SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Contracting Requirements and Division 01 General Requirements apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections include the following:
1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.

1.03 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. Ballast.
4. Energy-efficiency data.
5. Photometric data, in IESNA format, based on the certified laboratory tests of each lighting fixture type, outfitted with lamps, ballasts as applied in the Project.

B. Operation and Maintenance Data.

1.04 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, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.05 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 and fire-suppression system.

1.06 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 Lighting Unit Batteries, Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: 7 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

B. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.

1.07 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. Lamps: 5 for every 100 of each type and rating installed. Furnish at least one of each type.
   2. Battery and Charger Data: One for each type of emergency lighting unit.
   3. Ballasts: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent and HID Fixtures: Comply with UL 1598.

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 re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

E. Plastic Diffusers, Covers, 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 different thickness is indicated.
   b. UV stabilized.
2. Glass: Annealed crystal glass, unless otherwise indicated.

F. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction. For static fixtures the air supply slots are blanked off, and fixture appearance matches active units.

2.02 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. Electronic Ballasts: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
   1. Sound Rating: Class A.
   2. Total Harmonic Distortion Rating: Less than 20 percent.
   3. Transient Voltage Protection: IEEE C62.41, Category A or better.
   4. Operating Frequency: 20 kHz or higher.
   5. Lamp Current Crest Factor: 1.7 or less.
   6. BF: 0.85 or higher.
   7. Power Factor: 0.95 or higher.

B. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:
   1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher, unless otherwise indicated.
   9. Power Factor: 0.95 or higher.

C. Single Ballasts for Multiple Lighting Fixtures: Factory-wired master-slave arrangement with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

D. Ballasts for Low-Temperature Environments: Rated for 0 deg F starting and operating temperature with indicated lamp types.

2.03 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.

3. Sound Rating: A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.95 or higher.

2.04 EMERGENCY FLUORESCENT 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, specification grade equal to Bodine B50.
   1. Emergency Connection: Connect un-switched circuit to battery-inverter unit and switched circuit to fixture ballast.
   2. Night-Light 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. Integral Self-Test: Where specified, 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 flashing red LED.

2.05 BALLASTS FOR HID LAMPS

A. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Sound Rating: A.
   3. Total Harmonic Distortion Rating: Less than 15 percent.
   4. Transient Voltage Protection: IEEE C62.41, Category A or better.
   5. Lamp Current Crest Factor: 1.5 or less.
   6. Power Factor: .90 or higher.

B. Auxiliary Instant-On Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent light output.

2.06 EXIT SIGNS

A. Description: 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, 70,000 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 percent 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 flashing red LED.

2.07 EMERGENCY LIGHTING UNITS

A. Description: 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 flashing red LED.

2.08 FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.

C. T5 rapid-start low-mercury lamps, rated 28 W maximum, nominal length of 48 inches, 2900 initial lumens (minimum), CRI 82 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

D. T5HO rapid-start, high-output low-mercury lamps, rated 54 W maximum, nominal length of 48 inches, 5000 initial lumens (minimum), CRI 82 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

E. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start,unless otherwise indicated.
   1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
   2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
   3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).

2.09 HID LAMPS

A. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and color temperature 4000 K.

B. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000K.

C. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI 82, and color temperature 3000 K.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mounting: Provide hangers, channels, bars, supports and such additional equipment as may be required to align and to provide independent support. Do not support suspended fixtures from ductwork or piping.

B. Fixture locations indicated on the drawings are approximate; coordinate locations with other work in the same area to prevent interference between lighting fixtures, piping, and other equipment.

C. Secure each fixture to its support assembly. Provide field drilling, assembling, disassembling, reassembling, and wiring necessary to provide proper secure installation and positioning.

D. Where fixtures are indicated to be installed in rows, carefully align them in both vertical and horizontal directions. Center on the beam flanges or webs lighting fixtures and outlet boxes which are mounted on building steel, except where deviations are required to avoid interference with piping or miscellaneous steel.

E. Support fluorescent fixtures which are installed in suspended ceilings directly from the building structure and independent of the ceiling support system. For support use wire or chain having adequate tensile strength to support the fixture. Attach at least one support to each end of the fixture.

F. Fixtures mounted on outlet boxes shall be secured to a fixture stud in the outlet box.

G. Connect fixture wiring to branch circuit using not less than #16 AWG with insulation rated at 90°C or higher.

H. Install lamps in all fixtures. Clean fixtures regularly to keep them free of dust, grease, and other contamination, and maintain fixtures and lamps during the remainder of the construction period and until date of Substantial Completion. Replace burned out lamps immediately.

I. Suspended Lighting Fixture Support:
   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. 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.

3.02 FIELD QUALITY CONTROL

A. Test all lighting circuits. Energize lighting circuits by closing the individual switching devices for each circuit, check for missing or inoperational lamps and/or ballasts.

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.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

END OF SECTION 26 51 00