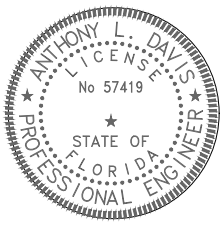
SECTION 26 00 00 - ELECTRICAL GENERAL REQUIREMENTS



Digitally signed by Anthony L Davis
DN: E=aldavis@watford-engineering.com, CN=Anthony L Davis, O="WATFORD ENGINEERING, INC.", SERIALNUMBER=AATL20230418294501, L=Marianna, S=Florida, C=US
Date: 2025.06.16 08:51:33-05'00'

PART 1 GENERAL 1.01SECTION

INCLUDES:

A. Electrical General Requirements specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements.

1.2 PROJECT/SITE CONDITIONS:

A. Install work in locations shown on Drawings, unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain permission of Engineer before proceeding.

C. Before submitting a proposal for the work contemplated in these specifications and accompanying Drawings, each bidder shall examine the site and familiarize himself with all the existing conditions and limitations. No additional compensation will be allowed because of the Contractor's misunderstandings as to the amount of work involved or his lack of knowledge of any condition in connection with the work.

1.3 REGULATORY REQUIREMENTS:

A. Permits and Inspections: This Contractor shall secure and pay for all permits, and inspections required on work performed under this section of the Specifications. He shall assume full responsibility for all assessments and taxes necessary for the completion and acceptance of the work.

B. Applicable Standards and Codes: All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations. In case of difference between building codes, specifications, federal and state laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent requirements shall govern. The Contractor shall promptly notify the Engineer in writing of such differences. Should the Contractor perform any work that does not comply with the requirements of the applicable building codes, federal and state laws, local ordinances, industry standards and utility company regulations, he shall bear all costs arising in correcting the deficiencies. Applicable codes and standards shall include all State laws, State Board of Health and State Rating Bureau, local ordinances, utility company regulations and the applicable requirements of the following:

1. Standard Building Code
2. National Fire Protection Association - NFPA
3. National Electrical Manufacturers Association - NEMA
4. National Bureau of Standards
5. American National Standards Institute - ANSI
6. Underwriters' Laboratories - UL

1.04COOPERATION:

A. Cooperate with others in laying out the electrical work so that this phase of the work will properly fit the building and other contractor’s requirements.

1.5 PRODUCTS FURNISHED BY OTHERS:

A. Products are furnished by the Owner or under other Divisions of these Specifications that require electrical connection. This Contractor shall provide all necessary materials and labor to connect to the electrical

B.

system all equipment and fixtures having electrical power connection requirements. Refer to other Divisions of these Specifications for additional or specific requirements. Actual rough-in dimensions shall be obtained from Shop Drawings or measurements of the equipment or fixture.

C. The unpacking, assembling and setting of equipment furnished by the Owner or under other Divisions of these Specifications will be performed by others, unless stated otherwise.

D. Because the manufacturer of the equipment actually purchased or supplied may vary slightly from that specified, as hereinbefore stated, some rearranging of the requirements may be necessary. This Contractor shall make connections as required by the actual equipment furnished.

1.6 SEQUENCING AND SCHEDULING:

A. Construct work in sequence under provisions of applicable sections of these specifications.

B. Power outages shall be scheduled with the Owner and other Contractors. Outages shall be at the convenience of the Owner.

1.7 APPROVAL OF MATERIALS AND EQUIPMENT:

A. Whenever a material, article, or piece of equipment is identified on the Drawings or in these Specifications by reference to manufacturer's or vendor's name, trade name, catalog number or the like, it is so identified for the purpose of establishing a standard of quality and shall not be construed as limiting competition. Any material, article, or piece of equipment of other manufacturers or vendors, which will perform adequately the intent of the design, will be considered equally acceptable provided written approval has been granted by the Engineer. Materials submitted for approval shall comply with all applicable Sections of these Specifications prior to acceptance. Submit proposed substitutions to the Architect for approval at least ten
(10) days prior to the bid so that an addendum can be issued to all contractors. Engineer's opinion shall be final on the equality of substituted items.

B. After the Contract has been awarded, catalog cuts on the following items shall be submitted to the Architect/Engineer for final approval before purchase of the equipment whether substitutions are being made or not:

1. Light Fixtures
2. Panelboards and Switchboards
3. Distribution Equipment
4. Wiring Devices
5. Fabricated Equipment
6. Automatic Transfer Switches

1.08OBSERVATION, TESTING AND BALANCING:

A. Observation: The complete job will be, during and/or after construction, subject to the administration of the Engineer. Site visit(s) shall be conducted by the Architect/Engineer or his designated representative as necessary to maintain compliance with the Contract requirements.

B. Balancing: All branch circuits and feeders shall be tested under typical load conditions (under maximum load conditions if so desired/requested by general contractor or engineer), and loads shall be balanced on the phases of the electrical system.

1.09WORKMANSHIP:

A. All work shall be executed in a neat and substantial manner by skilled workman, well qualified, and regularly engaged in the type of work required. Substandard work shall be removed and replaced by the Contractor at no cost to the Owner.

1.10 OPERATING AND MAINTENANCE INSTRUCTIONS/AS BUILT DRAWINGS:

A. Four (4) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner. Each set shall be permanently bound and shall have a hard cover. One complete set shall be furnished at the time that the test procedure is submitted, and remaining sets shall be furnished before the Contract is completed. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2" by 11" with large sheets of Drawings folded in. The instructions shall include information for major pieces of equipment and systems.

B. Upon completion of the work and at the time designated, the services of one project engineer shall be provided by the Contractor to instruct the representative of the Owner in the operation and maintenance of the systems.

C. This Contractor shall provide as-built Drawings at the completion of the job. Drawings shall show all significant changes in equipment, wiring, routing, location, etc.

1.11 GUARANTEE:

A. This Contractor shall guarantee to the Owner, all work performed under this contract to be free from defects in workmanship and material for a period of one year from date of final acceptance by Owner and Architect. Any defects arising during this period will be promptly remedied by the Contractor without cost to the Owner. Lamps and fuses burned out during normal operation after acceptance are exempt from guarantee. This Contractor shall furnish the Owner with an estimated time, from notification of a problem to presence on the site, for all service calls on warranty items.

1.12 COMPLIANCE:

A. In the event of a conflict between Specifications, Drawings, Codes, Requirements, etc., the most stringent requirements shall govern.

B. The interpretation of conflicts and resolution thereof shall remain the right of the Architect/Engineer or his designated representative.

PART 2 - PRODUCTS: Not Used PART 3 -

EXECUTION: Not Used

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS, CABLES, AND DEVICES

PART 1 GENERAL 1.01RELATED

DOCUMENTS:

A. Section 260000 - Electrical General Requirements, apply to the work specified in this Section, with additions and modifications specified herein.

1.2 SECTION INCLUDES:

A. Wire and Cable

B. Wiring Devices PART 2

PRODUCTS 2.01WIRE AND CABLE

A. Building Wire:

1. Feeder and Branch Circuits 10 AWG and Smaller: Copper, solid conductor, 600 volt insulation, rated 75 degrees C, THHN/THWN.

2. Feeder and Branch Circuits 8 AWG and 6 AWG: Copper, stranded conductor, 600 volt insulation, rated 75 degrees C, THHN/THWN.

3. Feeder and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation, rated 75 degrees C, THW.

4. Control Circuits: Copper, stranded conductor, 600 volt insulation, THHN/THWN.

NOTE: The use of Romex cable is not allowed on this project. MC (metal clad) cable may be used where applicable and approved by local AHJ. Aluminum wire may be used for feeder conductors provided the local AHJ approves and the minimal allowable ampacity (as specified) is met.

B. Remote Control Signal Cable (where applicable):

1. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 60 degree C, individual conductors twisted together, shielded, and covered with PVC jacket.

2. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60 degree C, individual conductors twisted together, shielded, and covered with PVC jacket; UL listed.

C. Cords: Oil-resistant thermoset-insulated multi-conductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations, type SO.

2.2 WIRING DEVICES AND WALL PLATES:

A. Manufacturers:
1. Hubbell
2.

3. Leviton
4. Arrow Hart

B. Wall Switches: AC general use, quiet-operating snap switch rated 20 amperes and 120/277 volts AC, with plastic toggle handle, ivory color unless noted otherwise on architectural drawings. Confirm with COSCo.

1. Single Pole Switch: Hubbell 1221-I (or equal)

2. Three Way Switch: Hubbell 1223-I (or equal)

C. Receptacle:

1. Convenience Receptacle Configuration: Type 5-20R, plastic face, ivory color. Model 5262-I manufactured by Hubbell (or equal).

2. Specific Purpose Receptacle: Configuration indicated on Drawings with black plastic face.

3. Provide straight-blade receptacles to NEMA WD 1.

4. Provide straight-blade receptacles to NEMA WD 5.

5. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter. Model GFR-5352IA manufactured by Hubbell (or equal). Device shall be compliant to the requirements of UL 943.

D. Wall Dimmer: Rotary dial or slide type, ivory color. (Confirm with COSCo) Model C-2000 manufactured by Lutron.(or equal) Rating of 2000 watts at 120 volts, AC.

E. Decorative Cover Plate: Smooth Stainless steel, ivory color, ANSI 302.

F. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers rated raintight while in use in accordance with Article 410-57 of the National Electrical Code.

G. Attachment Plug Cap: Match receptacle configuration provided for equipment connection.

H. Cord Reels: Provide cord reels as indicated on the drawings. Cords shall be sized per loads served and shall be 50’ in length.

PART 3 EXECUTION 3.01EXAMINATION AND

PREPARATION:

A. Verify that interior of building has been physically protected from weather.

B. Verify that mechanical work which is likely to injure conductors has been completed.

C. Completely and thoroughly swab raceway system before installing conductors.

3.02INSTALLATION:

A. Wiring Methods:

1. Concealed Interior Locations: Building wire in raceway.

2. Exposed Interior Locations: Building wire in raceway.

3. Above Accessible Ceilings: Building wire in raceway.

4. Wet or Damp Interior Locations: Building wire in raceway.

5. Exterior Locations: Building wire in raceway.

6. Underground Locations: Building wire in raceway.

7. Hazardous Locations: Building wire in raceway conforming to applicable NEC Articles as identified on the Drawings.

B. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring. Conductors shall be sized to compensate for voltage drop.

C. Neatly train and secure wiring inside boxes, equipment and panelboards.

D. Use UL listed wire pulling lubricant for pulling conductors in raceways.

E. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.

F. Devices shall mount flush or as indicated on the Drawings.

G. Install wiring devices in accordance with manufacturer's instructions.

1. Install wall switches 48 inches above floor, "OFF" position down.

2. Install wall dimmers 48 inches above floor. De-rate ganged dimmers as instructed by manufacturer. Do not use a common neutral, provide a separate neutral for each dimmed circuit.

3. Unless noted otherwise, install convenience receptacles 18 inches above floor, 6 inches above counters or splashbacks, with grounding pole on bottom.

4. Install GFCI receptacles at all outdoor locations and all indoor locations as required by NFPA70, and as indicated.

5. Install specific purpose receptacles at heights shown on Drawings.

6. Install cord and attachment plug caps on equipment where acceptable and approved by all local AHJ's… and deemed necessary. Size cord for connected load and rating of branch circuit over- current protection.

K. Install wall plates flush and level.

1. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

2. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

2. Install weatherproof coverplates on all devices/boxes in wet or outdoor locations.

3.3 FIELD QUALITY CONTROL:

A. Perform field inspection and testing of circuits under provisions of Section 16000.

1. Inspect wire and cables for physical damage and proper connection.

2. Torque test conductor connections and terminations to manufacturer's recommended values.

3. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

END OF SECTION 260519

SECTION 26 05 30 - RACEWAY SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Section 260000 - Electrical General Requirements, apply to the work specified in this section, with additions and modifications specified herein.

1.2 SECTION INCLUDES:

A. Conduit and Conduit Fittings

B. Electrical Boxes and Fittings

C. Cable

Tray PART 2

PRODUCTS

2.1 CONDUIT AND FITTINGS:

A. Conduit:

1. Metal Rigid Conduit: Galvanized steel.

2. Metal Tubing: Galvanized steel.

3. Flexible Conduit: Steel.

4. Liquid-Tight Flexible Conduit: Flexible conduit with PVC Jacket.

5. Plastic Conduit and Tubing: NEMA TC 2; PVC. Use Schedule 40 conduit.

B. Conduit and Fittings:

1. Conduit Fittings and Conduit Bodies: NEMA FB 1. Conduit fittings to be steel, threaded type. Split couplings are not acceptable.

2. Tubing Fittings: NEMA FB 1. Tubing fittings to be steel compression type for conduit up to 2" in diameter and set screw type for conduit 2-1/2" and larger.

3. Flexible Conduit Fittings: NEMA FB 1. Flexible conduit fittings to be steel set screw or screw in type.

4. Liquid-Type Flexible Conduit Fittings: NEMA FB 1. Liquid-tight flexible conduit fittings to be steel compression type.

5. Plastic Fittings and Conduit Bodies: NEMA TC 3.

2.2 ELECTRICAL BOXES:

A. Boxes:

1. Sheet Metal: NEMA OS 1; galvanized steel, 4" or 4-11/16" square. Provide galvanized plaster/tile ring for recessed outlet boxes.

2. Cast Metal: Aluminum or cast feralloy, deep type, gasketed cover, threaded hubs.

3. Nonmetallic: NEMA OS 2.

B. Large Enclosures: NEMA 250; Type 4, steel enclosures with manufacturer's standard enamel finish and cover, held closed screws.

2.03.1 CABLE TRAY (where applicable):

A. Manufacturers:

1. B-line

2. Mono-Systems

B. Ladder type, constructed of aluminum with 9” rung spacing, 6” siderails and 18” wide

C. Fittings: Horizontal 90° elbows, horizontal tees, and horizontal crosses with all metal accessories to connect to straight sections.

D. Support: Supports shall be fabricated channel, and threaded rods.

E. Grounding: Provide grounding straps as each junction, splice, fitting,

etc. PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION:

A. Examine supporting surfaces to determine that surfaces are ready to receive work.

B. Electrical boxes shown on Contract Drawings are approximate locations unless dimensioned.

3.2 INSTALLATION:

A. Use conduit and tubing for raceways in the following locations:

1. Underground Installations: Rigid steel conduit, painted with two coats of epoxy asphaltum paint, or PVC conduit.

2. Installations In Concrete: Rigid steel conduit, or PVC conduit.

3. In Slab Above Grade: Rigid steel conduit, or PVC conduit.

4. Exposed Outdoor Locations: Rigid steel conduit where damage from an external source is likely. Otherwise, schedule 80 PVC may be used.

5. Wet Interior Locations: Rigid steel conduit or electrical metallic tubing. Use threaded or raintight fittings for conduit.

6. Concealed Dry Interior Locations: Rigid steel conduit or electrical metallic tubing.

7. Exposed Dry Interior Locations: Rigid steel conduit or electrical metallic tubing.

8. Feeders: Galvanized rigid steel conduit on all feeders.

B. Size raceways for conductor type installed.

1. Minimum Size Conduit: 1/2 inch.

C. Arrange conduit and tubing to maintain headroom and to present a neat mechanical appearance.

1. Route exposed raceway parallel and perpendicular to walls and adjacent piping.

2. Maintain minimum 6 inch clearance to piping and 12 inch clearance to heat surfaces such as flues, piping, and heating appliances.

3. Maintain required fire, acoustic, and vapor barrier rating when penetrating walls, floors, and ceilings.

4. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket.

5. Group in parallel runs where practical. Use rack constructed of steel channel. Maintain spacing between raceways or de-rate circuit ampacities to NFPA 70 requirements.

6. Use approved manufactured conduit hangers and clamps; do not fasten with wire or perforated pipe straps. Utilize conduit hangers for conduits located below floor slabs.

7. Use conduit bodies to make sharp changes in direction.

8. Terminate all conduits with insulated bushings.

9. Use suitable caps to protect installed raceway against entrance of moisture and dirt.

10. Provide a pull string in all empty raceways.

11. Install expansion joints fittings where raceway crosses building expansion joints.

12. Install plastic conduit and tubing in strict accordance with the manufacturer's recommendations. When plastic conduit is installed, use galvanized rigid elbows for 90E bends.

D. Install electrical boxes as shown on the Drawings, and as required for splices, taps, wire pulling, equipment connections and regulatory requirements.

1. Use cast outlet box in exterior locations, wet locations, and exposed interior locations.

2. Use large enclosure for interior pull and junction boxes larger than 12 inches in any dimension.

3. Locate and install electrical boxes to allow access. Provide access panels if required.

4. Locate and install electrical boxes to maintain headroom and to present a neat mechanical appearance.

5. Install pull boxes and junction boxes above accessible ceilings or in unfinished areas.

6. Provide knockout closure for unused openings.

7. Align wall-mounted outlet boxes plumb and level for switches, and similar devices.

8. Coordinate mounting heights and locations of outlets above counters and backsplashes.

9. Install lighting outlets to locate luminaires as shown on the Drawings.

E. Use recessed outlet boxes in finished areas where indicated.

1. Secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness, and plaster/tile ring installation.

2. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

3. Locate boxes in masonry walls to require cutting corner only. Coordinate masonry cutting to achieve neat openings for boxes.

4. Do not install boxes back-to-back in walls; provide 6 inch separation, minimum. In acoustic-rated walls provide 24 inch separation minimum.

5. Do not damage

insulation. END OF SECTION 260530

SECTION 262713 - SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Section 260000 - Electrical General Requirements, apply to the work specified in this Section, with additions and modifications specified herein.

1.02 SECTION INCLUDES:

A. System Description

B. Utility Requirements

C. Grounding

D. Switchboards

E. Panelboards

F. Enclosed Switches

G. Fuses

H. Transformers

I. Enclosed Circuit Breakers

J. Plug-in Duct

1.03 SYSTEM DESCRIPTION:

A. The new service is to be 120/208V, 3-phase, 4W. Refer to 'Power Riser Diagram' for details. The EC shall field-coordinate with the utility company prior to construction to confirm method of new service and all requirements.

1.04 PROJECT CONDITIONS:

A. Verify field measurements for the equipment to ensure proper fit with in the space proposed.

1.05 UTILITY REQUIREMENTS:

A. The serving utility is FP&L (formerly GPCo). New 120/208V, 3-phase, 4-wire underground service to be installed from an existing padmount transformer to service-entrance equipment. Refer to 'Power Riser Diagram' and electrical site plan for details.

B. If required, metering shall be provided by the utility company and installed by electrical

contractor.

1. Coordinate with the utility for exact metering requirements.

2. Install metering devices provided by the utility company.

PART 2 PRODUCTS

2.01 SWITCHBOARD:

A. Manufacturers:

1. Square D Company

2. ITE-Siemens

3. General Electric Company

4. Cutler Hammer

B. Switchboard: NEMA PB2.

1. Line and Load Terminations: Accessible from front only of switchboard, suitable for conductor materials used.

2. Main Sections Devices: Individually mounted.

C. Ratings: As shown on Drawings.

D. Bussing:

1. Bus Material: Copper or Aluminum with tin plating sized in accordance with NEMA PB2.

2. Bus Connections: Accessible from front for maintenance.

3. Ground Bus: Copper

E. Enclosure: Type 1General purpose as shown on the Drawings.

1. Align sections at front and rear.

2. Height: 90 inches

3. Finish: Manufacturer's standard light gray enamel over external surfaces.

F. Future Provisions:

1. Fully equip spaces for future devices with bussing and bus connection provisions; continuous current rating as indicated on the Drawings.

2. Do not taper main bus rating.

G. Switching and Over-Current Protection Devices:

1. Molded Case Circuit Breakers: NEMA AB 1.

2. Solid State Molded Case Circuit Breakers: NEMA AB 1; with electronic sensing, timing and tripping circuits for adjustable current settings; ground fault trip; instantaneous trip and adjustable short time trip.

H. Switchboard Instruments:

1. Ground Fault Sensors: Zero sequence type.

2. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, time delay adjustable from 0 to 1 second.

3. Square D Power Logic

metering.

2.02 PANELBOARDS:

A. Manufacturers:

1. Square D Company

2. ITE-Siemens

3. General Electric Company

4. Cutler Hammer

B. Distribution Panelboards: NEMA PB 1; circuit breaker type.

1. Enclosures: Type 1 or 3R as shown on Drawings.

2. Mounting: Surface or flush mount as shown on Drawings.

3. Bus: Copper.

4. Ground Bus: Copper

5. Voltage and phase: As shown on Drawings.

6. Minimum Integrated Equipment: As shown on Drawings.

7. Hinged door with lock.

8. Circuit Breakers: Bolt-on, ratings as shown on Drawings.

C. Light and Power Panelboards: NEMA PB 1; circuit breaker type.

1. Enclosures: Type 1 or 3R as shown on Drawings.

2. Surface or flush mount as shown on Drawings.

3. Bus: Copper.

4. Ground Bus: Copper.

5. Voltage and phase as shown on Drawings.

6. Minimum Integrated Equipment: As shown on Drawings.

7. Hinged door with lock.

8. Circuit Breakers: Bolt-on, ratings as shown on Drawings.

D. Accessories: Provide panel and branch device accessories as shown on Drawings.

E. Future Provisions: Where space provisions are indicated on the Drawings provide bussing, bus extensions, etc. require to mount future circuit breakers. Where spare provisions are indicated on the Drawings provide circuit breakers complete and ready for connection.

2.3 ENCLOSED SWITCHES:

A. Manufacturers:

1. Square D Company

2. ITE-Siemens

3. General Electric Company

4. Cutler Hammer

B. Enclosed Switch Assemblies: NEMA KS 1; Type HD.

1. Fuse Clips: Designed to accommodate Class `R' or `J' fuses as shown on Drawings.

C. Enclosures: NEMA KS 1; Type 1 or 3R as required.

D. Ground: Provide grounding lug.

E. Ratings: 600 or 250 volts to match system service requirements, poles and ampere ratings as indicated on the Drawings.

2.04FUSES:

A. Manufacturers:

1. Bussman

2. Shawmut

3. Little Fuse

B. Service Entrance/Feeder Circuits-601 Amp and Larger

1. Current Limiting

2. UL Class L

3. 200,000 Ampere RMS Interrupting Rating

4. Voltage Rating: As required for system compatibility.

C. Service Entrance/Feeder Circuits-600 Amp and Smaller

1. Current Limiting

2. UL Class RK1

3. 200,000 Ampere RMS Interrupting Rating

4. Voltage Rating: As required for system compatibility

D. Motor, Motor Controller, Transformer and Inductive Circuits

1. Current Limiting

2. UL Class RK1, Time Delay

3. 200,000 Ampere RMS Interrupting Rating

4. Voltage Rating: As required for system

compatibility. 2.05TRANSFORMERS:

A. Manufacturers:

1. Square D Company

2. ITE-Siemens

3. General Electric Company

4. Cutler Hammer

B. Description: Enclosed air-cooled dry type transformer.

C. Ratings:

1. Primary Voltage: As shown on Drawings.

2. Secondary Voltage: As shown on Drawings.

3. Capacity: KVA ratings as shown on Drawings.

4. Basic Impulse Level: 10 BIL.

5. Insulation Class/Temperature Rise: Class 220/115 degrees C.

D. Configuration: Two winding, delta-wye.

E. Winding Taps: Four full capacity primary taps, each at 2.5 percent below rated voltage; and two full capacity primary taps, each at 2.5 percent above rated voltage.

F. Mounting: Wall, floor, or trapeze as shown on Drawings.

G. Enclosures: Code gauge steel, NEMA 1 or 3R as

required. 2.06ENCLOSED CIRCUIT BREAKERS:

A. Manufacturers:

1. Square D Company

2. ITE-Siemens

3. General Electric Company

4. Cutler Hammer

B. Circuit Breaker: NEMA AB 1.

1. Voltage: As shown on Drawings.

2. Enclosure: NEMA AB 1; Type 1 or 3R as required.

3. Accessories: As indicated on Drawings.

2.07.1 PLUG-IN DUCT

A. Manufacturers:

1. Square D Company

2. ITE-Siemens

3. General Electric

4. Cutler Hammer

B. Plug-in Duct

1. Bus Material: Copper

2. Enclosure: NEMA 1

3. Mounting: Suspended from structure

4. Rating: 225 amperes, 600 volt, 3 phase, 4 wire

C. Plug-in Units

1. Fusible

switches PART 3

EXECUTION

3.1 EXAMINATION AND PREPARATION:

A. Make arrangements with utility company to obtain permanent electrical service to the facility.

B. Provide concrete pad for utility transformer. Pad details on the Drawings are for estimating purposes. Coordinate exact pad requirements with the utility prior to installation.

3.02INSTALLATION:

A. Install utility services in accordance with utility company standards and requirements.

1. Underground Service: Install service entrance conduits and conductors from the utility padmounted

transformer to the service equipment as shown on the Drawings. (Verify with utility prior to bid/construction.) In addition, coordinate with utility company for required provisions for utility- owned underground primary cabling.

2. If applicable…provide lugs on utility transformer spaces sized to accommodate service entrance conductors.

B. Install equipment in accordance with manufacturer's instructions.

C. Install switchboard to NEMA PB 2.1.

D. Install panelboards to NEMA PB 1.1.

E. Ground the electrical service in accordance with NFPA 70, National Electrical Code, Article 250.

F. Provide labels for all switchboards, panelboards, and distribution equipment.

G. Provide typewritten directory inside panel door for all

panelboards. END OF SECTION 262713

SECTION 16700 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor shall furnish and install the Transient Voltage Surge Suppression (TVSS) equipment having the electrical characteristics, ratings and modifications as specified herein and as shown on the contract drawings. Refer to related sections for surge requirements in:

1.2 SUMMARY

a) Section 16300 -- Panelboards

1.3 DEFINITIONS

The TVSS units and all components shall be designed, manufactured and tested in accordance with the latest applicable UL Listed standards (UL 1449, 2nd Edition), UL 1283 and CSA certified per CSA 22.2

1.4 SUBMITTALS

A. The following information shall be submitted to the Engineer:

1. Provide verification that the TVSS device complies with the required UL 1449 2nd Edition and CSA approvals.

2. Provide actual let through voltage test data in the form of oscillograph results for the ANSI/IEEE C62.41 Category C3 & C1 (combination wave) and B3 (ringwave) tested in accordance with ANSI/IEEE C62.45.

3. Provide spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying the device's noise attenuation exceeds 41 dB at 100 kHz.

4. Provide test report from a recognized independent testing laboratory verifying the suppressor components can survive published surge current rating on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Note that test data on individual module is not accepted.

B. Submit five (5) copies of the above information.

1.05 SUBMITTALS – FOR INFORMATION:

When requested by the Engineer the following product information shall be submitted to the engineer:

a) UL 1449 Listing classifications, and clamping voltage rating for each mode of protection.
b) ANSI/IEEE C62.41 AND C62.45 Category C3 clamping voltage.
c) Sequential surge survivability per ANSI/IEEE C62.45.
d) Dimensions and weight
e) Recommended connection wiring diagram

1.06 QUALIFICATIONS

A. Manufacturer must have a minimum of five years (in U.S.) experience in producing TVSS systems.

B. TVSS devices and accessories shall be obtained through one manufacturer.

C. Other manufacturers not listed in this document may be considered by the engineer/architect at least 14 days prior to bid. The specifications of the product listed in 1.05 "SUBMITTALS- FOR INFORMATION" shall be highlighted.

1.07 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these Shall be included with the equipment at time of shipment.

1.08 OPERATION AND MAINTENANCE MANUALS

A. Five (5) copies of the equipment operation and maintenance manuals shall be provided.

B. Operation and maintenance manuals shall include the following information:

1. Instruction books and/or leaflets
2. Recommended renewal parts list

1.10 EXTRA MATERIALS:

A. Furnish replaceable protection modules for service entrance unit with labeled protective covering for storage.

II. PRODUCTS

2.01 MANUFACTURERS

A. Cutler-Hammer, Square D, Advanced Protection Technologies (APT), Surge Suppression Inc.

2.02 VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements

1. Unit Operating Voltage -- Refer to drawings for operating voltage and unit configuration.

2. Maximum Continuous Operating Voltage (MCOV) -- The MCOV shall be greater than 115% of the nominal system operating voltage.

3. Protection Modes -- For a wye configured system, the device must have directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G). For a delta configured system, the device must have suppression elements between line to line (L-L) and line to ground (L-G).

4. UL 1449 2nd Edition SVR -- The maximum UL 1449 2nd Edition SVR for the device must not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	500 V	900 V	1000 V
L-L	900 V	1500 V	1800 V

5. ANSI/IEEE Cat C3 Let Through Voltage -- The let through voltage based on IEEE C62.41 and C62.45 recommended procedures for Category C3 surges (20 kV, 10 kA) shall be less than:

Modes	208Y/120	480Y/277	600Y/347
L-N	910 V	1070 V	1300 V

6. ANSI/IEEE Cat. B3 Let Through Voltage -- Let through voltage based on IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B3 ringwave (6 kV, 5000 amps) shall be less than:

Modes	208Y/120	480Y/277	600Y/347
L-N	375 V	510 V	300 V

B. TVSS Design

1. Balanced Suppression Platform -- The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating TVSS modules shall not be acceptable.

2. Electrical Noise Filter -- Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be 41 dB at 100 kHz using the MIL-STD-220A insertion loss test method. The unit shall be complimentary listed to UL 1283. Products not able to demonstrate noise attenuation of 41 dB @ 100 kHz shall be rejected.

3. Internal Connections -- No plug-in component modules shall be used as surge current conductors. All internal components shall be hardwired with connections utilizing low impedance conductors and compression fittings.

4. Safety and Diagnostic Monitoring -- Each unit shall be equipped with 200 kAIC internal fuses. Each unit shall provide the following three levels of monitoring:

   a) Continuous monitoring of fusing system
   b) Thermal detection circuit shall monitor for overheating in all modes due to thermal runaway.

   c) A green/red solid state indicator light shall be provided on each phase. The absence of a green light and the presence of a red light, shall indicate which phase(s) have been damaged. Fault detection will activate a flashing trouble light. Units which can not detect open-circuit damage, thermal conditions and over current will not be accepted.

5. Warranty -- The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any TVSS part failure when installed in compliance with manufacturer's written instructions and any applicable national or local electric code.

2.03 SYSTEM APPLICATION

A. The TVSS applications covered under this section include distribution and branch panel locations, bus plugs, motor control centers (MCC), switchgear, and switchboard assemblies.

B. Surge Current Capacity -- The minimum total surge current 8 x 20 microsecond waveform that the device is capable of withstanding shall be as shown in the following table:

Application	Min. Surge Current (per mode)
Service Entrance (Switchboards Switchgear, MCC Main Entrance)	120 kA
Distribution Panelboards	80 kA
High Exposure Roof Top Locations	80 kA
Branch Locations (Panelboards, MCC's, Busway)	40 kA

2.04 Accessories

A. Push to test feature to verify operational integrity.

B. Form C dry contacts one NO, one NC for remote status monitoring.

2.05 Enclosures

A. All enclosed equipment shall have NEMA 1 general purpose enclosures, unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings and as described below:

1. NEMA 1 surface or flush-mounted general purpose enclosures primarily intended for indoor use
2. NEMA 12 dust-tight enclosures intended for indoor use primarily to provide protection against circulating dust, falling dirt and dripping non-corrosive liquids (Panelboards Only)
3. NEMA 3R rainproof enclosures intended for outdoor use primarily to provide protection against rain, sleet and damage from external ice formation
4. NEMA 4 watertight stainless steel intended for indoor or outdoor use primarily to provide protection against windblown dust and rain, splashing rain, hose-directed water, and damage from external ice formation. (Side Mounted Units Only)

III. EXECUTION

3.01 Examination

3.02 Factory testing

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.03 Installation

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. Surge protection devices shall be installed and connected before the service entrance is connected or energized.

C. Existing utilities shall not be interrupted without written permission from project's architect.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 265000 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Section 260000 - Electrical General Requirements, apply to the work specified in this Section, with additions and modifications specified herein.

1.2 SECTION INCLUDES:

A. Grounding and Bonding

B. Supports

C. Identification

D. Connection of Equipment

E. Excavation, Trenching, and Backfilling

F. Cleaning and Painting

G. Cutting and Patching

1.3 PROJECT CONDITIONS:

A. Existing project conditions indicated on Drawings are based on casual field observation and existing record documents.

B. Verify field measurements and circuiting arrangements as shown on the Drawings.

C. Report discrepancies to Engineer before disturbing existing installation.

PART 2 PRODUCTS

2.1 GROUNDING MATERIALS:

A. Ground Rod: Copper clad steel, 3/4 inch in diameter x 10 feet in length.

B. Mechanical Connectors: Cast bronze construction with matching bolt, nuts, and washers.

C. Exothermic Welds: Materials shall be from the same source. Materials shall be Cadweld or approved equal.

D. Conductors: Insulated type complying with applicable Sections of these Specifications or bare soft drawn copper as indicated.

2.2 SUPPORTS:

A. Fabrication Steel: Galvanized or painted steel of standard shapes and sizes.

B. Manufactured Channel: Hot dipped galvanized with all hardware required for mounting as manufactured by

Unistrut, Kindorf, or Powerstrut.

C. Miscellaneous Hardware: Standard sizes treated for corrosion resistance.

2.3 IDENTIFICATION:

A. Panel Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Additionally, Main Panel Nameplates to include Phase Rotation.

C. Panel Directories: Typewritten under plastic cover.

D. Receptacles and disconnects to be provided with label denoting panel and breaker.

E. Provide permanently mechanically-affixed tag on transformers denoting source panel and transformer identification.

F. Wire and Cable Markers: Cloth type, split sleeve type, or tubing type.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Install Products in accordance with manufacturer's instructions.

B. Except where specifically indicated otherwise, all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, and service neutral of the electrical system shall be grounded.

1. Equipment grounding shall be accomplished by installing a separate grounding conductor in each raceway of the system. The Conductor shall be provided with a distinctive green insulation or marker and shall be sized in accordance with Table 250-122 of the National Electrical Code for circuit ampacity ratings.

2. The electrical system grounding electrode shall be made at the main service equipment and shall be extended to the point of entrance of the metallic cold water service. Ground to be sized in accordance with Table 250-66 of the National Electrical Code. Connection to the water pipe shall be made by a suitable ground clamp. If flanged pipes are encountered, connection shall be made on the street side of the flange connection. If the metallic water service is coated with an insulating material or there is no metallic water service to the building, ground connection shall be made to ground rods at the exterior of the building driven full length into the earth. The maximum resistance of the driven ground shall not exceed 25 ohms under normally

dry conditions. If this resistance cannot be obtained with a single rod, additional rods shall be installed not less than 6 feet on centers, or if sectional type rods are used, additional sections may be coupled together and driven with the first rod. The resultant resistance shall not exceed 25 ohms measured not less than 48 hours after rainfall.

3. Ground all building steel including reinforcing bars in concrete and all piping entering the building from outside. Where applicable, see Section 16900 for additional requirements.

C. Make electrical connections to equipment in accordance with equipment manufacturer's instructions.

1. Verify that wiring and outlet rough-in work is complete and that equipment is ready for electrical connection, wiring, and energization.

2. Make wiring connections in control panel or in wiring compartment of pre-wired equipment. Provide interconnecting wiring as required by equipment manufacturer.

3. Install and connect disconnect switches, controllers, control stations, and control devices as required by equipment manufacturer.

4. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit in damp or wet locations.

5. Install pre-fabricated cord set where connections with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

6. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

D. Install support systems sized and fastened to accommodate weight of equipment and conduit, including wiring, which they carry.

1. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips.

2. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self- drilling anchors or expansion and anchors on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

3. Do not fasten supports to piping, ceiling support systems, ductwork, mechanical equipment, conduit, etc.

4. Do not use powder-actuated anchors.

5. Do not drill structural steel members.

6. Fabricate supports from structural steel or steel channel.

7. Install surface mounted cabinets and panelboards with minimum of four anchors.

8. Provide steel channel supports to stand cabinets one inch off wall in wet locations.

9. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

10. Install free-standing electrical equipment on 4 inch high concrete pads.

E. Identify electrical distribution and control equipment, and loads served, to meet regulatory requirements and as specified herein.

1. Degrease and clean surface to receive nameplates.

2. Secure nameplates to equipment fronts using screws or rivets with edges parallel to equipment lines.

3. Use nameplates with 1/4 inch lettering to identify Switchboard, Panelboards, Safety Switches, Motor Starters and Branch Devices of Switchboards.

4. Panel directories shall accurately indicate load served and location of load.

5. Engrave plates as indicated by Schedules on the Drawings.

F. Install wire markers on each conductor in panelboard gutters, boxes, and at load connections.

1. Use distribution panel and branch circuit or feeder number to identify power and lighting circuits.

2. Use control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings to identify control wiring.

G. Excavating, trenching, and backfilling shall be accomplished as indicated on the Drawings or where required to install systems and/or equipment.

1. Trenches for all underground conduits or equipment shall be excavated to the required depths. Where soft, wet, or unstable soil is encountered, the bottom of the trench shall be filled with 6 inches of compacted gravel and sand fill. All trench bottoms shall be tamped hard. Trenches shall be shored as required to meet OSHA requirements and general safe working conditions.

2. After conduits or equipment have been inspected and approved by the Architect and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of the excavation, or borrow of sand, gravel, or other materials approved by the Architect and shall be free of trash, lumber, or other debris. Backfill shall be placed in horizontal layers, not exceeding 9 inches in depth and properly moistened to approximate optimum requirements. Each layer shall be compacted by hand or machine tamped to a density equivalent to surrounding soil.

H. Cleaning and Painting: The respective Contractors for the various phases of work shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished in the clean first class condition.

1. All fixtures and equipment shall be thoroughly cleaned of plaster, stickers, rust, stains and other foreign matter or discoloration, leaving every part in an acceptable condition ready for use.

2. The Contractor shall refinish and restore to the original condition and appearance, all electrical equipment which has sustained damage to manufacturer's prime and finish coats or enamel or paint. Materials and workmanship shall be equal to the requirements described for other painting.

I. Cutting and Patching: This Contractor shall provide all cutting, digging, etc., incident to his work and shall make all required repairs thereafter to the satisfaction to the Engineer, but in no case shall the Contractor cut into any major structural element, beam, or column without written approval of the Engineer.

1. Pavements, sidewalks, roads, curbs, walls, ceilings, floors, and roofs shall be cut, patched, repaired and/or replaced as required to permit the installation of the electrical work.

2. The Contractor shall bear the expense of all cutting, patching, painting, repairing, or replacing of the work of other trades required because of his fault, error, or tardiness or because of any damage done by him.

END OF SECTION 265000

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 265100 - LIGHTING

PART 1 – GENERAL

Luminaire Schedule: Product requirements for each luminaire are specified in luminaire schedule on Drawings. **EQUALS MUST BE SUBMITTED TO ARCHITECT/ENGINEER FOR APPROVAL 10 DAYS PRIOR TO SUBMITTING BID.**

1.1 SUMMARY

A. Section includes the following types of LED luminaires:

1. Cylinder.
2. Downlight.
3. Lowbay.
4. Recessed linear.
5. Strip light.
6. Surface mount, linear.
7. Surface mount, nonlinear.
8. Suspended, linear.
9. Suspended, nonlinear.
10. Materials.
11. Finishes.
12. Luminaire support.

2.1 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

3.1 ACTION SUBMITTALS

A. Product Data: For each type of product, arranged by designation.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps, **Use same designations indicated on Drawings.**

4.1 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

B. Product Certificates: For each type of luminaire.

C. Sample warranty.

5.1 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

6.1 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: **Five** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

1.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE 7.

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Standards:

1. ENERGY STAR certified.
2. California Title 24 compliant.
3. NRTL Compliance (where applicable): Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
4. FM Global Compliance (where applicable): Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
5. UL Listing: Listed for damp location.
6. Recessed luminaires shall comply with NEMA LE 4.

C. CRI of minimum 80. CCT of minimum 2700 K (interior fixtures) and minimum 4000 K (exterior fixtures unless noted otherwise on drawings).

D. Rated lamp life of 50,000 hours to L70.

E. Lamps dimmable from 100 percent to 0 percent of maximum light output.

F. Internal driver.

G. Nominal Operating Voltage: 120-277 V ac (unless specified otherwise on drawings).

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

H. Housings:

1. Extruded-aluminum housing and heat sink.
2. Fixture dependent; refer to 'LIGHTING FIXTURE SCHEDULE' on drawings.

3.1 CYLINDER wall-mounted luminaires, used for direct or indirect lighting.

A. If 'Other Than Specified' fixtures are to be considered as equal for bidding, equal fixture shall be submitted to Architect/Engineer a minimum of 10 days prior to submitting bid.

B. Minimum 1000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. With integral mounting provisions.

4.1 DOWNLIGHT

A. Minimum 1,000 lumens. Minimum allowable efficacy of **80** lumens per watt.

B. Universal mounting bracket.

C. Integral junction box with conduit fittings.

D. Optics:

1. Refer to drawings to determine if fixtures are to have Fixed or Adjustable lens.
2. Refer to drawings to determine Spot/Medium/Wide light distribution.

5.1 LOWBAY

A. Minimum 5,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

B. Universal mounting bracket.

6.1 RECESSED LINEAR

A. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

B. Integral junction box with conduit fittings.

7.1 STRIP LIGHT

A. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

B. Integral junction box with conduit fittings.

8.1 SURFACE MOUNT, LINEAR

A. Minimum 750 lumens. Minimum allowable efficacy of 8**0** lumens per watt.

B. Integral junction box with conduit fittings.

9.1 SURFACE MOUNT, NONLINEAR

A. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

B. Integral junction box with conduit fittings.

10.1 SUSPENDED, LINEAR

A. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

11.1 SUSPENDED, NONLINEAR

A. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

B. Integral junction box with conduit fittings.

12.1 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

C. Diffusers, and Globes:

1. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Refer to drawings for type of finish.

13.1 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

14.1 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 50 00 "Basic Electrical Materials & Methods" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

1.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports: Sized and rated for luminaire weight.

E. Flush-Mounted Luminaire Support: Secured to outlet box.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls, to a minimum 20 gauge backing plate attached to wall structural members, or using through bolts and backing plates on either side of wall.

2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with minimum one (1) 5/32-inch diameter aircraft cable supports 120 inches in length.
2. Ceiling mount with pendant mount with 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.
3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. 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.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 16100 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

2.1 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.
3. All Lighting and Controls Systems shall undergo functional testing upon completion of construction to verify proper operation, calibration, and programming in accordance with Section C408.3 of the Florida Building Code, Energy Conservation. Testing shall be conducted to ensure the compliance with construction documents and manufacturer's instructions.

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

C. Prepare test and inspection reports.

END OF SECTION 265100

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 28 31 00 FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Fire alarm and smoke detection system.

1.02 REFERENCES:

A. NFPA 13: Standard for the Installation of Sprinkler Systems.

B. NFPA 13A: Recommended Practice for the Inspection, Testing and Maintenance of Sprinkler Systems.

C. NFPA 70: National Electrical Code

D. NFPA 72: Installation, Maintenance, and Use of Local Protective Signaling System.

E. NFPA 72E: Automatic Fire Detectors.

F. NFPA 72G: Notification Appliances for Protective Signaling Systems.

G. NFPA 72H: Guide for Testing Procedure for Local, Auxiliary, Remote Station and Proprietary Protective Signaling Systems.

H. NFPA 90: Standard for the Installation of Air Conditioning and Ventilating Systems.

I. NFPA 101: Life Safety Code.

1.03 REGULATORY REQUIREMENTS:

A. Systems: UL and FM listed.

B. Conform to requirements of NFPA.

C. Conform to requirements of Standard Building Code.

D. Conform to requirements of American's with Disabilities Act - ADA.

1.04 SYSTEM REQUIREMENTS:

A. The new devices, booster panel(s), etc. to match the existing campus system. All equipment and devices to be 100% compatible with the existing FACP. Where applicable, the system shall include, but not be limited to the following elements.

1. Master system CPU including all fire detection.

2. Circuit interface panels including all modules.

3. Power supplies, batteries and battery chargers.

4. Equipment enclosures.

5. Intelligent addressable manual pull stations, heat detectors, analog smoke detectors, alarm monitoring modules, and supervised control modules.

6. Annunciator panels, printers and video display terminals.

7. Audible and visual evacuation signals (equipped with voice evacuation technology).

8. Color graphic displays and historical archiving.

9. Software and firmware as required to provide a complete functioning system.

10. Wiring and raceway.

11. Installation, testing and certification and education labor.

12. Multipliex, system driven remote annunciator.

1.05 SYSTEM FUNCTION:

A. The system shall be a complete, electrically supervised multiplex style fire detection and audio/visual evacuation system with intelligent analog alarm initiation, to be device addressable and annunciated as described and shown on the Drawings.

B. The system shall support intelligent analog smoke detection, conventional smoke detection, manual station, water flow, supervisory, security, and status monitoring devices. The system shall also support audio/visual circuits.

C. The panel shall be UL listed as a test instrument for the measurement of the sensitivity of connected intelligent analog ionization and photoelectric smoke detectors to comply with the testing requirements of NFPA 72E.

D. The system shall annunciate a trouble condition when any smoke detector approaches 80% of its alarm threshold due to gradual contamination, signaling the need for service and eliminating unwanted alarms.

E. Any intelligent analog smoke detector or conventional smoke detector zone shall include a selectable alarm verification capability. This feature shall provide automatic verification capability. This feature shall provide automatic verification of smoke detector alarms as described by NFPA 72E.

F. The system shall recognize initiating of an alarm and indicate the alarm condition in a degrade mode of operation, in the event of processor failure or the loss of system communications to the circuit interface panels.

G. The system shall provide a one person field test of either the complete system or a specified area, maintaining full function of areas not under test.

H. The system shall be provided with eight levels of password protection with up to forty passwords.

I. The system shall be programmed in the field via a laptop computer. All programmed information shall be stored in nonvolatile memory after downloading into the control panel. No special programming terminal or prom burning shall be required and the system shall continue in service during reprogramming. Systems requiring on line programming or not capable of mass uploading of software for offsite documentation or editing will not be considered acceptable.

J. The system shall consist of central architecture using a single centrally located control unit. The system also shall be operable in a distributed multiplex architecture using a centrally located control unit with interconnection to remote circuit interface panels containing any combination of plug in intelligent analog signalling circuits, plug in conventional initiating device circuits and plug in relays.

K. The system shall support a UL listed supervised printer.

L. The system as installed shall be expandable to its predetermined maximum capacity of 3,000 initiation devices and/or 2,000 combined zones of audio/visual devices.

1.06 SYSTEM OPERATION:

A. Activation of any fire alarm initiating device shall cause the following actions and indications:

1. Display a custom message describing the device originating the alarm condition, at the fire alarm control panel LCD alpha numeric display. Remote LCD annunciators shall display the alarm condition via unique messages as required by the system Owner. LED type annunciator displays conventional and graphic style shall indicate alarm zoning as specified.

2. Sound the audio/voice circuits, and activate the visual signals.

3. Shut down all air handling units within the smoke zone of alarm origin.

4. Furnish an alarm system closure for connection to an off site reporting device as contracted for by the system user, via a dialer provided under this Section. THIS OPTION REQUIRED IF EXISTING SYSTEM IS NOT EQUIPPED TO PROVIDE THIS OPTION.

5. Close all smoke doors and smoke dampers (if any present in facility) shown on the Drawings to prevent the spread of smoke.

6. Record within the non-volatile system historical memory the occurrence of the event, the time and date of occurrence and the device initiating the event.

B. WHERE APPLICABLE… Activation of any smoke detector or two cross zoned smoke detectors in a single elevator lobby or an elevator equipment room shall, besides the actions described above, cause the recall of that bank of elevators to the erminal floor and the lockout of controls. In the event of recall initiation by a detector in the first floor lobby, the recall shall be to the alternate floor.

C. Activation of any detector in an elevator hoistway or machine room shall cause the capture of that bank of elevators per local requirements, upon completion of these actions, activate the sprinkler system pre-action release panel.

D. Activation of any supervisory circuit, shall cause the following actions and indications:

1. Display the origin of the supervisory condition report at the alarm control panel alphanumeric LCD display.

2. Activate supervisory audible and visual signals as indicated on the Drawings.

3. Furnish an alarm system closure for connection to an off site reporting device as contracted for by the system user.

4. Record the occurrence of the event, the time of occurrence and the device initiating the event.

E. Receipt of a trouble report (primary power loss, open or grounded initiating or signalling circuit wiring, open, grounded or shorted indication system wiring, device communication failure, battery disconnect) at the fire alarm control panel shall cause the following actions and indications:

1. Display at the alarm control panel alphanumeric LCD display, the origin of the trouble condition report.

2. Activate trouble audible and visual signals at the control panel and as indicated on the Drawings.

3. Furnish an alarm system closure for connection to an off site reporting device as contracted for by the system user, via a Dialer furnished under this Section.

4. Record the occurrence of the event, the time of occurrence and the device initiating the event.

1.07 SYSTEM ZONING:

A. Each intelligent addressable device or conventional zone on the system shall be displayed at the fire alarm control panel by a unique alpha numeric label identifying its location.

1.08 QUALIFICATIONS:

A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five years experience and an office within 125 miles of job site.

B. Installer: Company specializing in smoke detection and fire alarm system with three years experience.

1.09 SUBMITTALS:

A. Submit shop Drawings and products data.

B. Provide wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes. Include location of end-of-line devices.

C. Submit manufacturer's installation instructions.

1.10 OPERATION AND MAINTENANCE DATA:

A. Submit as-built Drawings indicating location of all devices, wiring, and end-of-line devices.

B. Include operating instructions, and maintenance and repair procedures.

C. Include manufacturer representative's letter stating that system is operational, and install in accordance with NFPA 72A, 72B, 72E, 72G and 101 and tested in accordance with NFPA 72H.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Where new fire alarm systems are required, acceptable manufacturers are: Pyrotronics, Simplex, EST, Gamewell, Notifier, and FCI (Fire Control Instruments)

2.02 FIRE ALARM CONTROL PANEL:

A. The control panel shall be modular in construction and shall include, but not limited to; the hardware, software and firmware required to perform system functions.

B. The control panel shall be housed within a code gage steel enclosure flush wall mounted.

C. System power supplies shall be housed within the enclosure. Primary power supply shall be from the building distribution system. Secondary power shall be provided by internal sealed gelled electrolyte batteries with capability to operate the system for eight (8) hours.

D. The panel shall provide a system for maintaining a historical event record.

2.03 FIRE ALARM INITIATING DEVICES:

A. Smoke Detector, Intelligent Ionization: The detector shall be addressable, dual chamber, self compensating for ambient temperature and humidity. Detectors shall be suitable for two wire operation.

B. Smoke Detector, Intelligent Photoelectric: The detector shall be addressable, self compensating for ambient temperature and humidity with integral self, restoring 135 degree heat detector. Detectors shall be suitable for two wire operation.

C. Smoke Detector, Intelligent Duct Type: The detector shall be addressable, self compensating for ambient temperature and humidity, ionization or photoelectric type as application requires.

D. Smoke Detector, Projected Beam: The detector shall consist of an infrared light beam transmitter and a light receiver. The detector shall be self compensating for ambient and temperature changes.

E. Thermal Detector, Intelligent: The detectors shall be addressable, rate compensated rated at 135 degrees or 200 degrees Fahrenheit. Detectors shall be suitable for two wire operation.

F. Manual Pull Station, Intelligent: The pull station shall be addressable single station type. Pull stations shall be flush wall mounted.

2.04 ZONE AND INTERFACE MODULES:

A. Remote Conventional Zone Module: Provide, for integration of compatible 2 wire and shorting style contact devices into the analog signaling circuit.

B. Intelligent System Interface Module: Furnish and install, for the monitoring of contact type initiation devices and for the control of electrical devices where required.

C. Intelligent Supervised Control Module: Furnish and install for the control of supervised relays, contractors, audible signal circuits, visual signal circuits, distributed speaker circuits and two way fire fighters communication circuits.

2.05 EVACUATION/SIGNALLING DEVICES:

A. Evacuation Horn(Speaker)/Strobe. Provide audible horns with strobe as indicated on the Drawings. Integral strobe shall be flashing, polarized type with polycarbonate lens producing 8000 peak candlepower at one flash per second.

B. Evacuation Strobe: Provide visual evacuation strobes at locations indicated on the Drawings. Strobes shall be flush wall mounted, flashing, polarized type with polycarbonate lens producing 8000 peak candlepower at one flash per second.

2.06 FIRE ALARM WIRE AND CABLE:

A. Fire Alarm Power Circuits: Building wire as specified in Section 16300. Minimum size conductors shall be 12 AWG.

B. Fire Alarm Loop Circuits: Analog loop circuits shall be 18 AWG twisted pair.

C. Fire Alarm Speaker Circuits: Speaker circuits shall be 18 AWG twisted pair.

D. Fire Alarm Initiating and Strobe Circuits: Circuits shall be minimum 14 AWG building wire as specified in Section 16300.

2.07 DIALER: Provide dialer for off site notification where required locally. Verify if existing system is equipped with the local requirement.

PART 3 EXECUTION

3.01 INSTALLATION:

A. Install system in accordance with manufacturer's instructions.

B. Install manual station with operating handle 48 inches above floor. Install audible and visual devices 80 inches above floor or as indicated.

C. Install cables and wiring in conduit.

D. Mount end-of-line device in control panel or in box with last device or separate box adjacent to last device in circuit.

E. Make conduit and wiring connections to sprinkler flow switches, sprinkler valve tamper switches, duct smoke detectors, HVAC shutdown equipment, and elevator control equipment.

F. Automatic Detector Installation: NFPA 72E.

G. Provide surge suppression for all wiring of the fire alarm system.

3.02 FIELD QUALITY CONTROL:

A. Field inspection and testing will be performed.

B. Test in accordance with NFPA 72H and local fire department requirements.

3.03 MANUFACTURER'S FIELD SERVICES:

A. Provide manufacturer's field services as required for installation.

B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

C. Instruct Owner in operation and function of the system.

END OF SECTION 283100