

## **SECTION 265100 - INTERIOR LIGHTING**

Latest Update 11-09-2017 See underlined text for Edits.

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all "Underlines".)

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

1.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 26.

#### 1.3 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps/modules, and drivers.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

#### 1.4 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. LER: Luminaire efficacy rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting fixture, including lamp module/driver housing if provided.

#### 1.5 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: <Engineer to Edit for Project Requirements>

1. Physical description of lighting fixture including dimensions.
  2. Emergency lighting units including battery and charger.
  3. Lamps/Modules
  4. Drivers
  5. Energy-efficiency data.
  6. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Submittals" Article in Division 23 Section "Air Terminal Units and Air Devices."
  7. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 23 Section "Air Terminal Units and Air Devices."
  8. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
    - a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Shop Drawings: All lighting fixtures shall include the following, in addition to the requirements of the Submittal section:
1. Wiring Diagrams: For power, signal, and control wiring.
- D. Samples: For each custom lighting fixture indicated in the Interior Lighting Fixture Schedule. Each Sample shall include the following:
1. Lamps/Modules, installed.
  2. Cords and plugs.
  3. Pendant support system.
  4. Drivers
- E. Installation instructions.
- F. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Lighting fixtures.
  2. Suspended ceiling components.

3. Partitions and millwork that penetrate the ceiling or extends to within twelve (12) inches of the plane of the luminaires.
  4. Ceiling-mounted projectors.
  5. Structural members to which suspension systems for lighting fixtures will be attached.
  6. Other items in finished ceiling including the following:
    - a. Air outlets and inlets.
    - b. Speakers.
    - c. Sprinklers.
    - d. Smoke and fire detectors.
    - e. Occupancy sensors.
    - f. Access panels.
    - g. <Insert item>.
  7. Perimeter moldings.
- G. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
- H. Product Certificates: For each type of driver and dimmer-controlled fixtures, from manufacturer.
- I. Field quality-control reports.
- J. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
1. Provide a list of all lamp/module types used on Project; use ANSI and manufacturers' codes.
- K. Warranty: Sample of special warranty.

## 1.6 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.
- 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.

D. LED fixtures shall comply with the following:

1. UL Standard 8750 “Light Emitting Diode Equipment for Use in Lighting Products”.
2. IES Standard LM-79 “Electrical and Photometric Measurements of Solid-State Lighting Products”.
3. IES Standard LM-80 “Measuring Lumen Maintenance of LED Light Sources”.
4. IES Standard TM-21 “Projecting Long term Lumen Maintenance of LED Light Sources”.
5. ANSI C78.377 “Specifications for the Chromaticity of Solid State Lighting Products” with LEDs binned within a maximum three-step MacAdam Ellipse to ensure color consistency amongst luminaires of the same type.

E. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of fixtures for mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

## 1.7 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.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Plastic Diffusers and Lenses: [One (1) for every one hundred (100)] <Insert quantity> of each type and rating installed. Furnish at least one (1) of each type.
2. LED-fixture-mounted, emergency battery pack: One (1) for every [twenty (20)] [fifty (50)] <Insert number> emergency lighting unit.
3. LED Lamps/Modules: [One (1) for every one hundred (100)] <Insert quantity> of each type and rating installed. Furnish at least one (1) of each type.

4. LED Drivers: [One (1) for every one hundred (100)] <Insert quantity> of each type and rating installed. Furnish at least one (1) of each type.
5. Globes and Guards: [One (1) for every twenty (20)] <Insert quantity> of each type and rating installed. Furnish at least one (1) of each type.

## 1.9 WARRANTY/GUARANTEE

- A. See Division 26 Specification Section “Basic Electrical Requirements” for warranty and guarantee requirements.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
- C. Warranty Period: Modules (lamps), drivers and all components, provide a complete warranty for parts and labor for a minimum of five (5) years from the date of Substantial Completion.
- D. Special Warranty for Cord-Connected, Plug-in Surge Suppressors: Manufacturer's standard form in which manufacturer agrees to repair or replace electronic equipment connected to circuits protected by surge suppressors.
- E. 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 Lighting Unit Batteries: [Ten (10)] <Insert number> years from date of Substantial Completion. Full warranty shall apply for two (2) years, and prorated warranty for the remaining eight (8) years.
  2. Warranty Period for [Emergency Fluorescent Ballast] [and] [Self-Powered Exit Sign] Batteries: [Seven (7)] <Insert number> years from date of Substantial Completion. Full warranty shall apply for two (2) years, and prorated warranty for the remaining five (5) years. <Engineer to Edit for Project Requirements>

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

## 2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. 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.
- E. Diffusers and Globes:
  - 1. Acrylic Lighting Diffusers: 100 % 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.
- F. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. 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 lamp and ballast characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp/Module code configuration type, and nominal wattage for luminaires.
    - c. Driver type (dim, non-dim, etc.) for luminaires.
    - d. CCT and CRI for all luminaires.
- G. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.
- H. Air-Handling LED Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in the mechanical specifications.
  - 1. Air-Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.

2. Heat-Removal Units: Air path leads through lamp cavity.
  3. Combination Heat-Removal and Air-Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air-supply units.
  4. Dampers: Operable from outside fixture for control of return-air volume.
  5. Static Fixture: Air-supply slots are blanked off, and fixture appearance matches active units.
- I. LED lighting fixtures scheduled on the drawings are found to offer products similar to the basis of design product, including performance, appearance, and quality. Listed equals must comply with minimum performance criteria. Additional documentation and calculations for LED lighting fixtures compliance should be made available upon request.

### 2.3 EMERGENCY POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
1. Emergency Connection: Operate <Insert number> LED lamp(s) continuously at an output of <Insert value> lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  2. Nightlight Connection: Operate one fluorescent lamp continuously.
  3. Test Push Button and Indicator Light: Visible and accessible without opening fixture 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.
  4. Battery: Sealed, maintenance-free, nickel-cadmium type.
  5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
  6. Remote Test: Switch in hand-held 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.
  7. 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.

### 2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for, visibility, luminance, and lettering size, comply with authorities having jurisdiction. Provide RED color sign.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
  - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
  - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 % of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
  - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
  - f. 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.

## 2.5 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained LED 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% 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. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of [fifteen (15)] <Insert period> minutes when power is restored after an outage.
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.

## 2.6 LED Lighting Products:

A. Acceptable Manufacturers:

1. Luminaires:
  - a. Refer to the Luminaires Schedule on the drawings.
2. Drivers:
  - a. Cree.
  - b. EldoLED.
  - c. Philips/Advance.
  - d. Thomas Research Products.
  - e. Or as supplied by the luminaire manufacturer, in compliance with these Specifications.
3. Dimmable Drivers:
  - a. Cree.
  - b. EldoLED.
  - c. Philips/Advance.
  - d. Thomas Research Products.
  - e. Or as supplied by the luminaire manufacturer, in compliance with these Specifications.

B. Luminaires:

<Engineer to coordinate exterior lighting fixture requirements with UMB Design Standards>.

1. Refer to Luminaire Schedule for specified parameters such as correlated color temperature (CCT) value(s), lumen output, efficiency, etc.
2. Products shall be fabricated to be Reduction of Hazardous Substances (RoHS) - compliant.
3. Must maintain their warrantied life while operating within the manufacturers' specified environmental parameters.
4. The lumen value specification listed in the Luminaire Schedule is a delivered lumen value specification. Products supplied shall deliver not less than the lumen value specified.
5. The lumen maintenance specification of any assembled LED based chip, array, module, driver, and luminaire combination shall be a minimum of L70, at 50,000 hours, as tested and measured in compliance with IES documents LM-79 and LM-80.
6. Except as otherwise stated in the Luminaire Schedule, the light source shall provide a minimum CRI of 80.

C. Drivers: Listed and so labeled per UL 8750 and UL 1310, and shall meet or exceed the following general specification criteria:

1. Designed and tested to be compatible with the luminaire light source operating current, voltage, and output power requirements.

2. Inaudible above 27 dBA ambient sound level.
3. Designed, fabricated, and tested to operate at an input voltage of 120 – 277VAC,  $\pm 10\%$  at 60 Hz, with no perceptible change in light source output.
4. Contribute less than 20% total harmonic distortion, operating at full rated load, and shall not exceed the maximum allowable THD requirements allowed per standard ANSI C82.11.
5. Provided with integral short circuit, open circuit, and overload protection.
6. Have an operating power factor  $\geq 0.9$ .
7. Limit conducted and radiated interference in compliance with FCC 47 CFR Part 15.
8. Housed in a UL compliant and listed enclosure, suitable for remote installation where required, and listed for installation within spaces used for environmental air (plenum), as defined in NFPA 70 – the National Electrical Code.

D. Dimmable Drivers - In addition to the general specification criteria specified above:

1. Have an operating power factor of  $\geq 0.9$  at full load, and not less than 0.8 at dimmed level.
2. Provide smooth, flicker-free, dimmable light output from 100% to less than 1%.
3. 0-10VDC "sinking" type dimming control protocol per enforced version of IEC Standard 60929, unless otherwise noted or required.

## 2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: One half (1/2) inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two (2), one half (1/2) inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, [12 gage] <Insert size>.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, [12 gauge] <Insert size>.
- F. Rod Hangers: Three sixteenth (3/16) inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

#### B. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by driver manufacturer. Verify, with driver manufacturers, maximum distance between driver and luminaire. Mount in nearby accessible ceiling space and provide label on ceiling.

#### C. 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 six (6) inches from lighting fixture corners.
2. 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 (2) three quarter (3/4) inch metal channels spanning and secured to ceiling tees.

#### D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than forty eight (48) inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

#### E. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

#### F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.2 IDENTIFICATION

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

### 3.3 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. 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.

### 3.4 STARTUP SERVICE

- A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least one hundred (100) hours at full voltage.

END OF SECTION 265100