

**Addendum No. 1  
February 12, 2020**

Project: Redfield Public School Addition  
Redfield, South Dakota  
Project No.: 2610

Architect: Architecture Incorporated

Letting: **Thursday, February 20, 2020**  
**2:00 PM**  
Redfield School District Library  
502 East 2<sup>nd</sup> Street  
Redfield, South Dakota, 57469

Scope of this Addendum:

To all bidders and all others to whom drawings and specifications have been issued by Architecture Incorporated.

Acknowledge receipt of this addendum by listing its number and date in the bidders Form of Proposal. Failure to do so may subject bidder to disqualification. This Addendum forms a part of the Contract Documents. It modifies them as follows:

**GENERAL ITEMS:**

1) TABLE OF CONTENTS:

- a) The Table of Contents has been modified to include the correct sections and page numbers. By receipt of this Addendum, all bidders acknowledge the receipt of the modified Table of Contents and the incorporated sections.

2) ARCHITECT'S ESTIMATE:

- a) The Architect's Estimate for the project is \$100,000.

3) 042000 – UNIT MASONRY ASSEMBLIES:

- a) Masonry as noted within this portion of the project is to be standard concrete masonry units (CMU) that will be receive a painted finish.
- b) New CMU walls to be finished to above the adjacent ceiling height

4) 099600 HIGH PERFORMANCE COATINGS

- a) All new walls to receive High Performance Coating per specification

5) Incorporate the following Electrical Sections into the Specification:

a) Electrical Sections:

SECTION 260500 – GENERAL ELECTRICAL PROVISIONS	1 - 2
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SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS	1 - 2
SECTION 265119 – LED INTERIOR LIGHTING	1 - 2

**GENERAL APPROVALS:**

The following material or equipment furnished by the manufacturer's listed, may be substituted as equivalent providing that each item, material, and piece of equipment conforms to the design and requirement of the specifications.

<u>SECTION</u>	<u>ITEM</u>	<u>MANUFACTURER</u>
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***NO ADDITIONAL APPROVALS PROVIDED AT THIS ADDENDUM***

END OF ADDENDUM No. 1

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**REDFIELD, SOUTH DAKOTA**

0428.2610.15

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## SECTION 26 0500 – GENERAL ELECTRICAL PROVISIONS

### 1.1 SCOPE

- A. The Contractor shall provide all labor and materials required to complete the electrical installation of the project as shown on the plans and described in the specifications.
- B. Drawings: All drawings accompanying these specifications shall be considered a part of these specifications.
- C. General terms and conditions of Architectural specifications shall be considered part of these specifications.
- D. Inspection of site: Before submitting a proposal on the work contained in these specifications, each bidder shall examine the site and familiarize themselves with all of the existing conditions and limitations. No extras will be allowed because of misunderstanding of the electrical contractor as to the amount of work involved or lack of knowledge of any pre-existing conditions.
- E. Workmanship: All work on the project shall be installed by craftsmen skilled and licensed in the trade. Work shall be completed in a neat and workman like manner, all to the satisfaction of the Project Engineer and Owner, modifications made to satisfy this requirement shall be made at the expense of the contractor.
- F. Permits and Inspection Fees: The contractor shall obtain and pay for all required permits and inspection fees.

### 1.2 ELECTRICAL DRAWINGS

- A. Electrical plans diagrammatically indicate the scope of work to be provided by the Electrical Contractor. The Contractor shall refer to architectural, civil, structural, mechanical and equipment drawings for exact dimensions and locations. Notify the A/E in the event of conflicting dimensions and actual field measurements.
- B. Equipment shown on drawings as existing are based on existing plans and limited field investigation. The field survey was conducted to verify, as much as possible, the accuracy of the locations shown. The Contractor shall verify the accuracy of the “Existing Conditions” as shown on the drawings. As the demolition work progresses perform modifications and additions as necessary to correct for these hidden conditions and allow for the completion of the new work.

### 1.3 PRIOR APPROVAL REQUESTS

- A. Submittals for substitutions for specified materials or products must arrive at the office of the Engineer no later than ten business days prior to the bid date. Email submittals are acceptable.
- B. Any approvals will be noted in an Addendum.

### 1.4 SHOP DRAWINGS

- A. Submit shop drawings electronically for the products and materials that are identified for review in each section of these specifications.
- B. Submittals must be created by Adobe Acrobat, Bluebeam PDF, or other similar PDF review software for applying electronic stamps and comments. Submit one combined PDF for each section that is being submitted on.
- C. There must be a cover sheet clearly stating the project name, location, the contractor’s name and contact information, the suppliers name and contact information, date, and which section(s) the submittals are for.
- D. The shop drawings must be clearly marked to indicate exactly which products are being submitted for review.
- E. Each set must be signed and dated indicating the Contractor has checked for compliance with specification requirements and space limitations.

- F. Only complete submittals will be reviewed.

1.5 OPERATION AND MAINTENANCE MANUALS AND AS-BUILT DRAWINGS

- A. The contractor shall furnish three (3) complete hardcopy sets of O&M manuals to the Engineer, containing all pertinent data to the electrical systems. Information shall be neatly organized and labeled. Include warranty information.
- B. The contractor shall maintain a set of as-built drawings at the project. Note the final location of circuit and conduit routes and any changes due to Change Orders.
- C. This set of drawings shall be submitted with the O&M manuals.
- D. Include in each O&M manual a CD containing an electronic version of the complete O&M and as-built drawings, in PDF format.

1.6 BUILDING STRUCTURE PENETRATIONS

- A. Provide penetration to the building structure as required for installation. Where existing or temporary systems are being demolished and the demolition leaves openings in the existing building structure, then the building structure shall be patched to match the existing construction and maintain the existing building fire ratings.

1.7 GUARANTEE

- A. The contractor shall provide a one-year warranty, beginning at the date of Substantial Completion, for all new work. Any work that is defective within that one-year period shall be replaced by the Contractor without charge. This does not include incandescent lamps.
- B. If longer warranties are noted elsewhere in the specifications, those warranties shall apply.

END OF SECTION 26 0500

SECTION 26 0510 - BASIC ELECTRICAL MATERIALS AND METHODS

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Supporting devices for electrical components.
  - 2. Electrical identification.
  - 3. Utility company electricity-metering components.
  - 4. Concrete equipment bases.
  - 5. Electrical demolition.
  - 6. Cutting and patching for electrical construction.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Devices for Utility Company Electricity Metering: Comply with utility company published standards.
- C. Comply with NFPA 70.

1.3 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
  - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for service entrances and electricity-metering components.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

1.4 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs. Strength rating to suit structural loading.
- D. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.
- E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Powder-Driven Threaded Studs: Heat-treated steel.



1.5 ELECTRICAL IDENTIFICATION

- A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications:
- |            | 120/208 v | 120/240v delta | 277/480v |
|------------|-----------|----------------|----------|
| 1. Phase A | Black     | Black          | Brown    |
| 2. Phase B | Red       | Orange         | Orange   |
| 3. Phase C | Blue      | Blue           | Yellow   |
| 4. Neutral | White     | White          | Grey     |
| 5. Ground  | Green     | Green          | Green    |
- B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:
1. Not less than 6 inches wide by 4 mils thick.
  2. Printed legend that indicates type of underground line.
- E. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- F. Fasteners for Nameplates and Signs: Self-tapping, galvanized screws or No. 10/32 galvanized machine screws with nuts and flat and lock washers.

1.6 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING AND TRANSFORMER PAD

- A. Comply with requirements of electrical power utility company for current transformer cabinets, meter sockets and transformer pad. The utility company has specific requirements for the metering of electric loads and requirements for the transformer pad, it is important to DISCUSS THESE REQUIREMENTS WITH A UTILITY REPRESENTATIVE PRIOR TO BIDDING.

1.7 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in the details as shown on the plans.
- B. Concrete: 3000-psi, 28-day compressive strength.

1.8 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

1.9 RACEWAY AND CABLE INSTALLATION

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Keep legs of raceway bends in the same plane and keep straight legs of offsets parallel.
- C. Use RMC elbows where RNC turns out of slab.

- D. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inches flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.
  - E. Set floor boxes level and trim after installation to fit flush to finished floor surface.
- 1.10 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS
- A. Application: Use wiring methods specified below to the extent permitted by applicable codes as interpreted by authorities having jurisdiction.
  - B. Exposed Feeders: Insulated single conductors in EMT or RMC raceway.
  - C. Concealed Feeders in Ceilings, and walls: Insulated single conductors in EMT raceway.
  - D. Concealed Feeders in Concrete and below Floors on Grade: Insulated single conductors in RNM or RMC raceway.
  - E. Exposed Branch Circuits including in Crawlspace: Insulated single conductors in EMT raceway.
  - F. Concealed Branch Circuits in Ceilings and walls: Insulated single conductors in EMT raceway.
  - G. Concealed Branch Circuits in Concrete and below Floors on Grade: Insulated single conductors in RNC or RMC raceway.
  - H. Underground Feeders and Branch Circuits: Insulated single conductors in raceway.
  - I. Fire Alarm, Remote-Control Signaling and Power-Limited Circuits, Classes 1, 2, and 3: Insulated conductors in metal raceway unless otherwise indicated.
- 1.11 WIRING INSTALLATION
- A. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - B. Splices and taps are not allowed in wireways or junction boxes immediately after the panel. The conductor shall be unbroken from the breaker termination to the homerun box or required pull box for runs that are longer and have more conduit bends.
- 1.12 ELECTRICAL SUPPORTING DEVICE APPLICATION
- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.
  - B. Dry Locations: Steel materials.
  - C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.
- 1.13 SUPPORT INSTALLATION
- A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
  - B. Size supports for multiple raceways or cable runs so capacity can be increased by a 25 percent minimum in the future.
  - C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps.
  - D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
  - E. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:
    - 1. Wood: Wood screws or screw-type nails.
    - 2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.

3. Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.
4. New Concrete: Concrete inserts with machine screws and bolts.
5. Existing Concrete: Expansion bolts or threaded studs driven by powder charge and provided with lock washers.
6. Structural Steel: Spring-tension clamps or Threaded studs driven by powder charge and provided with lock washers.
7. Light Steel Framing: Sheet metal screws.
8. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
9. Light Steel: Sheet-metal screws.
10. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

#### 1.14 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- G. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

#### 1.15 ELECTRICITY-METERING EQUIPMENT

- A. Install utility company metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

#### 1.16 FIRESTOPPING

- A. Apply firestopping to cable and raceway sleeves and other penetrations of fire-rated floor and wall assemblies to restore original undisturbed fire-resistance ratings of assemblies. Firestopping installation is specified in Division 7 Section "Through-Penetration Firestop Systems."

#### 1.17 CONCRETE BASES

- A. Coordinate below with Division 3 Sections and with Drawings.
- B. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage

recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

#### 1.18 ELECTRICAL EQUIPMENT MOUNTING HEIGHTS

A. Typical mounting heights:

- |                                   |   |
|-----------------------------------|---|
| 1. Switches                       | 46" AFF to center   |
| 2. Card Readers                   | 46" AFF to center   |
| 3. Duplex receptacle standard use | 18" AFF to center   |
| 4. Data/Phone                     | 18" AFF to center   |
| 5. Wall Mounted Phone             | 54" AFF to center   |
| 6. Receptacles in shop areas      | 48" AFF to bottom   |
| 7. Switches in shop areas         | 48" AFF to bottom   |
| 8. Devices above counters         | 2" between bottom of box and back splash or<br>6" above the counter without back splash |
| 9. Fire Alarm Pull Stations       | 48" AFF to top  |
| 10. Fire Alarm Horn/Strobe        | 80" AFF to bottom   |
| 11. Outdoor Fire Alarm Horn       | 96" Above grade   |
| 12. Emergency Light Fixtures      | 90" AFF to center   |
| 13. Outdoor Emergency Lights      | 90" Above grade to center   |
| 14. Bathroom Vanity Wall Fixtures | 6" Above the mirror   |

B. Mounting heights listed in part A are typical and many times will need to be altered based on specific uses, millwork or heights given on the plans.

#### 1.19 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

#### 1.20 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

END OF SECTION 26 0510

## SECTION 26 0519 - CONDUCTORS AND CABLES

### 1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

### 1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### 1.3 CONDUCTORS AND CABLES

- A. Conductors, cables, and insulation shall conform to NEMA, UL and NEC standards and rules. All conductors and cables shall be new and delivered to the job site in coils or reels, clearly marked with manufacture's name, insulation type, AWG size, and UL listings.
- B. Conductor Material: Copper; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- C. Conductor Insulation Types: Type THHN, THHN-THWN and XHHW.
- D. Multiconductor Cable: Armored cable, Type AC or Metal-clad cable, Type MC SHALL NOT BE A PERMITTED WIRING METHOD other than used for flex drops to recessed light fixtures and not exceeding 6 feet in length.

### 1.4 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Use twist on spring compression type such as Ideal Twister series or 3M Scotch-Loc. Push on connectors such as Wago Wall Nuts may only be used inside of light fixtures for ballast connections.

### 1.5 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Underground Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway
- I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- J. Fire Alarm Circuits: Type THHN-THWN or Plenum Rated Fire Alarm Cable, in raceway.
- K. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- L. Class 2 Control Circuits: Type THHN-THWN, in raceway or for thermostats Power-limited cable, concealed in building finishes may be used.

### 1.6 INSTALLATION

- A. Conceal wiring in finished walls, ceilings, and floors, unless otherwise indicated.

- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

END OF SECTION 26 0519

## SECTION 26 0526 - GROUNDING AND BONDING

### 1.1 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

### 1.2 SUBMITTALS

- A. Product Data: For ground rods and ground clamps.

### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### 1.4 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Chance/Hubbell.
  2. Copperweld Corp.
  3. Erico Inc.; Electrical Products Group.
  4. Framatome Connectors/Burndy Electrical.
  5. Ideal Industries, Inc.
  6. ILSCO.
  7. Kearney/Cooper Power Systems.
  8. O-Z/Gedney Co.; a business of the EGS Electrical Group.
  9. Raco, Inc.; Division of Hubbell.
  10. Thomas & Betts, Electrical.

### 1.5 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable, unless #6 or smaller.
- E. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- F. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Bolted type or exothermic-welded type, in kit form, selected per manufacturer's written instructions.

### 1.6 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
  1. Size: 3/4 inches in diameter by 120 inches in length.

### 1.7 INSTALLATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

- D. Equipment Grounding Conductors: Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
  - 1. Install insulated equipment grounding conductors in feeders.
  - 2. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
  - 3. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
  - 4. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install an insulated equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
  - 5. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
  - 6. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing an insulated equipment grounding conductor with supply branch-circuit conductors.
- E. Ground Rods: Install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
  - 1. Drive ground rods until tops are 24 inches below final grade, unless otherwise indicated.
  - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, or bolted connections. Make connections without exposing steel or damaging copper coating.
- F. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- G. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- H. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- I. Water Meter Piping: Install bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- J. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners..
- K. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- L. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.



1. Make connections with clean, bare metal at points of contact.
2. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
3. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
4. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
5. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

1.8 FIELD QUALITY CONTROL

- A. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes.
- B. Testing: Perform the following field quality-control testing:
  1. After installing grounding system but before permanent electrical circuitry has been energized, test for NEC compliance. If the test fails add one additional ground rod, retest and document results.

END OF SECTION 26 0526

## SECTION 26 0533 - RACEWAYS AND BOXES

### 1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 26 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
- C. See Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

### 1.2 SUBMITTALS

- A. Product Data: For surface raceways, such as Wiremold or Panduit products.

### 1.3 METAL CONDUIT AND TUBING

- A. RMC: Rigid metal conduit shall be galvanized steel with steel fittings (ANSI C80.1).
- B. EMT and Fittings: Electrical metallic tubing shall be galvanized steel (ANSI C80.3.)
  - 1. Fittings Dry Location: Steel set-screw type such as Raco series 2000.
  - 2. Fittings Wet Location: Steel compression type such as Raco series 2902.
- C. FMC: Flexible metal conduit shall be zinc-coated steel, ½" minimum size.
  - 1. Fittings Dry Location: Steel squeeze type such as Raco series 2100.
- D. LFMC: Liquid tight flexible metal conduit with PVC jacket.
  - 1. Fittings: Steel compression type such as Raco series 3500.

### 1.4 NONMETALLIC CONDUIT AND TUBING

- A. RNC: Rigid Non-Metallic conduit Schedule 40 unless otherwise specified on the plans.
  - 1. Fittings and conduit bodies: Compatible and of equal wall strength as the conduit.

### 1.5 METAL UNDERFLOOR BOXES

- A. Available Manufacturers:
  - 1. Steel City – 664-SC
  - 2. Approved Equal

### 1.6 SURFACE RACEWAYS

- A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
  - 1. Available Manufacturers:
    - a. Hubbell, Inc.; Wiring Device Division.
    - b. Lamson & Sessions; Carlon Electrical Products.
    - c. Panduit Corp.
    - d. Walker Systems, Inc.; Wiremold Company (The).
    - e. Wiremold Company (The); Electrical Sales Division.
- B. Use Panduit (or equal) type TE-70, with divider wall Te70DW, snap on electrical faceplate T70PG, hanging box TE70DW, device mounting bracket T70DB-X, and sloped snap on data faceplates. Provide all other misc items necessary for a complete system.

### 1.7 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: Use welded steel metal boxes – min. size 4"x4"x1 ½ ", size as required to meet NEC. Provide appropriate device rings and covers.
- B. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- C. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in

front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

## 1.8 RACEWAY APPLICATION

- A. Outdoors:
  - 1. Exposed: Rigid steel or IMC.
  - 2. Concealed: Rigid steel or IMC.
  - 3. Underground, Single Run: RNC.
  - 4. Underground, Grouped: RNC.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
  - 1. Exposed: EMT.
  - 2. Concealed: EMT.
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  - 4. Damp or Wet Locations: Rigid steel conduit.
  - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 3R.
- C. Minimum Raceway Size: ½" trade size above ground, ¾" below ground or under floor or in poured concrete and minimum size homerun shall not be less than ¾". Minimum Raceway Size for DATA/Communications systems shall be ¾".

## 1.9 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
  - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 4. Change from nonmetallic conduit to rigid steel conduit before rising above floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.

2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
  - J. Join raceways with fittings designed and approved for that purpose and make joints tight.
    1. Use insulating bushings to protect conductors, in any raceway 1 1/2" or larger.
  - K. Terminations:
    1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
    2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
  - L. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
  - M. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
  - N. Set floor boxes level and flush with finished floor surface.
  - O. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
  - P. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- 1.10 PROTECTION
- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
    1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
    2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 0533

## SECTION 26 2726 - WIRING DEVICES

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Single and duplex receptacles, ground-fault circuit interrupters, and integral surge suppression units.
  - 2. Snap switches and dimmer switches.
  - 3. Device wall plates.
  - 4. Floor service outlets.

### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### 1.4 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Wiring Devices:
    - a. Bryant Electric, Inc./Hubbell Subsidiary.
    - b. Eagle Electric Manufacturing Co., Inc.
    - c. Hubbell Incorporated; Wiring Device-Kellems.
    - d. Leviton Mfg. Company Inc.
    - e. Pass & Seymour/Legrand; Wiring Devices Div.
  - 2. Floor Service Outlets:
    - a. Wiremold Company (Walker).
    - b. Or equal – Floor service outlets must be compatible with floor duct

### 1.5 RECEPTACLES

- A. Straight-Blade-Type Receptacles:
  - 1. Tamper Resistant: P&S TR20-GRY or equal.
  - 2. Hospital Grade Heavy-Duty Duplex, Tamper Resistant P&S TR63-HGRY or equal.
- B. GFCI Self Testing Receptacles:
  - 1. Tamper Resistant P&S 2097TR-GRY or equal.
  - 2. Weather Resistant, Tamper Resistant P&S 2097TRWR-GRY or equal.
  - 3. Hospital Grade, Tamper-Resistant P&S 2097HGTR-GRY or equal.
  - 4. Hospital Grade, Tamper-Resistant, Nightlight P&S 2097HGNTLTR-GRY or equal.

### 1.6 EXTERIOR IN-USE COVER

- 1. Intermatic WP1010MXD, or equal.

### 1.7 SWITCHES

- A. Single Pole Switches: P & S CS20AC1-GRY, 20 A, 120/277-V ac or equal.
- B. Three Way Switches: P & S CS20AC3-GRY, 20 A, 120/277-V ac or equal.
- C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.

1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
2. Fluorescent Lamp and LED Dimmer Switches: Modular; compatible with fixture manufacturer. Capable of consistent dimming with low end not greater than 5 percent of full brightness.

#### 1.8 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
  1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Finished Locations: Type 302 stainless steel, P&S S(X)-N or equal
  3. All emergency power devices shall have the faceplate engraved with the panel name and circuit number.
  4. Wet Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in "wet locations."
  5. Unfinished Surface Mounted Locations: Raised covers such as Raco 800 series.

#### 1.9 FLOOR SERVICE FITTINGS

- A. Steel City 664-SC floor box with 664-CST cover (color selected by owner).
- B. At each power location provide and install one 20A 125v duplex receptacle. Configuration 5-20R, gray finish.
- C. At each voice and data communication outlet provide and install one Panduit GFG4IW "GFCI" module frame with two RJ45 Cat 6 jacks.

#### 1.10 FINISHES

- A. Color:
  1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70.
  2. Wiring Devices Connected to Emergency Power System: Red, unless otherwise indicated or required by NFPA 70.

#### 1.11 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging.
- C. Install unshared neutral conductors on line and load side of dimmers.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

#### 1.12 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."

#### 1.13 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
  2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 2726

## SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### 1.1 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers, rated 600 V and less, used for disconnecting and protection functions.

### 1.2 SUBMITTALS

- A. Product Data: For each type of switch and circuit breaker indicated.
- B. Shop Drawings: Include wiring diagrams for shunt-tripped circuit breakers.

### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Source Limitations: Obtain switches and circuit breakers through one source from a single manufacturer.
- C. Comply with NFPA 70.

### 1.4 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. General Electric Co.; Electrical Distribution & Control Division.
  - 2. Siemens Energy & Automation, Inc.
  - 3. Square D Co.

### 1.5 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle, interlocked with cover.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, and lockable handle, interlocked with cover.

### 1.6 ENCLOSED CIRCUIT BREAKERS

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  - 4. GFCI Circuit Breakers: Single- and two-pole configurations with 5 -mA trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
  - 1. Lugs: Suitable for number, size, trip ratings, and material of conductors.
  - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.



4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

#### 1.7 ENCLOSURES

- A. Listed for environmental conditions of installed locations, including:
  1. Outdoor Locations: NEMA 250, Type 3R.
  2. Food Service Areas: NEMA 250, Type 4X, stainless steel.
  3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

#### 1.8 INSTALLATION

- A. Identify components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

#### 1.9 FIELD QUALITY CONTROL

- A. Testing: After installing disconnect switches and circuit breakers and after electrical circuits have been energized, demonstrate product capability and compliance with requirements.
- B. Inspections and Tests for Switches and Circuit Breakers: Make internal and external inspections and perform tests, including the following:
  1. Inspect for freedom from physical damage, proper unit rating, mechanical condition, enclosure integrity, cover operation, unit anchorage, clearances, and tightness of electrical connections. If a loose electrical connection is observed on any unit, check each electrical connection for each switch and circuit breaker with a torque wrench for compliance with manufacturer's torquing instructions.
  2. Test cover and other interlocks and interlock release devices for proper operation.
- C. Additional Inspections and Tests for Switches: Include the following:
  1. Inspect for proper rating and fuse provisions.
  2. Check adequacy and integrity of fuseholders by removing and installing fuses.
  3. Check integrity of phase barriers.
  4. Inspect blade alignment visually while operating switch to observe adequacy of blade pressure.
- D. Additional Inspections and Tests for Circuit Breakers: Include the following:
  1. Inspect for proper frame, trip, and fault current interrupting rating.
  2. Test shunt trip devices, circuits, and actuating components for proper operation.
- E. Correct defective and malfunctioning units on-site, where possible, and re-inspect and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 26 2816

## SECTION 26 5119 - LED INTERIOR LIGHTING

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Interior solid-state luminaires that use LED technology.
  - 2. Lighting fixture supports.

### 1.2 DEFINITIONS

- A. Retain terms that remain after this Section has been edited for a project.
- B. CCT: Correlated color temperature.
- C. CRI: Color Rendering Index.
- D. Fixture: See "Luminaire."
- E. IP: International Protection or Ingress Protection Rating.
- F. LED: Light-emitting diode.
- G. Lumen: Measured output of lamp and luminaire, or both.
- H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

### 1.3 SUBMITTALS

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, and finishes.

### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

### 1.5 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: One (1) year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. CRI of minimum 80. CCT of 4000 K.
- F. Minimum rated lamp life of 50,000 hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage: Universal 120-277v.
- J. Housings: Extruded-aluminum housing and heat sink.

### 2.2 MATERIALS

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.

2. Sheet metal components shall be steel unless otherwise indicated.
  3. Form and support to prevent warping and sagging
  - B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit ordinary maintenance without removing the fixture from the ceiling grid. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.
- 2.3 METAL FINISHES
- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.
- 2.4 LUMINAIRE SUPPORT COMPONENTS
- A. Comply with requirements in Section 260510 "Basic Electrical Materials and Methods" for channel and angle iron supports and nonmetallic channel and angle supports.
  - B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
  - C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
  - D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
  - E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
  1. Install a minimum of two ceiling support system wires for each fixture. Locate not more than 6 inches from diagonally opposite fixture corners.
  2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
  3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
- C. Adjust aimable fixtures to provide required light intensities.

#### 3.2 FIELD QUALITY CONTROL

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

END OF SECTION 26 5119