SECTION 26 50 00
LIGHTING

PART 1 –GENERAL

1.01 SECTION INCLUDES

A. Lighting fixtures.
B. Fixture mounting hardware.
C. Lamps.
D. Emergency Lighting.
E. Lighting control equipment.
F. Source quality control.
G. Standard fixtures.

1.02 RELATED SECTIONS

A. Lighting control panel boards (addressable panels) are specified in Section 26 09 26, Lighting Control Systems.
B. Refer to Section 20 70 26, Common Materials and Methods for Electrical Systems, for requirements.

1.03 MEASUREMENT AND PAYMENT

A. Separate measurement and payment will not be made for the Work required under this Section. All costs in connection with the Work specified herein will be considered to be included with the related item of Work in the Bid Schedule of the Bid Form, or incidental to the Work of the Contract.

1.04 REFERENCES

A. Illuminating Engineering Society of North America (IES):
   1. IES Lighting Handbook, Reference and Application

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   1. IEEE C62.41 IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

C. National Electrical Manufacturers Association (NEMA):
   1. NEMA C81 Series Electric Lamp Bases and Holders
2. NEMA WD7 Occupancy Motion Sensors Standard

D. American Society for Testing and Materials (ASTM):

2. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low Alloy with Improved Formability, Solution Hardened, and Baked Hardenable

E. National Fire Protection Association (NFPA):

1. NFPA 1 Fire Code
2. NFPA 70 National Electrical Code
4. NFPA 110 Standard for Emergency and Standby Power Systems
5. NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail Systems

F. Underwriters Laboratories Inc. (UL):

1. UL 94 Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
2. UL 496 Standard for Safety Lampholders
3. UL 508 Standard for Safety Industrial Control Equipment
4. UL 773 Standard for Safety Plug-In, Locking Type Photocontrols for Use with Area Lighting
5. UL 916 Standard for Safety Energy Management Equipment
6. UL 924 Standard for Emergency Lighting and Power Equipment
7. UL 1598 Standard for Safety Luminaires

G. Environmental Protection Agency (EPA)

H. International Dark Sky Association (IDA)
1.05 REGULATORY REQUIREMENTS

A. Federal Communications Commissions (FCC):
   1. Title 47 Rules and Regulations

B. California Code of Regulations (CCR):
   1. Title 8 Industrial Relations
   2. Title 22 Social Security
   3. Title 24, Part 2 California Building Code
   4. Title 24, Part 3 California Electrical Code
   5. Title 24, Part 6 California Energy Code
   6. Title 24, Part 11 California Green Buildings Standards Code

1.06 SUBMITTALS

A. Refer to Section 01 33 00, Submittal Procedures, and Section 01 33 23, Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Submit product data including the following:
   1. Catalog sheets and specifications
   2. Ratings, configurations, wiring diagrams, dimensions, service conditions, options and features

C. Submit shop drawings including the following:
   1. Single line, schematic, block, and wiring diagrams
   2. Equipment layout of lighting system components
   3. Plan view details and component topologies
   4. Photometric drawings and network riser diagrams

D. Installation procedures: Include tools and materials list, mounting templates, and dimensions.

E. Calculations: Include photometric analysis performed at L70.

F. Submit test reports including the following:
   1. Certified test reports of factory and field tests performed
2. Title 24 Acceptance Testing Documentation in accordance to Title 24, Part 6
3. Seismic analysis report

G. Manufacturer’s certificates: Include certificate ensuring products meet or exceed specified requirements.

H. Submit the operation and maintenance manual, in accordance with Section 01 78 23, Operation and Maintenance Data, including the submittal items mentioned above and the following:
   1. Sequence of operation
   2. Preventive maintenance procedure
   3. Spare parts list and ordering form
   4. Troubleshooting guide for common issues

1.07 LABELING
   A. Lighting fixtures, light poles, lighting control equipment shall be labeled. Labelling shall be approved by the Engineer.

PART 2 – PRODUCTS

2.01 LIGHT EMITTING DIODE (LED) LIGHTING
   A. LED Luminaire
      1. LED fixture requirements are as described below:
         a. The LED fixture shall consist of LED lamps, driver, assembly, and mounting hardware.
         b. Each fixture shall have its own LED driver. LED drivers shall be placed within LED fixture, unless otherwise specified.
         c. Input voltage: 120 VAC to 277 VAC plus or minus 10 percent, 60Hz.
         d. Efficacy: as indicated.
         e. NEMA Rating: as indicated.
         f. Brightness and glare: LED Luminaires shall be free from distracting and uncomfortable glare; Prevent specular reflections on signage, direct glare from exposed lamps, high brightness areas of individual fixtures, and reflections in glazing or other specular surfaces.
         g. Warranty: minimum 5 years.
h. Cooling System: consist of a heatsink with no fans, pumps, or liquids and shall be resistant to debris buildup that does not degrade heat dissipation performance.

i. LED fixtures shall be rated for Class I Division II Hazardous Locations, as indicated.

j. Lens: as indicated.

k. Shields: as indicated.

l. LM-80 and TM-21 shall be used to determine lifespan outside L70 controlled lab settings.

m. Outdoor LED Luminaires rated for use with lamps greater than 150 watts shall be designed and installed to comply with backlight, uplight and glare (collectively referred to as “BUG” in accordance with IES TM-15-11, Addendum A) rating requirements in CALGreen Table 5.106.8 or comply with the local city ordinance, whichever is more stringent. Fixture shall be designed to accept a house-side shield to control/reduce back, or side glare.

B. LED lamp

1. LED lamp requirements are as described below:

   a. Definition: LED lamp Assembly is the LED assembly without LED driver.

   b. Correlated Color Temperature (CCT): 3200K to 3500K indoor, 4000K to 4500K outdoor.

   c. Color Rendering Index (CRI): greater than or equal to 80, except for parking garages where it shall be greater than or equal to 70.

   d. L70: minimum of 80,000 operating hours under warranty.

   e. Difficult Access: 100,000 operating hours under warranty.

C. LED Driver General Requirements:

1. LED driver general requirements as described below:

   a. Input voltage: 120 VAC to 277 VAC (plus or minus 10 percent).

   b. Frequency: 60Hz.

   c. Operating temperature: minus 25 degrees Celsius to plus 50 degrees Celsius.

   d. Minimum efficiency: 90 percent.

   e. Driver shall be dimmable.

   f. LED dimmable driver requirements are as described below:

      1) Driver shall withstand up to a 1000 V surge without impairment of performance as defined by IEEE C62.41 Category A.
2) There shall be no visible change in light output with a variation of plus or minus 10 percent line voltage input.

3) Driver shall provide step-free, continuous dimming from 100 percent to 10 percent; and shall respond similarly when rising from 10 percent to 100 percent.

4) LED dimming driver shall provide continuous step-free, flicker free dimming over the operating range, with “Fail-Safe” 0 to 10 V dimming standard.

g. LED driver shall be self-protected, including surge protection and short circuit protection.

h. Comply to FCC CFR, Title 47, Section 15.

i. LED driver shall have a minimum of 50,000 operating hours under warranty.

j. Power Factor (PF) greater than or equal to 0.90.

k. Regulatory compliance minimum UL recognized for the class. The driver shall be field replaceable with quick disconnect.

l. Each fixture shall have its own LED driver. LED drivers shall be placed within LED fixture, unless otherwise specified.

m. LED driver shall be easily replaceable.

2.02 (LEGACY) FLUORESCENT AND HIGH INTENSITY DISCHARGE–LIGHTING FIXTURES

A. Requirements:

1. Provide lighting fixtures, complete and ready for service, in accordance with UL 1598. Fixtures shall be of the number, type, material, finish, electrical components, and characteristics, and shall be provided with the necessary hardware and auxiliary equipment, as indicated. Light fixtures provided with provisions for raceways shall be UL-listed for this use. Comply also with applicable requirements and guidelines of the IES Lighting Handbook.

2. Mark fixtures clearly with manufacturer’s name and catalog number, voltage, acceptable lamp type, maximum wattage, and label for intended use.

3. Fixtures shall be UL listed for the location and application indicated.

B. Materials:

1. Thicknesses, gages, and tempers of products shall be as indicated, and as recommended by the manufacturer for the specific finish, proper forming operations, and structural requirements.

2. Reflector material shall be prefinished, copper-free aluminum alloy, minimum thickness 0.032 inch, Architectural Type 1 with Class M1 anodic coating providing 83 percent reflectivity.
3. Acrylic for lenses and diffusers shall be manufactured from virgin-acrylic extrusion or injection molding pellets.

4. Polycarbonate for lenses shall be manufactured from high temperature resin designed for use with HID lamps.

5. Glass for lenses shall be of tempered borosilicate pressed or spun glass, minimum 0.13 inch thick.

6. Stainless steel shall be Type 304.

C. Finishes:

1. Provide lighting fixtures completely factory-finished in colors to match the Engineer’s control samples.

2. Do not start finishing operations until fabrication and forming operations have been completed.

3. Aluminum to be anodized shall be given the Aluminum Association’s Architectural Class 1 anodic coating.
   a. Anodize aluminum in accordance with procedures established by alloy manufacturer to achieve color within specified range.
   b. Apply a clear organic protective coating to exposed aluminum surfaces that may experience prolonged contact with caustic material such as concrete and plaster.

4. Minimum cleaning of metal before painting shall be a five-stage phosphatizing system consisting of alkali cleaner, hot water rinse, zinc phosphatizing solution with toner, water rinse at room temperature, and chromic acid rinse for neutralizing.

5. Interior fixtures with surfaces not exceeding 150 degrees Fahrenheit shall be statically charged and painted two coats minimum of acrylic gloss enamel to a minimum total dry film thickness (DFT) of 2.5 mils.

6. Interior fixtures with surfaces exceeding a temperature of 150 degrees Fahrenheit, but not exceeding 300 degrees Fahrenheit, shall be statically charged and painted with silicone-alkyd enamel, two coats minimum to a total DFT of 2.5 mils.

7. Provide fixtures specified to be painted with one coat of epoxy-polyamide at a minimum DFT of 2 mils and one coat of aliphatic urethane to a minimum DFT of 2 mils. Interior reflective surfaces specified to be painted shall be as for interior fixtures.

8. Finish fixtures specified to be porcelain enameled, or painted fixtures with reflectors specified to be porcelain enameled, shall receive porcelain-enamel coating.
9. Reflective surfaces not specified to be specular shall be gloss white, guaranteed nonyellowing, with a reflectance rating of not less than 88 percent.

10. Provide galvanized coating, where indicated, hot-dip galvanized according to ASTM A123/A123M. Where painting of the galvanized surface is indicated, pretreat the surface with a spray of zinc chromate-vinyl butyryl wash primer at least 0.05 mil thick; apply an 80 percent zinc dust, 20 percent zinc oxide, alkyd resin primer conforming to MIL-DTL-24441/20; and then apply a single-component, Type II, modified acrylic or polyurethane top coat.

D. Electrical Components:

1. Lampholders:
   a. Provide lampholders and sockets in accordance with NEMA C81 and of the class and style recommended by the lamp manufacturer for the specific lamp required for each fixture design and rated for 660 W, 600 V, or as indicated.
   b. Fasten lampholders and sockets rigidly and securely to the mounting surface with the necessary provisions to prevent lampholder from turning and to be front removable without dismantling any part of the fixture.
   c. Locate lampholders and sockets correctly in the lighting fixtures to place each specified lamp in proper position with relation to the fixture design and to ensure proper distribution of light. Clearly mark lampholders and sockets to indicate manufacturer, lamp type, voltage, and appropriate listings.
   d. Provide replacement lampholders for legacy installations with body and finish to match existing fixtures remaining in the location of work. Lampholders shall consist of nonferrous metal components of heavy duty, vibration resistant design. Lampholders shall be in accordance with UL 496.

2. Drivers:
   a. Drivers shall be electronic type with an efficiency greater than 90 percent, in accordance with Article 2.01 C herein.
   b. Mount each driver securely inside the fixture so as to obtain the necessary heat dissipation.

3. Fixture Wiring:
   a. Provide fixture wires of stranded tinned-copper construction, not smaller in wire size than No. 16 AWG. Provide insulation of silicone rubber type SF-2, 200 degrees Celsius rated. Mark conductor size, temperature rating, voltage, and manufacturer clearly on the insulation of each conductor.
   b. Provide wires between lampholders and associated operating and starting equipment with the same ampacity rating as leads from the ballast. Wiring within the fixtures shall comply with the California Electrical Code.
   c. Tape wires at points of abrasion. Do not permit splices within fixtures other than as required to connect lampholders and ballast. Provide wireways and wiring channels with rounded edges or bushed holes wherever conductors
pass through. Install insulated bushings at points of entrance and exit of wiring.

4. Fixture Grounding:

a. Unless otherwise specified, provide the housing of each ballasted lighting fixture with a separate, factory-installed grounding device.

b. A separate grounding conductor shall be attached to the grounding device on each fixture housing and connected to the ground lug terminal in the hand hole of the light pole.

c. Fluorescent fixtures connected end-to-end shall have a common ground conductor between them to provide a continuous ground path.

d. Provide only galvanized rigid conduit (GRC) and accessories, except in underground or concrete encased duct banks.

e. Light poles shall be grounded by use of a separate grounding conductor connected at one end to the grounding lug in the hand hole of each pole, and the other end connected to the grounding bus in the lighting distribution panel.

E. Fixture Hardware:

1. Latch and release mechanism, hinges, pins, and other retaining parts of fixtures; screws, bolts, or other assembly and mounting parts shall be manufactured of Type 304 or Type 316 stainless steel. Provide springs of heavy-duty stainless steel. Provide self-retaining type retaining hardware.

2. Light transmitting panels shall be held in the frames in a neat, rattle-free manner that will provide proper tolerance for normal expansion and contraction.

3. Fabricate internal brackets from ASTM A1008/A1008M sheet steel, zinc-coated after fabrication, or finished extruded aluminum.

4. Gaskets, sealants, and adhesives shall be formed from silicone rubber.

5. Provide bolts, nuts, washers, screws, nails, rivets, and other fastenings necessary for proper installation or assembly of work. When exposed to the atmosphere, items shall be made of 300 series stainless steel. Fastenings within the housing shall be hot-dip galvanized steel. Nuts shall have captive externally-footed lockwashers.

6. Junction boxes suitable for the intended location and wiring requirements shall be provided with four 3/4 inch threaded and plugged conduit entries.
2.03 **FIXTURE MOUNTING HARDWARE**

A. **Requirements:**

1. Provide fixtures with brackets, straps, canopies and stems, poles, and miscellaneous hardware suitable for the mounting method specified. Pendant mounted fixtures shall have seismic resistant swivel mountings.

2. When exposed to public view, fabricate and finish hardware in material matching the fixture body.

3. Canopies, holders, and similar parts shall be drawn or spun in one piece with a minimum 0.026 inch finished thickness.

4. Tubing used for stems shall be seamless drawn with a minimum of 1/16-inch wall thickness of size and length as indicated. Stems shall be provided for pendant-mounted fixtures of length as required for the specified mounting height with swivel hangers or ball aligners.

B. **Light poles:**

1. Provide the type, configuration, and dimensions indicated. The pole shall resist wind loads in accordance with the California Building Code, with Basic Wind Speed of 80 mph, Exposure C, Importance Factor 1.0. Maximum deflection of pole shall be five percent when fully loaded. Furnish poles as indicated with handhole and flush cover with tamper proof screw and grounding stud, luminaire mounting tenon/bracket, base cover and mounting hardware including anchor bolts, nuts, washers, and baseplate to permit accurate alignment and installation of pole and luminaire as indicated. Light pole anchor bolt covers shall have tamper proof screw.

2. Light pole ladder and safety cable shall conform to CCR Title 8, Industrial Relations, Division 1, Chapter 4, Subchapter 7, Group 1, Article 4, Section 3277(m), Ladder Safety Systems, and CAL/OSHA.

3. Lowering types pole specifications shall be as follows:

   a. Poles shall be 50 feet galvanized round tapered steel and shall include pole shaft, hand hole, support plate, anchor base, anchor bolts with washers and nuts, and brackets to mount camera box.

   b. The pole shall resist wind loads in accordance with the California Building Code, with basic wind speed of 80 mph, Exposure C, Importance Factor 1.0. Maximum deflection of pole shall be five percent when fully loaded.

   c. Pole shall be equipped with a hand hole with cover plate. Hand hole shall be 30 inches by 11 inches to allow adequate clearance for installing, servicing, and maintaining the lowering device system. Hand hole shall include a steel cover plate 0.25 inch thick and shall be sealed with a neoprene rubber gasket and feature covered pulldowns to ensure weather tight protection. The hand hole hinge shall be 7 gauge steel, and shall be lockable for added safety and security. Hand hole rim shall conform to ASTM A572 Minimum Yield KSI 50.
Designation, Hand hole cover shall conform to ASTM A36 Minimum Yield KSI 36.

d. Base plate shall be ASTM A36 Minimum Yield KSI A36 Designation.

e. Support plate shall be ASTM A36 Minimum Yield KSI A36 Designation.

f. Anchor bolts shall be ASTM F1554 GR Minimum Yield KSI 55.

4. Lowering device specifications shall be as follows:

a. Lowering device shall have internal motor with a minimum of 1 hp heavy reversing type electrical motor with a stalled torque at least twice that required to operate the lowering device.

b. Lowering device shall have internal winch assembly. Lowering device shall consist of spun aluminum copper free cover, cast high strength copper free aluminum latch barrel, stainless steel latch pin, galvanize steel luminaire ring, stainless steel centering spring and steel adjustment nut, stainless steel wire rope grip, on-marking guide arm roller and cast aluminum iris guide arm, junction box and reflection latch indicator.

c. Lowering device shall be top latching, centering arm unit with an internal winch. Internal drive lowering device shall be able to hold multiple luminaires, 50 foot pole height, stainless steel 3/16 diameter hoist, 1/4 diameter winch cable, with camera ready provisions, and with special arm assemblies on frame.

2.04 LAMPS

A. Requirements: Provide each lighting fixture with the number, type, and wattage of lamps as indicated. Lamps used in the illumination system shall be of standard manufacture, readily available, and of the highest efficiency and life consistent with other requirements of the illumination system. Each type of lamp shall be provided by a single manufacturer.

B. LED (Light Emitting Diode): Refer to Article 2.01 herein. Luminaires shall be LED type. If a legacy fixture is to remain, the lamp shall be replaced with an LED equivalent lamp.

2.05 LIGHTING CONTROL EQUIPMENT

A. Refer to Section 26 09 26, Lighting Control System for lighting control equipment requirements.

2.06 EMERGENCY LIGHTING

A. Emergency lighting system shall be as indicated.
2.07 SOURCE QUALITY CONTROL

A. The lighting fixture to be tested shall be typical of the unit it represents, clean and free from mechanical defects, equipped with the proper fittings, and with the lamp of the size and type in the position recommended for service operation.

B. Test UL-listed material, equipment, and components in accordance with UL standards. Test material, equipment, and components not covered by UL standards in accordance with nationally recognized standards. Provide material, equipment, and components bearing a label tag or certification of such inspection.

C. Perform and report tests for photometric performance in accordance with the approved methods outlined by the IES Lighting Handbook for photometric testing, and include data on candlepower, distribution, zonal lumens, maximum luminance values, and luminaire efficiency, including complete coefficients of utilization tables to indicate compliance with performance requirements.

D. Test data shall be reported on 8-1/2 inch by 11-inch sheets and shall be certified by a nationally recognized independent testing laboratory.

2.08 STANDARD FIXTURES

A. Tunnel Fixtures: Provide fixtures that are UL listed for wet locations, and that include the following features, appurtenances, and accessories:

1. Housing shall be 0.125 inch extruded aluminum with anodized finish. Housing upper portion shall have an integral continuous clevis on each side, accommodating a slide grip hanger assembly, eliminating all mounting hole requirements.

2. End caps shall be 0.150 thick cast aluminum with service entry hubs on each end for 1/2-inch conduit. End caps and hub assembly shall be firmly held against the extruded housing and lens by a cast aluminum bracket on each end.

3. Reflector/driver cover shall be of 0.05 inch aluminum and chain hinged for ease of access with baked-on white enamel finish.

4. Provide gasket continuous along the length of lens/housing intersection with one piece 0.250 inch close celled neoprene gasket. Gasket the entire inner wall of each end cap with 0.250 inch close celled neoprene gasket.

5. Provide wall-mounting bracket for 45 degree mounting tilt. Bracket shall be galvanized plate steel and moveable along the entire length of fixture housing. Two brackets per fixture are required.

6. Diffuser shall be of 0.125 acrylic with internal prisms for low brightness and smooth external surface for minimizing dirt collection.

7. Tunnel lighting fixtures and mounting devices shall be designed to withstand air pressure waves ranging from plus 80 psf to minus 80 psf repetitively with each passing train.
B. Emergency Trip Station Blue Light: Provide fixtures that are UL listed for wet locations, and that include the following features, appurtenances, and accessories:

1. Provide housing and outlet box of glass reinforced (30 percent) polyester material conforming to UL 94V-0. Polyester housing and box shall be nonfading, permanent gray color, ultraviolet resistant.

2. Provide blue enclosing globe of heat-resistant glass with integral male threads for mounting into housing with white LED lamp.

3. Boxes shall be four-way tapped for 3/4-inch conduit. Plugs shall be of same polyester material. Provide box with mounting ears.

4. The blue light shall be composed of two ultra-bright, long lasting LED lamps and shall be visible at any point within 250 feet from its designated mounting location.

5. The blue light LED lamp shall provide a minimum of 1000 effective candela.

6. The blue light shall flash at a minimum rate of 78 flashes per minute.

7. The blue light shall be housed in vandal-resistant, impact resistant polycarbonate retractor housing resistant UV-fade.

8. The light LEDs shall be connectorized and field-replaceable.

C. Operator’s Access Aisle Fixture: Provide fixtures that are UL listed for wet locations, and that include the following features, appurtenances, and accessories:

1. Provide one piece housing of die cast aluminum with integral cooling fins over the optical chamber and electrical compartments and double thick gussets on the support arm-mounting end. Housing shall form a half-cylinder shape with 55 degree front face plane providing a recess to allow a flush single-latch detail. All hardware shall be stainless steel.

2. Provide lens frame and cam-latch of die cast aluminum and mate with 1 inch minimum depth around the gasket flange. Provide integral cast hinges with stainless steel pins that allow removal, without tools, from the housing. Cam-latch shall provide positive locking and sealing of the optical chamber.

3. Provide clear tempered glass lens 3/16-inch thick with one piece molded perimeter gasket seal retained by eight stainless steel clips.

4. Provide reflector assembly of specular alzak aluminum mounted in an aluminum frame attaching to fixture housing as a one piece module. Reflector module shall be field rotatable in 90 degree increments.

5. Provide factory pre-wired electrical module components on a single plate with a socket to a quick-disconnect plug and include a wire seal through the barrier wall. Attach module to housing with no-tool hinges and latches, accessible by opening the lens frame only.
6. Support arm shall be one piece extruded aluminum, fully radiussed internal bolt guides top and bottom and circular cut for specified round pole. Provide luminaire to pole attachment by internal draw bolts and include a pole reinforcement plate with wire strain relief.

7. Provide finish housing, lens frame, latch and support arm with thermoset polyester powder coat paint in natural aluminum color. Components shall be thoroughly cleaned and primed with protective chromate conversion coating prior to powder coating. Powder coating shall be 2.5 mils nominal thickness.

8. Provide LED lamp, 277 VAC.

D. Cross Passage Yellow Light: Fixture shall be identical to emergency trip blue light fixture except equipped with yellow enclosing globe. Enclosing globe shall be of heat-resistant glass with integral male threads for mounting into housing.

E. Wet Standpipe Valve White Light: White light shall be LED strobe type, 120 VAC, 1000 effective candela. The base shall be comprised of corrosion-resistant, anodized aluminum, with integrated power supply. Enclosing case shall be of heat resistant, Fresnel lens, and clear-type.

2.09 SPARE PARTS

A. General: Refer to Section 01 78 44, Spare Parts and Maintenance Materials, for spare part requirements.

B. Luminaire: Provide 2 percent of each style of lighting luminaire, or a minimum of 5 each, whichever is greater.

C. Light Poles: Provide 1 percent of each style of light pole assembly, or a minimum of 2 each, whichever is greater.

PART 3 – EXECUTION

3.01 INSTALLATION OF LIGHTING FIXTURES

A. Install lighting fixtures as indicated and in accordance with the manufacturer’s installation instructions and recommendations, complete with lamps, hangers, brackets, poles, fittings, and accessories, ready for operation.

B. Align, mount, and level lighting fixtures uniformly.

C. Avoid interference with, and provide clearance for, the equipment. Where the indicated locations for the lighting fixtures conflict with the locations for other equipment, change the locations for the lighting fixtures by the minimum distances necessary and as approved by the Engineer.

D. For suspended lighting fixtures, provide the indicated mounting height clearances between the bottoms of the fixtures and the finished floors.
E. Anchor lighting fixture supports to the structural slab or to structural members as indicated. Supports shall maintain the fixture positions after cleaning and re-lamping. Provide supports for seismic loading in accordance with applicable requirements of the California Building Code and the California Electrical Code.

F. Surface-mounted lighting fixtures shall be bracketed rigidly from the mounting surfaces. Provide 1/4-inch clearance between surfaces when the fixture is flat-mounted against concrete surfaces. Install fixtures with a non-cumulative dimensional alignment tolerance of 1/16-inch when mounted in continuous runs with one inch spacing between individual fixtures. Nipples carrying wires between fixtures shall be watertight.

G. Where aluminum is placed in contact with dissimilar materials, except galvanized steel, zinc, or stainless steel, treat contact surfaces as follows:
   
   1. When in contact with dissimilar metals, apply a prime coat of zinc chromate primer followed by two coats of aluminum and masonry paint.
   
   2. When in contact with concrete, masonry, and plaster, apply zinc chromate primer, bituminous paint, aluminum and masonry paint, or pressure-sensitive tape to aluminum contact surfaces.
   
   3. When in contact with wood or other absorptive materials, apply two coats of aluminum house paint to such materials, and protect aluminum contact surfaces with bituminous paint.

H. Welding:

   1. Locate welds in assemblies to be anodized so as to conceal visible discoloration in the heat-affected zone.
   
   2. Where weld metal will be exposed after anodizing, select filler alloys to closely match composition of base metal. Follow manufacturer’s recommendations for such filler alloys.

I. Provide pendant fixtures with stem swivel hangers to assure a plumb installation with a minimum 45-degree swing from horizontal in all directions. Where 45-degree movement of fixture is not possible due to field conditions, provide, in addition to above, cross bracing of aircraft cable to restrict movement in direction of potential contact. Tubing shall be not less than 3/16-inch diameter. Motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation. For heavy pendant-mounted fixtures, where support is to be independent of the outlet box, provide stem swivel hangers with fixture studs.

J. Install fixtures to be pole-mounted in accordance with the manufacturer’s installation instructions.

K. Provide required lamps in each pole-mounted lighting fixture as soon as fixtures are properly installed.
3.02 INSTALLATION OF DRIVERS

A. Install drivers, other than those mounted integrally within luminaries, in such a manner that the driver is protected from weather, moisture, and other atmospheric conditions, and in ambient temperatures that will not cause the temperature of the driver housing hot-spot to exceed UL requirements.

B. Voltage drop to lamp, due to remote driver mounting, shall not exceed one percent of the nominal lamp voltage. Provide secondary driver conductors with 600 V insulation. When more than one driver is mounted at one location, the minimum spacing between driver shall be 6 inches in a horizontal direction and 12 inches in a vertical direction. Mount driver components securely in such a manner as to obtain the necessary heat dissipation.

3.03 INSTALLATION OF LIGHT POLES

A. Determine surface and structure load ratings prior to installation of equipment.

B. Install light poles as indicated and in accordance with the manufacturer’s installation instructions and recommendations. Light poles shall be grounded as indicated on the Contract Drawings.

3.04 CONCRETE BASES

A. Provide necessary templates and anchor kits before starting work, and coordinate installation of anchors in concrete with the work specified under Division 3 - Concrete.

3.05 JOBSITE CONDITIONS

A. Install exposed parts of fixtures after construction, painting, and general cleanup of completed area.

3.06 FIELD QUALITY CONTROL

A. Inspect luminaries, lamps, and associated hardware before and after installation to ensure that they are of the quality and type specified and indicated, and are free of defects and damage.

B. Deliver luminaries and lighting equipment to the project site complete with related items, completely wired and assembled.

C. Whenever practicable, test lighting systems at the same time that the distribution panelboard or switchboard is tested.

D. Replace lamps that fail within 90 days after final acceptance without additional cost to the District.

E. Test light poles for continuity to the grounding system.
F. Inspect lighting fixtures, light poles, and lighting control equipment for labelling.

END OF SECTION 26 50 00