

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Interior lighting fixtures, lamps, and drivers.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. Related Sections:
 - 1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
 - 2. Section 26 09 43.23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
 - 3. Section 26 27 26 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
 - 4. Section 26 55 61 "Theatrical Lighting" for theatrical lighting fixtures and their controls.

1.03 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. Driver: Electronics components that couple to Light engine to convert power from line voltage AC to light engine operating mA output and voltage.
- D. LED: Light Emitting Diode
- E. LER: Luminaire efficacy rating.
- F. Light Engine: One or more LEDs coupled to a circuit board with or without on board optics.
- G. Lumen: Measured output of lamp and luminaire, or both.
- H. Luminaire: Complete lighting fixture, including remote driver housing if provided.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Energy-efficiency data.
 - 4. LED light engines for each type used. Provide compatibility information for LED light engines used in conjunction with dimming systems.
 - 5. Life, output (lumens, CCT, and CRI), of each light engine, and energy-efficiency data for light engines.
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this

Project. Solid state LED lighting photometric data based on IES LM-79 laboratory tests of each luminaire type, complete with indicated LED engines, power supplies, operating current in milliamps (mA), and accessories.

- a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
7. Power supplies, including energy-efficiency data.
8. LED engines, including life based on IES LM-80, output based on IES LM-79 testing methods, CCT, CRI, lumens, operating current in milliamps (mA), and energy-efficiency data.

B. Installation instructions.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
 1. Provide a list of all LED light engine and driver types used on Project; use manufacturers' codes.
 2. Provide recommended LED light engine and driver replacement schedule for each lamp type based on manufacturer's listed lamp life ratings.
 3. Provide manufacturer's maintenance and trouble-shooting information for all luminaire.

1.06 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. 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.
- C. Comply with NFPA 70.

1.07 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.08 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Emergency LED luminaire Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.
- B. Product Substitutions: Provide product data per "Action Submittals" for all proposed substitute products submitted during bid period for Architect and Engineer review. Substitute products are any products not specifically detailed on Drawings with full model numbers. Substitute products are subject to review and acceptance of Architect and Engineer. Listing on Drawings of alternate manufacturer's names without detailed full model numbers does not equate to specific product approval or acceptance.

2.02 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. LED Fixtures: Test in accordance with IES LM79 & LM80.

- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- F. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- G. Factory-Applied Labels: Comply with UL 1598. Include recommended replacement LED light engines and drivers. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following LED light engine and driver characteristics:
 - a. "USE ONLY" and include specific LED light engine type.
 - b. Driver info including operating mA output and wattage.
 - c. CCT and CRI for all luminaires.

2.03 LED LIGHT SOURCE REQUIREMENTS

- A. Solid State Lighting (LED) sources must meet the following requirements:
 - 1. Luminaires must be rated for -40°C to +50°C operation.
 - 2. Correlated Color Temperature (CCT) shall be 4000.
 - 3. Color Rendering Index (CRI) of: ≥ 80 .
 - 4. Lumen Maintenance: $\geq 50,000$ hours to 70% Lumen Maintenance per IES LM-80, tested per IES LM-79 procedures.
 - 5. Luminaire efficiency shall be ≥ 100 lumens per watt. Small lumen output fixtures (less than 1000 lumens) and decorative fixtures may be below 100 lumens per watt.
 - 6. Fixtures shall be Energy Start or DesignLights Consortium "DLC" labeled / qualified.

2.04 DRIVER REQUIREMENTS

- A. Power Supply Units (PSUs) including drivers must meet the following requirements:
 - 1. Must have a minimum efficiency of 85%.
 - 2. Must be rated to operate between -40°C to +50°C
 - 3. Input Voltage: capable of 120 to 277 ($\pm 10\%$) volt, single phase as required by the site.
 - 4. Power supplies can be UL Class I or II output.
 - 5. Operating frequency must be 60 Hz.
 - 6. Drivers must have a Power Factor (PF) of: ≥ 0.90 .
 - 7. Drivers must have a Total Harmonic Distortion (THD) of: $\leq 20\%$.
 - 8. Drivers must comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
 - 9. Drivers must be Reduction of Hazardous Substances (RoHS) compliant.
 - 10. Drivers for fixtures connected to dimmers must be compatible with specified dimming controls.

2.05 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. 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.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. 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.

2.06 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

2.07 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- C. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- D. Lamps, and sockets.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lighting fixtures:
 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
 2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Drivers: Distance between the ballast and fixture shall not exceed that recommended by luminaire and driver manufacturer. Verify, with driver manufacturers, maximum distance between driver and luminaire.
- D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners at minimum of two corners.
 2. Support Clips: Fasten to lighting 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.
 4. Install at least two independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

- E. Suspended Lighting Fixture Support:
 - 1. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
- F. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.02 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Test all dimmed luminaires with manual and automatic dimming controls. Verify proper dimming from low output to full output with each device type.
- C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.04 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to one visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
 - 1. Adjust aimable luminaires in the presence of Architect.

3.05 SPARE PARTS AND TOOLS

- A. Replace non-functioning lamps at time of final acceptance and provide 20% spare lamps for each lamp type on project.

END OF SECTION 26 51 00