

EDGEMONT SCHOOL DISTRICT  
TOILET RENOVATIONS AND RELATED WORK  
JR./SR. HIGH SCHOOL ADMINISTRATION BUILDING  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

**SECTION 26 0519**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Wire pulling lubricant.
- F. Cable ties.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 8400 - Firestopping.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

**1.3 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- C. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- E. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- F. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- I. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- J. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- K. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- L. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Fuller and D'Angelo, P.C. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.1 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Metal-clad cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      - a) Maximum Length: 6 feet.
    - b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits.
      - a) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
  - 2. In addition to other applicable restrictions, may not be used:
    - a. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.
    - b. Where exposed to damage.

**2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
- H. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.

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- 3. Color Code:
  - a. 208Y/120 V, 3 Phase, 4 Wire System:
    - a) Phase A: Black.
    - b) Phase B: Red.
    - c) Phase C: Blue.
    - d) Neutral/Grounded: White.
  - b. Equipment Ground, All Systems: Green.

**2.3 SINGLE CONDUCTOR BUILDING WIRE**

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

**2.4 METAL-CLAD CABLE**

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  - 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.

**2.5 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

**2.6 ACCESSORIES**

- A. Electrical Tape:
  - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
  - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
- B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- C. Cable Ties: Material and tensile strength rating suitable for application.

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**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that work likely to damage wire and cable has been completed.
- B. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

**3.3 INSTALLATION**

- A. Circuiting Requirements:
  - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
  - 2. When circuit destination is indicated without specific routing, determine exact routing required.
  - 3. Arrange circuiting to minimize splices.
  - 4. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
  - 5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- H. Terminate cables using suitable fittings.
  - 1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.

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1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  3. Do not remove conductor strands to facilitate insertion into connector.
  4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- Q. Provide covers for and close all boxes above suspended ceilings.

**END OF SECTION**

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GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**SECTION 26 0526**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Notify Fuller and D'Angelo, P.C. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

**1.6 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.1 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

**2.2 GROUNDING AND BONDING COMPONENTS**

- A. General Requirements:
  - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
  - 1. Use insulated copper conductors unless otherwise indicated.
- C. Connectors for Grounding and Bonding:
  - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

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2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
  1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

**END OF SECTION**

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HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

**SECTION 26 0529  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.2 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

**1.3 REFERENCE STANDARDS**

- A. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
- B. MFMA-4 - Metal Framing Standards Publication; 2004.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Fuller and D'Angelo, P.C. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems.

**1.6 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

**PART 2 PRODUCTS**

**2.1 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:

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1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Do not use products for applications other than as permitted by NFPA 70 and product listing.
4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
  - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  1. Comply with MFMA-4.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
  1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Masonry: Use expansion anchors or screw anchors.
  3. Steel: Use beam clamps, machine bolts, or welded threaded studs.
  4. Powder-actuated fasteners are not permitted.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Fuller and D'Angelo, P.C., do not provide support from suspended ceiling support system or ceiling grid.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Secure fasteners according to manufacturer's recommended torque settings.
- G. Remove temporary supports.

**END OF SECTION**

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**SECTION 26 0533.13**  
**CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Electrical metallic tubing (EMT).
- B. Conduit fittings.
- C. Accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 8400 - Firestopping.
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0533.16 - Boxes for Electrical Systems.

**1.3 REFERENCE STANDARDS**

- A. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- C. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
- E. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- H. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  - 5. Notify Fuller and D'Angelo, P.C. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

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**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.1 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT).
- D. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

**2.2 CONDUIT REQUIREMENTS**

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
  - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

**2.3 ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
    - a. Do not use indenter type connectors and couplings.

**2.4 ACCESSORIES**

- A. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

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**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. Conceal all conduits unless specifically indicated to be exposed.
  - 3. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  - 4. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
- D. Conduit Support:
  - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  - 4. Use conduit strap to support single surface-mounted conduit.
    - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
  - 5. Use of wire for support of conduits is not permitted.
- E. Connections and Terminations:
  - 1. Use suitable adapters where required to transition from one type of conduit to another.
  - 2. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  - 3. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- F. Penetrations:
  - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  - 3. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- G. Provide grounding and bonding in accordance with Section 26 0526.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Correct deficiencies and replace damaged or defective conduits.

**3.4 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

**3.5 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

**SECTION 26 0533.16**  
**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 8400 - Firestopping.
- B. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
- E. Section 26 2726 - Wiring Devices:
  - 1. Wall plates.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 5. Notify Fuller and D'Angelo, P.C. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes and junction and pull boxes.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

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**PART 2 PRODUCTS**

**2.1 BOXES**

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  - 2. Use suitable masonry type boxes where flush-mounted in masonry walls.
  - 3. Use raised covers suitable for the type of wall construction and device configuration where required.
  - 4. Use shallow boxes where required by the type of wall construction.
  - 5. Do not use "through-wall" boxes designed for access from both sides of wall.
  - 6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  - 7. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  - 8. Wall Plates: Comply with Section 26 2726.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- D. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes so that wall plates do not span different building finishes.
  - 4. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
  - 5. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
- E. Box Supports:

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1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- F. Install boxes plumb and level.
- G. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  2. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- J. Close unused box openings.
- K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- L. Provide grounding and bonding in accordance with Section 26 0526.

**3.3 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.4 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

**SECTION 26 0535**  
**SURFACE RACEWAYS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Surface raceway systems.
- B. Install in all finished areas where concealed conduit or wiring could not be installed.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 2726 - Wiring Devices: Receptacles.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
  - 1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.1 RACEWAY REQUIREMENTS**

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

**2.2 SURFACE RACEWAY SYSTEMS**

- A. Manufacturers:
  - 1. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Surface Metal Raceways: Listed and labeled as complying with UL 5.
- C. Surface Raceway System:
  - 1. Raceway Type: Single channel, painted steel.
  - 2. Size: As required for wiring sizes and quantities. Minimum 1/2"x 1/2"..
  - 3. Color: To be selected by Architect.
  - 4. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.

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- C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.
- D. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install raceways in a neat and workmanlike manner in accordance with NECA 1.
- C. Install raceways plumb and level.
- D. Bend raceway or provide fittings as required to fit around existing obstructions or building trim.
- E. If possible and as approved by the Owner or Architect, cut and remove any trim to allow straight installation of raceway.
- F. Secure and support raceways in accordance with Section 26 0529 at intervals complying with NFPA 70 and manufacturer's requirements.
- G. Close unused raceway openings.
- H. Provide grounding and bonding in accordance with Section 26 0526.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect raceways for damage and defects.
- C. Correct wiring deficiencies and replace damaged or defective raceways.

**3.4 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**3.5 PROTECTION**

- A. Protect installed raceways from subsequent construction operations.

**END OF SECTION**

**SECTION 26 0923**  
**LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Occupancy sensors.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
- C. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Operation and Maintenance Data: Include detailed information on device programming and setup.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.7 DELIVERY, STORAGE, AND PROTECTION**

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

**1.8 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.

**PART 2 PRODUCTS**

**2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

**2.2 OCCUPANCY SENSORS**

- A. Manufacturers:

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1. WattStopper; Dt-355: [www.wattstopper.com/#sle](http://www.wattstopper.com/#sle).
  2. Substitutions: See Section 01 6000 - Product Requirements.
- B. All Occupancy Sensors:
1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
  3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
  7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
- C. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
  2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Install lighting control devices in accordance with manufacturer's instructions.
- C. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

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- D. Install lighting control devices plumb and level, and held securely in place.
- E. Provide required supports in accordance with Section 26 0529.
- F. Occupancy Sensor Locations:
  - 1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

**3.4 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Fuller and D'Angelo, P.C..

**3.5 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**3.6 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of lighting control devices to Fuller and D'Angelo, P.C., and correct deficiencies or make adjustments as directed.
- B. Training: Train Edgemont School District's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

**END OF SECTION**

**SECTION 26 2726  
WIRING DEVICES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 0923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

**1.3 REFERENCE STANDARDS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Revision H, 2014.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Revision G, 2014.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 2. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 3. Notify Fuller and D'Angelo, P.C. of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install wiring devices until final surface finishes and painting are complete.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

**1.6 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

## **PART 2 PRODUCTS**

### **2.1 WIRING DEVICE APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

### **2.2 WIRING DEVICE FINISHES**

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: Ivory with stainless steel wall plate.

### **2.3 WALL SWITCHES**

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw as indicated on the drawings.

### **2.4 RECEPTACLES**

- A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.

### **2.5 WALL PLATES**

- A. Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

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**3.2 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

**3.3 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches above finished floor.
    - b. Receptacles: 18 inches above finished floor or 6 inches above counter.
  - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- E. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- G. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- H. Install wall switches with OFF position down.
- I. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- J. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- K. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

**3.4 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

**3.5 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

**3.6 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

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**SECTION 26 5100**  
**INTERIOR LIGHTING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 0923 - Lighting Control Devices.
  - 1. Includes automatic controls for lighting including occupancy sensors.
- D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

**1.3 REFERENCE STANDARDS**

- A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 101 - Life Safety Code; 2015.
- I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- J. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
  - 2. Notify Fuller and D'Angelo, P.C. of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:

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- a. Include estimated useful life, calculated based on IES LM-80 test data.

**1.6 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**1.7 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

**1.8 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for LED luminaires, including drivers.

**PART 2 PRODUCTS**

**2.1 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01 6000 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

**2.2 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
  - 1. Ceiling Compatibility: Comply with NEMA LE 4.
- H. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

**2.3 EMERGENCY LIGHTING UNITS**

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
  - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

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- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  - 3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 4. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
  - 5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Emergency Lighting Units:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test emergency lighting units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Fuller and D'Angelo, P.C..

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**3.4 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting) and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

**3.5 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**