## SECTION 16500 - PROVISIONAL

## LIGHTING

***Provisional Specification Summary:***
*1.1.01 thru 1.1.04 - Add sections as shown below.*
*1.3.01 thru 1.3.02 - Add sections as shown below.*
*1.5 thru 1.9.03 - Add sections as shown below.*
*2.4 thru 2.9.02 - Add sections as shown below.*
*3.3 thru 3.3.20 - Add sections as shown below.*

## PART 1 - GENERAL

1.1.01 The Contractor shall furnish and install all lighting fixtures, labor, and material, in accordance with the preceding Specifications, the requirements of this Section, and as shown on Project Drawings.

1.1.02 Lighting shall be in accordance with the latest requirements of the Illuminating Engineering Society, and all lighting fixtures shall have the Underwriters Laboratories, Inc. label of approval.

1.1.03 All wiring shall be placed in conduit and shall comply with the Specifications for conduit, outlet boxes, pull and junction boxes, wires and cables, grounding, and other Sections as set forth in these Specifications and as noted herein.

1.1.04 Related Sections:

1.1.04.01 Section 16050, Electrical General Requirements.

1.1.04.02 Section 16120, Wires and Cables 600 Volt and Less.

1.1.04.03 Section 16420, Underground Electrical Services.

1.1.04.04 Section 16450, Grounding Systems

1.3.01 The Contractor shall obtain from the equipment manufacturers and submit the following In accordance with the procedures and requirements set forth in the General Conditions and Section 01080, Project Submittals:

1.3.01.01 Manufacturer data sheets including photometric data.

1.3.01.02 Operation and Maintenance Manuals.

1.3.01.03 Spare Lamps and Parts Lists

1.3.01.04 Special Tools List

1.3.01.05 Reports of Certified Shop Tests

1.3.02 Each submittal shall be identified by the applicable specification section.

1.5 TESTING

1.5.01 All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1.5.01.01 Certified Shop Tests: The lighting fixtures shall be given routine factory tests in accordance with the requirement of ANSI, NEMA and Underwriters Laboratories standards.

1.5.01.02 Field Tests: Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and Section 16050, Electrical General Requirements.

1.6 SHOP DRAWINGS

1.6.01 Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

1.6.02 Partial, incomplete or illegible submittals will be returned to the Contractor for resubmittal without review.

1.6.03 Shop drawings shall include but not be limited to:

Lighting fixture specifications and product data sheets.

Catalog cuts for each fixture type showing performance and construction details of standard fixtures, and complete working drawings showing all proposed construction details of special or modified standard fixtures.

Photometric curves.

Lamp data.

Ballast information.

Catalog data including applicable coefficients of utilization tables, isolux chart of illumination on a horizontal plane, beam efficiency, horizontal and vertical beam spread, and beam lumens.

Pole calculations.

1.6.04 Shop drawings shall be submitted to the Contracting Officer for review and acceptance for all fixtures before fixtures and poles are manufactured. Substitutions will be permitted only if acceptable to the Contracting Officer.

1.6.05 Manufacturer's catalog number and description in the fixture schedule on the Contract Drawings establishes a level of quality, style, finish, etc. The use of a catalog number describing the various types of fixtures shall be used as a guide only, and does not exclude all the required accessories or hardware that may be required for a complete installation.

1.7 OPERATION AND MAINTENANCE MANUALS

1.7.01 The Contractor shall submit Operation and Maintenance Manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

1.8 TOOLS, SUPPLIES AND SPARE PARTS

1.8.01 The light fixtures shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment.

1.8.02 The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

1.8.03 Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to the Owner.

1.8.04 Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

1.8.05 Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts that are identical for more than one size shall have the same parts number.

1.9 LIGHTING CONTROLS

1.9.01 The lighting systems shall be controlled as specified herein and indicated on the Drawings.

1.9.02 Lighting contactors shall be furnished and installed for specific lighting control applications as specified herein and indicated on the Drawings.

1.9.03 Exterior lighting shall be controlled by photocell and a three way Manual-Off-Auto switch to bypass the photocell for testing and maintenance of the light fixtures. The photocell shall be fail off mode type.

## PART 2 – PRODUCTS

2.4 MANUFACTURERS

2.4.01 The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.4.02 Lighting contactors shall be as manufactured by Cutler-Hammer/Westinghouse Electric Corporation, Square D Company, or General Electric Company. Lighting contactors shall be heavy duty industrial type with 25A minimum rating, shall have coils with voltages as shown, and shall have the number of contacts required. Contactors shall be housed in enclosures with NEMA rating to match the environment. Contactor ampere rating shall be as required to suit the application. Contactors shall be the electrically held type. Any auxiliary relays, or other devices required for proper operation shall be included.

2.5 FIXTURES

2.5.01 Each fixture shall bear the Underwriters Laboratories, Inc. label. All lighting fixtures shall be furnished complete with lamps of the size and type as indicated on the Drawings and all fittings and hardware necessary for a complete installation. Lighting

fixtures shall have all parts and fittings necessary to completely and properly install the fixtures.

2.5.02 Fixture leads shall be as required by NEC and shall be grounded by the conduit connection to the fixture.

2.5.03 All glassware shall be high quality, homogeneous in texture, uniform in quality, free from defects, of uniform thickness throughout, and properly annealed. Edges shall be well rounded and free from chips or rough edges.

2.5.04 Fluorescent fixtures shall be complete with housing, louvers (if required), accessories and starters of the types and quantities specified herein and indicated on the Drawings.

2.5.05 Fixtures shall be as specified in the fixture schedule indicated on the drawings.

2.6 BALLASTS

2.6.01 Where available, ballasts shall be as manufactured by the fixture manufacturer. Ballasts for fluorescent fixtures shall be programmable start, high efficiency and high power factor, with certification by ETL, CBM and Underwriters Laboratories, Inc. Ballasts shall have copper windings. All ballasts for indoor fluorescent fixtures shall be equipped with an internal, thermally actuated automatic reclosing protection device. Ballasts shall be guaranteed against service failure for a period of two (2) years. Ballasts shall be rated "Class P" to agree with requirements of 410-73 (e) and other applicable articles of the NEC, to conform to the time schedule for this requirement, and shall be Class A sound rated.

2.6.02 Ballasts for HID fixtures shall have copper windings and shall be high power factor, constant wattage autotransformer (CWA) (i.e. lead type for high pressure sodium or peak lead type for metal halide), or constant wattage (CW) with certification by ETL, CBM and Underwriters Laboratories, Inc. All ballasts for HID fixtures shall be Class "H" insulated, encapsulated for quiet operation, and shall have an integral thermal protector.

2.6.03 All outdoor fixtures and fixtures located in unheated areas shall be furnished and installed with ballasts rated for outdoor installation.

2.6.04 Fixtures shown or specified to be controlled by dimmers shall be furnished with suitable dimming ballasts.

2.6.05 Ballasts shall be as manufactured by Advance, or Universal.

2.7 LAMPS

2.7.01 The Contractor shall furnish and install lamps in all fixtures. Lamps shall be of the following types:

2.7.01.01 Fluorescent: Rapid-Start With extra long life features by using rapid start programmable ballast.

2.7.01.02 HID: High Pressure Sodium, Metal Halide

2.7.01.03 Incandescent: 120 volt

2.7.02 Lamps shall be as manufactured by General Electric Company, Sylvania Lighting Equipment, or Phillips Lighting Company.

2.8 PHOTOCELLS

2.8.01 Photocells shall be as manufactured by Tork 5300 series, fail off mode type.

2.9 POLES

2.9.01 Poles shall be designed to withstand calculated wind force due to 100 mph winds with a 1.3 gust factor without structural damage.

2.9.02 Poles shall be as manufactured by Holophane or Lithonia.

## PART 3 - EXECUTION

### 3.3 INSTALLATION

3.3.01 Lighting fixtures shall be located symmetrically with building lines as shown on the Drawings. The Contractor shall furnish and install the lighting fixtures to allow "convenient" access for maintenance such as cleaning, relamping, and other activities. The fixtures shall be installed to be accessed by a 16 ft. ladder unless otherwise noted on the drawing. Where fixtures are shown in locations on the Drawings where maintenance would be difficult, the Contractor shall notify the Contracting Officer for direction.

3.3.02 The Contractor shall provide and install all inserts, conduit, structural supports as required, lamps, ballasts, poles, wiring, and any other items required for a complete system. Contractor shall properly adjust and test, to the satisfaction of the Contracting

Officer, the entire lighting system. The Contractor shall provide pigtails and flexible conduit connected to an outlet box where necessary or required resulting in a neat and complete installation.

3.3.03 The Contractor shall protect all fixtures at all times from damage, dirt, dust, and the like. Before final acceptance, all fixtures and devices shall be cleaned of all dust, dirt or other material, be fully re-lamped and in operating condition to the satisfaction of the Contracting Officer.

3.3.04 Circuiting shall be as shown on Project Drawings and as follows:

3.3.04.01 Voltage drop of the remote lighting fixture shall be limited to 2 percent.

3.3.05 The Contractor shall furnish and install all pendant trapezes and pendant stem hangers with durable swivel or equivalent trapeze hanger permitting normal fixture motion and self-alignment. Fixture pendants shall be Appleton Type UNJ ball type flexible hanger at the fixture and supports from an Appleton JBLX junction box with JBLX hub cover, or equal. Pendant lengths shall be adequate and adjusted to provide uniformity of installation heights above the reference datum. Stems shall be one-piece, with matching canopies and fittings.

3.3.06 Fixtures located on the exterior of the building shall be provided with neoprene gasket and non-ferrous metal screws finished to match the fixtures.

3.3.07 The finish or exposed metal parts of lighting fixtures and finish trims of all recessed lighting fixtures shall be as directed by the Contracting Officer.

3.3.08 The Contractor shall furnish and install recessed fixtures with a separate junction box concealed and located as to be accessible when fixture is removed.

3.3.09 The Contractor shall furnish and install all boxes for lighting fixtures such that the box is not the sole support of the fixture. The boxes shall be offset to allow maintenance such that access to wiring within the box can be attained without having to consider supporting (holding) the fixture.

3.3.10 All lighting units, when installed, shall be set true and be free of light leaks, warps, dents, and other irregularities. All hangers, cables, supports, channels, and brackets of all kinds for safely erecting this equipment in place, shall be furnished and erected in place by the Contractor.

3.3.11 The Contractor shall install fixtures at mounting heights indicated on the Drawings or as instructed by the Contracting Officer. In areas with exposed ducts and/or

piping, installation of lighting fixtures shall be adapted to field conditions as determined by the Contracting Officer.

3.3.12 The Contractor shall support each fixture securely. Each fluorescent fixture shall be secured to the building structure. The Contractor shall not secure fixtures to the work of other trades, unless specified or noted otherwise, and shall not support fixtures to plaster. The Contractor shall furnish and install all steel members and supports as required to fasten and suspended fixtures from the structure.

3.3.13 In all mechanical equipment areas, the Contractor shall install lighting fixtures on the ceiling after all piping and equipment therein has been installed. Exact locations for such fixtures may be determined by the Contracting Officer on the site during the course of the work.

3.3.14 Upon completion of work, and after the building area is broom clean, all fixtures shall be made clean and free of dust and all other foreign matter both on visible surfaces, and on surfaces that affect the lighting performance of the fixture including diffusers, lenses, louvers, reflectors, and lamps.

3.3.15 All fixtures that require physical adjustment shall be so adjusted in accordance with the directions of the Contracting Officer. The Contractor shall also adjust angular direction of fixtures and/or lamps, as directed.

3.3.16 Relamping access shall require no special tools. All optical control surfaces such as lenses and reflectors shall be safely and securely attached to fixtures and shall be easily and quickly removed and replaced for cleaning without the use of tools. No fixture part that may be removed, for maintenance, shall be held in place by metal tabs that must be bent to remove said part.

3.3.17 Pole mounted fixtures shall be mounted on poles as designated in the fixture schedule or as indicated on the Drawings. All metal poles shall be bonded to the plant grounding system. Poles shall have adequate handholes and weatherproof receptacles where indicated. All anchor bolts and nuts shall be stainless steel.

3.3.18 The Contractor shall furnish and install a concrete foundation for the pole mounted fixtures as indicated on the Drawings and as required. Foundation shall be approved by a professional structural Contracting Officer. Pole structure/foundation shall be able to handle fixture/pole weight and withstand wind velocity of up to 100 MPH with a 1.3 gust factor. Provide calculations for review.

3.3.19 The Contractor shall furnish and install switches as indicated on the Drawings. Switches shall be single pole, double pole, 3-way, or 4-way as indicated on the

Drawings and as required. Switches located outdoors or in wet indoor locations shall be installed in cast boxes complete with yellow, fiberglass weatherproof covers.

3.3.20 The Contractor shall furnish and install time switches and photocells as specified herein or indicated on the Drawings. Time switches shall be provided with a manual bypass switch controlling the lights locally and remotely. Time switches and photocells shall control lighting contactors, relays, or direct controlling of one, two, or three lighting circuits, as indicated. The Contractor shall furnish and install photocells as specified herein or indicated on the Drawings for automatic "ON/OFF" switching of outdoor lighting.

End of Provisional Section

THIS PAGE LEFT INTENTIONALLY BLANK