

SECTION 265100 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to the work of this section.
- B. 2018 North Carolina Energy Code.

1.2 SUMMARY

- A. This section includes the supply and installation of fixtures, supports, lamps, ballasts and accessories, and supply of plaster frames, trim rings and backboxes for plaster or drywall ceilings or concrete.

1.3 COORDINATION

- A. Confirm compatibility and interface of other material with luminaire and ceiling system. Report discrepancies to the Engineer, and defer ordering until clarified.
- B. Supply plaster frames, trim rings and backboxes to other trades.
- C. Coordinate with other Divisions to avoid conflicts between luminaires, supports, fittings, and mechanical equipment.

1.4 LUMINAIRE DESIGNATION

- A. Furnish, assemble, install and connect all lighting fixtures for outlets shown on the drawings. Fixtures shall be as indicated in the LIGHTING FIXTURE SCHEDULE as shown on the drawings.
- B. All fixtures shall be furnished complete with sockets, lamps, internal wiring, leads, trims, hangers, supports, frames, ballasts, etc., as applicable and required for a complete and workmanlike installation.

1.5 DEFINITIONS

- A. Emergency Lighting Unit: A fixture with integral emergency battery power supply and the means for controlling and charging the battery. They are also known as an emergency light set.
- B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute the light, position and protect lamps, and connect lamps to the

power supply. Internal battery powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units are available with and without integral lamp heads and lamps.

- C. Luminaire: Fixture.
- D. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

1.6 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:
 - 1. Outline drawings of fixtures indicating dimensions and principal features.
 - 2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.
 - 3. Data on batteries and chargers of emergency lighting units.
- C. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 1.
- D. Product certifications signed by manufacturers of lighting fixtures certifying that their fixtures comply with specified requirements.
- E. Shop drawings from manufactures detailing nonstandard fixtures and indicating dimensions, weights, methods of field assembly, components, features, and accessories.
- F. Coordination drawings for fixtures mounted on, in, or above the ceiling indicating coordination with ceiling grids and other equipment installed in the same space.

1.7 QUALITY ASSURANCE

- A. Listing and Labeling: Provide fixtures, poles/standards and emergency lighting units that are listed and labeled for their indicated use on the Project.
 - 1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, underwater, and recessed in combustible construction specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
 - 2. 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. Reference Section 26 05 00 for acceptable listing and labeling agencies.

3. Listing and Labeling Agency Qualification: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Manufacturers Qualifications: Firms experienced in manufacturing fixtures that are similar to those indicated for this Project and that have a record of successful in-service performance.
- C. Coordination of Fixtures With Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 1. Warranty Period for Luminaires: Five years from date of Final Acceptance.
 2. Warranty Period for Metal Corrosion: Five years from date of Final Acceptance.
 3. Warranty Period for Color Retention: Five years from date of Final Acceptance.
 4. LED Luminaire Warranty:
 - a. Provide a comprehensive written 5-year warranty for including luminaire finish, on-site replacement of material, and workmanship. On-site replacement includes transportation, removal, and installation of new products. Finish warranty shall include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
 - b. Provide a written 5-year replacement material warranty for defective or non-starting LED source assemblies.
 - c. Provide a written 5-year replacement material warranty on all PSUs.
 - d. Provide a written 5-year replacement warranty for non-maintained illuminance levels on all light sources (LED package, LED array, or LED module) including, but not limited to the LED die, encapsulate, and phosphor. If the expected useful life of the luminaire system as defined in this specification is not maintained, then the manufacturer shall replace the light source(s) or luminaire as needed.
 - e. Provide a written 5-year warranty that LED color shift from initial shall color be less than 0.007 on the CIE 1976 (u',v') diagram

1.9 EXTRA MATERIALS

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

1. LED Modules: 5 for every 100 of each type and rating installed. Furnish at least five (5) of each type.
2. Drivers: 5 for every 100 of each type and rating installed. Furnish at least five (5) of each type.
3. Fixture Types: one (1) of each type.

PART 2 - PRODUCTS

2.1 FIXTURES, GENERAL

- A. Comply with the requirements specified in the Articles below and the lighting fixture schedule on the drawings.

2.2 FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs and sharp corners and edges.
- B. Sheet Metal Components: Steel, except as indicated. Components are formed and supported to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in the operating position.
- D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
 1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
 4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass except as indicated.
 1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation.
 2. Lens Thickness: 0.125 inches, minimum.

2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS

- A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

- B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- C. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.
- D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking- type plug.

2.4 LED LIGHTING

A. General:

- 1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
- 2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
- 3. LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.
 - b. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
 - c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
 - d. Integral short circuit, open circuit, and overload protection.
 - e. Power Factor: ≥ 0.95 .
 - f. Total Harmonic Distortion: $\leq 20\%$.
 - g. Comply with FCC 47 CFR Part 15.
- 4. LED modules shall include the following features unless otherwise indicated:
 - a. Comply with IES LM-79 and LM-80 requirements.
 - b. Minimum CRI 80 and color temperature 3000° K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
 - c. Minimum Rated Life: 50,000 hours per IES L70.
 - d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.
- 5. Provide 2.5kV surge suppression on all interior luminaires and 10 kV surge suppression on all exterior luminaires.

B. LED Downlights:

- 1. Housing, LED driver, and LED module shall be products of the same manufacturer.

2.5 EMERGENCY LIGHTING UNITS

- A. It shall be completely self-contained, provided with 12 volt maintenance-free battery, automatic charger, and other features. Luminaire must be third party listed as emergency lighting equipment, and meet or exceed the following standards; NEC, N.C. Building Code, Energy Code, NFPA-101, and NEMA Standards.

- B. The battery shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, asintered + positive terminal and - negative terminal.
- C. The charger shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if LEAD Battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage. Additional features shall include a pilot light to indicate the unit is connected to AC power. The unit shall be provided with self-diagnostics and will perform all tests required by NFPA 101 and UL 924. The unit will automatically test the battery capacity every thirty days for 30 seconds. It will perform a full battery capacity test for 90 minutes, randomly within each 6-month period. The unit continuously monitors the condition of the circuit board and lamps. If a circuit failure occurs that turns off the lamps or the battery charger circuit fails, then a circuit failure will be indicated by the indicator blinking three times. If one or more of the lamps in the EMERGENCY FIXTURE fail, the diagnostic LED will indicate a lamp failure by blinking four times. A test switch to simulate the operation of the unit upon loss of A.C power by energizing the lamps from the battery. This simulation must also exercise the transfer rely.
- D. The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.
- E. The Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection by the Designer. **This test should take place at night or the contractor shall simulate a condition where no ambient light is available.** Any unit which fails the test must be repaired or replaced, and tested again. The test shall also verify compliance with NEC-700. 12 (F), therefore contractor shall test initial footcandle levels as well as the footcandle levels at the end of the 90 minute period as well as voltage levels at the battery terminals Copy of the test report shall be sent to the Designer for review prior to the final inspection.

2.6 EXIT SIGNS

- A. A.It shall be completely self-contained. Luminaire must be third party listed as emergency lighting equipment, and meet or exceed the following standards; NEC, N.C. Building Code, NFPA-101, and NEMA Standards.
- B. The entire unit shall be warranted for three years. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document. The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

2.7 LED Emergency Egress Luminaires

Provide unitary emergency egress luminaires with maintenance-free battery, automatic charger, and two lighting heads. Luminaire shall be third-party listed as emergency lighting equipment, and meet or exceed the standards noted above and the following standards.

- A. Provide battery voltage as recommended by luminaire manufacturer for LED light source.
- B. Square wave inverters shall not be used with LED emergency egress lighting. Sinusoidal wave inverters are the preferred method.

- 1. LED Emergency Egress Luminaires for Normal lighting with Integral Emergency Batteries

- 2. Additional Features

Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, and self-diagnostic functions. A test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay. Provide a switch accessible without removing covers or opening the fixture.

- 3. Battery for Emergency Egress Luminaires

For unitary emergency lighting, provide maintenance free battery, with minimum of 90 minutes operating endurance and a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0oC to 60oC and contain a resealable pressure vent, a sintered + positive terminal, and a - negative terminal.

For normal lighting fixtures with integral batteries, provide maintenance free batteries with minimum 90 minutes operating endurance, normal life expectancy of 5 years, and listed for use with the associated fixture. Provide minimum 5 year full warranty with an additional 2 more years prorated warranty.

- 4. Charger

Provide fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if a battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

- 5. Warranty

The entire unit shall be warranted for minimum five years. The battery must have a 3 year warranty with an additional 3 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract documents.

- 6. Unit Test

Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes, in accordance with NEC 700. Any unit which fails the test must be repaired or replaced, and tested again. Copy of the test report shall be available at final inspection and shall be included in owner's operation and maintenance manual. Include either starting voltage, ending voltage, and percent voltage drop or starting lumens, ending lumens, and percent lumens drop in the test report

2.8 FINISH

- A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.
- B. Other Parts: Manufacturer's standard finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved shop drawings.
- B. Support For Recessed and Semirecessed Fixtures: **Reference Drawings for specific details.**
- C. Support for Suspended Fixtures: Brace pendants and rods that are 4-feet long or longer to limit swinging. Support stem mounted single-unit suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- D. Lamping: Lamp units according to manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.3 ADJUSTING AND CLEANING

- A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

3.4 Verify with the Contractor the type of ceilings which will be used in the various spaces before ordering fixtures, to ensure compatibility with the ceiling types to be actually installed, including trim and accessories.

3.5 Mounting heights of fixtures are, in most cases, indicated on the drawings or scheduled. Where job conditions require mounting heights different from those shown or specified to avoid equipment, structural features, etc., such changes in mounting height shall be as directed without additional cost to the Owner.

3.6 The work of this Section shall include the careful examination of the Architectural and Mechanical drawings as to become acquainted with the structural features of the building, and the location of pipe and ductwork which would alter the location and spacing of outlets for fixtures. Where conflicts develop, same shall be referred to the Engineer for a decision as to the proper location. The work of this Section shall also include responsibility for the proper reinforcement of any ductwork necessary to carry the added weight of lighting fixtures where same must be supported by such ductwork.

3.7 Attention is directed to the possible close fit requirements of some lighting fixtures within bar joist areas. All fixtures for these areas shall be closely coordinated with bar joist locations for proper fit and alignment.

END OF SECTION 265100

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