

## SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Supplemental requirements applicable to Work specified in Division 26.

#### 1.2 REFERENCES

##### A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. 8PSJ or 8P8C: Miniature 8-position series jack, also called an 8-position 8-contact modular jack for some applications.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AFCI: Arc-fault circuit interrupter.
5. AIC: Ampere interrupting capacity.
6. AL, Al, or ALUM: Aluminum.
7. ASD: Adjustable-speed drive.
8. ATS: Automatic transfer switch.
9. AWG: American wire gauge; see ASTM B258.
10. BAS: Building automation system.
11. BIL: Basic impulse insulation level.
12. BIM: Building information modeling.
13. CAD: Computer-aided design or drafting.
14. CATV: Community antenna television.
15. CB: Circuit breaker.
16. CO/ALR: Copper-aluminum, revised.
17. COPS: Critical operations power system.
18. CU or Cu: Copper.
19. CU-AL or AL-CU: Copper-aluminum.
20. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
21. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
22. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
23. dBm: Decibel absolute power with respect to 1 mW.
24. DC or dc: Direct current.
25. DCOA: Designated critical operations area.
26. DDC: Direct digital control (HVAC).
27. EGC: Equipment grounding conductor.
28. EMF: Electromotive force.
29. EMI: Electromagnetic interference.

- 30. EPM: Electrical preventive maintenance.
- 31. EPS: Emergency power supply.
- 32. EPSS: Emergency power supply system.
- 33. ESS: Energy storage system.
- 34. EV: Electric vehicle.
- 35. EVPE: Electric vehicle power export equipment.
- 36. EVSE: Electric vehicle supply equipment.
- 37. fc: Footcandle, a unit of illuminance equal to one lumen per square foot.
- 38. FLC: Full-load current.
- 39. ft: Foot.
- 40. GEC: Grounding electrode conductor.
- 41. GFCI: Ground-fault circuit interrupter.
- 42. GFPE: Ground-fault protection of equipment.
- 43. GND: Ground.
- 44. HACR: Heating, air conditioning, and refrigeration.
- 45. HDPE: High-density polyethylene.
- 46. HID: High-intensity discharge.
- 47. HP or hp: Horsepower.
- 48. HVAC: Heating, ventilating, and air conditioning.
- 49. Hz: Hertz.
- 50. IBT: Intersystem bonding termination.
- 51. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
- 52. IP: Ingress protection rating (enclosures); Internet protocol (communications).
- 53. IR: Infrared.
- 54. IS: Intrinsically safe.
- 55. IT&R: Inspecting, testing, and repair.
- 56. ITE: Information technology equipment.
- 57. kAIC: Kiloampere interrupting capacity.
- 58. kcmil or MCM: One thousand circular mils.
- 59. kV: Kilovolt.
- 60. kVA: Kilovolt-ampere.
- 61. kVA<sub>r</sub> or kVAR: Kilovolt-ampere reactive.
- 62. kW: Kilowatt.
- 63. kWh: Kilowatt-hour.
- 64. LAN: Local area network.
- 65. lb: Pound (weight).
- 66. LCD: Liquid-crystal display.
- 67. LCDI: Leakage-current detector-interrupter.
- 68. LED: Light-emitting diode.
- 69. LNG: Liquefied natural gas.
- 70. LP-Gas: Liquefied petroleum gas.
- 71. LRC: Locked-rotor current.
- 72. MCC: Motor-control center.
- 73. MDC: Modular data center.
- 74. MG set: Motor-generator set.
- 75. MIDI: Musical instrument digital interface.
- 76. MLO: Main lugs only.
- 77. MVA: Megavolt-ampere.
- 78. mW: Milliwatt.
- 79. MW: Megawatt.
- 80. MWh: Megawatt-hour.

- 81. NC: Normally closed.
- 82. NiCd: Nickel cadmium.
- 83. NIU: Network interface unit.
- 84. NO: Normally open.
- 85. NPT: National (American) standard pipe taper.
- 86. OCPD: Overcurrent protective device.
- 87. ONT: Optical network terminal.
- 88. PC: Personal computer.
- 89. PCS: Power conversion system.
- 90. PCU: Power-conditioning unit.
- 91. PF or pf: Power factor.
- 92. PHEV: Plug-in hybrid electric vehicle.
- 93. PLC: Programmable logic controller.
- 94. PLFA: Power-limited fire alarm.
- 95. PoE: Power over Ethernet.
- 96. PV: Photovoltaic.
- 97. PVC: Polyvinyl chloride.
- 98. pW: Picowatt.
- 99. RFI: Radio-frequency interference (electrical); Request for interpretation (contract).
- 100. RMS or rms: Root-mean-square.
- 101. RPM or rpm: Revolutions per minute.
- 102. SCADA: Supervisory control and data acquisition.
- 103. SCR: Silicon-controlled rectifier.
- 104. SPD: Surge protective device.
- 105. sq.: Square.
- 106. SWD: Switching duty.
- 107. TCP/IP: Transmission control protocol/Internet protocol.
- 108. TEFC: Totally enclosed fan-cooled.
- 109. TR: Tamper resistant.
- 110. TVSS: Transient voltage surge suppressor.
- 111. UL: Underwriters Laboratories, Inc. (standards) or UL LLC (services).
- 112. UL CCN: UL Category Control Number.
- 113. UPS: Uninterruptible power supply.
- 114. USB: Universal serial bus.
- 115. UV: Ultraviolet.
- 116. V: Volt, unit of electromotive force.
- 117. V(ac): Volt, alternating current.
- 118. V(dc): Volt, direct current.
- 119. VA: Volt-ampere, unit of complex electrical power.
- 120. VAr: Volt-ampere reactive, unit of reactive electrical power.
- 121. VFC: Variable-frequency controller.
- 122. VOM: Volt-ohm-multimeter.
- 123. VPN: Virtual private network.
- 124. VRLA: Valve-regulated lead acid.
- 125. W: Watt, unit of real electrical power.
- 126. Wh: Watt-hour, unit of electrical energy usage.
- 127. WPT: Wireless power transfer.
- 128. WPTE: Wireless power transfer equipment.
- 129. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. EMT-A: Aluminum electrical metallic tubing.
3. EMT-S: Steel electrical metallic tubing.
4. EMT-SS: Stainless steel electrical metallic tubing.
5. ENT: Electrical nonmetallic tubing.
6. EPEC: Electrical HDPE underground conduit.
7. EPEC-40: Schedule 40 electrical HDPE underground conduit.
8. EPEC-80: Schedule 80 electrical HDPE underground conduit.
9. EPEC-A: Type A electrical HDPE underground conduit.
10. EPEC-B: Type B electrical HDPE underground conduit.
11. ERMC: Electrical rigid metal conduit.
12. ERMC-A: Aluminum electrical rigid metal conduit.
13. ERMC-S: Steel electrical rigid metal conduit.
14. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
15. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
16. ERMC-SS: Stainless steel electrical rigid metal conduit.
17. FMC: Flexible metal conduit.
18. FMC-A: Aluminum flexible metal conduit.
19. FMC-S: Steel flexible metal conduit.
20. FMT: Steel flexible metallic tubing.
21. FNMC: Flexible nonmetallic conduit. See LFNC.
22. HDPE: See EPEC.
23. IMC: Steel electrical intermediate metal conduit.
24. LFMC: Liquidtight flexible metal conduit.
25. LFMC-A: Aluminum liquidtight flexible metal conduit.
26. LFMC-S: Steel liquidtight flexible metal conduit.
27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
28. LFNC: Liquidtight flexible nonmetallic conduit.
29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
32. PVC: Rigid PVC conduit.
33. PVC-40: Schedule 40 rigid PVC conduit.
34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERMCS-G.
38. RMC: See ERMCS.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Cable Types:

1. AC: Armored cable.

2. CATV: Coaxial general-purpose cable.
3. CATVP: Coaxial plenum cable.
4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.
11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.
17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.
27. ITC: Instrumentation tray cable.
28. ITC-ER: Instrumentation tray cable, exposed run.
29. MC: Metal-clad cable.
30. MC-HL: Metal-clad cable, hazardous location.
31. MI: Mineral-insulated, metal-sheathed cable.
32. MTW: Moisture-, heat-, and oil-resistant thermoplastic cable (machine tool wiring).
33. MV: Medium-voltage cable.
34. NM: Nonmetallic sheathed cable.
35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
37. NPLF: Non-power-limited fire-alarm circuit cable.
38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
40. NUCC: Nonmetallic underground conduit with conductors.
41. OFC: Conductive optical fiber general-purpose cable.
42. OFCG: Conductive optical fiber general-purpose cable.
43. OFCP: Conductive optical fiber plenum cable.
44. OFCR: Conductive optical fiber riser cable.
45. OFN: Nonconductive optical fiber general-purpose cable.
46. OFNG: Nonconductive optical fiber general-purpose cable.
47. OFNP: Nonconductive optical fiber plenum cable.
48. OFNR: Nonconductive optical fiber riser cable.
49. P: Marine shipboard cable.
50. PLTC: Power-limited tray cable.
51. PLTC-ER: Power-limited tray cable, exposed run.

- 52. PV: Photovoltaic cable.
- 53. RHH: Thermoset rubber, heat-resistant cable (high heat).
- 54. RHW: Thermoset rubber, moisture-resistant cable.
- 55. SA: Silicone rubber cable.
- 56. SE: Service-entrance cable.
- 57. SER: Service-entrance cable, round.
- 58. SEU: Service-entrance cable, flat.
- 59. SIS: Thermoset cable for switchboard and switchgear wiring.
- 60. TBS: Thermoplastic cable with outer braid.
- 61. TC: Tray cable.
- 62. TC-ER: Tray cable, exposed run.
- 63. TC-ER-HL: Tray cable, exposed run, hazardous location.
- 64. THW: Thermoplastic, heat- and moisture-resistant cable.
- 65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
- 66. THHW: Thermoplastic, heat- and moisture-resistant cable.
- 67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
- 68. TW: Thermoplastic, moisture-resistant cable.
- 69. UF: Underground feeder and branch-circuit cable.
- 70. USE: Underground service-entrance cable.
- 71. XHH: Cross-linked polyethylene, heat-resistant cable.
- 72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Definitions:

- 1. Basic Impulse Insulation Level: Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
- 2. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
- 3. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
- 4. Designated Seismic System: A system component that requires design in accordance with ASCE/SEI 7, Ch. 13 and for which the Component Importance Factor is greater than 1.0.
- 5. Direct Buried: Installed underground without encasement in concrete or other protective material.
- 6. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
  - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
  - b. Concrete Box: A box intended for use in poured concrete.
  - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.

- e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
  - f. Device Box: A box with provisions for mounting a wiring device directly to the box.
  - g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
  - h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
  - i. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
  - j. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
  - k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
  - l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
  - m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
  - n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  - o. Raised-Floor Box: A floor box intended for use in raised floors.
  - p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
  - q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
  - r. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
  - s. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
  - t. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
7. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
8. Essential Electrical Systems: Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system. (healthcare facilities)

9. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
10. Jacket: A continuous nonmetallic outer covering for conductors or cables.
11. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
12. Miniature 8-Position Series Jack (8PSJ): Also called an 8-position 8-contact (8P8C) modular jack. An unkeyed jack with up to eight contacts commonly used to terminate twisted-pair and multiconductor Ethernet cable. Shape and dimensions are specified by TIA-1096.
  - a. Caution: An 8PSJ is not the same thing as an FCC "registered jack" RJ45S, now called a miniature 8-position keyed jack (8PKJ). Ethernet cable plugs do not have rejection keys. Many manufacturers and suppliers incorrectly use "RJ45" as a generic term to describe any 8-position series plug or jack whether it has a rejection key or not.
13. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
14. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
15. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
16. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
17. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
18. Sheath: A continuous metallic covering for conductors or cables.
19. UL Category Control Number: An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
20. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
  - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
  - c. Extra-Low Voltage: Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
  - d. Low Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
  - e. Medium Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
  - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV



but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.

### 1.3 PREINSTALLATION MEETINGS

- A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner. Agenda topics include, but are not limited to, the following:
  - 1. Electrical installation schedule.
  - 2. Status of power system studies.
  - 3. Value analysis proposals and requests for substitution of electrical equipment.
  - 4. Utility work coordination and class of service requests.
  - 5. Commissioning activities.
  - 6. Sustainability activities.

### 1.4 SEQUENCING

- A. Conduct and submit results of power system studies before submitting Product Data and Shop Drawings for electrical equipment.

### 1.5 ACTION SUBMITTALS

- A. Coordination Drawings for Ceiling Areas: Where indicated on drawings, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Structural members to which equipment and suspension systems will be attached.
  - 3. Size and location of access panels on ceilings.
  - 4. Elevation, size, and route of sprinkler piping.
  - 5. Elevation, size, and route of plumbing piping.
  - 6. Elevation, size, and route of ductwork.
  - 7. Elevation, size, and route of cable tray.
  - 8. Elevation, size, and route of conduit.
  - 9. Elevation and size of wall-mounted and ceiling-mounted equipment.
  - 10. Access panels.
  - 11. Sprinklers.
  - 12. Air inlets and outlets.
  - 13. Control modules.
  - 14. Luminaires.
  - 15. Communications devices.
  - 16. Speakers.
  - 17. Security devices.
  - 18. Fire-alarm devices.
  - 19. Indicate clear dimensions for maintenance access in front of equipment.
  - 20. Indicate dimensions of fully-open access doors.

- B. Coordination Drawings for Cable Tray Routing: Reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Elevation, size, and route of cable trays.
  2. Relationships between components and adjacent structural, electrical, and mechanical elements.
  3. Vertical and horizontal offsets and transitions.
  4. Elevation and size of sleeves for wall, ceiling, and floor cable penetrations.
  5. Elevation of ceilings and size of ceiling tiles.
  6. Locations of access panels on ceilings.
  7. Locations where cable tray crosses or parallels sprinkler piping.
  8. Locations where cable tray crosses plumbing piping.
  9. Locations where cable tray crosses or parallels ductwork.
  10. Locations of access panels on ductwork.
  11. Locations where cable tray crosses conduit.
  12. Items blocking access around cable trays, including the following:
    - a. Light fixtures.
    - b. Speakers.
    - c. Fire-alarm devices.
    - d. Power outlets.
    - e. Wall-mounted equipment.
    - f. Equipment racks.
    - g. Furniture.
    - h. Door swings.
    - i. Building features.
  13. Indicate clear dimension between cable tray and walls or obstructions that are closer than **10 ft (3 m)**.
  14. Highlight locations where cable tray is greater than **3 ft (1 m)** above ceilings. Explain how personnel access will be accommodated for cable tray maintenance.
- C. Coordination Drawings for Large Equipment Indoor Installations:
1. Location plan, drawn to scale, showing heavy equipment or truck access paths to loading dock or other freight access into building. Indicate available width and height of doors or openings.
  2. Floor plan for entry floor and floor where equipment is located, drawn to scale, showing heavy equipment access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
    - a. Dimensioned concrete bases, outlines of equipment, conduit entries, and grounding equipment locations.
    - b. If freight elevator must be used, indicate width and height of door and depth of car. Indicate if large equipment must be tipped to use elevator.
    - c. Dimensioned working clearances and dedicated areas below and around electrical equipment where obstructions and tripping hazards are prohibited.

3. Reflected ceiling plans for entry floor and floor where equipment is located, drawn to scale, on which the following items shown and coordinated with each other, based on input from installers of the items involved:
  - a. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways.
  - b. Location of lighting fixtures, sprinkler piping and sprinklers, ducts and diffusers, and other obstructions, indicating available overhead clearance.
  - c. Dimensioned working clearances and dedicated areas above and around electrical equipment where foreign systems and equipment are prohibited.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:

1. Submission of power system studies.
2. Submission of specified coordination drawings.
3. Submission of action submittals specified in Division 26.
4. Orders placed for major electrical equipment.
5. Arrival of major electrical equipment on-site.
6. Preinstallation meetings specified in Division 26.
7. Utility service outages.
8. Utility service inspection and activation.
9. Mockup reviews.
10. Closing of walls and ceilings containing electrical Work.
11. System startup, testing, and commissioning activities for major electrical equipment.
12. System startup, testing, and commissioning activities for emergency lighting.
13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
15. Requests for special inspections.
16. Requests for inspections by authorities having jurisdiction.

- B. Delegated Design Drawings for Structural Masonry Wall Penetrations: Where indicated on Drawings, provide reflected ceiling plan(s), supplemented by elevations, sections, and other details, drawn to scale, signed and sealed by a qualified structural professional engineer, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Location and dimensions of structural members supporting wall.
2. Location and dimensions of columns near penetrations.
3. Location and dimension of headers and lintels.
4. Doors and windows near penetrations.
5. Location and dimensions of penetrating cuts.
6. Sprinkler piping and sleeves.
7. Plumbing piping and sleeves.
8. Ductwork and sleeves.

9. Cable tray and sleeves.
10. Conduit and sleeves.
11. Firestopping assemblies for rated penetrations.
12. Structural supports for piping, ductwork, and conduit on both sides of wall.

C. Qualification Statements: if applicable

1. For qualified regional manufacturer.
2. For structural professional engineer.
3. For electrical professional engineer.
4. For lighting professional engineer.
5. For EPM specialist.
6. For welder.
7. For ERMC-S-PVC raceway Installer.
8. For medium-voltage cable Installer.
9. For medium-voltage duct Installer.
10. For medium-voltage equipment Installer.
11. For switchboard Installer.
12. For generator set Installer.
13. For lightning protection system Installer.

## 1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide emergency, operation, and maintenance manuals for each system, equipment, and device as indicated in plans.
2. Include the following information:
  - a. Manufacturer's operating specifications.
  - b. User's guides for software and hardware.
  - c. Schedule of maintenance material items recommended to be stored at Project site.
  - d. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
  - e. List of load-current and overload-relay heaters with related motor nameplate data.
  - f. List of lamp types and photoelectric relays used on Project, with ANSI and manufacturers' codes.
  - g. Manufacturer's instructions for setting field-adjustable components.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:

1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.
2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

## PART 3 - EXECUTION

### 3.1 DEVELOPMENT OF FACILITY EPM PROGRAM

- A. Facility EPM Program must be developed by qualified EPM specialist.
- B. Conduct Facility EPM Program analysis in accordance with NFPA 70B recommendations.
  1. Renovation Projects:
    - a. Facility diagrams must include connected existing equipment for entire facility where known. Areas of uncertainty should be clearly indicated.
    - b. Obtain copies of existing operation and maintenance data and existing Facility EPM Program information from Owner.
    - c. Facility EPM Program analysis should identify existing equipment that does not have available operation and maintenance data, and should explain the Owner's risks because this equipment is not included in Facility EPM Program.
    - d. Data for existing equipment outside scope of Project may be inserted in Facility EPM Program Binders without analysis.
    - e. Data for existing equipment impacted by scope of Project should be analyzed and documented similar to Project's new equipment data as much as possible.
- C. Compile operation and maintenance data from Facility EPM Program analysis and submit updated Facility EPM Program Binders.

### 3.2 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

### 3.3 FIELD QUALITY CONTROL

- A. Adminstrant for [Medium-Voltage and ]Low-Voltage Electrical Tests and Inspections:

1. Engage qualified [**medium-voltage and**] low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
2. Administer and perform tests and inspections.

### 3.4 CLOSEOUT ACTIVITIES

#### A. Demonstration:

1. Demonstrate to Owner's maintenance and clerical personnel how to operate the following systems and equipment:
  - a. Lighting control devices specified in Section 260923 "Lighting Control Devices."

END OF SECTION 260010