PART 2 - PRODUCTS

2.1 General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in storm systems. Where more than one type of materials or products is indicated, selection is Installer's option.

2.2 Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following listed for each item.

2.3 Pipes and Fittings: Provide pipes and pipe fittings complying with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

A. Above Ground Storm Piping:

1. Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fitting, solvent cement joints. Do not use in fire-rated assemblies or return air plenums.

B. Underground Building Drain Piping (within 5 feet of the building):

1. Polyvinyl chloride sewer pipe (PVC); Type DWV; PVC plastic type DWV socket-type.

2.4 Pipe Specialties: Provide piping specialties complying with Division-22 Basic Materials and Methods section "Piping Specialties".

2.5 Supports and Anchors: Provide supports and anchors complying with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

2.6 Cleanouts: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations. Josam, Jay R. Smith, Wade, Zurn.

A. Cleanout for PVC Systems:

1. Floor Cleanouts: Cast-iron body with adjustable head, brass plug, and scoriated nick-brass cover. Furnish with carpet flange style for carpeted floors. Furnish with recessed cover for tile floors. Furnish with clamping ring for floors with membrane. Wade W-6030 hub outlet for push-on.
2. Cleanouts in Piping: PVC cleanout adaptor with threaded PVC plug.
3. Wall Cleanouts: PVC cleanout adaptor with tapped, countersunk, threaded brass plug and round stainless steel access cover with screw. Wade W-8304-75.
4. Grade Cleanouts: PVC cleanout adaptor with countersunk, threaded brass plug. Wade W-8590-D plug. In sidewalks and other finished concrete, provide access cover frames with a non-tilting tractor cover. Wade W-7035-Z or equal.
5. Cleanouts in Paved Areas: Cast iron body, adjustable housing, ferrule with plug and round loose scoriated tractor cover. Wade W-8300-MF. Coordinate concrete depth at site with adjustable flange.

2.7 Roof Drains: Provide roof drains of size as indicated on drawings; and type, including features, as specified herein. Josam, Jay R. Smith, Wade, Zurn. Basis of design: Wade W-3010 cast iron roof drain with adjustable extension and reversible deck ring, gravel stop integral with flashing collar, underdeck clamp, and cast iron mushroom dome. Plastic domes are not acceptable. Furnish 36" x 36", 16 oz. copper or 4 lb. sheet lead roof flashing for each drain.

2.8 Inlet Drains:

A. General Drains: Provide drains of size as indicated on the drawings; and type, including features as specified herein. Josam, Jay R. Smith, Wade W1420.

PART 3 - EXECUTION

3.1 Examine substrates and conditions under which storm systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 Piping Installation:

A. Install above grade storm piping in accordance with Division-22 Basic Plumbing Materials and Methods section "Pipes and Pipe Fittings", and with Standard Plumbing Code.

B. Install underground storm pipes as indicated and in accordance with Standard Plumbing Code. Lay underground piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

C. Install building storm piping pitched to drain at minimum slope of 1/4" per foot (2%) or 1/8" per foot (1%) per storm riser requirements on the drawings.

3.3 Install piping specialties in accordance with Division-22 Basic Plumbing Materials and Methods section "Piping Specialties".

3.4 Install supports and anchors in accordance with Division-22 Basic Plumbing Materials and Methods section "Supports and Anchors".

3.5 Installation of Cleanouts: Install in above ground piping and building drain piping as indicated, as required by Standard Plumbing Code; and at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each vertical stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

A. Size: Cleanouts shall be full size up to 4". Piping over 4" shall have a reducing fitting to accommodate a 4" cleanout unless indicated otherwise on drawings.

B. Install cleanouts to allow adequate clearance for rodding.

C. Protect all finished surfaces of cleanouts with a suitable adhesive covering until construction is completed.

D. Cleanouts to Grade: Provide an 18" x 18" x 8" thick concrete pad around the cleanout. Set the cleanout ferrule, adapter, or access cover frame in the concrete as required. The cleanout shall be extended to the finished grade. The concrete pad shall slope away from the cleanout in all directions approximately one inch. Cover pad with fill to finished grade.

E. Cleanouts in Paved Areas: Provide concrete pad similar to cleanout to grade and coordinate concrete depth at site with adjustable flange. Access cover frames are required.

3.6 Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.

3.7 Installation of Roof Drains: Install roof drains in accordance with manufacturer's written instructions and in locations indicated.

3.8 Coordinate flashing work with work of roofing, water-proofing and adjoining substrate work.

3.9 Coordinate with roofing as necessary to interface roof drains with roofing work.

3.10 Install roof drains at low points of surface areas to be drained, or as indicated.

3.11 Install drain flashing collar or flange so that no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.

3.12 Position roof drains so that they are accessible and easy to maintain.

3.13 Test, clean, flush, and inspect storm piping in accordance with requirements of Division-22 Basic Plumbing Materials and Methods section "Testing, Cleaning, and Sterilization of Piping Systems".

END OF SECTION

SECTION 22 24 00
TESTING, CLEANING, AND STERILIZATION OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 This section is a Division-22 Basic Plumbing Materials and Methods section and is part of each Division-22 section making reference to or requiring the testing and other procedures specified herein.

1.3 Notify the Architect/Engineer when system tests are ready to be witnessed at least 24 hours prior to the test.

1.4 All materials, test equipment, and devices required for cleaning, testing, sterilizing or purging shall be provided by the Contractor.

PART 2 - PRODUCTS

2.1 None.

PART 3 - EXECUTION

3.1 Pressure Tests:

A. General: Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with indicated medium and pressurize for indicated pressure and time.

B. Required test period is 2 hours.

C. No piping, fixtures, or equipment shall be concealed or covered until they have been tested. The contractor shall apply each test and ensure that it is satisfactory for the period specified before calling the Architect/Engineer to observe the test. Test shall be repeated upon request to the satisfaction of those making the inspection.

D. Observe each test section for leakage at the end of the test period. Test fails if leakage is observed or if pressure drop exceeds 5% of the test pressure.

E. Check of systems during application of test pressures should include visual check for water leakage and soap bubble or similar check for air and nitrogen leakage.

F. During heating and cooling cycles, linear expansion shall be checked at all elbows and expansion joints for proper clearance.

G. Repair piping systems sections which fail required piping test. Disassemble and re-install using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

3.2 Pressure Test Requirements:

A. Soil, Waste, Vent: Test all piping within the building with a 10 foot head of water. Test piping in sections so that all joints are tested. Provide test tees as required. A smoke test can be used at the Contractor's option.

B. Domestic Water: Perform hydrostatic test on all piping within the building at twice the normal static pressure at service point, but not less than 100 psig. Once tested, flush out piping and leave under pressure of the supply main or 40 psig for the balance of the construction period.

C. Storm Water: Test rain leaders and all piping within the building with a 10 foot head of water.

3.3 Cleaning and Sterilization:

A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water or blowdown with air before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
B. Flush and drain all water systems at least three times. Reverse flush systems from smallest piping to largest piping. Replace startup strainers with operating strainers.
C. Blowdown all gas, air and vacuum systems with air or nitrogen (at a rate of flow exceeding design) at least three times or until no residue shows at each outlet. Reverse blowdown systems from smallest piping to largest piping.
D. Cleaning: After completion of all work and operational check out of the plumbing installations and prior to acceptance of the project by the Owner, the following shall be accomplished. The completed piping systems shall be thoroughly flushed (reversed flushing) and chemically cleaned as needed to remove all dirt, debris, and any foreign matter that may have been trapped in the piping systems during construction. After flushing of systems is complete, the Contractor shall clean all strainers.

3.4 Sterilization of Domestic Water Systems:

A. Prerequisites: All hot and cold water piping installed (complete), all fixtures connected, system flushed out, and system filled with water.
B. The shut off valve at the water main shall be closed, all fixture outlets opened slightly, and a sterilizing solution shall be introduced at a manifold connection installed by the Contractor at the meter.
C. The solution shall contain 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or calcium hypochlorite. The solution shall be allowed to stand in the system for at least eight hours after which the entire system shall be flushed.
D. After final flushing, all aerators shall be removed, cleaned, and reinstalled. After final flush the residual chlorine shall not exceed 0.2 parts per million.
E. The Architect/Engineer shall be notified 24 hours prior to the procedure so that it can be witnessed.
F. Provide sampling and certified report by an independent testing lab. Provide written Health Department approval of disinfection samples.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

A. Division-22 Basic Plumbing Requirements and Basic Plumbing Materials and Methods sections apply to work of this section.
B. Extent of plumbing fixtures work required by this section is indicated on drawings and schedules, and by requirements of this section.
C. Refer to Division-26 sections for field-installed electrical wiring required for plumbing fixtures; not work of this section.

1.2 Codes and Standards:

A. Plumbing Fixture Standards: Comply with applicable portions of Standard Plumbing Code pertaining to materials and installation of plumbing fixtures.
B. ANSI Standards: Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.
C. PDI Compliance: Comply with standards established by PDI pertaining to plumbing fixture supports.
D. UL Listing: Construct plumbing fixtures requiring electrical power in accordance with UL standards and provide UL-listing and label.
E. ARI Compliance: Construct and install water coolers in accordance with ARI Standard 1010 "Drinking-Fountains and Self-Contained Mechanically-Refrigerated Drinking-Water Coolers", and provide Certification Symbol.
F. ANSI Compliance: Construct and install barrier-free plumbing fixtures in accordance with ANSI Standard A117.1 "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People".

1.3 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, furnished specialties and accessories; and installation instructions. Submit manufacturer's assembly-type drawings indicating dimensions, roughing-in requirements, required clearances, and methods of assembly of components and anchorages. The submittal shall be organized by "fixture number" and each fixture package shall be so identified. Each fixture package shall include all of the required fitting and trim, even if such devices are used for more than one fixture.
B. O&M Data Submittals: Submit a copy of approval submittals. Submit maintenance data and parts lists for each type of plumbing fixture and accessory; including "trouble-shooting" maintenance guide. Include these data in O&M manual.

1.4 Handle plumbing fixtures carefully to prevent breakage, chipping, and scoring fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

2.1 General: Provide factory-fabricated fixtures of type, style, and material indicated. For each type fixture, provide trim, carrier, seats, and valves as specified. Where not specified, provide products as recommended by manufacturer, and as required for

complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

2.2 Model Numbers: Basis of design model numbers of a particular manufacturer are listed in the fixture schedule as an aid to contractors. Where conflicts between the model number and the written description occur, the written description shall govern. Where acceptable manufacturers are listed, products are subject to compliance with requirements.

2.3 Materials:

A. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

B. All fixtures shall be white vitreous china unless otherwise specifically noted. Where enameled iron fixtures are specified, they shall be furnished with acid resisting enamel.

C. Where fittings, trim, and accessories are exposed or semi-exposed provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.

D. Stainless Steel Sheets: ASTM A 167, Type 304, hardest workable temper. Finish shall be No. 4, bright, directional polish on exposed surfaces.

E. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes, and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ASTM C 554.

F. Synthetic Stone: High quality, free from defects, glaze on exposed surfaces, stain resistant.

G. Plumbing Fittings, Trim, and Accessories:

1. Faucets: At locations where water is supplied (by manual, automatic, or remote control), provide commercial quality chrome-plated, cast-brass faucets, valves, or other dispensing devices, of type and size indicated, and as required to operate as indicated.
2. Automatic Faucets: Provide electronic sensor-operated faucets with vandal-resistant spray head. Set volume adjustment at 0.07//0.25 gallons per operation. Provide box-mounted, hard-wired transformer (120 VAC primary - 24 VAC secondary) with each faucet. All wiring and electrical connections shall be provided by Division 26.
3. Aerators: Provide aerators of types approved by Health Department having jurisdiction.
4. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. American Standard, Chicago Faucet Co., Symmons, Eljer Co., Kohler Co., Speakman Co., T & S Brass and Bronze Works, Water Saver Faucet Co.
5. Stops: Provide chrome-plated brass, quarter-turn, angle type, manual shutoff valves, and chrome-plated flexible supply pipes to permit fixture servicing without shutdown of water supply piping systems for all fixtures. Coordinate with fixture requirements.
    a. Provide standard stops.
    b. Provide stops with integral piston type water hammer arrestor on all fixtures that have quick-closing valves. This includes, but is not limited to: Ice

machines, clothes washing machines, bottle fillers, dishwashers, and electric water coolers.

6. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. McGuire, or approved equal.
7. Waste Outlets: Provide removable P-traps, drains, waste arms, tailpieces, and wastes-to-wall where drains are indicated for direct connection to drainage system for all fixtures unless otherwise noted. Provide drains, tailpieces, and waste arms where indirect drains are indicated. Waste outlets shall be full size of fixture drain connection.
    a. Provide PVC DWV Schedule 40 P-Traps
8. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. McGuire, or approved equal.
9. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
10. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome-plated brass escutcheons with friction clips.

H. Flush Valves: Provide quiet-flush, chrome-plated, cast-brass flush valves with vacuum breaker and screwdriver stop. Where accessible service is indicated, provide ADA compliant handles with the handle on the wide side of the stall.

1. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Sloan Valve Co., Delany Co., Zurn.

I. Carriers: Provide cast-iron supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron or steel as indicated. Coordinate with specific fixture requirements and conditions of the project.

1. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Josam, Wade, Zurn, J.R. Smith.

J. Comply with additional fixture requirements listed for each fixture and as required for a complete and functional system.

2.4 Water Closets:

A. General: Provide white china siphon jet type unless otherwise noted.
B. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. American Standard, Crane, Kohler, Eljer, Gerber.
C. Fixture Seats: Provide white, heavy molded plastic fixture seats with stainless steel self-sustaining check hinges.
D. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Bemis Mfg. Co., Beneke Corp., Church, Sperzel, Olsonite.
E. Water Closet Schedule:

1. WC2 Accessible Floor-Mounted Flush Valve Water Closet: Provide floor-mounted elongated bowl water closet with 1-1/2" top spud and manual 1.28 gpf flush valve. Provide open front seat, less cover.

Water Closet	Kohler K-96057
1.28 GPF Flush Valve	Sloan 111-1.28

Seat	Kohler K-4670-SC

2.5 Lavatories:

A. General: Provide white china lavatories. Unless otherwise specified.
B. Fixture Carriers: Provide short foot, coated cast iron carrier with adjustable top and bottom hanger plates. Provide with horizontal or vertical piping connections based on installation type. Provide with vent connection. Coordinate installation for clearance within walls with general contractor and other trades.
C. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. American Standard, Crane, Kohler, Eljer, Gerber.
D. Lavatory Schedule:

1. L9 Accessible Wall Hung Lavatory with Automatic Faucet: Provide accessible 20" x 18" wall hung lavatory with ADA compliant automatic, plug-in hand-washing faucet with hot and cold water supply. Provide accessible type waste and grid drain. Provide insulation kit for supply and waste. Provide with 0.5 gpm aerator.

Lavatory	Kohler K-2084
Wired Faucet	Bradley S53-3700 Chrome
Grid Drain	Kohler 7129-A

2.6 Electric Water Coolers:

A. General: Provide self-contained electric water cooler with entire water system free of lead. All joints shall be made using silver solder. Units shall be complete with an air-cooled refrigeration system consisting of a hermetic compressor, cooler, pre-cooler, condenser fan, thermostat safety controls and all other related devices. The unit shall have a capacity of 8 gallons per hour. The cabinet shall be stainless steel with vermin proof insulation. The top shall be fabricated of stainless steel with a No. 4 finish. Where accessible units are indicated, the bubbler and fountain shall be ADA compliant.
B. Fixture Carriers: Provide short foot, coated cast iron carrier with adjustable top and bottom hanger plates. Provide with horizontal or vertical piping connections based on installation type. Provide with vent connection. Coordinate installation for clearance within walls with general contractor and other trades.
C. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Elkay Mfg. Co., Halsey Taylor Div., Haws Drinking Faucet Co., Sunroc, Oasis.
D. Electric Water Cooler Schedule:

1. EWC4 Dual Wall Hung Electric Water Cooler with Bottle Filler: Provide combination dual wall hung unit with bottle filler.

Electric Water Cooler and Bottle Filler	Elkay LZSTL8WSSP

2.7 Mop Receptors:

A. General: Provide one piece mop receptors with 3" integral stainless steel grid drain. Provide wall-mounted faucet with arm handles, vacuum breaker, stops, hose connection and hose bracket. Provide 30" hose.
B. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Stern-Williams Co., Fiat.
C. Mop Receptor Schedule:

1. MR2 Square Mop Receptor: Provide 24" x 24" precast terrazzo mop receptor with 12" high shoulders. Provide stainless steel caps on all curbs. Provide two panel stainless steel wall guard.

Mop Receptor 24" x 24"	Fiat TSB -100
Faucet	Fiat 830-AA
Bracket	Fiat 832-AA
Wall Guard	Fiat MSG 2424

2.8 Stainless Steel Sinks:

A. General: Provide Type 302, 20 gauge self-rimming stainless steel back ledge with No. 4 finish. Provide sound deadening material on the sides and bottom of the sink. Provide grid drain or strainer with removable crumb cup and stopper as indicated.

B. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following for each item. Elkay, Just, Kohler.

C. Stainless Steel Sink Schedule:

1. SK 1 Single Compartment Sink: Provide 24" x 18-1/4" x 9-1/2 " deep single compartment stainless steel sink with top mount single lever hot and cold water supply fitting with pull down spray head. Provide strainer, crumb cup, and stopper.

Sink	Kohler K-5286
Faucet	Kohler K-22972 Chrome
Strainer	LK-35

PART 3 - EXECUTION

3.1 Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Install plumbing fixtures of types indicated where shown and at indicated heights. Install in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Install in accordance with ADA and applicable accessible code requirements. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of Standard Plumbing Code pertaining to installation of plumbing fixtures. Furnish templates for cut-outs in countertops. Coordinate exact fixture locations with countertop shop drawings.

3.3 Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement. Mount at heights shown on the drawings. Fixture heights are floor-to-rim distance. Fitting heights are to centerline.

3.4 Install all equipment, including but not limited to water heaters, expansion tanks, and pumps on concrete bases. Bases shall exceed the physical equipment dimension by a minimum of 4” on all sides. Height shall be enough to provide 1/8” per 12” slope for any drain component to drain termination, or a minimum of 4” tall.

3.5 Install stop valve in water supply to each fixture.

3.6 After fixtures are set, the crack between the fixture and wall shall be caulked with DAP silicone-based caulking, or approved equal.

3.7 Protect installed fixtures from damage during remainder of construction period.

3.8 Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

3.9 Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

3.10 Clean plumbing fixtures, trim, aerators, and strainers of dirt and debris upon completion of installation.

3.11 Adjust water pressure at drinking fountains, faucets, shower valves, and flush valves to provide proper flow stream and specified gpm.

3.12 Adjust or replace washers to prevent leaks at faucets and stops.

END OF SECTION