

SECTION 26 50 00 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luminaires.
2. Luminaire fittings.
3. Electric-discharge lamp control equipment.
4. Lamps.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" specifies wiring connections installed by this Section.
3. Section 26 05 29 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.
4. Section 26 05 53 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
5. Section 26 09 23 "Lighting Control Devices" specifies automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors installed by this Section.

1.2 DEFINITIONS

- A. BUG Rating: Backlight, uplight, and glare rating for light pollution from exterior luminaires.
- B. Correlated Color Temperature (CCT): The absolute temperature (in kelvins) of a blackbody whose chromaticity (color quality) most nearly resembles that of the light source.
- C. Color Rendering Index (CRI): The measure of the degree of color shift objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference light source. The lower the CRI of a light source, the more difficult it is to identify colors and stripes on electronic components and wiring.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For luminaires.

- a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
 - 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
 - b. Product Certificates: Include product certificates stating compliance with standards listed below, signed by manufacturer or fabricator.
 - 1) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with current accreditation under National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
 - 2) Testing Agency Certified Data: For luminaires indicated on Lighting Fixture Schedule on Drawings, photometric data certified by qualified independent testing laboratory. Photometric data for remaining luminaires must be certified by manufacturer.
 - c. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - d. Include operating characteristics, electrical characteristics, and furnished accessories.
 - e. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
 - f. Include battery and charger data for emergency lighting units.
 - g. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - h. Include photometric data and adjustment factors obtained from qualified laboratory tests.
 - i. Include manufacturer's sample warranty language.
2. For luminaire fittings.
- a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.

- 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
 - b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - c. Include operating characteristics, electrical characteristics, and furnished accessories.
 - d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
 - e. Include manufacturer's sample warranty language.
 3. For electric-discharge lamp control equipment.
 - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
 - 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
 - b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - c. Include operating characteristics, electrical characteristics, and furnished accessories.
 - d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
 - e. Include manufacturer's sample warranty language.
 - B. Shop drawings.
 - C. Field quality-control reports.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Manufacturers' published instructions.
 - B. Field Reports:
 1. Manufacturer's field reports for field quality-control support.
 2. Manufacturer's field reports for system startup support.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare parts.
- B. Extra stock material.

1.7 MOCKUPS

- A. Provide mockups as indicated on Drawings to verify selections made under Sample submittals and to set quality standards for materials and execution.
 - 1. Build mockup of luminaires in room or space, complete with power and control connections.
 - 2. Obtain Architect's approval of mockups before starting installation of related Work on Project.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 4. Maintain mockups during construction in undisturbed condition as standard for judging completed Work.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect exposed surface finishes on lighting equipment by applying strippable, temporary protective covering before shipping.

1.9 WARRANTY FOR LUMINAIRES

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed luminaires perform in accordance with specified requirements and agrees to repair or replace products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.
 - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that luminaires perform in accordance with specified requirements and agrees to provide repair or replacement of products that fail to perform as specified within extended-warranty period.
 - 1. Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.

1.10 WARRANTY FOR BATTERIES

- A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended-warranty period.
 - 1. Initial Extended-Warranty Period for Li-ion Batteries: Three years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.
 - 2. Follow-On Extended-Warranty Period for Li-ion Batteries: 10 years from date of Substantial Completion; prorated coverage for materials only, free on board origin, freight prepaid.
 - 3. Initial Extended-Warranty Period for Ni-Cd Batteries: Five years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.
 - 4. Follow-On Extended-Warranty Period for Ni-Cd Batteries: 15 years from date of Substantial Completion; prorated coverage for materials only, free on board origin, freight prepaid.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - b. See individual product types below for listing criteria.
 - c. Marked in accordance with UL CCN HYXT, including UL 1598, for compatible power supply, installation location, and environmental conditions.
- B. Source Quality Control:
 - 1. Compile and submit product data.
 - 2. Compile and submit sustainable design product data.
 - 3. Compile and submit samples.
- C. Surface-Mounted Luminaire
 - 1. Source Limitations: Obtain products for this luminaire type from single manufacturer.
 - 2. Product Listing Criteria, Incandescent: UL CCN IEZR; including UL 1598.
 - 3. Product Listing Criteria, Fluorescent: UL CCN IEUZ; including UL 1598.
 - 4. Product Listing Criteria, LED: UL CCN IFAM; including UL 1598.
 - 5. Product Listing Criteria, CMH HID: UL CCN IEXT; including UL 1598.
 - 6. Product Listing Criteria, Outdoor Canopy Luminaires: UL CCN IFAW; including UL 1598.
 - 7. Product Characteristics:

- a. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
- b. Nominal Operating Voltage: 120 V(ac).
- c. Nominal Luminaire Operating Power Rating: 20 to 60 W.
- d. CRI: 80+.
- e. Ballast or Driver Location: Internal.
- f. Materials:
 - 1) Enclosure: ASTM B209/B209M extruded-aluminum housing and heat sink; free of sharp edges and burrs.
 - 2) Enclosure Ingress Protection Rating: UL 50E Type 1 or IEC 60529 IP20.
 - 3) Lenses, Diffusers, and Globes:
 - a) Fixed lens.
 - b) Medium light distribution.
 - c) Clear, heat- and UV-stabilized virgin acrylic plastic.
 - d) Lens Thickness: Not less than 0.125 inch unless otherwise indicated.
 - e) Distribution: Type II.
 - 4) Visible variations in metal finishes are unacceptable in adjoining components.
- g. LED Luminaires (UL CCN IFAM):
 - 1) Output Intensity: Not less than 250 lm.
 - 2) Efficacy: Not less than 75 lm/W.
 - 3) Rated Life: 35 000 hours to L70.
 - 4) CCT: 4000 K.
- h. Roadway Pole: Arm-mounted.
- i. Finishes:
 - 1) Enclosure: powder-coat finish.
 - 2) Reflector: Aluminum.
 - 3) Reflecting surfaces must have minimum reflectance as follows, unless otherwise indicated:
 - a) White Surfaces: 85 percent.
 - b) Specular Surfaces: 83 percent.
 - c) Diffusing Specular Surfaces: 75 percent.
- j. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1) Finish designations prefixed by AA comply with system established by Aluminum Association for designating aluminum finishes.
 - 2) Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.

- 3) Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin.
 - a) Chemical Finish: Etched, medium matte.
 - b) Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker), complying with AAMA 611.
- 4) Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin.
 - a) Chemical Finish: Etched, medium matte.
 - b) Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
- 5) Color: Dark bronze.
- k. Visible variations in metal finishes outside range of approved Samples are unacceptable in adjoining components.
- l. Dimmable from 100 percent to zero percent of maximum light output.
- m. EMI Filters: Factory installed to suppress conducted EMI in accordance with MIL-STD-461E. Fabricate luminaires with one filter on each ballast requiring filter.
- n. Lamp Rating: Lamp marked for outdoor use.
- 8. Installation Markings:
 - a. Relamping Labels: Include recommended lamp type, diameter, shape, size, wattage, and coating on factory-applied label that is visible when luminaire is open for relamping.
 - b. All Luminaires (UL CCN HYXT):
 - 1) "DRY LOCATIONS ONLY."
 - 2) "SUITABLE FOR DAMP LOCATIONS."
 - 3) "SUITABLE FOR WET LOCATIONS."
 - 4) "SUITABLE FOR MOUNTING WITHIN 1.2 M (4 FT) OF THE GROUND" or "SUITABLE FOR FLOOR PROXIMITY INSTALLATION."
 - 5) "SUITABLE FOR GROUND-MOUNTED RECESSED."
 - 6) "LIMIT RANGE OF ADJUSTMENT TO
 - 7) "COVERED CEILING MOUNT ONLY."
 - 8) "WALL MOUNT ONLY"
 - 9) "FOR CEILING MOUNTING ONLY."
 - 10) Marked with mounting orientation, such as "THIS END UP."
 - 11) "SUITABLE FOR AIR-HANDLING USE."
 - 12) "VENTILATING OR COOLING AIR ONLY."
 - 13) "ONLY FOR USE IN CEILING PLENUM OF NONCOMBUSTIBLE CONSTRUCTION OR WITH AIR-HANDLING PARTS THAT COVER VENT OPENINGS."
 - 14) "INSTALL ONLY IN ENVIRONMENTAL AIR-HANDLING SPACES WHERE A COMPLETE METAL ENCLOSED WIRING SYSTEM IS PROVIDED."

- 15) "MIN 150°C SUPPLY CONDUCTORS."
 - 16) "NOT FOR USE IN DWELLING."
 - 17) "SUITABLE FOR USE AS RACEWAY."
 - 18) "60 Hz" or "AC ONLY."
 - 19) Marked to identify voltage supply or type of branch circuit or both.
- c. LED Luminaires (UL CCN IFAM):
- 1) "PUSH CONDUCTORS INTO JUNCTION BOX."
 - 2) "WALL MOUNT ONLY."
 - 3) "NONCOMBUSTIBLE SURFACE ONLY."
 - 4) "SUITABLE FOR UNDER-CABINET MOUNT."
 - 5) "SUITABLE FOR CONTINUOUS ROW MOUNTING."
 - 6) "THIS LUMINAIRE MUST BE MOUNTED OR SUPPORTED INDEPENDENTLY OF AN OUTLET BOX."
- d. Outdoor Canopy Luminaires (UL CCN IFAW):
- 1) "CANOPY LUMINAIRE - NOT THERMALLY PROTECTED."
 - 2) "FOR COVERED CEILING MOUNT ONLY."
 - 3) "OPEN CEILING MOUNT ONLY."
- D. Recessed Luminaire
- 1. Source Limitations: Obtain products for this luminaire type from single manufacturer.
 - 2. Product Listing Criteria, LED: UL CCN IFAO; including UL 1598
 - 3. Product Characteristics:
 - a. Ceiling Compatibility: NEMA LE 4.
 - b. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
 - c. Nominal Operating Voltage: 120 V(ac).
 - d. Nominal Luminaire Operating Power Rating: 20 to 60 W.
 - e. CRI: 80+.
 - f. Ballast or Driver Location: Internal.
 - g. Materials:
 - 1) Enclosure: ASTM B209/B209M extruded-aluminum housing and heat sink; free of sharp edges and burrs.
 - 2) Enclosure Ingress Protection Rating: UL 50E Type 1 or IEC 60529 IP20.
 - 3) Lenses, Diffusers, and Globes:
 - a) Fixed lens.
 - b) Medium light distribution.
 - c) Clear, heat- and UV-stabilized virgin acrylic plastic.
 - d) Lens Thickness: Not less than 0.125 inch unless otherwise indicated.
 - 4) Visible variations in metal finishes are unacceptable in adjoining components.
 - h. LED Luminaires (UL CCN IFAO):

- 1) Output Intensity: Not less than 250 lm.
 - 2) Efficacy: Not less than 75 lm/W.
 - 3) Rated Life: 35 000 hours to L70.
 - 4) CCT: 4000 K.
4. Required Product Options:
- a. Mounting Hardware: Wall-mounted; include universal mounting bracket and integral junction box with conduit fittings.
 - b. Finishes:
 - 1) Enclosure: Clear finish.
 - 2) Reflector: Aluminum.
 - 3) Visible variations in metal finishes outside range of approved Samples are unacceptable in adjoining components.
 - c. Dimmable from 100 percent to zero percent of maximum light output.
 - d. EMI Filters: Factory installed to suppress conducted EMI in accordance with MIL-STD-461E. Fabricate luminaires with one filter on each ballast requiring filter.
 - e. Stainless-steel latches.
 - f. Integral pressure equalizer.
5. Installation Markings:
- a. Relamping Labels: Include recommended lamp type, diameter, shape, size, wattage, and coating on factory-applied label that is visible when luminaire is open for relamping.
 - b. All Luminaires (UL CCN HYXT):
 - 1) "DRY LOCATIONS ONLY."
 - 2) "SUITABLE FOR DAMP LOCATIONS."
 - 3) "SUITABLE FOR WET LOCATIONS."
 - 4) "SUITABLE FOR MOUNTING WITHIN 1.2 M (4 FT) OF THE GROUND" or "SUITABLE FOR FLOOR PROXIMITY INSTALLATION."
 - 5) "SUITABLE FOR GROUND-MOUNTED RECESSED."
 - 6) "LIMIT RANGE OF ADJUSTMENT TO
 - 7) "COVERED CEILING MOUNT ONLY."
 - 8) "WALL MOUNT ONLY"
 - 9) "FOR CEILING MOUNTING ONLY."
 - 10) Marked with mounting orientation, such as "THIS END UP."
 - 11) "SUITABLE FOR AIR-HANDLING USE."
 - 12) "VENTILATING OR COOLING AIR ONLY."
 - 13) "ONLY FOR USE IN CEILING PLENUM OF NONCOMBUSTIBLE CONSTRUCTION OR WITH AIR-HANDLING PARTS THAT COVER VENT OPENINGS."
 - 14) "INSTALL ONLY IN ENVIRONMENTAL AIR-HANDLING SPACES WHERE A COMPLETE METAL ENCLOSED WIRING SYSTEM IS PROVIDED."
 - 15) "MIN 150°C SUPPLY CONDUCTORS."
 - 16) "NOT FOR USE IN DWELLING."

- 17) "SUITABLE FOR USE AS RACEWAY."
 - 18) "60 Hz" or "AC ONLY."
 - 19) Marked to identify voltage supply or type of branch circuit, or both.
- c. LED Luminaires (UL CCN IFAO):
- 1) "TYPE IC LUMINAIRE."
 - 2) "TYPE NON-IC LUMINAIRE."
 - 3) "INHERENTLY PROTECTED LUMINAIRE."
 - 4) "INSTALL IN BUILDINGS OF FIRE-RESISTANT CONSTRUCTION."
 - 5) "FOR USE IN CONCRETE ONLY."
 - 6) "SUITABLE FOR USE IN POURED CONCRETE."
 - 7) "SUITABLE FOR SUSPENDED CEILING."
 - 8) "SUITABLE FOR GROUND-MOUNTED RECESSED ONLY."
 - 9) "SUITABLE FOR GROUND-MOUNTED RECESSED."
 - 10) "BLINKING LIGHT OF THIS THERMALLY PROTECTED LUMINAIRE MAY INDICATE OVERHEATING."
 - 11) "ACCESS ABOVE CEILING REQUIRED."
 - 12) "ACCESS BEHIND WALL REQUIRED."
 - 13) "FOR USE IN ONE- AND TWO-FAMILY DWELLINGS ONLY."
 - 14) "FOR USE IN NON-FIRE-RATED INSTALLATIONS."
 - 15) Provide correlating markings identifying matching housing, trim, rough-in section, and finishing section.
 - 16) "Chicago Electrical Code" or "CCEA."
- E. UL FTBR or FTBV - Emergency Lighting and Power Equipment:
1. Source Limitations: Obtain products from single manufacturer.
 2. Product Listing Criteria: UL CCN FTBR or UL CCN FTBV; including UL 924, NFPA 101, and ICC IBC.
 3. Product Characteristics:
 - a. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 - b. Status and Test Indication: Visible and accessible without opening luminaire or entering ceiling space.
 - 1) Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 2) Test Push-Button: Push-to-test button in unit housing simulates loss of normal power and demonstrates unit operability.
 - c. Nominal Operating Voltage: 120 V(ac).
 - d. Mounting: Ceiling or with universal junction box adaptor.
 - e. Enclosure: UV stable thermoplastic housing rated for wet locations.
 - f. Flame Rating: UL 94 5VA.
 - g. Light Source: LED heads.
 4. Required Product Options:
 - a. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body.

- 1) Emergency Connection: Operate one lamp(s) continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
- 2) Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
- 3) Nightlight Connection: Operate lamp continuously at 40 percent of rated light output.
- 4) Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
 - a) Push-Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b) Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
- 5) Battery Type: Ni-Cd.
- 6) Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
- 7) Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
- 8) Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

5. Installation Markings:

- a. Relamping Labels: Include recommended lamp type, diameter, shape, size, wattage, and coating on factory-applied label that is visible when luminaire is open for relamping.
- b. All luminaires (UL CCN HYXT):
 - 1) "SUITABLE FOR DAMP LOCATIONS."
 - 2) "SUITABLE FOR WET LOCATIONS."
 - 3) "SUITABLE FOR MOUNTING WITHIN 1.2 M (4 FT) OF THE GROUND" or "SUITABLE FOR FLOOR PROXIMITY INSTALLATION."
 - 4) Marked to identify voltage supply or type of branch circuit or both.
- c. Emergency Lighting and Power Equipment (UL CCN FTBR):
 - 1) "HAS CLASS 2 OUTPUTS."

F. UL FWBO - Exit Fixture

1. Source Limitations: Obtain products from single manufacturer.
2. Product Listing Criteria: UL CCN FWBO; including UL 924, NFPA 101, and ICC IBC.

3. Product Characteristics:

- a. Nominal Operating Voltage: 120 V(ac).
- b. Light Source: LED; 50,000 hours minimum rated life.
- c. Legend Color: Red.
- d. Internal emergency power unit.
- e. Battery Type: Ni-Cd.
- f. Master/Remote Sign Configurations:
 - 1) Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
 - 2) Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

4. Installation Markings:

- a. All Luminaires (UL CCN HYXT):
 - 1) "SUITABLE FOR DAMP LOCATIONS."
 - 2) "SUITABLE FOR WET LOCATIONS."
 - 3) "SUITABLE FOR MOUNTING WITHIN 1.2 M (4 FT) OF THE GROUND" or "SUITABLE FOR FLOOR PROXIMITY INSTALLATION."
 - 4) Marked to identify voltage supply or type of branch circuit or both.

2.2 LUMINAIRE FITTINGS

A. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- b. See individual product types below for listing criteria.

B. Source Quality Control:

1. Compile and submit product data.
2. Compile and submit sustainable design product data.
3. Compile and submit samples.

C. Luminaire Support Accessories:

1. Product Characteristics:

- a. Sized and rated for luminaire weight.

- b. Capable of maintaining luminaire position after cleaning and relamping.
 - c. Capable of supporting luminaire without causing deflection of ceiling or wall.
 - d. Capable of supporting horizontal force equal to 100 percent of luminaire weight and vertical force equal to 400 percent of luminaire weight.
2. Required Product Options:
- a. Hook Hangers: Integrated assembly matched to luminaire, supply voltage, and equipment with threaded attachment, cord, and locking-type plug.
 - b. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage wire supports 10 ft in length.
 - c. Aircraft Cables: 5/32 inch diameter aircraft cable supports 10 ft in length.
 - d. Single-Stem Hangers: 1/2 inch nominal diameter steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
 - e. Rod Hangers: 3/16 inch nominal diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Shop Drawings: Prepare and submit the following:
 - 1. Drawings, Diagrams, and Supporting Documents for Custom Luminaires:
 - a. Include plans, elevations, sections, and mounting and attachment details.
 - b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - c. Include diagrams for power, signal, and control wiring.
- B. Temporary Lighting: If approved by Architect, specified luminaires for Project may be installed for temporary lighting. Install and energize minimum quantity of luminaires necessary to meet needs of construction activities. When construction is sufficiently complete, remove, disassemble, clean, and relamp luminaires used for temporary lighting before reinstalling for Project delivery.

3.3 INSTALLATION OF LIGHTING

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
 - 1. Installation of Indoor Lighting Systems: NECA NEIS 500.
 - 2. Installation of Exterior Lighting Systems: NECA NEIS 501.
 - 3. Installation of Industrial Lighting Systems: NECA NEIS 502.
 - 4. Installation of Luminaires, Lampholders, and Lamps: Article 410 of NFPA 70.
 - 5. Installation of Extra-Low-Voltage Lighting: Article 411 of NFPA 70.
 - 6. Installation of Lighting for Sensitive Electronic Equipment: Article 647 of NFPA 70.
 - 7. Installation of Emergency Lighting and Exit Signs: ICC IBC, NFPA 101, and Parts IV and V in Article 700 of NFPA 70.
 - 8. Consult Architect for resolution of conflicting requirements.
 - 9. Wall-Mounted Luminaire Support:
 - a. Attached using through bolts and backing plates on either side of wall.
 - b. Do not attach luminaires directly to gypsum board.
 - 10. Suspended Luminaire Support:
 - a. Ceiling Mount:
 - 1) Hook hangers.
 - 2) Two wires.
 - 3) Two aircraft cables.
 - b. Pendants and Rods: Where longer than 48 inch, brace to limit swinging.
 - c. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 - d. Continuous Rows of Luminaires: Provide tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
 - e. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
 - 11. Ceiling-Grid-Mounted Luminaire Support:
 - a. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inch from luminaire corners.
 - b. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for application.
 - c. Luminaires of Sizes Smaller Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently

- with no fewer than two 3/4 inch metal channels spanning and secured to ceiling tees.
- d. Seismic Restraint: Install at least one independent support rod or wire from structure to tab on luminaire. Wire or rod must have breaking strength for luminaire weight with safety factor of 3.
- 12. Remote Mounting of Ballasts: Do not exceed distance between ballast and luminaire recommended by ballast manufacturer.
 - 13. Emergency Power Units: Secure with approved fasteners in four or more locations, spaced near corners of unit.
 - 14. Install wiring connections for luminaires.
 - 15. Identification: Provide labels for luminaires and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Provide warning signs.
 - c. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL OF LIGHTING

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 - 1. Perform manufacturer's recommended tests and inspections.
 - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 3. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
 - 4. Verify operation of photoelectric controls.
 - 5. Exterior Illumination Tests:
 - a. Measure light intensities at night. Use photometers with calibration referenced to NIST standards.
- C. Nonconforming Work:
 - 1. Luminaire will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- E. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.
 - 1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at Project site.

3.5 SYSTEM STARTUP

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's published instructions.
2. Burn-in lamps that require specific aging period to operate properly, prior to occupancy by Owner.
3. Charge emergency power units minimum of one hour and depress switch to conduct short-duration test.
4. Charge emergency power units minimum of 24 hours and conduct one-hour discharge test.
5. .

B. Manufacturer Services: Engage factory-authorized service representative to support system startup.

1. Manufacturer's Field Reports for System Startup Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at Project site.

3.6 ADJUSTING

A. Luminaire Aiming Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aiming direction of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies must be manufacturer's authorized replacement parts and supplies.
3. Adjust aim of luminaires in presence of Architect.

3.7 CLOSEOUT ACTIVITIES

A. Maintenance Material Submittals:

1. Spare Parts: Furnish to Owner spare parts, for repairing lighting equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:
 - a. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - b. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
 - c. Luminaire-Mounted Emergency Battery Packs: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

3.8 PROTECTION

- A. After installation, protect lighting equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 26 50 00

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