SECTION 16510 - LIGHTING FIXTURES

1.0 GENERAL

1.1 DRAWINGS AND GENERAL PROVISIONS OF CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION-1 SPECIFICATION SECTIONS, APPLY TO WORK OF THIS SECTION.

1.2 DIVISION-16 BASIC ELECTRICAL MATERIALS AND METHODS SECTIONS APPLY TO WORK OF THIS SECTION.

1.3 SUBMITTALS:

1.3.1 SUBMIT IN BROCHURE FORM, CATALOG SHEET OR CUTS OF ALL LIGHTING FIXTURES. MARK EACH SHEET TO MATCH "TYPE" NUMBER AS SPECIFIED IN FIXTURE SCHEDULE ON THE DRAWINGS. FABRICATE NO FIXTURES UNTIL APPROVAL OF SUBMITTALS AND CATALOG CUTS HAVE BEEN MADE. PROVIDE DETAILED MANUFACTURER'S SPECIFICATION INFORMATION ON ALL FIXTURE BALLAST LISTED BELOW. THE FOLLOWING ITEMS SHALL BE SUBMITTED:

A. FLUORESCENT LIGHTING FIXTURES.

B. FLUORESCENT LAMPS. INDICATE FIXTURES THE LAMPS WILL BE INSTALLED IN.

C. FLUORESCENT ENERGY-SAVER BALLAST WITH INPUT WATTAGE REQUIREMENTS. INDICATE WHICH FIXTURES THE BALLAST WILL BE INSTALLED IN.

D. FLUORESCENT ELECTRONIC BALLAST WITH INPUT WATTAGE REQUIREMENTS. INDICATE WHICH FIXTURES THE BALLAST WILL BE INSTALLED IN.

E. HIGH-INTENSITY-DISCHARGE (HID) LIGHTING FIXTURES.

F. HID BALLAST WITH INPUT WATTAGE REQUIREMENTS.

G. HPS LAMPS.

H. METAL-HALIDE LAMPS.

I. INCANDESCENT LIGHTING FIXTURES.

J. INCANDESCENT LAMPS.

K. LED EXIT LIGHTS

L. EMERGENCY LIGHTING FIXTURES

M. SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS.

1.3.2 FIXTURES DESCRIBED AND LISTED DO NOT INCLUDE ALL STEM HANGERS, FRAMES, ETC. PROVIDE LIGHTING FIXTURES OF TYPE AND QUALITY SPECIFIED WITH ALL ACCESSORIES AT EACH LOCATION.

1.3.3 PROVIDE LIGHTING FIXTURES COMPLETE WITH LAMPS, IN ACCORDANCE WITH THE FIXTURE SCHEDULE ON THE DRAWINGS.

1.4 SUBSTITUTIONS - PRIOR APPROVAL REQUIRED. SUBSTITUTIONS SHALL BE SUBMITTED TO THE ENGINEER 14 DAYS PRIOR TO BID FOR WRITTEN APPROVAL AS EQUAL.

2.0 PRODUCTS

2.1 ACCEPTABLE PRODUCERS: STANDARD BALLASTS PRODUCED BY ADVANCE, GENERAL ELECTRIC OR JEFFERSON, ELECTRONIC BALLAST BY EBT, MOTOROLA, UNIVERSAL, OR ADVANCE, AND LAMPS PRODUCED BY GENERAL ELECTRIC, WESTINGHOUSE OR SYLVANIA. SEE LIGHTING FIXTURE SCHEDULE ON THE DRAWINGS FOR PRODUCERS OF LIGHTING FIXTURES.

2.2 BALLASTS: FLUORESCENT BALLAST SHALL BE ENERGY SAVER TYPE AND SHALL HAVE CBM LABEL, ETL TEST, UL 935 LABEL, ANSI C82.1, AND BE "A" SOUND RATED, CLASS P, HIGH POWER FACTOR. BALLASTS SHALL BE COORDINATED WITH REQUIREMENTS OF THE FIXTURE AND LAMPS SPECIFIED. BALLASTS SHALL BE SERVICEABLE WHILE FIXTURES ARE IN THEIR NORMALLY INSTALLED POSITION AND SHALL NOT BE MOUNTED TO REMOVABLE REFLECTORS OR WIREWAY COVERS. FIXTURES AND BALLASTS SHALL BE DESIGNED AND CONSTRUCTED TO LIMIT THE BALLAST CASE TEMPERATURE TO 90 DEGREES CELSIUS (C) WHEN INSTALLED IN AN AMBIENT TEMPERATURE OF 40 DEGREES C. THREE LAMP FIXTURES SHALL BE PROVIDED WITH TWO BALLAST PER FIXTURE UNLESS NOTED OTHERWISE.

2.2.1 LOW TEMPERATURE FLUORESCENT BALLAST: PROVIDE FLUORESCENT BALLAST HAVING A MINIMUM STARTING TEMPERATURE OF ZERO DEGREES F IN FIXTURES MOUNTED IN OUTDOORS, IN UNHEATED BUILDINGS, AND AS INDICATED.

2.2.2 ENERGY-SAVINGS FLUORESCENT BALLAST: PROVIDE ENERGY-SAVINGS FLUORESCENT BALLASTS OF THE CBM CERTIFIED FULL LIGHT OUTPUT TYPE. THE BALLAST SHALL HAVE AN AVERAGE INPUT WATTAGE OF 72 OR LESS WHEN OPERATING TWO F32T8 LAMPS, 40 WATTS OR LESS WHEN OPERATING ONE F32T8 LAMP, OR 110 WATTS OR LESS WHEN OPERATING THREE F32T8 LAMPS TESTED IN ACCORDANCE WITH ANSI C82.2 METHODS.

2.2.3 FLUORESCENT SOLID-STATE BALLAST: PROVIDE ENERGY-SAVING, SOLID STATE (FULL IC) FLUORESCENT BALLAST OF THE FULL LIGHT OUTPUT TYPE. ELECTROMAGNETIC INTERFERENCE SHALL NOT BE GREATER THAN THAT ALLOWED BY THE FEC RR, PART 15, SUBPART J. THE BALLAST SHALL BE ABLE TO WITHSTAND VOLTAGE TRANSIENTS IN ACCORDANCE WITH IEEE C62.41, CATEGORY A, FOR NORMAL AND COMMON MODES. MINIMUM POWER FACTOR SHALL NOT BE LESS THAN 0.90. THE BALLAST SHALL OPERATE AT A FREQUENCY NOT LESS THAN 20,000 HERTZ. THE BALLAST THIRD HARMONIC CONTENT SHALL BE LESS THAN 33 PERCENT. THE BALLAST SHALL HAVE AN AVERAGE WATTAGE OF 59 WHEN OPERATING TWO F32T8 LAMPS, OR 90 WHEN OPERATING THREE F32T8 LAMPS TESTED IN ACCORDANCE WITH ANSI C82.2 METHODS. BALLAST SHALL BE COMPATIBLE FOR USE WITH ENERGY-SAVINGS LAMPS. BALLAST SHALL BE PRODUCED IN THE UNITED STATES OF AMERICA.

2.2.4 HID BALLAST: SHALL BE CONSTANT WATTAGE AUTOTRANSFORMER (CWA) OR REGULATOR, HIGH POWER FACTOR TYPE WITH UL 1029 AND ANSI C82.4 LISTINGS. PROVIDE SINGLE-LAMP BALLAST WHICH SHALL HAVE A MINIMUM STARTING TEMPERATURE OF MINUS 30 DEGREES C. BALLAST SHALL BE:

A. DESIGNED TO OPERATE ON THE VOLTAGE SYSTEM TO WHICH THEY ARE CONNECTED.

B. DESIGNED FOR INSTALLATION IN A NOMINAL AMBIENT TEMPERATURE OF 40 DEGREES C.

C. CONSTRUCTED SO THAT THE OPEN CIRCUIT OPERATION WILL NOT REDUCE THE AVERAGE LIFE.

2.3 AUTOMATIC RESETTING THERMAL PROTECTORS: FURNISH WITH EACH FLUORESCENT BALLAST TO PROVIDE PROTECTION AGAINST COMPOUND DRIP, CAPACITOR LEAK AND END-OF-LIFE DAMAGE.

2.4 FUSES: FURNISH FUSE AND FUSE HOLDER FOR EACH HIGH INTENSITY DISCHARGE BALLAST.

2.5 FIXTURE WIRE: TYPE SF-1, SF-2, TF, TFF, TFN, TFFN OR OTHER APPROVED WIRE.

2.6 GASKET: PROVIDE GASKETS ON ALL LENSES TO PREVENT LIGHT LEAKS, UNLESS FIXTURE PROVIDED WITH MECHANICAL SEAL. PROVIDE GASKETS ON ALL FIXTURES LOCATED IN DAMP AND WET LOCATIONS TO PREVENT MOISTURE AND INSECTS INTO THE OPTICAL CHAMBER. GASKETS FOR INDOOR FIXTURES, IF REQUIRED, SHALL BE POLYETHER/POLYURETHANE. QU02-ET REED RUBBER PRODUCTS, INC. OR APPROVED EQUAL.

2.7 PLASTER FRAMES: FURNISH WITH ALL FIXTURES INSTALLED IN STUCCO OR PLASTER SURFACES.

2.8 PLASTIC ACCESSORIES: USE 100% CLEAR VIRGIN METHYL METHACRYLATE. LENSES SHALL BE MALE CONICAL PRISMATIC TYPE (A19), MINIMUM .156 INCH FOR ALL LENS TYPE FIXTURES.

2.9 LENSES AND DIFFUSERS: INCANDESCENT AND HIGH INTENSITY DISCHARGE FIXTURE LENSES AND DIFFUSERS SHALL BE TEMPERED GLASS, UNLESS SCHEDULED OTHERWISE.

2.10 LAMPS

2.10.1 FLUORESCENT LAMPS: PROVIDE THE NUMBER, TYPE, AND WATTAGE INDICATED. RAPID-START LAMPS (T8) SHALL BE RATED 32 WATTS, 2950 APPROXIMATE INITIAL LUMENS, 20,000 HOURS AVERAGE RATED LIFE, 3500K COLOR TEMPERATURE. COMPACT FLUORESCENT LAMPS SHALL BE RATED AS INDICATED WITH 10,000 HOURS AVERAGE RATED LIFE, COLOR TEMPERATURE SHALL BE 3500K UNLESS NOTED OTHERWISE. AVERAGE RATED LIFE IS BASED ON 3 HOURS OPERATING PER START. FLUORESCENT LAMPS SHALL BE GENERAL ELECTRIC WATT MISER II, SYLVANIA SUPER SAVER II, OR WESTINGHOUSE ECON-0-WATT II.

2.10.2 INCANDESCENT LAMPS: PROVIDE WITH INSIDE FROSTED, LONG LIFE UNLESS NOTED OTHERWISE. INCANDESCENT LAMPS SHALL BE RATED 130 VOLTS. HIGH INTENSITY DISCHARGE LAMPS SHALL BE AS NOTED ON THE FIXTURE SCHEDULE.

2.10.3 HPS LAMPS: HPS LAMPS: 35-WATT CONFORMING TO ANSI C78.1358, 50-WATT CONFORMING TO ANSI C78.1359, 70-WATT CONFORMING TO ANSI C78.1353, 100-WATT CONFORMING TO ANSI C78.1354, 150-WATT CONFORMING TO ANSI C78.1355, 250-WATT CONFORMING TO ANSI C78.1351, 400-WATT CONFORMING TO ANSI C78.1350, AND 1000-WATT CONFORMING TO ANSI C78.1352.

2.10.3 METAL-HALIDE LAMPS: LAMPS SHALL BE 175-WATT CONFORMING TO ANSI C78.1377,

400-WATT CONFORMING TO ANSI C78.1375, AND 1000-WATT CONFORMING TO ANSI C78.1376.

2.10.4 INCANDESCENT LAMPS: SHALL BE TUNGSTEN HALOGEN TYPE, 130 VOLT (SYLVANIA CAPSYLITE OR APPROVED EQUAL). PROVIDE THE NUMBER, TYPE, AND WATTAGE INDICATED. STANDARD INCANDESCENT LAMPS ARE NOT ACCEPTABLE. THIS TYPE LAMP SHALL ALSO BE PROVIDED FOR ALL PAR TYPE LAMPS.

2.11 LAMP SOCKETS:

2.11.1 FLUORESCENT: LAMPHOLDER CONTACTS SHALL BE THE BITING EDGE TYPE OR PHOSPHOROUS-BRONZE WITH SILVER FLASH CONTACT SURFACE TYPE. LAMPHOLDERS FOR BI-PIN LAMPS, WITH THE EXCEPTION OF THOSE FOR "U" TYPE LAMPS, SHALL BE OF THE TELESCOPING COMPRESSION TYPE, OR THE SINGLE SLOT ENTRY TYPE REQUIRING A ONE-QUARTER TURN OF THE LAMP AFTER INSERTION.

2.11.2 INCANDESCENT: LAMPHOLDER CONTACTS FOR INCANDESCENT LAMPS SHALL HAVE PORCELAIN ENCLOSURES.

2.11.3 HIGH INTENSITY DISCHARGE (HID): PROVIDE SOCKETS WITH PORCELAIN ENCLOSURES FOR HID TYPE LAMPS.

2.12 RECESSED AND FLUSH MOUNTED FIXTURES: PROVIDE TYPE THAT CAN BE RELAMPED FROM THE BOTTOM. ACCESS TO BALLAST SHALL BE FROM THE BOTTOM. TRIM FOR THE EXPOSED SURFACE OR FLUSH MOUNTED FIXTURES SHALL BE INDICATED.

2.13 SUSPENDED FIXTURES: PROVIDE HANGERS CAPABLE OF SUPPORTING TWICE THE COMBINED WEIGHT OF THE FIXTURES SUPPORTED BY THE HANGERS. PROVIDE SWIVEL HANGERS TO INSURE PLUMB INSTALLATION. HANGERS SHALL BE CADIUM-PLATED STEEL WITH A SWIVEL-BALL TAPPED FOR THE CONDUIT SIZE INDICTED. HANGERS SHALL ALLOW FIXTURES TO SWING WITHIN AN ANGLE OF 20 DEGREES. BRACE PENDANTS 4 FEET OR LONGER, WHERE NOTED, TO LIMIT SWINGING. SINGLE-UNIT SUSPENDED FLUORESCENT FIXTURES SHALL HAVE TWIN-STEM HANGERS. MULTIPLE-UNIT OR CONTINUOUS ROW FLUORESCENT FIXTURES SHALL HAVE A TUBING OR STEM FOR WIRING AT ONE POINT AND A TUBING OR ROD SUSPENSION PROVIDED FOR EACH UNIT LENGTH OF CHASSIS, INCLUDING ONE AT EACH END. RODS SHALL BE A MINIMUM OF 3/16-INCH DIAMETER.

2.14 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS

2.14.1 WIRES: ASTM A 853, GRADE 1010, ANNEALED, LIGHT ZINC-COATED FINISH, 0.1055 INCHES IN DIAMETER (12 GAUGE).

2.14.2 WIRES, FOR HUMID SPACES: ASTM A 580, COMPOSITION 302 OR 304, CONDITION ANNEALED STAINLESS STEEL OR FS QQ-N-281, CLASS A NICKEL-COPPER ALLOY, 0.1055 INCHES IN DIAMETER (12 GAUGE).

2.15 LIGHTING FIXTURES:

2.15.1 FLUORESCENT TROFFER TYPE: MAJOR STRUCTURAL PARTS TO BE FABRICATED FROM MINIMUM 22 GAUGE ELECTRO-PLATED, ZINC COATED STEEL, BONDERIZED FOR PAINT ADHESION AND RUST PREVENTION WITH FINISH COAT APPLIED AFTER FABRICATION, 1.4 TO 1.7 MIL THICK, WITH A MINIMUM REFLECTION FACTOR OF 85% AND MINIMUM EFFICIENCY OF 65%. DESIGN DOOR FRAMES AND LENS ASSEMBLIES TO ALLOW COMPLETE REMOVAL FOR CLEANING AND TO HOLD LENS SECURELY IN POSITION

WITHOUT LIGHT LEAKS. DO NOT USE SLOTTED SCREWS OR THUMB SCREWS TO LATCH DOOR. FINISH LATCHES FOR CORROSION RESISTANCE AND FABRICATE OF INCONSPICUOUS DESIGN FOR OPERATION WITHOUT TOOLS. DOOR SHALL HAVE MITERED CORNERS. FIXTURES USED IN THE CLASSROOM MUST BE APPROVED BY THE STATE OF FLORIDA FOR CLASSROOM USE.

2.15.2 LOUVERED TYPE: FABRICATE AS ABOVE EXCEPT PROVIDE SEMI-SPECULAR ALUMINUM LOUVERS.

2.15.3 INDUSTRIAL TYPE: DESIGN FOR INDIVIDUAL MOUNTING ON CHANNEL OF DIE-FORMED STEEL NOT LESS THAN 0.032" THICK AFTER FABRICATION. DESIGN CHANNEL TO INCREASE REFLECTOR STRENGTH AND HOUSE BALLAST. ARRANGE CHANNEL FOR STEM HANGERS. TREAT METAL WITH RUST INHIBITOR AFTER FABRICATION AND PRIOR TO FINISH COAT. PROVIDE BAKED ON ENAMEL FINISH.

3.0 EXECUTION

3.1 SET LIGHTING FIXTURES PLUMB, SQUARE, AND LEVEL WITH CEILING AND WALLS, IN ALIGNMENT WITH ADJACENT LIGHTING FIXTURES, AND SECURE IN ACCORDANCE WITH MANUFACTURERS' DIRECTIONS AND APPROVED DRAWINGS. THE INSTALLATION SHALL MEET WITH THE REQUIREMENTS OF NFPA 70. MOUNTING HEIGHTS SPECIFIED OR INDICATED SHALL BE TO BOTTOM OF FIXTURE FOR CEILING-MOUNTED FIXTURES AND TO CENTER OF FIXTURE FOR WALL-MOUNTED FIXTURES. OBTAIN APPROVAL OF THE EXACT MOUNTING FOR LIGHTING FIXTURES ON THE JOB BEFORE INSTALLATION IS COMMENCED AND, WHERE APPLICABLE, AFTER COORDINATING WITH THE TYPE, STYLE, AND PATTERN OF THE CEILING BEING INSTALLED. RECESSED AND SEMIRECESSED FIXTURES MAY BE SUPPORTED FROM SUSPENDED CEILING SUPPORT SYSTEM CEILING TEES IF THE CEILING SYSTEM SUPPORT WIRES ARE PROVIDED AT A MINIMUM OF FOUR WIRES PER FIXTURE AND LOCATED NOT MORE THAN 6 INCHES FROM EACH CORNER OF THE FIXTURE. ADDITIONALLY, FOR RECESSED FIXTURES, PROVIDE SUPPORT CLIPS SECURELY FASTENED TO CEILING GRID MEMBERS, A MINIMUM OF ONE AT OR NEAR EACH CORNER OF EACH FIXTURE. FOR ROUND FIXTURES OR FIXTURES SMALLER IN SIZE THAN THE CEILING GRID, PROVIDE A MINIMUM OF FOUR WIRES PER FIXTURE AND LOCATE AT EACH CORNER OF THE CEILING GRID IN WHICH THE FIXTURE IS LOCATED. DO NOT SUPPORT FIXTURES BY CEILING ACOUSTICAL PANELS. WHERE FIXTURES OF SIZES LESS THAN THE CEILING GRID ARE INDICTED TO BE CENTERED IN THE ACOUSTICAL PANEL, SUPPORT SUCH FIXTURES INDEPENDENTLY OR WITH AT LEAST TWO 3/4-INCH METAL CHANNELS SPANNING, AND SECURED TO THE CEILING TEES. PROVIDE WIRES FOR LIGHTING FIXTURE SUPPORT IN THIS SECTION.

3.2 WHERE A FIXTURE TYPE IS NOT DESIGNATED ON ELECTRICAL DRAWINGS, INSTALL THE FIXTURE TYPE USED IN A SIMILAR LOCATION.

3.3 LOCATE FIXTURES TO SUIT ARCHITECTURAL DETAIL OF AREA INVOLVED. WHERE LOCATED IN ACOUSTIC CEILINGS, COORDINATE PLACEMENT WITH ARCHITECTURAL REFLECTED CEILING PLAN, OR IF SUCH PLAN IS NOT AVAILABLE, OBTAIN APPROVAL OF FIXTURE LOCATION.

3.4 FIXTURE SCHEDULE ON THE DRAWINGS SHOWS TYPE OF FIXTURE REQUIRED. DETERMINE MODIFICATIONS TO MAKE FIXTURES SUITABLE FOR THE CEILINGS IN WHICH THEY ARE INSTALLED AND FURNISH FIXTURES ADAPTED TO CEILING.

3.4.1 THERE ARE MANY TYPE OF CEILING SYSTEMS AVAILABLE ON THE MARKET AND ANY NUMBER OF THESE CEILING SYSTEMS MAY BE USED AS PART OF THIS WORK. VERIFY

THE TYPES OF CEILING CONSTRUCTION BEFORE ORDERING FIXTURE FABRICATION. DETERMINE THAT SUSPENSION METHODS AND FLANGE ARRANGEMENTS FOR FIXTURES COORDINATE WITH CEILING TYPES AND THEIR SUSPENSION SYSTEMS.

3.5 EXIT AND EMERGENCY LIGHTS: WIRE EXIT AND EMERGENCY LIGHTS ON SEPARATE CIRCUITS AND SERVE FROM THE EMERGENCY PANEL "4EM". EMERGENCY LIGHTS SHALL BE CONTROLLED SUCH THAT FAILURE OF ANY LOCAL LIGHTING CIRCUIT WILL OPERATE EMERGENCY CIRCUITS ON THAT PARTICULAR CIRCUIT. LIGHTS SHALL HAVE ONLY ONE CONTROL, WHICH SHALL BE THE DISCONNECT SWITCH. DETERMINE EXACT INSCRIPTION FOR EXIT SIGNS.

3.6 INTERFERENCES: IN AREAS WHERE INDUSTRIAL TYPE FIXTURES ARE TO BE INSTALLED, SUCH AS EQUIPMENT ROOMS, FIXTURES WHICH ARE NEAR OBSTRUCTIONS SUCH AS DUCTS, LARGE PIPES, GROUPS OF PIPES, ETC., ARE TO BE SUSPENDED SO THAT BOTTOM OF THE FIXTURE IS NOT HIGHER THAN BOTTOM OF DUCT, ETC. DO NOT LOCATE OUTLETS UNTIL LOCATIONS OF THESE OBSTRUCTIONS ARE DETERMINED. INSTALL CONDUITS AND OUTLETS EXPOSED TO INSURE ACCESSIBILITY.

3.7 PROTECT ALL FIXTURES AND LAMPS AND REPLACE BROKEN PARTS INCLUDING THOSE FOR TEMPORARY LIGHTING SYSTEM.

3.8 CLEAN ALL LENSES AND LOUVERS AFTER ALL OTHER TRADES HAVE COMPLETED THEIR WORK IN EACH AREA; OR DO NOT INSTALL LENSES AND LOUVERS BEFORE THAT TIME.

END OF SECTION