

16511 LIGHTING FIXTURES AND LAMPS

SPECIFIER:

CSI MasterFormat 2004 number: 26 51 00

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Provide all labor, materials, equipment and services necessary to complete the lighting fixture installation work, and as indicated on the drawings and as specified herein.
- B. All materials shall be listed by an OSHA approved National Recognized Testing Laboratory (NRTL).
- C. Related Sections:
 - 1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
 - 2. 09510 - Acoustical Ceilings.
 - 3. 16112 - Raceways and Conduits.
 - 4. 16120 - Wire and Cable.

1.2 SYSTEM DESCRIPTION

- A. Explosion-proof, shielded, and vapor tight and wet location fixtures shall bear a NRTL label appropriate for the type of application.

1.3 SUBMITTALS

- A. Submit, shop drawings, manufacturer's literature and technical product data as required.
- B. Shop drawings shall include but not be limited to:
 - 1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all luminaires including finished, metal thickness, fabrication methods, support method, ballasts, sockets type of shielding, reflectors, provisions for re-lamping and all other information to show compliance with the Contract Documents.
 - 2. Submit shop drawings and samples as requested of luminaires for approval before fabrication. Luminaire details may vary slightly from those shown on drawings provided the changes do not adversely affect size of installation, durability of luminaire, luminaire performance or appearance. Submitted samples may be subjected to photometric testing at an independent testing laboratory, refer to Section 01330, "Submittals".
- C. Furnish certified photometric data for every fixture specified.
- D. Upon request, a sample of each fixture proposed for every use and specified unit shall be submitted to the A/E for review.

- E. Lighting calculations shall comply with Florida Building Code (FBC) and IES minimum foot-candle level when required.

1.4 QUALITY ASSURANCE

- A. Materials, equipment and appurtenances as well as workmanship provided under this section shall conform to the highest commercial standard and as specified and as indicated on drawings. Luminaire parts and components not specifically identified or indicated: made of materials most appropriate for their use or function and as such resistant to corrosion, thermal, and mechanical stresses encountered in the normal application and functioning of the luminaires.
- B. All cast parts, including die-cast members: of uniform quality, free from blow holes, pores, hard spots, shrinkage defects, cracks or other imperfections that affect strength and appearance, or are indicative of inferior metals or alloys. Exterior surfaces, which do not otherwise receive a finishing coating: machined, sanded or similarly treated areas, such as extruded metal parts. All such finished castings: given a minimum of one coat of baked-on clear methacrylate lacquer unless a painted finish is specified.
- C. Comply with Florida Building Code (FBC).
- D. Luminaries and components shall be built under provisions of the N.E.C.

PART 2 PRODUCTS

2.1 EQUIPMENT

- A. Fixtures in student occupied areas and where food is prepared or consumed, shall be provided with solid lenses. Exposed lamps of any type are not allowed in these areas.
- B. Surface mounted fixtures in student areas or outdoors shall be vandal resistant, with 10-year lens warranty. Fixture bases shall be metal and fastened to mounting locations with metal components.
- C. Exterior fixture shall be of aluminum or plastic construction.
- D. Lighting Fixtures:
 - 1. Provide lighting fixtures as indicated on the drawings and as specified.
 - 2. The schedule and details of lighting fixtures, appearing on the drawings, indicate the type, construction, appearance, quality and performance of the fixtures required.
 - a. Any proposed deviation from the fixtures specified requires the proposed substitute product be listed in the latest FPL Commercial/Industrial Lighting Approved Products.
 - b. Any proposed deviation from the fixtures specified shall equal or be superior to the item specified under these headings.
 - c. Proposed substitute lighting fixtures will be judged on overall quality on construction.
 - d. Provide 120V working sample of proposed substitution with cord, plug, and lamp.

- e. The fixture manufacturers products scheduled are considered acceptable, based on the equivalency of individual units as determined by the A/E.
3. Materials used in the manufacture of fixtures shall be new and the best of their respective kind, and shall be formed and assembled in a neat, accurate, and professional manner.
- a. Sheet metal shall be of sufficient thickness or shall be ribbed, flanged, or otherwise reinforced so that lighting fixtures and their component parts will withstand the stresses of normal handling and installation and service without undue distortion of shape.
 - b. Plastering or other installation procedures shall not be relied on to reinforce lighting fixtures or their component parts.
 - c. Fixture bases shall be metal and fastened to mounting location with metal components.

NOTE TO SPECIFIER: Modify the following paragraph to list specific areas requiring impact resistant light fixtures. Coordinate with the Light Fixture Schedule.

- d. Lighting fixtures in gymnasium areas shall have solid, protective lenses and be impact resistant or have protective covers, with 10-year lens warranty.
4. Finishes:
- a. Painted steel sheet shall be processed with Bonderize or equal phosphate treatment or shall be Paintlok or Galvanneal.
 - b. Unpainted sheet steel shall be Galvanneal, by Republic Steel or accepted equivalent.
 - c. Springs shall be of full hard temper stainless steel.
 - d. Fasteners of ferrous metal shall be cadmium plated or zinc plated with chromate.
 - e. Screws mounting fixture housing in plaster ring shall be minimum #8, pointed to facilitate installation.
 - f. Plaster frame rings shall be of sufficient strength to withstand deformation during installation, and of suitable materials or finish to prevent corrosion from ceiling plasters and mortars.
 - 1) The contractor shall furnish the fixture manufacturer a complete list of fixtures that will be installed in acoustical plaster ceilings with types and quantities.
 - g. Painted finishes shall be baked epoxy, polyester powder coated, acrylic or accepted equivalent finish suitable for the service required including temperature and accepted by the A/E. Finish shall be applied after fabrication.
5. Fixtures shall be complete with canopies, suspensions of proper lengths, hickey, casing, sockets, holders, reflectors, hardware, and shall be completely wired and assembled. Each troffer shall have positive enclosed spring-loaded catches and safety hinges.
6. Furnish suitable plaster rings or plaster stops for fixtures set in plaster ceilings. Consult the "Finish Schedules" on drawings for locations and extent of plaster

ceilings. Coordinate the mounting methods of recessed fluorescent lighting fixtures with ceiling suspension system and ceiling trades.

7. Fluorescent and HID ballasts shall be low wattage, high efficiency 480, 277 volt, or 120 volt as noted on Drawings.
 - a. Linear fluorescent lamp ballasts shall be individually fused, hi-efficiency, programmed start, high power factor, non-PCB construction. Listed Class P, and a minimum power factor of 94%. Advance Optanium fluorescent ballast or accepted equivalent. Ballasts used outdoors shall be suitable for 32 degrees F. operation.
 - b. Provide electronic ballasts, with a Total Harmonic Distortion (THD) of not more than 15 percent and a 5-year manufacturer's warranty, for fluorescent fixtures compatible with 25-watt T-8 lamps.
 - c. Ballast sound rating shall be ASA "A" for fluorescent ballasts.
 - d. Provide emergency fluorescent fixtures with Type B-30 by Bodine or accepted equivalent where indicated.
 - e. HID electronic ballasts shall be capable of operating pulse start type lamps.

8. Lamp Holders
 - a. Fluorescent Lampholders shall be General Electric or Leviton.
 - b. Silicone-fiberglass insulated wire rated at 150 degrees or 200 degrees C. or Teflon-fiberglass insulated wire rated at 250 degrees C. shall be provided as required with recessed HID fixtures for connection of fixtures to adjacent boxes.
 - c. Medium and mogul screw base lampholders shall have porcelain bodies.
 - d. Screw-shell sockets shall be nickel plated and shall have spring contacts wherever possible
 - e. Lamp sockets: Rigidly and securely attached to luminaire enclosure or husk.
 - 1) Metallic vapor lamp sockets: Of heavy-duty heat-resistant porcelain type.
 - 2) Plastic or metal sheet sockets: Do not use unless specified.
 - 3) Fluorescent lamp sockets operating with an open circuit voltage in excess of 300 volts: Of the safety-type and open the supply circuit when the lamp is removed from the sockets.
 - f. Provide a positive device to assure proper axial alignment of lamps with asymmetric distribution when re-lamping.
 - 1) This device may be preset or adjustable as required by the specifications.
 - 2) Axial and angular lamp adjustments shall have provision for locking in adjusted position by hex head or hex socket bolts or nuts with special toothed washers that resist turning in both directions.
 - g. Fluorescent ballasts and lamp holders shall be readily and simply replaceable without demounting the fixture.
 - 1) Bottom and one side of ballast shall be in full contact with metallic fixture surfaces for maximum heat conductance.
 - 2) Exposed lamp fluorescent sockets shall be telescoping type or be provided with lamp support brackets.

NOTE TO SPECIFIER: The following subparagraph applies only to non-student areas.

- h. Exposed bare lamps fixtures shall be protected with wire guards. For HID lamps, consult with respective manufacturer for requirements of enclosure made of suitable material capable of withstanding the glass lamp particles if the outer jacket of the lamp bursts or shatters.

E. REFLECTORS

- 1. HID reflectors shall be fabricated from minimum 0.050 Alcoa #12 reflector sheet or accepted equivalent, free from forming lines and other visible imperfections.
 - a. Black anodized finish shall be minimum 0.001 thick guaranteed against fading and discoloration.
 - b. Plain anodized finish used indoors shall be Alcoa MI Alzak or accepted equivalent.
 - c. Plain anodized finish used outdoors shall be Alcoa SI Alzak with fixture protected with glass cover or other means.
- 2. Fluorescent Specular Reflectors: Specular reflectance shall be 86 percent minimum.
 - a. Concealed fluorescent specular reflectors shall be Alcoa MI Alzak finish or accepted equivalent.
 - b. Visible reflectors shall be Alcoa reflector sheet type 1 or accepted equivalent.
- 3. Reflectors and reflecting cones or baffles: fabricated from #12 aluminum reflector sheets, 0.57: (15 gage) or heavier, all absolutely free of any tooling marks including spinning lines, and free of any marks or indentations caused by riveting or other assembly techniques. No rivets, springs or other hardware will be visible after installation.
- 4. Reflectors and baffles: of first quality polished, buffed and anodized finish, "Alzak", and of specular finish color as selected by the A/E. Reflector and baffles: modified elliptical contour and produce no apparent brightness from nadir to 40 degrees above nadir, nor the lamp image nor any part of the lamp be visible from nadir to 40 degrees above nadir.
- 5. Submit samples of colored aluminum finished (black, brass, bronze, etc.) for approval before fabrication.

F. LENSES

- 1. Glass lenses for HID fixtures shall be borosilicate glass with maximum coefficient of expansion of 0.33×10^{-7} . Glass lenses for fluorescent fixtures shall be Corning Glass or accepted equivalent.
- 2. Plastic lenses and diffusers used on fluorescent or LED fixtures shall be 100 percent prime virgin acrylic KSH K-12 or accepted equivalent, minimum unpenetrated thickness of 0.125" and be furnished with anti-static treatment. Injection molded lenses shall be as manufactured by Holophane or accepted equivalent.
- 3. Exposed fixture housings or frames shall have a continuous smooth surface with no visible seams and a neat and finished quality appearance. Hinges and fastening devices shall be fully concealed unless otherwise specifically approved by the A/E.

4. The thickness of visible edges of mounting frames and rings at the ceiling line shall be between 0.035" and 0.050". Light leaks around trim frame or lens or between any of these are unacceptable.
5. Where fixture type is not indicated on drawings, fixture type used in similar locations shall be provided, as accepted by the A/E.
6. Components of the same type, size, rating, functional characteristics, and make of similar interior lighting fixtures shall be interchangeable.
7. Fixture stems shall be furnished by the manufacturer of the fixture specified or as shown on the drawings.
8. Fixtures for use outdoors or in wet areas shall be suitably gasketed to prevent access of moisture or insects into fixture or diffuser.
9. Metal parts of fixtures for use in damp locations, specified as requiring painting, shall be painted with suitable weather and moisture resistant paints exhibiting moisture resisting qualities equal to epoxy based coatings.
10. Aluminum parts of fixtures for use in damp locations specified as requiring an unpainted finish shall be anodized.

G. Lamps:

1. Provide lamps for lighting fixtures. Lamps shall be as specified and indicated on the drawings.
 - a. Provide electric lamps as shown on reviewed shop drawings plus 10 percent additional spare lamps of each type fixture to M-DCPS at project site upon substantial completion.
 - b. Lamps as specified for the individual luminaires or lighting equipment: provide in luminaires and lighting equipment leaving these completely lamped and in normal operating condition.
2. Linear fluorescent lamps shall be suitable to operate with specified ballasts on 277 or 120 volts, 60 Hertz supply as required, with the following requirements:
 - a. Wattage rating as shown on fixture schedule.
 - b. Lamp shall be programmed start energy saving type 25 watts T-8, with 2380 minimum initial lumen output, and a lumen maintenance 97%, by Philips Alto II or accepted equivalent.
 - c. Provide T-8 lamps with 4-foot lengths, whenever possible, and medium bi-pin bases, as shown on the drawings and fixture schedule.
 - d. Color: 4100 degrees Kelvin, 85 CRI with a rated life of 30,000 hours.
 - e. Fluorescent lamps shall have a mercury content less than 1.7 mg and TCLP compliant.
3. Compact fluorescent lamps shall be used for down lighting applications and shall be suitable to operate with specified ballasts on 277 volts or 120 volts, 60 hertz supply as required with the following requirements:
 - a. High power factor ballasts only.
 - b. Wattage rating and lamp type as shown on fixture schedule.
 - c. Color: 4100 degrees Kelvin, 85 CRI.
4. HID lamps shall be suitable to operate with specified ballasts on 480 volts, 277 volts or 120 volts, 60 hertz supply as required with the following requirements:

- a. Wattage ratings and lamp designation as shown on fixture schedule.
- b. Lamp base shall be mogul base, whenever possible.
- c. Metal halide lamps shall be phosphorous coated.
- d. HID lamps shall be pulse start type.

5. LED:

- a. Shall be Reduction of Hazardous Substance (RoHS) compliant, and shall comply with FCC 47 CFR Part 15, IES LM-79 & 80.
- b. Minimum CRI of 80 with a color temperature of 3000-3500°K for interior fixtures and 4000-4500°K for exterior fixtures, unless otherwise noted in the Contract Documents.
- c. Minimum rated life of 60,000 hours at 25°C ambient temperature.
- d. LED driver shall have a THD of <20% and a power factor of 0.95 or higher with integral short circuit, open circuit and overload protection.
- e. LED driver and LED module shall be accessible and replaceable from below.
- f. LED lighting fixtures shall be assembled in the USA with minimum 80% materials content from the USA.
- g. All LED fixtures located within instructional spaces shall have factory installed dimmable control modules built right into the fixture.
- h. LED fixtures shall be provided with a minimum 10-year warranty on entire fixture (all components).
- i. Approved LED fixtures:
 - 1) Size: 2'-0" x 2'-0": Model #ZR22 by Cree or other A/E approved equivalent by Lithonia or Kenall.
 - 2) Size 2'-0" x 4'-0": Model #ZR24 by Cree or other A/E approved equivalent by Lithonia or Kenall.
 - 3) At makeup mirrors in Stage dressing rooms: Provide linear-style LED fixtures mounted the full length along the left, top and right edges of the makeup mirror. LED fixtures shall be dimmable and shall be controlled by a wall-mounted LED dimmer switch. LED fixtures shall be as indicated in the Contract Documents and shall meet the following minimum requirements:
 - a) Input Voltage: 120V.
 - b) UL Listed.
 - c) Minimum 90 CRI.
 - d) Each fixture shall have a tampered proof, low-glare white-frosted diffuser.
 - e) Manufacturer: Model FMVTRL by Lithonia, or other A/E approved equivalent by Cree or Kenall.
 - 4) Other LED fixtures of size and type as indicated in Contract Documents: Fixtures shall be as manufactured by Cree, Lithonia or Kenall, and as approved by A/E.

H. BALLASTS

- 1. Linear fluorescent lamp ballasts shall be individually fused, hi-efficiency, programmed start, high power factor, non-PCB construction. Listed Class P, and a minimum power

factor of 94%. Advance Optanium fluorescent ballast or accepted equivalent. Ballasts used outdoors shall be suitable for 32 degrees F. operation.

2. Provide electronic ballasts for fluorescent fixtures compatible with 25-watt T-8 lamps and with a Total Harmonic Distortion (THD) of not more than 15 percent and a 5-year manufacturer's warranty.
3. Ballast sound rating shall be ASA "A" for fluorescent ballasts.
4. Provide emergency fluorescent fixtures with Type B-30 by Bodine or accepted equivalent where indicated.
5. HID Ballasts shall be constant wattage type.
6. Ballasts installed within each luminaire type shall be identical. Luminaire design, fabrication, and assembly of luminaire shall be such to prevent overheating or cycling of lamps and ballasts under all conditions.
7. All ballasts shall be multi-volt.
8. All ballasts used with motion sensors shall be program start.

2.2 MARKING OF LUMINAIRES

- A. Mark luminaires designed for voltages other than 110-125 volts circuits.

2.3 SOUND TRANSMISSION

- A. It is the intent of this Specification that sound transmission through the luminaire units, when spaced as indicated on drawings, shall be sufficiently attenuated to maintain speech privacy between adjoining spaces.

2.4 LUMINAIRE TRIMS

- A. Luminaires shall have finish trim designed for the following types of ceiling systems:

1. Tungstein Lamp when used as a back-up for HID Luminaires H.I.D. Luminaires:

<u>Ceiling Type</u>	<u>Trim Type</u>
a. Plaster	IR - Inside Reveal
b. Concrete	IR - Inside Reveal
c. Mineral Tile	OL - Overlap Trim
d. Drywall	OL - Overlap Trim
e. Metal Deck	OL - Overlap Trim

2. Fluorescent or LED Luminaires:

<u>Ceiling Type</u>	<u>Trim Type</u>
a. Plaster	F - Flanged with Plaster Frame
b. Metal pan	M - Modular - Fit-In
c. Mineral Tile	F - Flanged
d. Drywall	F - Flanged
e. Lay-In	G - Grid

- B. Each trim detail shall be as shown on the drawings, which are indicative of appearance and dimensional requirements. The manufacturer's trim finish and dimensions: subject to the approval of the A/E. Flush mounted ceiling trims for rectangular or square recessed luminaires shall include mitered corners continuously welded and smoothed before shop finish is applied. No lapping of trim metal is permitted.

- C. Trim of luminaires installed in metal shall match the color of that deck.

2.5 EXIT LIGHTS

- A. LED lamps shall have 6-inch red letters on white background.
- B. Field convertible mounting-end, back or top.
- C. Field convertible directional arrows.
- D. Each LED exit light shall have a total connected load of less than 2 watts.

2.6 LIGHTING CONTACTOR

- A. Electrically operated, mechanically held, double break silver alloy contacts. Fully rated for tungsten lamp loads, when used as a back-up for HID luminaires, fluorescent lamp loads and general use loads. Interrupting capacity: 300 percent of rated current. NEMA I enclosure except otherwise specified.
- B. As manufactured by: Asco-920RC, Square 'D' - Class 8903, General Electric - CR160MB, Westinghouse A202.

2.7 MODULAR RELAY PANEL

- A. Comply with UL 508 and UL 916; factory assembled with modular single pole relays, power supplies, and accessory components required for specified performance.
 - 1. Cabinet: Steel with hinged, locking door.
 - a. Barriers separate low-voltage and line-voltage components
 - b. Directory: Mounted on back of door. Identifies each relay as to load groups controlled and each programmed pilot device if any.
 - c. Control Power Supply: Transformer and full-wave rectifier with filtered dc output.
 - 2. Single-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type.
 - a. Low-Voltage Leads: Plug connector to the connector strip in cabinet and pilot light power where indicated.
 - b. Rated capacity (Mounted in Relay Panel): 20A, 125V AC for tungsten filaments; 20A, 277V AC for ballasts.
 - c. Endurance: 50,000 cycles at rated capacity.
 - d. Mounting: Provision for easy removal and installation in relay cabinet.

2.8 CLASSROOM LIGHTING CONTROL

- A. Provide a motion detector(s) in each teaching space.
- B. Sequence of Operations:

1. Overview: Classroom lighting is controlled by motion sensors in series with normal power wall toggle switches and relay override control of emergency power wall toggle switches for emergency lighting.
 - a. Normal Operations: When a person enters the classroom, the motion sensor energizes the normal power lighting circuit in the classroom. If the wall toggle switches are "ON", the normal power lighting fixtures will operate. If the wall toggle switches are "OFF", the normal power lighting fixtures will not operate until the switch is placed in the "ON" position. The emergency power lighting fixtures are controlled by a separate wall toggle switch for "ON" or "OFF".
 - b. Emergency Operation: In case of a loss of utility normal power, the emergency generator will operate (starts within 10 seconds) and provide limited power to emergency power light fixtures. The normal power light fixtures will not operate. The emergency power light fixtures are override controlled through a relay and will operate "ON", no matter what position its wall toggle switch is in.
 - c. Slide/Video Show Operation: The wall toggle switches would control the normal power and emergency power light fixtures to allow darkening of the classroom. In case of a loss of utility normal power, the emergency power light fixtures will operate "ON", no matter what position the wall toggle switch is in.
 - d. After Hours and Vacant Rooms: The motion sensor will de-energize all lighting circuits, no matter what position the wall toggle switches are in. The emergency power lighting fixtures will be energized upon loss of power and generator starts.

C. Motion sensors shall be installed following manufacturer's recommendations.

D. Motion sensors and their power packs must be of the same manufacturer.

E. Motion sensor failure shall leave lights on.

F. Motion sensors shall be provided with a 5-year warranty.

2.9 TIME SWITCHES (Allowed only when EMS is not available to perform the function)

A. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Circuitry: Allow connection of a photoelectric relay as a substitute for on-off function of a program.
2. Astronomic Time Clock capability.
3. Battery Backup: For schedules and time clock.

B. Electromechanical-Dial time switches:

1. Circuitry: Allow connection of a photoelectric relay as a substitute for on-off function of a program.
2. Astronomic time dial.
3. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

C. Description: Solid state, with dry contacts to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.

2.10 INDOOR PHOTOELECTRIC SWITCHES

- A. Ceiling Mounted Photoelectric Switch: Solid-State, light level sensor unit, with separate relay unit, to detect changes in lighting levels that are perceived by the eye.
 1. Sensor output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 2. Relay unit: Dry contacts rated for 20A ballast load at 120V and 277V, for 13A tungsten at 120V AC, and for 1hp at 120V AC. Power supply to sensor shall be 24V DC, 150mA, Class 2 power source as defined in NFPA 70.
 3. Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
 4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with dead-band adjustment.
 5. Indicator: Two LEDs to indicate the beginning of on-off cycles.

- B. Skylight Photoelectric Sensors: Solid state, light-level sensor; housed in a threaded, plastic fitting for mounting under skylight, facing up at skylight; with separate relay unit, to detect changes in lighting levels that are perceived by the eye.
 1. Sensor output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 2. Relay unit: Dry contacts rated for 20A ballast load at 120V and 277V, for 13A tungsten at 120V AC, and for 1hp at 120V AC. Power supply to sensor shall be 24V DC, 150mA, Class 2 power source as defined in NFPA 70.
 3. Light-Level Monitoring Range: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.
 4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with dead-band adjustment.
 5. Indicator: Two LEDs to indicate the beginning of on-off cycles.

2.11 ILLUMINANCE COMPUTER ANALYSIS

- A. Provide illuminance computer analysis for all indoor space.

- B. For indoor analysis the initial light loss factor shall be taken as the product of the voltage drop factor (0.97) times the ballast factor.

PART 3 EXECUTION

3.1 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

- A. Install fixtures according to manufacturer's recommendations and in compliance with the NEC.
- B. Install "Lay-In" type fixtures with 6-foot lengths of flexible conduit to enable fixture relocation with minimum inconvenience. Fixture shall be securely fastened to ceiling frame members by mechanical means as per the NEC.
- C. Luminaire locations as indicated on the drawings are generalized and approximate. Carefully verify future locations with architectural floor plans, reflected ceiling plans and other reference data prior to installation. Check for adequacy of headroom and non-interference with other equipment, such as ducts, pipes or openings
- D. Upon completion of the installation, the luminaires and lighting equipment must be in first class operating order and free from defects in condition and finish. At time of final inspection, all luminaires and equipment shall be fully lamped, and be complete with required lenses or diffusers, reflectors, side panels, louvers or other components necessary for the functioning of the luminaires. Luminaires and equipment shall be clean and free from dust, plaster or paint spots. Any reflectors, lenses, diffusers, side panels or other parts damaged prior to the final inspection shall be replaced by the Contractor.
- E. The housings of recessed luminaires shall be adequately protected during installation by internal blocking or framing to prevent distortion of sides or dislocation of threaded lugs which, upon completion, shall be in perfect alignment and match the corresponding holes in frames or rims. Holding screws shall be inserted freely without forcing and remain easily removable for servicing. Threads intended to receive holding screws shall be chased after plating and finished to ensure easy installation and removal of knurled headed screws.
- F. Housings shall be rigidly installed and adjusted to neat flush fit with the ceiling or other finished mounting surface. No light leaks will be permitted at the ceiling line or from any visible part or joints of the luminaires.
- G. Housings installed directly in concrete shall be fabricated of hot dip galvanized steel or cast aluminum. Where cast aluminum housings are used, provide two coats of asphaltum paint prior to installation.
- H. Provide 1/8 inch thick x 2 inch diameter solid neoprene grommets at every mounting point for all luminaires surface mounted to concrete structure to prevent direct contact of housing to concrete.
- I. Adjust all directional luminaires to obtain the most uniform distribution. Orient all similar luminaires consistently. Coordinate luminaires with speakers, air grilles, pipes and ductwork.
- J. Luminaire bottoms, edges and ends of rows shall be even. Rows shall be straight, aligned and equally spaced in distinct areas. Clean all luminaires of debris and fingerprints and adjust trim to fit surface snug.
- K. Provide all necessary hangers and mounting accessories for a complete installation.

- L. Locate the fluorescent luminaires in the equipment rooms to best illuminate the equipment installed. Use chains or rods to support below ducts and pipes as required. Install after pipes and ducts are in.
- M. Test all luminaires, switches and controls for operation. Replace all lamp burnouts if their estimated operating period is less than 80 percent rated lamp life prior to final acceptance.

3.3 Exit lights:

- A. Install wall or ceiling mounted as shown on drawings.
- B. Provide directional arrows required to show correct path to exit.
- C. Install exit lights at a location and height to ensure a clear line of sight from the egress passageway.
- D. Relocate exit lights that are not readily visible at no additional cost to M-DCPS.
- E. Internally illuminated exit signs shall have LED light source on normal power.

3.4 SUPPORTS

A. Fixture Supports:

- 1. Fixtures shall be supported according to manufacturer's recommendations and the NEC.
- 2. Where pendant fixtures are mounted in continuous rows, the number of hangers shall equal the number of 4-foot lengths, plus 1.
- 3. Do not support fixtures to plaster or gypsum board ceilings.
- 4. Furnish and install steel members and supports to fasten and suspend fixtures.

B. Install lighting fixtures on ceilings or walls of mechanical and electrical equipment rooms after piping, ductwork, and equipment are installed therein.

- 1. Exact location and switching for such fixtures will be determined at the job site during the work.
- 2. Fixtures shall be located to give maximum illumination to items of equipment requiring servicing and moving machinery.
- 3. Any lighting fixtures blocked, inaccessible or improperly located shall be relocated at no extra cost.
- 4. Where fan rooms are used as an air plenum, provide suitable gasketed vapor-tight lighting fixtures.

C. Plaster frames for lighting fixtures shall be furnished under this Section and installed by others under this Contract. Frames shall be finished matte white baked enamel unless otherwise noted.

D. Recessed luminaires shall be provided complete with mounting devices and accessories and constructed and mounted as to permit access to wiring.

E. Attachment devices shall be fabricated of formed, rolled or cast metal shapes with the requisite rigidity and strength to maintain continuous alignment of the installed luminaires.

- F. Contractor shall be responsible for necessary adjustments in ceiling required to install luminaires.
- G. Contractor shall verify all ceiling conditions from the architectural plans and provide appropriate mounting details for each luminaires.
- H. Reflectors shall be attached to housing by means of a length of chain, which will prevent reflector from falling. Ensure that no part of chain is visible after installation when viewed from any angle below 45 degrees from the horizontal.
- I. Pendant or surface mounted luminaires shall be provided with required mounting devices and accessories, including hickies, stud-extensions, ball-aligners, canopies and stems. Coordinate locations of luminaires in mechanical areas. Mounting stems of pendant luminaires shall be of the correct length to uniformly maintain the luminaire heights shown on the drawings or established in the field.

3.5 ADJUSTMENTS

- A. After the installation of luminaires is completed, adjust luminaires after dark under the supervision of the A/E at no additional cost to M-DCPS.
- B. Upon the completion of the installation of all luminaires, turn on for a continuous period of 48 hours and during that time, replace any burned-out lamps, defective ballasts or fuses, etc.

END OF SECTION