

1.00 GENERAL

1.01. WORK INCLUDES

A. Base Bid

1. General Contractor Provide:

- a. This section includes the furnishings, installation of and connection of the building lighting.

1.02. RELATED WORK

A. Specified Elsewhere:

1. 16050 - Basic Methods and Requirements
2. 16450 – Secondary Grounding

1.03. SUBMITTALS

A. In accordance with section 01340

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include electrical ratings, dimensions, mounting, material, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, lenses, louvers, lamps, and controls.
3. When catalog data and/or shop drawings for fluorescent fixtures are submitted for approval, photometric data from an independent testing laboratory shall be included with the submittal, indicating average brightness and efficiency of the fixture. Coefficient of utilization data will not be considered a suitable substitute.

1.04. APPLICABLE PUBLICATIONS

The following specifications and standards, except as hereinafter modified, are incorporated herein by reference and form a part of this specification to the extent indicated by the references thereto. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date of Invitation for Bids shall be applicable. In text such specifications and standards are referred to by basic designation only.

A. American National Standards Institute (ANSI):

1. C-81 - Electric Lamp Bases and Holders
2. C-82 - Lamp Ballasts

B. Certified Ballast Manufacturers Association (CBM):

1. Requirements for Ballast Certification.

- C. National Fire Protection Association (NFPA):
 - 1. No. 70 - National Electrical Code (NEC)
 - D. Underwriters Laboratories, Inc. (UL):
 - 1. No. 57 - Electric Lighting Fixtures
 - 2. No. 496 - Edison-Base Lampholders
 - 3. No. 542 - Lampholders, Starters, and Starter Holders for Fluorescent Lamps
2. PRODUCTS
- 2.01 LIGHTING FIXTURES
- A. Shall be as called out on the drawing fixture schedule and any detail drawings.
 - B. Sheet Metal:
 - 1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved), and parallel to each other as designed.
 - 2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
 - 3. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner.
 - 4. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, and latches shall function easily by finger action without the use of tools.
 - C. Ballasts shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.
 - D. Lamp Sockets:
 - 1. Fluorescent:
 - a. Lampholder contacts shall be the biting edge type or phosphorous-bronze with silver flash contact surface type and shall conform to the applicable requirements of UL 542 and ANSI C-81.
 - b. Contacts for recessed double contact lampholders and for slimline lampholders shall be silver plated.
 - c. Lampholders for bi-pin lamps, with the exception of those for "U" type lamps, shall be of the telescoping compression type, or of the single slot entry type requiring a one-quarter turn of the lamp after insertion.
 - 2. Incandescent:
 - a. Shall have porcelain enclosures and conform to the applicable requirements of UL 496.

- E. Recessed incandescent fixtures mounted in an insulated ceiling shall be listed for use in insulated ceilings.
- F. Fluorescent fixtures with louvers or light transmitting panels shall have hinges, latches and safety catches to facilitate safe, convenient cleaning and relamping.
- G. Vaportight Fluorescent fixtures shall have pressure clamping devices in lieu of the latches.
- H. Mechanical Safety: Lighting Fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by screws, chains, captive hinges or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
- I. Metal Finishes:
 - 1. The manufacturer shall apply his standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking.
 - 2. Interior light reflecting finishes shall be white with not less than 85 percent reflectances, except where otherwise shown on the drawing.
 - 3. Exterior finishes shall be as shown on the drawings.
- J. Ballasts for fluorescent fixtures shall be operated by electronic high-frequency type ballasts.
 - 1. UL listed, CBM approved, Class protected.
 - 2. High power factor type, with less than 10% THD.
 - 3. Same wiring connections as electromagnetic ballasts.
 - 4. Solid-state, discrete or integrated circuit type, with an output frequency of 20 kHz or higher.
 - 5. Certified as meeting FCC Part 18 for EMI.
 - 6. Capable of withstanding an ANI C62.41, category a waveshape without damage.
 - 7. Have a minimum starting temperature of 50⁰F.
 - 8. Acceptable Manufacturers:
 - a. Advance
 - b. EBT
 - c. Magnetek
 - d. Motorola
 - e. Valmont

9. Ballasts for lighting fixtures controlled by dimming devices shall conform to the recommendations of the manufacturer of the associated dimming devices to assure satisfactory operation of the lighting systems, and shall be the product of one manufacturer.
 10. All ballasts serving straight or "U" type lamps, nominal three feet (socket to socket) or longer in tube length, shall be mounted by four non-turning studs (or captive bolts) equipped with lockwashers and nuts or locking type nuts, or by four thread cutting (TC) sheet metal screws which are firmly secured against the fixture body (or wireway) to maximize dissipation of heat and minimize noise. Exception: high frequency electronic ballast may be mounted at a minimum of two points, one at each end of unit.
 11. Ballasts shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.
 12. To facilitate multi-level lamp switching, lamps within fixture shall be wired with the outermost lamp at both sides of the fixture on the same ballast, the next inward pair on another ballast and so on to the innermost lamp (or pair of lamps). Within a given room, each switch shall uniformly control the same corresponding lamp (or lamp pairs) in all fixture units that are being controlled.
 13. Where three-lamp fixtures are indicated, unless switching arrangements dictate otherwise, utilize a common two-lamp ballast to operate the center lamp in pairs of adjacent units that are mounted in a continuous row. The ballast fixture and slave-lamp fixture shall be factory wired with leads or plug devices to facilitate this circuiting. Individually mounted fixtures and the odd fixture in a row shall utilize a single-lamp ballast for operation of the center lamp.
- K. Provide all lighting fixtures with a specific means for grounding their metallic wireways and housings to an equipment grounding conductor.
- L. Lighting Transmitting Components for Fluorescent Fixtures:
1. Shall be 100 percent virgin acrylic plastic or water white, annealed, crystal glass.
 2. Flat lens panels shall have not less than 1/8-inch of average thickness. The average thickness shall be determined by adding the maximum thickness to the minimum unpenetrated thickness and dividing the sum by 2.
 3. Unless otherwise specified lenses and diffusers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction of the lens without distortion or cracking.
- M. Lighting Fixtures in Hazardous Areas: Fixtures shall be suitable for installation in flammable atmospheres (Class and Group) as defined in the NEC.
- N. Fluorescent Inverter Ballasts
1. Inverter ballasts for Emergency Egress lighting shall be capable of operating a minimum of two 32 watt lamps for 90 minutes of operation.
 2. Inverter ballasts for Emergency Egress lighting shall be wired to operate two lamps so that a single failure of a lamp shall not prevent egress lighting.

3. Manufacturer of inverter ballasts shall be base fixture Manufacturer's recommended supplier. Where no recommendation is made, inverter ballasts shall be those units manufactured under the name Bodine.
 4. Inverter ballast shall be provided with test switch and charging indicator lamp compatible with base fixture, and providing for charging status verification and testing of inverter ballast without disassembly of the fixture.
- O. Exit Lights shall be equipped with "self-powered" Emergency Egress battery and chargers.

3. EXECUTION

3.01. INSTALLATION

- A. Installation shall be in accordance with the NEC in general, specifically article 410, and as shown on the drawings.
- B. Align, mount and level the lighting fixtures uniformly.
- C. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, contact the Architect/Engineer for resolution in accordance with Section 1 specifications.
- D. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings, or where not shown shall be a minimum of 96 inches.
- E. Lighting Fixture Supports:
 1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
 2. Shall maintain the fixture positions after cleaning and relamping.
 3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
 4. Hardware for recessed fluorescent fixtures:
 - a. Where the suspended ceiling system is supported at the four corners of the fixture opening, hardware devices shall clamp the fixture to the ceiling system structural members, or plaster frame at not less than four points in such a manner as to resist spreading of the support members and safely lock the fixture into the ceiling system.
 - b. Where the suspended ceiling system is not supported at the four corners of the fixture opening, hardware devices shall independently support the fixture from the building structure at four points.
 5. Hardware for surface mounting fluorescent fixtures to suspended ceilings:

- a. In addition to being secured to any required outlet box, fixtures shall be bolted to a grid ceiling system at four points spaced near the corners of each fixture. The bolts shall be not less than 1/4-inch secured to channel members attached to and spanning the tops of the ceiling structural grid members. Non-turning studs may be attached to the ceiling structural grid members or spanning channels by special clips designed for the purpose, provided they lock into place and require simple tools for removal.
 - b. In addition to being secured to any required outlet box, fixtures shall be bolted to a plaster ceiling at four points spaced near the corners of each fixture. Pre-positioned 1/4-inch studs or threaded plaster inserts secured to ceiling structural members shall be used to bolt the fixtures to the ceiling. In lieu of the above, 1/4-inch toggle bolts may be used on new or existing ceiling provided the plaster and lath can safely support the fixtures without sagging or cracking.
- F. Completely lamp each new lighting fixture installed in accordance with following requirements:
1. Fluorescent Lamps:
 - a. Size, Shape, and Wattage as listed in Fixture Schedule.
 - b. Fluorescent lamps to have 3500 K color temperature and minimum 80 CRI.
 - c. 4-foot lamps to be T8 size unless noted otherwise.
 - d. All lamps by same manufacturer.
 - e. All lamps in similar locations shall have same color temperature and CRI.
 2. Acceptable Manufacturers:
 - a. General Electric.
 - b. Philips.
 - c. Sylvania/Osram.
 2. Incandescent lamps shall be the general service, inside frosted type rated 125 volts except where otherwise shown on the drawings.
- G. Contractor shall coordinate between the electrical and ceiling trades to ascertain approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.

END 16510.