SECTION 16500
LIGHTING

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.

B. Requirements of Section 16050, "Basic Electrical Materials and Methods," apply to this Section.

1.02 SUMMARY

A. Work Included: Furnish, install, test, and place in operation interior and exterior lighting systems. Lighting systems include lighting fixtures, lamps, ballasts, transformers, supports, and accessories.

B. Lighting fixtures and lamp types are scheduled on the Drawings.

C. Related Work Specified in Other Sections:
1. Raceways, Section 16130.
2. Conductors, Section 16120.
3. Boxes, Section 16135.
4. Electrical identification, Section 16075.
5. Hangers and supports, Section 16070.

1.03 REFERENCE STANDARDS

A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of, the Contract Documents.
1. NFPA 70: National Electrical Code
2. UL4: Armored Cable
3. UL62: Flexible Cord and Fixture Wire
4. UL844: Electric lighting fixtures for use in hazardous locations.
5. UL935: Fluorescent Lamp Ballasts.
6. UL1570: Fluorescent Lighting Fixtures.
7. ANSI C2, National Electrical Safety Code."

1.04 SUBMITTALS

A. Product Data describing fixtures and finishes, lamps, ballasts, emergency lighting units, and accessories. Include the following:

1. Outline drawings indicating dimensions and principal features of the fixtures.

2. Electrical Ratings and Photometric Data: Certified results of independent laboratory tests for fixtures and lamps.

B. Samples: Submit samples of each lighting fixture, if requested by the Architect/Engineer for approval.

C. Requests for Substitutions: Comply with requirements specified in Section 01620, Product Options and Substitutions. If a substitution is proposed for any fixture indicated on the drawings, in addition to requirements specified in Section 01620, submit complete information for the proposed luminaire, including ballast sound rating and electrical data, lamp and fixture photometric data, materials and finish, type of mounting, dimensional data, lighting quality, lens design, and reflector design.

D. Closeout Submittals: Maintenance data for fixtures to include in the operation and maintenance manual specified in Division 1.

1.05 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with the referenced Electrical Code and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project. (The Terms "Listed" and "Labeled" are defined in the National Electrical Code, Article 100.)

1.06 COORDINATION

A. Coordinate the work of this section with other work under this Contract.

1. The placement of light fixtures shall not interfere with HVAC and Plumbing work. Where required, each contractor shall prepare coordination drawings as specified in Section 16050.

2. Coordinate fixture supports, mounting hardware and trim with ceiling system.

PART 2 - MATERIALS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide lighting fixtures manufactured by one of the following:

1. Fluorescent commercial and industrial:
   a. Corelite
   b. Day-Brite
   c. Lithonia
   d. Columbia

2. Lamps:
   a. General Electrical Company
   b. Osram Sylvania Inc.
   c. Phillips Lighting Corporation.

3. Fluorescent lamp ballasts:
   a. Advance.
   b. Valmont.
   c. MagneTek.
   d. EBT.
   e. Motorola.

2.02 LAMPS

A. Where lamp types are not designated on the drawings, provide energy saving fluorescent lamps with 3500°K color.

B. Fluorescent lamps type T8: Furnish long-life, high performance, energy-saving lamps with color rendering index CRI not less than 81. Lamp shall be Sylvania Xtreme System Octron XPS Ecologic or GE Starcoat SXL Ecolux.

C. Incandescent Lamps: Provide lamps rated at 130 volt.

2.03 FLUORESCENT LAMP BALLASTS

A. Ballast: For Type T8 fluorescent lamps, furnish matching ballasts – Sylvania Quicktronic PROStart Xtreme (PSX) or GE 232-MAX-L/Ultra respectively.

B. Provide ballasts that operate two and three lamps whenever possible. Fixtures with three lamps may be tandem wired to achieve dual lighting level control when shown on the drawings.

C. Provide low temperature ballast for use outdoors or in unheated spaces, designed for temperatures as low as minus 20 degrees Fahrenheit.

D. Electronic ballasts for compact fluorescent lamps must have an end of lamp life shut down circuit to prevent base melting and bulb wall cracking. The ballast shall be suitable for the lamp wattage and shall be high power factor type with Class P thermal protection. Ballast factor shall be .90 – 1.0.

2.04 LIGHTING RACEWAY AND CABLE

A. Lighting raceway and raceway fittings are indicated on the drawings and specified in Section 16130, "Raceways."

B. Provide the following cable types for use in lighting circuits, in accordance with the requirements of Section 16120, "Conductors."

Cable Type	Lighting Circuit Use

THHN	Where fluorescent fixture channel is used as a raceway.
SF-1, SF-2	Fixture connections.
THHN	Where 10 AWG and 12 AWG MC type cables are used

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Work shall conform to the Drawings, Specification, and the approved Shop Drawings, and to the requirements of the governing laws and Building Code.

B. Inspect job conditions and related work and report to the Architect, of any conditions adversely affecting lighting fixtures and raceway installation.

C. Make changes and adjustments in this work and other work under this Section as needed to accommodate the work of other trades.

3.02 INSTALLATION OF LIGHTING FIXTURES

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. Relocate fixture if, after installation, it is found to interfere with other equipment or is so located to prevent its practical and intended use.

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

3.03 TESTING

A. Test all lighting circuits. Energize lighting circuits by closing the individual switching devices for each circuit. While circuit is energized, check for missing or defective lamps.

3.04 CLEANING AND ADJUSTING

A. All electrical light fixtures shall be completely cleaned prior to initial energizing. Cleaning shall consist of vacuuming enclosure (inside and out), etc. After vacuuming is complete, light fixtures shall be wiped down.

END OF SECTION 16500