

SECTION 26 51 00 – LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes interior LED lighting fixtures, LED lighting fixtures mounted on exterior building surfaces, emergency lighting units, and accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture indicated, provide typical cutsheets. Include data on features, accessories, and the following:
 - 1. Light output in lumens, color temperature (CCT), color rendering index (CRI) and energy efficiency data.
 - 2. Lighting fixture accessories.
 - 3. Dimensions of fixtures.
 - 4. Light Pole Bases (when contractor elects to provide precast concrete bases in lieu of cast in place).
- B. Exterior Fixture Performance
 - 1. Site lighting is based on the manufacturers and distribution patterns specified. It shall be the Contractor's responsibility to review all "approved substitute" manufacturers to match the lighting levels achievable with the basis of design.
 - 2. If requested, the Contractor shall supply the Engineer with a 10'x10' lighting level plot plan of the site using the proposed approved alternate manufacturer for review. If the alternate manufacturer cannot meet light levels within Engineer acceptable limits, the Contractor will be required to select another manufacturer from the approved substitute list.
- C. Coordination: The electrical contractor shall be responsible to coordinate all light fixtures with ceiling installer before installation of ceiling grid. The electrical contractor shall also coordinate light fixture installation with HVAC and plumbing contractor for installation of piping and ductwork. Should there be any conflicts, they should be brought to the attention of the Architect/Engineer prior to the installation of the ceiling grid. Any conflicts not brought to the attention of the Architect/Engineer before installation of ceiling, the electrical contractor shall bear all costs associated with rework to install light fixtures, piping, ductwork, ceiling grid, etc.

1.3 QUALITY ASSURANCE

- A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.4 COORDINATION

- A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.
- B. Lighting Control: Verify compatibility of lighting controls (analog dimmers and digital systems) with lighting fixtures to be installed. Where controls are not compatible with the lighting to be installed, bring to the attention of the Architect/Engineer in writing prior to ordering lighting fixtures or controls.

1.5 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Architect/Engineer prior to the start of luminaire installation.
- B. Where aimable fixtures are specified (i.e. flood lights), fixtures shall be aimed at night, and presented to the Architect/Engineer for review prior to final approval.

1.6 WARRANTY

- A. Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within the project specified warranty period.
- B. Manufacturer warranty: Contractor shall ensure manufacturer published warranty furnished with the luminaires remain in-tact through the project as well as the project warranty period. Any luminaires that are damaged during the project shall be replaced at no additional cost to the owner in order to ensure maintenance of the product warranty.

1.7 EXTRA MATERIALS

- A. Exit Signs: Provide two (2) 2-sided exit signs, matching the units being specified for the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide from manufacturers as specified in the Lighting Fixture Schedules or on the drawings.

2.2 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. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels 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 characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.

c. CCT and CRI.

- C. Recessed luminaires shall comply with NEMA LE 4.

2.3 FIXTURES AND FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged 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 operating position.
- D. Reflecting Surfaces: Minimum reflectance as follows, unless 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 annealed crystal glass, unless otherwise indicated.
1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
 2. Lens Thickness: 0.156 inch minimum, unless greater thickness is indicated.
- F. Metal Finishes: Variations in finishes are unacceptable in the same piece, or in adjacent fixtures.
1. Exterior luminaires shall be provided with the same finish, regardless of manufacturer. Custom finishes must be provided were required to ensure same finish.
 2. Pole light heads and poles shall match. Color chips and custom finishes shall be applied to ensure they match, regardless of manufacturer.

2.4 PRECAST LIGHT POLE BASES

- A. The contractor may use precast concrete bases in lieu of cast in place concrete.
- B. Precast light pole bases shall meet all requirements specified on the drawings and in the specifications, including reinforcing, anchor bolts, grounding, etc.
- C. Precast light pole bases shall be formed using 5,000 psi concrete.

2.5 LED DRIVERS

- A. Provide low-energy LED drivers, capable of operating the LEDs indicated. Drivers shall operate at an input voltage between 120 to 277 VAC at an input frequency of 60 Hz +/- 10%. Light output shall remain constant for line voltage fluctuations within the range described. Drivers shall comply with EMI and RFI limits set by the FCC (CFR 41 Part 18) for non-residential applications and not interfere with normal electrical

equipment. Drivers shall meet applicable ANSI standards and must be UL listed with the fixtures. In order to maximize compatibility, drivers shall provide 0-10V dimming operation, unless noted otherwise.

1. Where fixtures are connected to a switching device on the drawings, the 0-10V terminations shall remain unconnected.
- B. Compatibility: Certified by manufacturer for use with specific dimming system indicated for use with each dimming ballast.

2.6 BATTERY POWERED EMERGENCY LIGHTING UNITS

- A. Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body.
 1. Emergency Connection: Operate lamp(s) continuously upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire.
 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. Test Push-Button and Indicator Light: Visible and accessible when fixture installed in final location.
 - 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: Provide type as specified.
 5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 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.

2.7 EXIT SIGNS

- A. General Requirements: Comply with UL 924 and the following:
 1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
 2. Internally Lighted Signs: As follows:
 - a. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

2.8 LAMPS

- A. LED lamps shall comply with the LM-79 and LM-80 standards and be provided to meet the following minimum specifications:
 1. Recessed 1'x4', 2'x2' and 2'x4' fixtures: minimum 50,000 hours at 70% lumen output.
 2. Recessed downlights: minimum 50,000 hours at 70% lumen output.
 3. Linear pendant fixtures: minimum 70,000 hours at 80% lumen output.
 4. Exterior fixtures: minimum 50,000 hours at 70% lumen output.

B. LED lamps shall be rated as follows, unless specified otherwise:

1. Interior luminaires:

- a. CCT: 4100K nominal.
- b. CRI: 80% minimum.

2. Exterior luminaires:

- a. CCT: 4100K nominal.
- b. CRI: 70% minimum.

2.9 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- minimum diameter, cadmium-plated, threaded steel rod.
- D. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- E. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.
- F. Independent Support Anchors: Anchors shall be on every fixture at the four (4) opposite corners. The contractor is required to independently support all recessed 1'x4', 2'x2', 2'x4', 4'x4', 2' diameter or larger fixture from all four corners. Circular fixtures smaller than 2' diameter, linear slot fixtures, etc. shall be support from at least two (2) opposite corners. Provide additional supports as recommended by the manufacturer.
- G. Ceiling support steel for light fixtures: Support steel (unistrut) shall be installed to provide additional support for light fixtures from ceiling grid. Unistrut shall be installed above ceiling grid T-bars where the weight of the light fixtures require additional ceiling supports. Unistrut shall be supported independently from ceiling system.

2.10 FINISHES

- A. Fixtures: Manufacturer's standard, unless otherwise indicated.
- B. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
- C. Metallic Finish: Corrosion resistant.

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 TEMPORARY LIGHTING

- A. The use of permanent lighting shall not be used for temporary lighting, unless approved, in writing, by the Architect/Engineer.

3.3 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings. Fixtures shall be independently supported from building structure from all four corners of recessed fixtures including 2x4, 1x4, 2x2, 4x4, etc. and from opposite corners from recessed downlight and 1x1 fixtures to building steel. Wire shall be galvanized steel and rated for fixture, but not less than 14 gauge. Braided wire shall be acceptable.
 - 1. Fixtures must be tied to structure so that failure of a single wire does NOT constitute failure of the independent support (i.e. at least two (2) wires must be tied to structure independently).
- C. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
- D. Fixtures of Sizes Less Than Ceiling Grid: Arrange 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.
- E. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Chain Hung: Suspend with jack chain from structure.
 - 4. Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.
 - 5. Do no support suspended fixtures from grid. Fixtures must be supported from building structure.
- F. Light fixtures shall be installed over junction boxes so they can be removed at a later date to access the wiring in the junction box.
- G. Undercabinet Lighting: When installing undercabinet lighting, take care to hide all wiring. If there is a valance under the cabinet, wiring may exit the wall below the cabinet, and be run tight to the backside of the valance. If there is no valance, wiring shall exit the wall within the cabinet at a lower corner, run along

the edge of the bottom shelf to the front of the cabinet to feed the end of the undercabinet light fixture. All exposed wiring shall be MC cable, and be tightly trained using straps and mechanical fasteners.

- H. Where digital or analog dimming devices are indicated to control light fixtures, the required low and/or line voltage wiring shall be provided to control the fixture. Any and all additional accessories required shall be provided in their entirety.
- I. Bollard Luminaires: Align units for optimum directional alignment of light distribution.
 - 1. Install on concrete base with top flush with grade or surface at luminaire location, unless noted otherwise. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth.
- J. Ground-Mounted Luminaires: Aim toward building elements. Coordinate final aiming with Architect.
 - 1. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Provide 1" chamfer around concrete base. Cast conduit into base, and finish by troweling and rubbing smooth.

3.4 CONNECTIONS

- A. Ground equipment.
- B. Furnish and install code compliant fixture disconnecting devices.
- C. Tighten electrical 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.

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Tests: As follows:
 - 1. Verify normal operation of each fixture after installation.
 - a. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
- C. Corrosive Fixtures: Replace during warranty period.

3.6 CLEANING AND ADJUSTING

- A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities. Inform Architect/Engineer when aiming fixtures.

END OF SECTION 26 51 00