SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Basic electrical methods.
   2. Grounding and bonding.
   3. Hangers and supports.
   4. Electrical identification.
   5. Electrical system testing and inspection.

B. Related Documents: The contract documents, as defined in Section 011000 – Summary of Work, apply to the work of this section. Additional requirements and information necessary to complete the work of this section may be found in other documents.

C. Related Sections:
   1. Section 078400 - Firestopping
   2. Section 260519 - Low-Voltage Electrical Power Conductors and Cables
   3. Section 260533 - Raceway and Boxes for Electrical Systems
   4. Section 262200 - Low Voltage Transformers
   5. Section 262416 - Panelboards
   6. Section 265100 - Interior Lighting (LED - Solid State)

1.2 REFERENCES

A. National Electrical Contractors Association (NECA):
   1. NECA SI - Standard of Installation.

B. National Electrical Manufacturers Association (NEMA):
   1. NEMA KS 1 - Enclosed Switches.

C. National Electrical Testing Association (NETA):
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Procedures for submittals.
   1. Product Data:
      a. Grounding electrodes and connections.
      b. Starter electrical characteristics and connection requirements.
   2. Assurance/Control Submittals:
      a. Electrical System Test Reports: Submit report including the following directly to the USPS Project Manager from Testing Laboratory, with copy to Contractor. Prepare reports in conformance with Section 014000 - Quality Requirements.

b. Summary of project.
c. Description of equipment tested.
d. Description of test.
e. Test results.
f. Conclusions and recommendations.
g. Appendix, including appropriate test forms.
h. List of test equipment used and calibration date.
i. Signature of responsible Testing Laboratory Officer.
j. Certificates: Manufacturer's certificate that each Product specified meet or exceed specified requirements.
k. Qualification Documentation: Submit documentation of experience indication compliance with specified qualification requirements.

B. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals.
1. Project Record Documents: Accurately record the following.
a. Locations of components and grounding electrodes.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing Work of this Section with minimum 5 years documented experience.

B. Regulatory Requirements:
1. Products: Listed and classified by Underwriters Laboratories, Incorporated as suitable for the purpose specified and indicated.
2. Work herein shall conform to all applicable laws, ordinances and regulations in accordance with the latest applicable requirements of:
a. The National Electrical Code (NFPA 70).
b. National Electrical Manufacturer’s Associates.
c. Standards of National Fire Protection Association (NFPA 72, 90A and 101).
d. Underwriter’s Laboratories.
e. Occupational Safety and Health Agency Standards.
f. Illuminating Engineering Society Handbook.
g. The International Existing Building Code.
h. The International Electrical Code.
i. ASHRAE Standard 90.1.
j. The International Energy Conservation Code.

1.5 BASIC ELECTRICAL METHODS

A. Drawings are schematic and diagrammatic. Use judgment and care to install electrical Work to function properly and fit within building construction and finishes. Electrical conductors, conduit, components, not shown or specified, which are required for any device or system to produce a complete and operative system are required to be furnished and installed.

B. Exact location of outlets is determined from dimension on Drawings, manufacturer's shop drawings, or as may be determined at Project Site. Do not scale Drawings for exact location of any item. Verify item mounting heights as required by project conditions prior to rough-in.

C. Route conduits and wiring associated with new equipment and systems above ceilings, in existing chases, and concealed within building structure.

D. Surface mounted raceways or conduit permitted only at locations indicated on Drawings.

E. Circuit grouping, conduit or cable runs and home runs are indicated with number of conductors shown in each raceway to clarify operation and function of various systems. Provide proper number of conductors and conduits or cables to provide operative system as indicated on Contract Documents. Do not regroup any feeder circuits, branch circuits, home runs, and zone alarms at any point, from that shown on Contract Documents. Each conduit run shall contain no more than (6) current carrying conductors.

F. Branch and home run circuits are indicated as 2, 3, or 4 wire circuits unless otherwise noted. Do not connect two ungrounded conductors to same circuit breaker/fused switch in any panel. Circuit runs consist of a maximum of five conductors; 3 phase conductors, 1 neutral conductor, and 1 equipment ground conductor, unless otherwise noted. Do not splice branch circuit conductors in any panels, safety switches, or circuit breakers in separate enclosures.

G. The sharing of neutral conductors for multiwire branch circuits is prohibited. All branch circuits shall contain individual neutrals.

H. Proposed equipment, switches or devices, shown mounted on and/or adjacent to equipment, which if installed, would impair proper operation of existing or new equipment, shall be removed and relocated by Contractor as required so equipment will function properly. Notify Contracting Officer immediately if any such condition exists.

I. Seal and make permanently watertight penetrations by electrical raceways or equipment through ceilings, walls or floors.
   1. Seal penetrations in non-fire rated ceilings, walls or floors material specified in Section 079200 – Joint Sealants.
   2. Seal penetrations in fire rated walls with material specified in Section 078400 - Firestopping.

J. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A, and NFPA 70.

K. Install equipment and materials to provide required maintenance and code working clearance for servicing and maintenance. Coordinate final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow required space for removal of parts that require replacement or servicing.

L. Remove existing equipment, lighting fixtures, switches, and receptacles as required to facilitate proposed installation. Remove existing wiring and conduit serving items to be removed. Conduit in inaccessible areas shall be cut off below finished surfaces and existing surface patched to match existing. Provide blank plates on existing flush mounted outlet boxes that will be abandoned. Remove all abandoned conductors from raceways.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING

A. Grounding System Resistance: Five ohm.

B. Rod Electrodes:
   1. Material: Copper.
   2. Diameter: 3/4 inch.
   3. Length: 10 feet.

C. Mechanical Connectors: Bronze.

D. Electrode Conductor:

1. Material: Bare stranded copper.
2. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

2.2 HANGERS AND SUPPORTS

A. Product Requirements: Furnish and install approved materials, sizes, and types of anchors, fasteners, and supports to carry loads of equipment and conduit, including weight of wire in conduit plus 300 pounds.

B. Materials and Finishes: Corrosion resistive.

C. Anchors and Fasteners:
1. Steel Structural Elements: Beam clamps and welded fasteners.
2. Concrete Surfaces: Self-drilling anchors and expansion anchors.
3. Hollow Masonry, Plaster, and Gypsum Board Partitions: Toggle bolts and hollow wall fasteners.
4. Solid Masonry Walls: Expansion anchors.
5. Sheet Metal: Sheet metal screws.
6. Wood: Wood screws.

2.3 ELECTRICAL IDENTIFICATION

A. Nameplates:
1. Engraved three-layer laminated phenolic plastic, white letters on black background.
2. Locations:
   a. Each electrical distribution and control equipment enclosure.
   b. Panelboards
   c. Transformers.
   d. Pull boxes.
   e. Switches and disconnects.
3. Letter Size:
   a. Use 1/8 inch letters for identifying individual equipment and loads.
   b. Use 1/4 inch letters for identifying grouped equipment and loads.
4. Nameplates shall indicate voltage of the equipment and the source of power from the upstream device or equipment.

B. Wire and Cable Markers:
1. Description: Cloth tape or tubing type wire markers.
2. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
3. Identification:
   a. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.
   b. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on Drawings.

C. Conduit Markers:
1. Underground conduit routings shall be marked utilizing magnetic marker tape set atop of the entire conduit run.
   a. Underground-Type Plastic Line Marker: Manufacturer’s standard detectable permanent, bright colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6 inches wide by 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried cable. Locate tape 12 inches above top of conduit.
2. Detectable marker tape cannot be installed atop of directionally bored underground conduits. Directionally bored conduits containing only fiber cabling shall therefore be equipped with a #12/AWG copper conductor to enhance detection.

D. Arc Flash Warning Signs: Furnish signs in accordance with NEC Article 110.16, warning of potential arc flash hazard and requiring suitable Personal protective equipment. Locate and install signs per INSTALLATION Section of this specification.

E. Confined space markings: Work within electrical manholes and underground vaults must comply with “confined space” OSHA requirements. Manhole covers and the entrance to underground vaults shall be stamped or marked as “CONFINED SPACE – PERMIT REQUIRED”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to the USPS Project Manager prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION - GROUNDING AND BONDING

A. Provide bonding and grounding in conformance with NFPA 70.

B. Equipment Grounding Conductor: Provide separate, insulated conductor within all lighting and power raceways. Terminate each end on suitable lug, bus, or bushing.

C. Testing and Inspection:
1. Inspect and test in accordance with NETA ATS, where applicable.
2. Perform inspections and tests listed in NETA ATS, Section 7.13.
3. Test ground resistance of system with clamp-on ground resistance tester. The resistance of the grounding system shall not exceed 5 ohms. Where tests show resistance-to-ground is over 5 ohms, take appropriate action to reduce resistance to 5 ohms, or less, by driving additional ground rods, lengthening the rods or installing ground enhancing materials; then retest to demonstrate compliance. Install rods at least 8 feet apart.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Install products in accordance with manufacturer's published instructions.

B. Furnish and install anchors, fasteners, and supports in accordance with NECA SI.

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not use spring steel clips and clamps.

E. Do not use powder-actuated anchors.

F. Obtain permission from structural engineer before drilling or cutting structural members.

G. Fabricate supports from structural steel angle or structural steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

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

I. In wet and damp locations use structural steel channel supports to stand cabinets and panelboards one inch off wall.

J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

3.4 INSTALLATION - ELECTRICAL IDENTIFICATION

A. Install nameplate parallel to equipment lines.

B. Secure nameplate to equipment front using stainless steel screws. Use minimum two screws at each end of nameplate.

C. Secure nameplate to outside surface of door on panelboards and switchboards.

D. Install Arc Flash Warning Signs on switchboards, panelboards, control panels, meter socket enclosures, and motor control centers likely to require examination, adjustment, servicing, or maintenance while energized. Locate sign so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

3.5 FIELD QUALITY CONTROL - ELECTRICAL TESTING AND INSPECTION

A. Section 014000 - Quality Requirements: Field testing and inspection.

B. Section 260800 - Commissioning of Electrical Systems: Requirements related to Division 26 Commissioning

C. Conduct testing to Determine that Electrical Equipment and Systems:
   1. Are in conformance with Contract Documents and applicable reference standards.
   2. Is properly installed without damage due either to installation or shipment.
   3. Operate correctly, meet design intent, and are performing at optimum level, in safe manner.

D. Provide a complete written record of operational values to be used as a baseline for future operational testing.

E. Instrumentation:
   1. Provide calibration program that assures applicable test instrumentation is maintained within rated accuracy and directly traceable to National Bureau of Standards.
   2. Calibrate instruments in accordance with following frequency schedule:
      a. Field Instruments:
      b. Analog - 6 months maximum.
      c. Digital - 12 months maximum.
      d. Leased Specialty Equipment: 12 months. (Where accuracy is guaranteed by lessor.)
   3. Dated Calibration Labels: Visible on test equipment.
   4. Keep records current; Show date and result of instruments calibrated or tested.
   5. Maintain current instrument calibration instruction and procedure for each test instrument.

6. Calibrating Standard: Higher accuracy than that of instrument being calibrated.

F. Regulatory Requirements:
   1. Safety Practices: Include, but not limited to, the following requirements:
      a. Occupational Safety and Health Act of 1970 - OSHA.
      b. Accident Prevention Manual for Industrial Operations, Seventh Edition, National Safety Council, Chapter 4.
      c. Applicable State and Local Safety Operating Procedures.
      d. NETA Safety/Accident Prevention Program.
      e. United States Postal Service Safety Practices.
      f. NFPA 70E - Electrical Safety Requirements for Employee Workplace.
      g. American National Standards for Personnel Protection, ANSI Z244.1.
   2. Perform tests with apparatus de-energized except where otherwise specifically required herein.
   3. Testing Laboratory: Provide a designated safety representative present at Project Site and supervise safety operations.
   4. Power Circuits: Conductors shorted to ground by a hot line grounded device approved for the purpose.
   5. Do not proceed until safety representative has determined that it is safe to do so.
   6. Testing Laboratory: Provide sufficient protective barriers and warning signs to conduct specified tests safely.

G. Tests and inspections include, but are not limited to the following:
   1. Proper operation of lights and equipment.
   2. Continuity of raceway system.
   3. Insulation leakage and impedances.
   4. Ground system resistance.
   5. Elimination of reverse rotation and single-phasing of motors.
   6. Sub-system tests indicated in other Sections.
   7. Proper operation of communications systems specified in Section 270500.
   8. Proper operation of intrusion detection systems specified in Section 281600.
   9. Proper operation of video surveillance system specified in Section 282305.
   10. Proper operation of fire alarm system specified in Section 283100.

H. Load balance all electrical phases, at device, panels, and switchboards.

I. Perform electrical system testing and inspection as specified in each related Section and as specified in this Section.

END OF SECTION

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SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:
   1. Building wire and cable.
   2. Branch-circuit cable.
   3. Wiring connectors and connections.

B. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. As specified in Section 260500 - Common Work Results for Electrical: Basic electrical methods.

1.2 REFERENCES

A. As specified in Section 260500 – Common Work Results for Electrical.

1.3 SUBMITTALS

A. As specified in Section 260500 - Common Work Results for Electrical.

1.4 QUALITY ASSURANCE

A. As specified in Section 260500 – Common Work Results for Electrical.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Transport, handle, store, and protect products.

B. Deliver in accordance with NEMA WC 26.

PART 2 - PRODUCTS

2.1 BUILDING WIRE AND CABLE

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
   1. Alcan Cable, Atlanta, GA (770) 392-2376.
   2. Anixter, Inc., Skokie, IL (800) ANIXTER.
   3. General Cable, Highland Heights, KY (800) 526-4391.
   4. General Electric, Plainville, CT (860) 747-7111.

5. Okonite, Ramsey, NJ (201) 825-0300.
6. Southwire Company, Carrollton, GA (800) 444-1700.
7. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Description: Single conductor insulated wire.

C. Conductor: Copper, except conductors #1/0 AWG and larger may be compact stranded aluminum if equipped with compression lugs and installed per manufacturer's recommendations and the National Electrical Code.

D. Insulation Voltage Rating: 600 Volts.

E. Insulation: NFPA 70, Type THHN/THWN or Type XHHW-2.

2.2 WIRING CONNECTORS

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
1. Buchanan Construction Products, Hackettstown, NJ (800) 610-5201.
2. Thomas and Betts, Memphis, TN (800) 695-1901.
3. 3M, St. Paul, MN (800) 364-3577.
4. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Compression Connectors; Conductor sizes #12 through #6 AWG:
1. Buchanan: 2006S or 2011S.
2. Thomas and Betts: CTS.
3. 3M: Scotchlok.

PART 3 - EXECUTION

3.1 EXAMINATION

A. As specified in Section 260500 – Common Work Results for Electrical.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION - CONDUCTORS

A. Wiring methods:
1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN or Type XHHW-2 insulation in metallic raceway or MC multiconductor cable.
2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN or Type XHHW-2 insulation in metallic raceway or MC multiconductor cable.
3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN or Type XHHW-2 insulation in metallic raceway or MC multiconductor cable.
4. Wet or Damp Interior Locations: Use only building wire, Type THW or THWN or Type XHHW-2 insulation in raceway.

B. Install products in accordance with manufacturers published instructions and NECA SI.

C. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

D. Use stranded conductors for control circuits and final connections to all vibration equipment.

E. Use conductor not smaller than 12 AWG for power and lighting circuits.

F. Use conductor not smaller than 14 AWG for control circuits.

G. Use 10 AWG conductors for 20 ampere, 120 Volt branch circuits longer than 75 feet.

H. Use 10 AWG conductors for 20 ampere, 277 Volt branch circuits longer than 200 feet.

I. Pull all conductors into raceway at same time.

J. Use approved wire pulling lubricant for all building wire.

K. Protect exposed cable from damage.

L. Neatly train and lace wiring inside boxes, equipment, and panelboards in accordance with NECA Standards.

M. Clean conductor surfaces before installing lugs and connectors.

N. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

O. For splices and taps, use only compression connectors for copper or aluminum conductors, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
   1. Splicing of copper feeder conductors #3 AWG and larger is prohibited.
   2. Splicing of aluminum feeder conductors #1 AWG and larger is prohibited.
   3. Splices within branch circuit or feeder conductors located underground or below grade shall not be provided. All splices shall be terminated above grade.

P. Use solderless pressure compression connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

Q. Use conductors rated 90 degrees C, inside a ballast compartment or within 6 inches of any ballast.

R. Conductor Sizes #8 and Larger: Class B stranding.

S. Install Drop Cords to building structure at locations indicated on Drawings as indicated on Drawings.

T. The sharing of neutral conductors for multiwire branch circuits is prohibited. All branch circuits shall contain individual neutral conductors.

3.4 CONSTRUCTION

A. Interface with Other Work:
   1. Identify wire and cable using Thomas and Betts type WM vinyl markers.
   2. Identify each conductor with its circuit number or other designation indicated on Drawings in all junction, pull, terminal boxes and cabinets. Identify neutrals with common circuit numbers in all junction, pull and terminal boxes, panels and cabinets.

3.5 WIRING COLOR CODE

A. Comply with the following color code for each voltage system.

B. 208Y/120 Volt System:
1. Phase A - Black.
2. Phase A Switch Leg - Black with “S” tag.
3. Phase B - Red.
4. Phase B Switch Leg - Red with “S” tag.
5. Phase C - Blue.
6. Phase C - Switch Leg - Blue with “S” tag.
7. Travelers - Yellow.
8. Neutral - White.
9. Equipment Ground - Green.

C. 240/120 Volt System:
1. Phase A - Black.
2. Phase A Switch Leg - Black with “S” tag.
3. Phase B - Orange (High-Leg).
4. Phase C - Blue.
5. Phase C Switch Leg - Blue with “S” tag.
6. Travelers - Yellow.
7. Neutral - White.
8. Equipment Ground - Green.

D. 480Y/277 Volt System:
1. Phase A - Brown.
2. Phase A Switch Leg - Brown with "S" Tag.
3. Phase B - Orange.
4. Phase B Switch Leg - Orange with "S" Tag.
5. Phase C - Yellow.
6. Phase C Switch -Leg- Yellow with "S" Tag.
7. Travelers - Yellow with "T" Tag.
8. Neutral - Grey.
9. Equipment Ground - Green with Yellow stripe.

E. Use same color for same phase throughout. Use same colors for switch legs. Travelers shall be yellow. Phase rotation shall be same in all panels. Identify large cables with colored tape.

F. Provide identification tags on each conductor entering panel, switch, junction box and pull box to identify conductor.

3.6 FIELD QUALITY CONTROL

A. As specified in Section 260500 – Common Work Results for Electrical.

B. Cables, 600 Volt or less and size no. 3 or larger, shall be meggered using an industry-approved “megger with a minimum of 500 Volt internal generating voltage. All inspection, cleaning and testing procedures shall be in compliance with the recommendations and standards outlined in the “maintenance testing specifications for electrical power distribution equipment and systems”, latest edition, published by International Electrical Testing Association (NETA). Insulation resistance test values shall be no less than 250 megaohms. A typewritten report of all readings shall be prepared and submitted.

END OF SECTION

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SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduit.
2. Flexible metal conduit.
3. Electrical metallic tubing.
4. Fittings and conduit bodies.
5. Pull and junction boxes.

B. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
1. Section 260500 – Common Work Results for Electrical.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM A 123 - Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products.

B. American National Standards Institute (ANSI):
1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
3. ANSI C80.5 - Rigid Aluminum Conduit.

C. National Electrical Contractors Association (NECA):
1. NECA "Standard of Installation."

D. National Electrical Manufacturers Association (NEMA):
1. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
2. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
3. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
4. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
5. NEMA VE 1 - Metallic Cable Tray Systems.

E. National Fire Protection Association (NFPA):
1. NFPA 70 - National Electrical Code.

1.3 SYSTEM DESCRIPTION

A. Design Requirements
1. Conduit Size: NFPA 70, unless indicated otherwise on Drawings.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Conform to requirements of NFPA 70.
   2. Provide products listed and classified by Underwriters Laboratories, Incorporated.

1.5 PROJECT OR SITE CONDITIONS

A. Existing Utilities: Contact local utility companies and make arrangements to obtain utility company location and marking service prior to start of Work.
   1. Locate existing underground utilities in areas of Work using “Ground Penetrating Radar (GPR)” detection. If utilities are to remain in place, provide means of support and protection during trenching and excavation operations.
      a. Pothole and locate existing underground utilities at locations to assure that no conflict with Work of this Contract will occur and required clearance is available to prevent damage to existing utilities.
      b. Perform potholing minimum 10 days before start of excavation or underground work.
   2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility company and Contracting Officer immediately for directions.
   3. Coordinate with Contracting Officer and utility companies to keep existing utility services and facilities in operation.
   4. Repair damaged utilities to satisfaction of utility company, at no additional cost to U.S. Postal Service.
   5. Do not interrupt existing utilities serving facilities occupied and used by U.S. Postal Service or others, during occupied hours, except when permitted in writing by Contracting Officer and then only after acceptable temporary utility services have been provided and approved by Contracting Officer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Transport, handle, store, and protect products.

B. Accept conduit on site. Contractor inspect for damage prior to acceptance.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Where conduit is required by standards, codes, or required elsewhere, minimum size shall be as follows:
   1. 1/2 inch for power and branch circuit wiring, unless indicated otherwise. All homerun conduits shall be 3/4 inch, minimum.
   2. 3/4 inch for communications cable, unless indicated otherwise.
   3. 3/4 inch for low voltage, control, intercom, security and communications unless indicated otherwise.
   4. Underground conduits shall be sized 1 inch, minimum.

2.2 METAL CONDUIT

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. Allied Tube & Conduit, Harvey, IL (800) 882-5543.
   2. Wheatland Tube Co., Collinswood, NJ (800) 257-8182.
   3. Republic Wire & Cable, Rocky Mount, NC (800) 533-8198.
   4. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Rigid Galvanized Steel Conduit (GRC): ANSI C80.1, UL6.

C. Intermediate Metal Conduit (IMC): UL1242.

D. Fittings and Conduit Bodies: NEMA FB1 Material to match conduit.

2.3 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. Hubbell, Millford, CT (203) 882-4800.
   2. Electriflex, Roselle, IL (800) 323-6174.
   3. 0-Z/Gedney, Farmington, CT (860) 677-5541.
   4. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Description: Interlocked steel and aluminum construction.

C. Fittings: NEMA FB 1.

2.4 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. Allied Tube & Conduit, Harvey, IL (800) 882-5543.
   2. Wheatland Tube Co., Collinswood, NJ (800) 257-8182.
   3. Republic Wire & Cable, Rocky Mount, NC (800) 533-8198.
   4. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel set-screw type. Die-cut Zinc not permitted.

2.5 NONMETALLIC CONDUIT

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. Carlon, Cleveland, OH (800) 322-7566.
   2. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Description: NEMA TC 2; Schedule 40 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

2.6 FITTINGS

A. Manufacturer: Raco, Inc., South Bend, IN (219) 234-7151.
   1. Subject to compliance with project requirements, one of the following manufacturers may also be provided:
      a. Steel City.
      b. 0-Z/Gedney.
   2. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Conduits 1/2 inch thru 1 inch enter junction boxes, pull boxes, panels, cabinets, and gutters, provide the following:
   1. Rigid Conduit: Raco 1222, 1223, 1224.
   2. Flexible Metal Conduit: Raco 3302, 3303, 3304, 3305, 3306, 3308.
   3. Liquidtight Flexible Metal Conduit: Raco 3511, 3512, 3513, 3541, 3542, 3543.

C. Conduits 1-1/4 inch and larger entering junction boxes, pull boxes, panels, cabinets, and gutters, provide Insulated throat type bushings; Raco 1225, 1226, 1228, 1230, 1232, 1234, 1236.

D. Provide threaded joint connectors and malleable iron no thread compression box connectors on rigid conduit. Do not provide fittings requiring set screws or indentor type applications including BM connectors.

E. Provide only steel set-screw couplings and connectors on EMT conduit.

2.7 CONDUIT STRAPS AND HANGERS

A. Strap Manufacturer: Raco, Inc., South Bend, IN (219) 234-7151
   1. Subject to compliance with project requirements, one of the following manufacturers may also be provided:
      a. Steel City.
      b. Unistrut.
   2. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Hanger Manufacturer: Steel City/Thomas & Betts, Memphis, TN (800) 888-0211.
   1. Subject to compliance with project requirements, one of the following manufacturers may also be provided:
      a. Unistrut.
      b. Raco.
   2. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

C. Straps: Two-hole push on stamped steel straps on surface areas such as concrete, masonry, wide flange beams, columns, and wood.
   1. Rigid Conduit: Raco 2232, 2233, 2234, 2235, 2336, 2238.
   2. Electrical Metallic Tubing: Raco 2092, 2093, 2094.

D. Hangers: Lay-in pipe hanger.
   1. Conduits 1-1/4 Inch and Larger: Steel-City C-149.

E. Trapeze Hangers for Conduits Grouped Together: Hangers consisting of all thread rods sized as required and Kingdorff channel.

1. Steel City B-909, 1/2 inch x 1-7/8 inch (12 gauge) with single bolt channel pipe straps.
2. Steel City C-105, C-105-AL, or C-106, (no wire permitted for anchoring conduit).

2.8 SEAL-OFF AND EXPANSION FITTINGS

A. Seal-Off Fitting Manufacturer: Crouse-Hinds, Syracuse, NY (315) 477-5531.
   1. Subject to compliance with project requirements, one of the following manufacturers may also be provided:
      a. Killark.
      b. Appleton.
      c. O-Z/Gedney.
   2. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

B. Expansion Fitting Manufacturer: OZ/Gedney, Farmington, CT (860) 677-5541
   1. Subject to compliance with project requirements, one of the following manufacturers may also be provided:
      a. Crouse-Hinds.
      b. Killark.
      c. Appleton.
   2. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

C. Provide seal-off fittings where required by governing authority, code, or as indicated on Drawings.
   1. Vertical Runs: Crouse-Hinds Type EYS.
   2. Horizontal and Vertical Runs: Crouse-Hinds Type EZS.
   3. Elbows: Crouse-Hinds Type EYS.
   4. Sealing Compound: "Chico X" fiber and "Chico A".

D. Provide expansion fittings in conduits where indicated on Drawings or where required to pass through expansion joints embedded in concrete.
   1. O-Z/Gedney Type AX.

2.9 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Verification of existing conditions before starting work.

B. Verification of Existing Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify routing and termination locations of proposed conduit prior to rough-in.

C. Existing Utilities, Conduits and Piping:
   1. Locate the routings of the existing underground utilities, conduits and piping in the areas of the Work prior to the installation of the proposed conduit. Trace the locations of existing underground utilities, conduits, and piping using “Ground Penetrating Radar (GPR)” detection.

a. The routings of these existing underground utilities, conduits and piping shall be identified and marked to avoid any trenching conflicts. These routings shall be recorded on the As-Built drawings prepared by the Contractor for future reference.

2. Existing utilities, conduits and piping that are to remain shall be supported and protected during the trenching process.

D. Report in writing to the USPS Project Manager prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

E. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION - RACEWAYS

A. Install in accordance with the following schedule, unless indicated otherwise on Drawings: Plastic flexible PVC conduit shall not be permitted. Flexible metal conduit shall be permitted for electrical power and security wiring only and not permitted for fire alarm cables.

1. Above suspended ceilings: Galvanized or sherardised thick wall rigid steel (GRC) or electrical metallic tubing (EMT).
2. Metal stud walls: Galvanized or sherardised thick wall rigid steel (GRC) or electrical metallic tubing (EMT).
3. Exposed interior areas: Galvanized or sherardised thick wall rigid steel (GRC) or electrical metallic tubing (EMT).
4. Exposed exterior areas: Galvanized or sherardised thick wall rigid steel (GRC).
5. Underground or below slab areas: Rigid polyvinyl chloride conduit (PVC-Sched. 40).

B. Install conduit in accordance with NECA "Standard of Installation."

C. Install nonmetallic conduit in accordance with manufacturer's instructions. Nonmetallic conduit shall only be used under slabs or direct buried in earth. Conduit penetrations through slab including elbows shall be galvanized rigid conduit.

D. Conduit routing indicated on Drawings are approximate locations unless dimensioned. Route parallel and perpendicular to building construction for complete wiring system regardless whether exposed or concealed.

E. Arrange supports to prevent misalignment during wiring installation.

F. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

G. Group related conduits; support using conduit rack. Construct rack using approved steel channel and provide space on each rack for 25 percent additional conduits.

H. Fasten conduit supports to building structure and surfaces under provisions of this section.

I. Do not support conduit with wire or perforated pipe straps in any type structure. Remove wire used for temporary supports. Steel tie wire may be used to anchor conduit down to reinforcing rods in concrete encasement only.

J. Do not attach conduit or boxes to ceiling support wires. Boxes shall be independently supported.

K. Arrange conduit to maintain headroom and present neat appearance. Maintain required clearance between conduit and piping.

L. Route all conduit, whether exposed or concealed, parallel and perpendicular to walls, ceilings, building structures, etc.

M. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

N. Cut EMT conduit square using saw or pipe cutter; de-burr cut ends and ream. Bring conduit to shoulder of fittings; fasten securely.

O. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

P. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes. Use Myers hub connectors on all conduit entering top or sides of all junction boxes, pull boxes, wiring gutters, exposed to weather.

Q. The number of conduit bends per box shall comply with NFPA 70, Article 360. Conduit bends for “SCS” installation shall not exceed two 90 degree bends or exceed a total of 180 degrees of bend between pull boxes or conduit ends. Pull boxes shall be sized per NEC codes per conduit installed. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or use factory elbows for bends in metal conduit larger than 2 inch size.

R. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

S. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.

T. Provide suitable nylon pull string or #14 AWG steel wire in each conduit excluding sleeves and nipples.

U. Ground and bond conduit per NFPA 70.

V. Coat all metallic conduit with "General Electric" RTV silicone sealer where conduit is installed in exterior areas or in contact with concrete or earth.

W. Conduits shall be sized as indicated on Drawings. Where sizes are not indicated, conduit shall be sized per NFPA 70.

X. Cap all upturned conduits during construction rough-in to prevent moisture or debris from entering. Pull through each and every conduit a dry swab of sufficient size to remove any and all moisture.

Y. Maximum length of flexible metal conduit (Greenfield), or flexible liquid-tight shall be 5 feet.

Z. Assure ground continuity on all branch circuitry conduits with two locknuts, one inside and one outside of all boxes, cabinets and gutters for rigid conduit. One locknut inside of all boxes, cabinets, and gutters for EMT.

AA. Provide conduit supports as follows:
1. Galvanized rigid thick wall conduit (GRC), intermediate grade rigid conduit (IMC) and electrical metallic conduit (EMT) within three feet of all outlet boxes, junction boxes, cabinets, gutters, or fittings. Horizontally anchored at 10 foot maximum intervals. Other spacings indicated on Drawings.
2. Flexible metal conduit (Greenfield) and liquid-tight flexible metal conduit, within 12 inches of all outlet boxes, junction boxes, cabinets, gutters, or fittings and bends or turns. Horizontally anchored at 4-1/2 foot intervals. 1/2 inch minimum size permitted.

BB. Overhead conduits shall be routed below the roof decking. Raceways shall not be routed between the decking flutes.

3.3 INSTALLATION - BOXES

A. Install boxes in accordance with NECA "Standard of Installation."

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with NFPA 70.

C. Set wall mounted boxes at elevations to accommodate mounting heights indicated or as required for specific project requirements. Orient boxes to accommodate wiring devices as specified in Section 262726.

D. Electrical boxes are indicated on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose with no additional cost to contract. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

E. Maintain headroom and present neat mechanical appearance.

F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Install pull boxes in freezer and dock area above bottom chord of structural joist. Pullboxes sized in excess of 12 inches shall be equipped with hinged and hasped covers.

G. Install outlet and junction boxes within inaccessible ceiling areas, no more than 6 inches from ceiling access panel or from removable recessed luminaire.

H. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.

I. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

J. Locate flush mounted box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening. Use approved raised gang covers in masonry and stud walls.

K. Flush mounted boxes shall not be mounted back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

L. Secure flush mounted box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Use approved stamped steel bridges to fasten box between studs.

M. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

N. Use approved adjustable steel channel fasteners spanning joist for hung ceiling outlet box.

O. Provide factory sectioned multi-gang boxes where more than one adjacent device is to be mounted. Sectional boxes shall not be permitted.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspection.

B. Inspect conduit installation, types, sizes, fittings and attachment to structure.

C. Inspect box installation, locations, connection to conduit, and attachment to structure.

D. Inspect cable tray installation, locations, connection to conduit, and attachment to structure.

3.5 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.6 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish like new.

END OF SECTION

USPS specification Last Revised: 10/1/2023

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SECTION 262200

SECONDARY DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: The work specified in this Section includes, but shall not be limited to, the following:
   1. Transformers shall be manufactured in compliance with D.O.E. 10 CFR 431.192, April 2013.
   2. Transformer shall be UL 1561 listed to feed a mix of equipment load profiles such as computers without derating or significant degradation of efficiency.

B. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
   1. Section 260500 - Common Work Results for Electrical.

1.2 REFERENCES

A. As specified in Section 260500 – Common Work Results for Electrical.

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   1. IEEE 1100, “IEEE Recommended Practice for Powering and Grounding Electronic Equipment.”
   2. ANSI/IEEE C57.1110, " Recommended Practice for Establishing Transformer Capability When Feeding Nonsinusoidal Load Currents."

C. International Code Council (ICC):
   1. ICC ES AC156, “Acceptance Criteria for Seismic Qualification by Shake Table Testing of Nonstructural Components and Systems.”
   2. ICC IBC, "International Building Code."

D. International Organization for Standardization (ISO):
   1. ISO 9001, "Quality Management Systems Requirements."
   2. ISO 14001, “Environmental Management Systems Requirements with Guidance for Use.”

E. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)."
   2. NEMA ST 20, "Dry Type Transformers for General Applications."
   3. NEMA TP 1, "Standard for the Labeling of Distribution Transformer Efficiency.”
   4. NEMA TP 2, "Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.”

F. National Fire Protection Association (NFPA):
   1. NFPA 70, "National Electrical Code," hereinafter referred to as NEC.
   2. NFPA 5000, “Building Construction and Safety Code.”

G. Underwriters Laboratories, Inc. (UL):
   1. UL 1561, "Standard for Dry Type General Purpose and Power Transformers."
   2. UL 250, “Enclosure for Electrical Equipment”.

H. 2005 Energy Act PUBLIC LAW 109-58-AUG. 8, 2005. Comply with all Rules from Department of Energy:
   1. 10 CFR 429
   2. 10 CFR 431

1.3 SUBMITTALS

A. As specified in Section 260500 – Common Work Results for Electrical.

B. Section 013300 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
   2. Manufacturer's Test Reports:
      a. Copy of ISO 9001 Certification of manufacturing operation.
      b. Copy of ISO 14001 Certification of manufacturing operation.
      c. Confirmation that transformers are UL 1561 listed with a K1 rating. Those requiring a k factor rating will be K13 rated.
      d. Construction details, including, but not limited to, enclosure dimensions, kVA rating, primary and secondary nominal voltages, voltage taps, approximate center of gravity, and unit weight.
      e. Basic performance characteristics, including, but not limited to, insulation class, temperature rise, core and coil materials, impedances and audible noise level, unit weight, and inrush value expressed in a multiplier of rated primary current RMS.
      f. Efficiency data shall be reported as described in the following sections. Reference temperatures shall be included when reporting efficiency.
         1) No load and full load losses shall be calculated per NEMA ST 20 test methods.
         2) Efficiency curves as follows:
            i. Linear loads.
            ii. Data per the non linear load test program.
      g. Sound level ratings.
   3. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      b. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

C. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals:
   1. Project Record Documents: Record actual locations of transformers.
   2. Maintenance Data: Include recommended maintenance procedures and intervals.

1.4 QUALITY ASSURANCE

A. As specified in Section 260500 – Common Work Results for Electrical.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
   1. Seismic Requirements:
      a. ICC IBC, NFPA 5000.
      b. Tri axial shake table test results conducted in accordance with the ICC ES AC156 test protocol 3 (Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components).

2. Comply with D.O.E. Guidelines established for manufacture, January 1, 2016 (10 CFR 431.192, April 2013.

C. Compliance: Comply with applicable requirements of the following standards.
1. CSA 802.2.
2. CSA C22.2.
3. ASHRAE 90.1.

D. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Transport, handle, store, and protect Products.

B. Transformers shall be packaged for shipment using materials that shall have the least environmental impact.
1. Transformer Wrapping: Transformers shall be protected by cardboard protective material; all plastic wraps shall not be accepted.
2. Transformer Shipping Base: Transformers shall be shipped on a base that uses at least 50 percent less wood than traditional pallets. Comply with ISPM No. 15.

C. Store in a warm, dry location with uniform temperature. Cover ventilation openings to keep out dust, water, and other foreign material.

D. Handle transformers using lifting eyes and/or brackets provided for that purpose. Protect against unfavorable external environment such as rain and snow, during handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
1. ABB/G.E. Industrial Solutions (ABB/GEIS), Mebane, NC (800) 431-7867.
2. Eaton/Cutler-Hammer Corporation, Pittsburgh, PA (800) 525-2000.
3. Siemens Energy & Automation, Inc., Alpharetta, GA (800) 964-4114.
4. Square D Company, Palatine, IL (800) 392-8781.

B. Basis of Design: Product specified shall be D.O.E. 10 CFR 431.192, April 2013 compliant transformers (“EX” Series) as manufactured by Square D Schneider Electric. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect/Engineer will be the sole judge of the basis of what is equivalent.

C. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 TWO WINDING TRANSFORMERS

A. The transformer shall be UL 1561 listed and labeled with a K1 rating (per UL 1561 35.2.1 and 34.2). Provide K13 rated transformers to serve mail processing equipment and other non-linear loads.

B. Windings shall be continuous wound copper with brazed or welded terminations.

C. Insulation and varnish systems shall be Nomex-based UL recognized 220 degrees C class utilizing an epoxy polyester impregnation.

D. Maximum winding temperature rise for K1 rated units shall be 80 degrees C and K13 rated units shall be 130 degrees C rise.

E. Terminals, including, but not limited to, those for changing taps, shall be readily accessible by removing a front coverplate.

F. The transformers shall have a basic impulse level of 10 kV BIL.

G. Voltage taps shall be as follows:
   1. Primary 480 volts.
      a. For transformers 15 kVA to 300 kVA, provide two 2-1/2 percent full capacity taps above and four 2-1/2 percent below nominal primary voltage.
      b. For transformers 500 kVA to 750 kVA, provide two 2-1/2 percent full capacity taps above and two 2-1/2 percent below nominal primary voltage.

H. Impedance shall be the manufacturer’s standard.

I. Three phase transformer efficiency shall be as stated below (tested at 35 percent of the nameplate rating, per D.O.E. 10 CFR 431.192:
   1. 75 kVA: 98.97 percent.

J. Sound Levels shall be as follows:
   1. 45 and 75 kVA: 44 dB.

K. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.

L. Where required for K13 rating, the neutral bus shall be configured to accommodate 200 percent of the rated current.

M. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap in accordance with Article 250 of NFPA 70.

N. Mounting: Suitable for wall, floor, or trapeze mounting, except transformers larger than 75 kVA, suitable for floor mounting.

2.3 ENCLOSURE

A. The enclosure construction shall be ventilated, NEMA 2 drip-proof, with lifting holes. All ventilation openings shall be protected against falling dirt. On outdoor units, provide weather shields over ventilated openings.

B. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

2.4 SOURCE QUALITY CONTROL

A. Production test each transformer according to NEMA ST20.

PART 3 - EXECUTION

3.1 EXAMINATION

A. As specified in Section 260500 – Common Work Results for Electrical.

3.2 PREPARATION

A. Provide minimum 3 inch high concrete pad for floor mounted transformers.

3.3 INSTALLATION

A. Install transformers in accordance with NECA SI and manufacturer's published instructions, at locations and as indicated on Drawings.
   1. Use manufacturer approved mounting brackets for transformers supported from building structure.
   2. Securely anchor transformers to concrete pad for floor mounted transformers.
   3. Provide working clearances in conformance with NFPA 70 and manufacturer’s recommendations.
   4. Provide both primary and secondary protection using fuses or circuit breakers as indicated on Drawings.

B. Set transformers plumb and level.

C. Use minimum 2 foot length flexible conduit for connections to transformer case. Make conduit connections to side panel of enclosure.

D. Mount transformers on vibration isolating pads suitable for isolating transformer noise from building structure.

E. Provide grounding and bonding as specified in Section 260500.

F. Furnish and install engraved plastic nameplates to include the voltage and source of power upstream, as specified in Section 260500.

G. Furnish and install seismic restraints designed for type of mounting used.

3.4 FIELD QUALITY CONTROL

A. As specified in Section 260500 – Common Work Results for Electrical.

B. Section 014000 - Quality Control: Field testing and inspection.

C. Check for damage and tight connections prior to energizing transformer.

D. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

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SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes:
   1. Panelboards.

B. Related Documents: The contract documents as defined in Section 011000 – Summary of Work, apply to the work of this section. Additional requirements and information necessary to complete the work of this section may be found in other documents.

C. Related Sections:
   1. Section 260500 – Common Work Results for Electrical.

1.2 REFERENCES

A. As specified in Section 260500 - Common Work Results for Electrical.

B. National Electrical Manufacturers Association (NEMA):
   1. NEMA AB 1 – Molded Case Circuit Breakers.
   2. NEMA ICS 2 – Industrial Control Devices, Controllers, and Assemblies.
   3. NEMA KS 1 – Enclosed Switches.
   4. NEMA PB 1 – Panelboards.
   5. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

C. Underwriters Laboratories (UL):
   1. UL 486 – Molded Case Circuit Breakers.
   2. UL 67 – Heat Rise Test for Panelboards.
   3. UL 50 – Steel Gauge Requirements for Cabinets and Enclosures.
   4. UL 1449 4th Edition – Standard for Transient Voltage Surge Suppressors.

1.3 SUBMITTALS

A. As specified in Section 260500 – Common Work Results for Electrical.

   1. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
   2. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
   3. Shall include UL 1449 Listing documentation verifying the following:
      a. Short Circuit Current Rating (SCCR).
      b. Voltage Protection Ratings (VPRs) for all modes.
      c. Maximum Continuous Operating Voltage Rating (MCOV).
      d. I-nominal rating (I-n).

B. Section 017704 – Closeout Procedures and Training: Procedures for closeout submittals:

1. Project Record Documents: Record actual locations of Products; indicate actual branch circuit arrangement.
2. Operation and Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.
3. Submit data showing compliance with UL 1449.

1.4 QUALITY ASSURANCE

A. As specified in Section 260500 - Common Work Results for Electrical

B. Panelboards shall be UL Listed and labeled and shall be designed in accordance with the applicable standards of ANSI and NEMA.

C. Qualifications
1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

PART 2 - PRODUCTS

2.1 GENERAL CLASSIFICATION

A. Manufacturers: ABB/G.E. Industrial Solutions (ABB/GEIS) Catalog numbers are used to identify type of equipment specified. Equivalent products by the following manufacturers are acceptable:
1. Siemens
2. Square-D
3. Eaton/Cutler Hammer
   a. Branch Circuit Panels:
      1) 120/208V: ABB/GEIS Type ReliaGear.
4. No substitutions permitted.

2.2 BRANCH CIRCUIT PANELS

A. Cabinet: Construct cabinet with code gauge galvanized steel. Provide minimum 20 inch wide cabinets, and extra wiring space where incoming feed-through or parallel lines are required.

B. Doors: Provide single door construction, made of cold-rolled steel. Door shall have concealed hinges, flush catch, and lock. (Tee bar handles not acceptable). Secure top and bottom of door to cabinet by slotted steel bolts. Release shall be by one-half turn with a screwdriver. All panels shall be keyed alike.
1. Panelboards shall be equipped with “door within door” type trim.

C. Panels located adjacent to each other shall have identically sized enclosures and trims.

D. Finish: Finish exposed parts with one coat of primer and one coat of light gray enamel suitable for overpainting in field if desired.

E. Phase, neutral and ground bus bars shall be tin plated copper.

F. Provide all hardware for future breakers, identified on drawings as SPACES, or for the full length of usable bus, whichever is longer.

G. Provide ground bus with full complement of terminals in addition to insulated neutral bus.

H. Circuit Breakers:

1. Provide multi-pole units with common trip elements. Handle ties are not acceptable.
2. Provide circuit breakers equipped with padlockable handle attachments, padlocks and keys for padlocking the breaker in the “on” position when used to serve Fire Alarm. Security and CCTV Systems. Handle padlock attachment shall be similar to Square D types #QOHPL or #QO1PA with padlock and keys or Garvin Industries #UBL2-UPC. Key operated, circuit breaker attachments utilizing a screwdriver or allen wrench shall not be acceptable.
3. 120/208V branch circuit panelboards: Molded cast bolt-on type designed for 120/208V, three phase, four wire service with minimum 10,000 amperes rms short circuit rating.
4. 277/480V branch circuit panelboards: Molded cast bolt-on type designed for 277/480V, three phase, four wire service with minimum 14,000 amperes rms short circuit rating.

I. Main circuit breakers shall be individually mounted. The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breakers shall have barriers on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the main shall have barriers.

J. Provide all panelboards with lockout/tagout devices; Circuit-Safe type as manufactured by Stranco, Inc. or approved equal.

K. Nameplates: Provide engraved plastic nameplate identification on outside of each panel to include the voltage and source of power upstream, as specified in section 260500.

L. Circuit directories: Provide a metal-framed circuit directory on inside of inner door, with plastic protector.

M. Provide two 3/4 inch and one 1 inch spare empty conduits routed above into accessible ceiling space from all flush mounted panelboards.

N. Panels serving electronic equipment and/or other harmonic producing loads shall be equipped with double neutral bus bars.

PART 3 - EXECUTION

3.1 EXAMINATION

A. As specified in Section 260500 – Common Work Results for Electrical.

3.2 CLEARANCES

A. Minimum code required clearances around panelboards must be maintained.

3.3 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb. Provide supports in accordance with Section 260500.

C. Provide filler plates for unused spaces in panelboards.

3.4 MOUNTING HEIGHT

A. Typically mount panel boards top at 6 feet above finished floor but no more than 6 feet 6 inches above finished floor to top of circuit breaker handle.

3.5 MOUNTING HARDWARE

A. Provide all necessary blocking, channels and other hardware for securing panelboards to wall, column, or other parts of building structure.

3.6 FIELD CONTROL

A. Section 014000 – Quality Requirements: Field Testing and Inspection.

B. Perform inspections and tests listed in NETA ATS, Section 7.6.

C. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

D. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION

USPS MPF Specification Last Revised: 10/1/2022

SECTION 265100

INTERIOR LIGHTING
(LED - SOLID STATE)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Interior luminaires and accessories.
2. Emergency lighting units.
3. Ballast/Light emitting diode (LED) drivers.
4. Light Sources.
5. Luminaire accessories.

B. Substitutions:
1. Section 016000 - Product Requirements: Product substitutions permitted by manufacturers listed in Paragraph 2.1A.

C. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

D. Related Sections:
1. Section 260500 - Common Work Results for Electrical: Basic electrical methods.

1.2 REFERENCES

A. As specified in Section 260500 – Common Work Results for Electrical.

B. Illuminating Engineering Society (IES):
1. IES LM-79 - (2008) Electrical and Photometric Measurements of Solid-State Lighting Products.
2. IES LM-80 - (2015) Measuring Lumen Maintenance of LED Light Sources.
3. IES TM-21 - (2011; Addendum B 2015) Projecting Long Term Lumen Maintenance of LED Light Sources.

C. National Fire Protection Association (NFPA):
1. NFPA 70 - National Electrical Code.
2. NFPA 101 - Life Safety Code.

D. National Electrical Manufacturers Association (NEMA):
1. NEMA ANSILG C78.377 – (2017) Electric Lamps— Specifications for the Chromaticity of Solid State Lighting Products.
2. NEMA SSL 1 – (2010) Electronic Drivers for Led Devices, Arrays, or Systems.
3. NEMA SSL 3 - (2011) High-Power White LED Binning for General Illumination.

E. Federal Communications Commission Parts 18.305, 18.307 (EMI RFI).

F. American Society of Heating, Refrigerating and Air Conditioning, Inc.
1. ANSI/ ASHRAE/ IES Standard 90.1.

G. Underwriters Laboratories (UL)
1. UL 1472 – (2015) UL Standard for Safety Solid-State Dimming Controls.
2. UL 1598 – (2008; Reprint Oct 2012) Luminaires.

3. UL 844 – (2012; Reprint Mar 2016) UL Standard for Safety Luminaires for Use in Hazardous (Classified) Locations.
4. UL 8750 – (2015; Reprint Feb 2018) UL Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products.
5. UL 924 – (2016; Reprint Nov 2017) UL Standard for Safety Emergency Lighting and Power Equipment.

1.3 SUBMITTALS

A. As specified in Section 260500 - Common Work Results for Electrical.
   1. Product Data: Submit catalog cuts, drawings, descriptive matter and lighting performance characteristics as required to completely define the materials and construction details employed, finishes applied, dimensions, hinging, latching and relamping provisions, and electrical characteristics.
   2. Assurance/Control Submittals:
      a. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

B. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals:
   1. Operation and Maintenance Data: Submit manufacturer's operation and maintenance instructions for each type of luminaire.

1.4 DEFINITIONS

A. For LED luminaire light sources, “Useful Life” is the operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent “Rated Lumen Maintenance Life” as defined in IES LM-80.

B. For LED luminaires, “Luminaire Efficacy” (LE) is the appropriate measure of energy efficiency, measured in lumens/watt. This is gathered from LM-79 data for the luminaire, in which absolute photometry is used to measure the lumen output of the luminaire as one entity, not the source separately and then the source and housing together.

C. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.5 QUALITY ASSURANCE

A. As specified in section 260500 – Common Work Results for Electrical.

B. Products shall be tested, approved and labeled/listed by Underwriters Laboratories, Inc., or by a nationally recognized testing laboratory (NRTL).

C. Electrical equipment and materials shall be new and within one year of manufacture, complying with the latest codes and standards. Re-built, refurbished and/or re-manufactured electrical equipment and materials shall not be furnished on this project.

1.6 MAINTENANCE

A. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals.

B. Extra Products: At completion of installation, deliver to the USPS Project Manager.
   1. Two of each luminaire lens type.

2. Each component type: Provide quantity for each unique ballast/driver, and LED array equal to 2 percent of luminaire total, but not less than two of each type.

PART 2 - PRODUCTS

2.1 LUMINAIRE MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
1. Alphabet Lighting, Tustin, CA (714) 259-9959.
2. Barron/Exitronix, Glendale, AZ (888) 533-3948.
3. Beghelli, Miramar, FL (954) 442-6600.
4. Chloride Systems, Burgaw, NC (910) 259-1000.
5. Cooper Lighting (Halo, Invue, Lumark, McGraw-Edison, Failsafe, Metalux, Portfolio, Sure-Lites), Peachtree City, GA (770)486-4800.
6. Current Lighting (Albeo, Columbia, Compass, Dual-Lite, Kurt Versen, Forum, Lite Control, Prescolite), Greenville, SC (866) 758-0116.
7. Day-Brite, Tupelo, MS (662) 842-7212.
8. Edison-Price Lighting, Long Island City, NY (718) 685-0700.
9. Elcast Lighting, Addison, IL (630) 543-5390.
10. Evenlight, Trevose, PA (800) 872-0879.
11. H.E. Williams, Carthage, MO (417) 358-4065.
12. Holophane, Newark, OH (740) 345-9631.
13. Indy Lighting, Fishers, IN (317) 849-1233.
14. Intense Lighting LLC, Anaheim, CA (800) 691-5321.
15. Isolite, Berwyn, PA (800) 888-5483.
16. Kenall Manufacturing, Gurnee, IL (847) 360-8200.
17. Killark Electric, Fenton, MO (314) 531-0460.
18. Kirlin Lighting, Detroit, MI (313) 259-6400.
19. Kramer Lighting, Sturtevant, WI (800) 236-6800.
20. Kurtzon Lighting, Chicago, IL (773) 277-2121.
21. LaMar Lighting, Farming Dale, NY (631) 777-7700.
22. LightAlarms (Thomas & Betts) Montreal, ON (888) 552-6467.
23. Lithonia Lighting (Gotham, Acuity, Sensor Switch), Conyers, GA (770) 922-9000.
24. LSI Industries, Cincinnati, OH (513) 793-3200.
25. Lumax Industries, Altoona, PA (814) 944-2537.
26. Mercury Lighting, Fairfield, NJ (800) 637-2584.
27. Omega Lighting, Tupelo, MS (800) 234-1890.
28. Orion Energy Systems, Inc., Manitowoc, WI (800) 660-9340.
29. Pheonix Products, Milwaukee, WI (414) 438-1200.
30. Prudential Lighting, Los Angeles, CA (213) 746-0360.
31. Solas Ray Lighting, Indianapolis, IN (800) 840-5635.
32. Vista Lighting, Tupelo, MS (662) 690-4105.
33. Zumtobel Staff, Highland, NY (800) 448-4131.

2.2 LUMINAIRE TYPES

A. Type A: Lithonia #XIB-48-24000LM-GL-MVOLT-50K-90CRI.
1. Description: Surface Mount, 2 feet W x 4 feet L x 6 inch D LED type troffer and clear center lens non-air handling.
2. Lens: High performance extruded acrylic diffuser with curved linear prisms.
3. Housing:
a. 22 gauge steel body, flush steel door with mitered corners.
b. Frame and housing finished with baked white enamel or powder coated finish.

4. Ballast/Driver: LED high efficiency – 153W and 24,000 Lumen. Wattage based on lumen package selected.
5. Mounting:
   a. Surface mounted to hard deck.
6. Lamps: 24000 Lumen LED array; 5000K rated 60,000 hours at LLD = 0.8.
7. Marking: Luminaires are to be labeled on the interior side with lumen package used.
8. Emergency: If fixture is Emergency, Lithonia #XIB-48-12000LM-GL-MVOLT-50K-90CRI-IE18WCPHECW.
9. Alternate Manufacturers:
   a. Columbia.
   b. Metalux.
   c. Substitutions permitted: As listed in Paragraph 2.1A.

2.3 LUMINAIRES

A. Provide luminaires as indicated in luminaire schedule and details on project plans. Provide luminaires complete with light sources of quantity, type and wattage indicated. Provide all luminaires of the same type by the same manufacturer. Luminaires must be specifically designed for use with the driver or ballast and light source provided.

B. LED Luminaires:
1. Install ballast/drivers, LED arrays and specified accessories at the factory.
1. Luminaires must have a minimum 5 year manufacturer's warranty.
2. Luminaires must have a minimum L70 lumen maintenance value of 50,000 hours as calculated by IES TM-21, with data obtained per IES LM-80 requirements.
3. Luminaire drive current value must be identical to that provided by test data for luminaire in question.
4. Luminaires must be listed with the DesignLights Consortium 'Qualified Products List' when falling into category of "General Application" luminaires, i.e. Interior Directional, Display Case, Troffer, Linear Ambient, or Low/High Bay. Requirements are shown in the DesignLights Consortium "Technical Requirements Table" at https://data.energystar.gov/dataset/EPA-Recognized-Laboratories-For- Lighting-Products/jgwf-7qrr.
5. Provide Department of Energy 'Lighting Facts' label for each luminaire.

C. Luminaires for hazardous locations:
1. In addition to requirements stated herein, provide LED luminaires for hazardous locations which conform to UL 844 or which have Factory Mutual certification for the class and division indicated.

2.4 LED DRIVERS

A. NEMA SSL 1, UL 8750. LED drivers must be electronic, UL Class 1, constant-current type and comply with the following requirements:
1. Output power (watts)and luminous flux (lumens) as shown in luminaire schedule for each luminaire type to meet minimum luminaire efficacy (LE) value provided.
2. Power Factor (PF) greater than or equal to 0.9 over the full dimming range when provided.
3. Current draw Total Harmonic Distortion (THD) of less than 20 percent.
4. Class A sound rating.
5. Operable at input voltage of 120-277 volts at 60 hertz.
6. Minimum 5 year manufacturer's warranty.
7. RoHS compliant.
8. Integral thermal protection that reduces or eliminates the output power if case temperature exceeds a value detrimental to the driver.
9. UL listed for dry or damp locations typical of interior installations.
10. LED driver shall tolerate sustained open circuit and short circuit output conditions without damage.

11. LED driver shall comply with the requirements of the FCC rules and regulations, Title 47 CFR Part 15 Non-Consumer (Class A).

2.5 LIGHT SOURCES

A. NEMA ANSLG C78.377, NEMA SSL 3. Provide type and wattage as indicated in luminaire schedule on project plans.

B. LED arrays shall have a correlated color temperature (CCT) of 4000K; minimum color rendering index (CRI) value of 80.

C. High power, white light output utilizing phosphor conversion (PC) process or mixed system of colored LEDs, typically red, green and blue (RGB).

D. Provide light source color consistency by utilizing a binning tolerance within a 4 step McAdam ellipse.

E. Luminaire shall have door frame and lens compatible for use with LED arrays and integral airflow ventilation system.

2.6 LED EMERGENCY DRIVERS

A. Provide LED emergency driver with automatic power failure detection, test switch and LED indicator (or combination switch/indicator) located on luminaire exterior and provide self-diagnostic function integral to emergency driver. Integral nickel cadmium or lithium iron phosphate battery is required to supply a minimum of 90 minutes of emergency power at 700 Lumens (at 100 Lumens/Watt). Driver must be RoHS compliant, rated for installation in plenum-rated spaces and damp locations, and be warranted for a minimum of five years.

2.7 LUMINAIRE SUPPORT HARDWARE

A. Wire:
1. ASTM A641/A641M; Galvanized, soft tempered steel, minimum 0.11 inches in diameter, or galvanized, braided steel, minimum 0.08 inches in diameter.

F. Threaded Rods:
1. Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.

G. Straps:
1. Galvanized steel, one inch by 3/16 inch, conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.8 EQUIPMENT IDENTIFICATION

A. Each item of equipment must have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

B. Provide labeled luminaires in accordance with UL 1598 requirements. All luminaires must be clearly marked for operation of specific light sources and ballasts or drivers. Note the following light source characteristics in the format "Use Only _____":
1. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

2. All markings related to light source type must be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when light sources are in place. Ballasts or drivers must have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.9 FACTORY APPLIED FINISH

A. Provide all luminaires and lighting equipment with factory-applied painting system that as a minimum, meets requirements of NEMA 250 corrosion-resistance test.

2.10 RECESS- AND FLUSH-MOUNTED LUMINAIRES

A. Provide access to lamp and ballast from bottom of luminaire. Provide trim for the exposed surface of flush-mounted luminaires as indicated on project drawings and specifications.

2.11 SUSPENDED LUMINAIRES

A. Provide hangers capable of supporting twice the combined weight of luminaires supported by hangers. Provide with swivel hangers to ensure a plumb installation. Provide cadmium-plated steel with a swivel-ball tapped for the conduit size indicated. Hangers must allow fixtures to swing within an angle of 45 degrees. Brace pendants 4 feet or longer to limit swinging. Single-unit suspended luminaires must have twin-stem hangers. Multiple-unit or continuous row luminaires must have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Provide rods in minimum 0.25 inch diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. As specified in Section 260500 – Common Work Results for Electrical.

3.2 INSTALLATION

A. Electrical installations must conform to IEEE C2, NFPA 70, and to the requirements specified herein. Install luminaires to meet the requirements of ASHRAE 90.1 and ASHRAE 189.1. To encourage consistency and uniformity, install luminaires of the same manufacture and model number when residing in the same facility or building.

B. Luminaires:
1. Set luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent luminaires and secure in accordance with manufacturers' directions and approved drawings. Installation must meet requirements of NFPA 70. Obtain approval of the exact mounting height on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed.
2. Recessed and semi-recessed luminaires must be independently supported from the building structure by a minimum of four wires, straps or rods per luminaire and located near each corner of the luminaire. Ceiling grid clips are not allowed as an alternative to independently supported luminaires.
3. Round luminaires or luminaires smaller in size than the ceiling grid must be independently supported from the building structure by a minimum of two wires, straps or rods per luminaire,

spaced approximately equidistant around. Do not support luminaires by acoustical tile ceiling panels.

a. Where luminaires of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support each independently and provide at least two 3/4 inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the luminaire. Provide wires, straps, or rods for luminaire support in this section.

C. Suspended Luminaires:

1. Provide suspended luminaires with swivel hangers so that they hang plumb and level. The stem, canopy and luminaire must be capable of 45 degree swing. Pendants, rods, or chains, 4 feet or longer excluding luminaire, must be braced to prevent swaying using three cables at 120 degree separation.
2. Suspended luminaires in continuous rows must have internal wireway systems for end to end wiring and must be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces.
3. Match supporting pendants with supported luminaire. Aircraft cable must be stainless steel. Canopies must be finished to match the ceiling and must be low profile unless otherwise shown.
4. Maximum distance between suspension points must be 10 feet or as recommended by the manufacturer, whichever is less.

D. Locate ceiling luminaires as indicated on reflected ceiling plan.

E. Install surface mounted luminaires and exit luminaire signs plumb and adjust to align with building lines and with each other. Secure to prevent movement. Mount exit signs to outlet box mounted flush in wall or ceilings. Outlet box for ceiling mounted exit signs: Connect to rigid conduit system.

F. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. In fire rated ceilings, recessed luminaires must carry 1 hour UL fire rating classification.

G. Install earthquake clips to secure recessed grid-supported luminaires in place.

H. Install wall mounted luminaires, emergency lighting units and exit luminaire signs at height as scheduled.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Install specified light sources in each emergency lighting unit, exit luminaire sign, and luminaire.

L. Wire exit signs and emergency lighting units ahead of the local switch, to the normal lighting circuit located in the same room or area.

M. Luminaire whips shall be steel or aluminum. M/C cable shall be permissible for luminaire whips/connections. Luminaire whips/connections shall be made with a minimum of #12 AWG copper conductors. Equipment grounding conductors shall be provided in all luminaire whips and/or connections.

1. All luminaire whips shall be supported to luminaire support wire/cable with an approved fastener equal to an Erico “KX” flexible conduit hanger or other UL listed supports and fasteners.

N. Luminaires are not to be used as a raceway unless stamped for use as raceway by manufacturer. Single luminaire in lay-in ceilings shall not be used for raceway and shall be connected to an outlet box located within six feet (6’) of fixture with flexible conduit or luminaire whips.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field testing and inspection.

B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

C. Final acceptance will be based on measurement of initial lighting levels after required hours of burn in as specified in USPS Mail Processing Facility Design Criteria, not maintained lighting levels.

3.4 WARRANTY

A. Provide a written 5 year on-site replacement warranty for material, luminaire finish, and workmanship. On-site replacement includes transportation, removal, and installation of new products.
   1. Include finish warranty to include failure and substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
   2. Material warranty must include:
      a. All drivers.
      b. Replacement when more than 10 percent of LED sources in any lightbar or subassembly are defective or non-starting.

B. Warranty period must begin on date of beneficial occupancy. Provide the USPS Project Manager with signed warranty certificates prior to final payment.

3.5 ADJUSTING

A. Aim and adjust luminaires as directed by the USPS Project Manager.

B. Position exit luminaire sign directional arrows as indicated.

3.6 CLEANING

A. Section 017300 - Execution: Cleaning installed work.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

END OF SECTION

USPS Specification Last Revised: 10/1/2023