SECTION 26 56 19

ROADWAY LIGHTING (LED)

(April 1, 2018)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The work of this Section as shown on E series drawings includes, but is not limited to furnishing and installing:

1. Roadway lighting work including light poles, luminaires, decorative bracket arms and pole fitters, lamps, ballasts, pull boxes, fuses, fuse holders, photoelectric controls, conduits and wiring.

2. Roadway lighting standards.

3. Foundation work required for the support of lighting standards.

4. Field testing of luminaires, photocells and fuses.

5. Pole and luminaries finish and color shall be per contract drawings.

1.2 RELATED SECTIONS

A. Section 26 04 00 - General Requirements for Electrical

B. Section 26 05 00 - Common Work Results for Electrical

C. Section 31 23 33 – Trenching and Backfilling

1.3 REFERENCE STANDARDS

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

1. ASTM A 123: Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

2. ASTM A 167: Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

3. ASTM A 366: Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

B. Federal Specifications (FS): TT-P-641: Primer Coating, Zinc Dust-Zinc Oxide (for Galvanized Surfaces).

C. National Fire Protection Association (NFPA) 70: National Electric Code (NEC).

D. Illuminating Engineering Society Lighting Handbook.

E. Illumination criteria, American National Standard Practice for Roadway Lighting, ANSI/IES RP-8.

1.4 SUBMITTALS

A. The Contractor shall submit the following:

1. Data Sheets: Lighting fixture data sheets which provide documentation indicating fixture construction, photometric performance, installation, and maintenance requirements. Include the following:

    a. The data sheets shall be complete with cover, title page, and table of contents. The table of contents shall provide at a glance the overall documents scope and structure and, as a minimum, a heading for each fixture type with each grouping prefaced by a “general information” report sheet.

    b. The data sheets shall include drawings of sufficient detail to show the following:

        i. Fixture housing, hardware, and finishes.

        ii. Light controlling elements.

        iii. Electrical components, including driver, and provision for conduit entry.

        iv. Support details including foundation. Indicate weight of fixture, complete with lamps.

    c. Include procedures for the installation of the complete lighting fixture type in its final service location. Dimension locations of openings and parts interfacing with remote systems, such as mounting hardware, auxiliary electrical equipment, lighting control equipment, and lamps. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

    d. Include operation and maintenance data. Include the following:

        i. Materials and components clearly indicating the parts list.

        ii. Relamping methods.

        iii. Special tools required.

        iv. Frequency of inspection, tightening or other service recommended for preventive maintenance.

2. Certified photometric test data from an independent testing laboratory for the roadway luminaires.

3. Certified vibration test procedure, photometrics and data for the roadway luminaire and bracket arm anchorage, from an independent laboratory.

4. Certified test reports, which verify material conformance to minimum yield strength requirements, shall be submitted to the Engineer. Such test reports may be the mill test reports for the as received steel or, when the as received steel has a lower yield strength than required, the Contractor shall provide supportive test data which provides assurance that his method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. Such supportive test data shall include tensile properties of the steel both before and after cold forming for specific heats and thicknesses.

5. Computer readout that indicates light level and uniformity ratio for area to be lit.

6. Shop drawings for the bracket arms, swivel support and pole cap for luminaires.

7. Product data on the lamps.

8. Submit outline of Operations and Maintenance Manual format and contents.

9. Detailed shop drawings and catalog cuts for lighting standards, base covers, pole bracket arms, and luminaire mountings.

B. Submittals shall include manufacturer's installation drawings for approval by the Engineer.

C. The Contractor shall provide with his/her Submittals, a list of spare furnished under this Section. The list shall include part numbers, part description and current pricing. Prices are to be valid for a period of one year following the date of system commissioning.

D. The Contractor shall provide six (6) copies of complete factory testing results of the fixture and lamp use for review and approval by the Engineer.

E. Submit equipment mounting dimensions for installation of cast-in-place anchor bolts.

F. Submit manufacturer's recommendations for painting and coating of equipment.

1.5 QUALITY ASSURANCE

A. Like items of equipment specified herein shall be the end products of one manufacturer in order to achieve standardization for operation, maintenance, spare parts, and manufacturer's service.

1.6 WARRANTY

A. The Contractor shall furnish a two (2) year Warranty for all work covered by this Section.

B. The luminaire shall have a 5 year warranty from the date of final acceptance, against material defects and deterioration, product workmanship, and performance degradation It shall be replaced by the manufacturer, including materials, and equipment necessary, at no cost to the City.

1.7 MAINTENANCE

A. Spares

1. Furnish 10 percent of the total number of fixtures type including lamp, ballast and poles, round off to the nearest whole number as spare, unless otherwise noted per contract drawings.

1.8 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for the protection of equipment during shipment and temporary storage until Substantial Completion of the project.

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. The luminaire shall be a slim, low profile design that minimizes wind load requirements. Provide 7-Pin twistlock photocell as per ANSI C136.10. The luminaire shall be per

contract drawing.

B. The luminaire shall be constructed from rugged extruded aluminum and cast aluminum components. LED are mounted in the cast aluminum door and rated for IP66.

C. A High Performance aluminum heat-sink shall be specifically designed for LED roadway lighting applications.

D. The luminaire shall be finished with an E-coat epoxy primer with an ultra- durable powder topcoat providing excellent resistance to corrosion and ultraviolet degradation and abrasion. With a 10 year finish warranty.

E. Luminaire Efficiency – allow for thermal and optical losses – efficiency should be determined on a delivered lumens per watt basis for comparison at each luminaire drive current required initial delivered lumens per watt minimums required with independent testing lab verification:

- 60 Lumens per watt (L/W) at 525mA drive current

F. Average delivered lumens – average delivered lumens over 50,000 hours of operation should be a minimum of 87 % of initial delivered lumens, based on a 15 degree C ambient operating temperature at 525ma.

G. LED's in the luminaire shall be rated for "life" in hours as defined by IESNA LM 80 standards, and correlated in luminaire testing. Average delivered lumens for 525mA drive current shall be 70% of initial delivered lumens after exceeding 117,000 hours of operation at 15C ambient.

H. The luminaire shall control the light to provide an I.E.S type III distribution. Luminaire shall have FVH and BVH values of equal to or less than 0.5%, and UP of 0%. Luminaire should have independent photometric test reports IES LM79 and be dark sky compliant.

I. Contractor shall provide maximum system wattage (including driver loss) – LED wattage only not accepted and calculation of delivered lumens/total wattage with bid. If LED lumens/watt increase between the time of specification and the time product of ordering you will either get more light for the same energy or be able to reduce the wattage to obtain the same delivered lumens.

J. The luminaire shall have a minimum color temperature of 3000K +/- 300 color temp and 70 CRI or better.

K. The luminaire shall be provided with warranty from the manufacturer with 5 years on the LEDs, 5 years on the driver, and 10 years on the paint finish of the fixture.

L. The luminaire shall be US, UL ROHA and EMI, class 1 rated.

M. Driver specifications as follows:

1. Electronic
2. Voltage range (120 – 277V) +/- 10%, (347-480V) +/-10% optional
3. Current .350 Adc (+/- 5%), .525 Adc (+/-5%), .700 Adc (+/-5%)
4. Frequency 50/60 Hz
5. Power Factor >90% at full load
6. THD < 20% at full load
7. Load Regulation: +/- 1% from no load to full load

8. Output ripple < 10%
9. Output should be isolated
10. Case temperature: rated for -40 through +80 C
11. Fully encased and potted
12. Overheat protection, self-limited short circuit protection and overload protected
13. Primary Fused
14. 10 KVA surge protection
15. Life rating not less than 100,000 hours
16. 0-10V Dimming capabilities
17. Meet IP 66 standards
18. EMC compliance-FCC part 15B, CISPR 15
19. UL listed
20. Useful life no less than 100,000 hours

N. The luminaire shall be designed to mount on 1.25” IP and/or 2” IP horizontal tenon and is adjustable +/- 5 degrees to allow for fixture leveling. Luminaire shall utilize terminal block for power input suitable for #6 AWG wire.

O. The luminaire shall be provided with NEMA photo control receptacle and twist lock photocell, fuse and backlight cut-off.

P. All access doors shall be hinged and capable of opening to 180 degrees. The door shall be secured to the luminaires housing.

Q. The luminaires shall have wireless monitoring and control system capabilities.

R. 120 degree back of the house shield shall be provided to all luminaire, unless otherwise noted.

S. Manufacturer: Per contract drawing

2.2 LIGHTING POLE STANDARDS

A. The street lighting standard shall be as indicated on the plans and shall be made from a one piece, high-tensile carbon steel shaft sealed by a roll and flattened vertical weld seam and welded over the high-tensile carbon-steel pole base. The assembly shall be welded to both the top and the bottom of a steel base. A 4" by 9" maintenance opening, complete with cover and copper ground lug, is centered approximately 21" from the ground.

B. The base cover shall be made from two pieces of cast aluminum mechanically fastened to the base with stainless steel screws or per pole manufacturer recommendation.

C. All steel pole shall be “Hot Dip” chemical etched, (interior and exterior).

D. Streetlight pole height shall be round tapered pole 11GA, 8.0” x 4.01” x 28’-6” with 6 foot upswept hot dip galvanized, double simplex bolt arm assemblies, unless otherwise noted on contract drawings.

E. Pedestrian pole shall be 16 feet round pole, 11GA, unless otherwise noted on contract drawings.

F. An access door away from the street oriented 180 degree around pole opposite facing the sidewalk from flow of traffic from luminaire arm and shall be provided in the base for securing anchor bolts and wiring access. A grounding screw shall be provided and installed inside base opposite the door for each access.

G. Factory Galvanized and Powder Coated Finish:

The pole shall be "Hot Dip" chemical etched, luminaire shall be polyester powder coat semi gloss finished. Durable UV-resistant exterior finish shall be as per # ASTM G7 and salt-spray resistance shall be according to # ASTM D2247 testing procedure. Finished pole shall have powder coat with minimum four mils thick coating.

Refer to contract drawings for color requirement.

H. Cement Grout shall be provided around the pole base.

I. Concrete Pole shall be per SPDPW plan and per contract drawings.

J. Where required per contract drawing, flush duplex GFCI receptacle shall be provided with vandal resistant weather proof pad lockable metallic while-in-use cover. Outlet box shall be 6” integral from the top of the pole. Outlet box to be located 180 degree facing the sidewalk.

K. Anchor bolt for pedestrian lighting shall be 36” and for streetlight shall be 42”. All anchor bolt shall be threaded throughout.

L. Pole manufacturer shall be Ameron Series, Valmont or approved equal.

2.3 FUSES AND FUSE HOLDERS IN LIGHTING CIRCUITS

A. Fuse and fuse holders shall be provided in each pull box adjacent to the pole. Each fuse and fuse holder shall be of the size and shall be installed as shown on DPW Standard Plan 87,203. The Contractor shall furnish and install an insulating boot on each fuse holder. Provide additional ground wire from the pullbox to luminaire.

B. Fuse holders for services, feeders, and branch loads energized by two ungrounded conductors shall be of the two-pole simultaneous disconnect type with insulating boots.

C. Fuses shall be of the rating indicated on the SPDPWSF Plans.

2.4 LIGHT POLE FOUNDATION

A. Concrete for foundations shall conform to CTSS and Special Provisions; unless otherwise noted in the contract drawing and related concrete foundation specification.

B. Refer to pole foundation details shown on contract drawings and specific structural and manufacturer drawings.

2.5 PHOTOCELLS

A. For street lights equipped with photoelectric control, the photocell shall be photoelectric unit which plugs into an EEI-NEMA 7 pin twist lock receptacle integral with luminaire.

B. The photoelectric controls shall be operable within a minimum voltage range between 105 and 280 VAC.

C. All photoelectric controls shall be oriented to the north.

D. Photoelectric controls for LED luminaires shall have a design life of 20 years and inrush protection with triac assisted relay and surge protection. Double thick enclosure and lens with additional UV inhibitor. Cover to match fixture, unless otherwise noted. Multi-Voltage with fail on feature and 1.5 ANSI standard, UL listed. Cover color to match fixture.

PART 3 - EXECUTION

3.1 LUMINAIRES

A. The luminaires shall be carefully mounted, leveled, secured and connected in accordance with the manufacturer's instructions and recommendations as follows:

1. Level laterally and longitudinally.

2. Properly secure luminaire to bracket-arm by threading 1-1/4" NPT onto luminaire and arm mounting casting.

3. The luminaire shall be fastened to the bracket arm according to the manufacturer's recommendations.

4. Install proper lamp and close door(s).

5. Test luminaire operation by orienting the photo electric control north and covering it to activate switching and energizing the lamp ballast system. If the lamp fails to burn, the Contractor shall check for and replace the defective lamp, photo electric control switch and/or fuse(s).

6. Provide twist lock photocell per contract drawing.

3.2 FUSES AND FUSE HOLDERS IN LIGHTING CIRCUITS

A. Each ungrounded service, feeder, and branch load conductor shall be fused. Each fuse shall be of the size and shall be installed in a waterproof fuse holder as shown on DPW Standard Plan 87,203. Each pole shall be fused in the adjacent pull box.

B. Installation of the fuse holders shall be in accordance with the manufacturer's recommendations.

C. The line and load sides of each 50 ampere or greater fused connector shall be identified with 1-inch high stenciled letters "LI" and "LO", respectively.

D. When more than one pair of fuse holders are installed in the same enclosure, each shall be tagged identifying the feeder or branch circuit it protects. The tags shall be white plastic cards. The identification shall be raised 1/2-inch white letters on black plastic tape with adhesive backing applied to the cards. Each completed card shall be laminated in clear plastic furnished with two brass eyelets and mounted on each fuse holder with nylon 6/6 cable ties.

3.3 LIGHTING POLE STANDARDS

A. Install in accordance with manufacturers' instructions.

B. Install lighting poles at locations indicated on plans.

C. Install poles plumb. Grout around each base.

D. Bond metal accessories and metal poles to branch circuit equipment grounding conductor.

E. Poles shall be set not earlier than seven days after foundations are installed and shall not be loaded to design requirements earlier than 28 days after foundations are installed, without the Engineer's prior approval. See Structural drawings for foundation designs.

F. Pole caps shall be installed on all poles, prior to setting of the poles.

G. Where cables are carried inside poles, the cables may be pulled through the pole, while the poles are still on the ground in a horizontal position prior to being raised and set on pole bases. In every case during pole installation care shall be taken to avoid damage to the cable insulation. The Contractor shall submit the proposed cable installation procedure for approval by the Engineer prior to commencing work.

H. The poles shall be installed so that the hand hole is located on the side of the pole, 180 degrees from the street side.

3.4 FIELD TESTING - LUMINAIRES

A. Install new lamps not earlier than 48 hours before the date of final inspection and replace lamps that fail within 90 days after final acceptance at no extra cost to the City. When energized, the luminaires shall provide steady and non-flickering illumination.

B. Luminaires shall not generate any audible noise measured at street level immediately below the luminaire.

C. Luminaires which fail the tests shall be satisfactorily replaced at no additional cost to the City.

D. Test lighting fixtures for continuity to the grounding system.

E. Aim and adjust luminaires with the street side of the luminaire towards the street and provide back of the house shield as required at no additional cost to the City.

F. Label the month and year of the installation inside the luminaire housing’s door.

3.5 NUMBERING OF STREET LIGHT STANDARDS

Each streetlight shall have a number for identification (ID). The ID will be assigned by the SFPUC-BLHP. Coordinate with SFPUC 15 days prior to start of punch list work for pole identification and the decal specification. The contractor shall provide and apply the decals to the poles as shown on BLHP standard drawing 1277A, revision as incidental cost. The decals shall be pressure sensitive, and shall be 2-1/2-inches high, yellow reflectorized number color with black background on 2-7/8-inches high x 2-3/4 inches wide. The decals shall not be installed during inclement weather.

3.6 PAINTING AND COATING

Luminaire housing and poles shall be furnished with manufacturer’s standard powder coat semi gloss finish. Shaft assembly shall be hot-dip galvanized prior to finishing. New luminaires, crossarms and light poles shall be per contract drawing. Refer to other drawings for specific color.

3.7 POLE – DUPLEX RECEPTACLE WITH COVER

Where required per contract drawing, flush duplex GFCI receptacle shall be provided with vandal resistant weather proof pad lockable while-in use metallic cover. Outlet box shall be 6” integral

from the top of the pole. Outlet box to be located 180 degree facing the sidewalk

3.8 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

A. Removing, reinstalling or salvaging electrical equipment shall be in accordance with CTSS - Existing Electrical Systems, as required. Coordinate with Caltran Inspector for Removing, Reinstalling or Salvaging Electrical Equipment. Refer to Contract Drawings.

B. For City contract, refer to contract drawing.

1. If existing equipment, required to be salvaged, is damaged by the Contractor or by others when such equipment is within the Contractor's control.

2. If pole(s) and equipment to be removed and salvaged, the equipment shall be removed from poles before delivering to City yard(s).

3. If such equipment is lost prior to or during delivery to the City, deductions shall be made from final payment in accordance with the following table:

EQUIPMENT	DEDUCTION
Lighting Standard	$3,000 each

C. If repairs, required to be made by this Section of the Specifications, are not to the satisfaction of the Engineer, the respective equipment shall be considered as lost. Deduction from final contract payment shall be made in accordance with the above table.

D. The listing of the above equipment and payment adjustments does not preclude the City from making claims or adjustments for other existing equipment which may be lost or damaged by the Contractor.

E. Contractor to maintain existing circuit continuity that are impact beyond the current scope of work and if the existing circuit is disconnected due to the remodel, contractor shall re-connect it to an adjacent existing available circuit in similar existing service condition as incidental cost.

F. All existing fixtures that are not impacted by the project shall be maintained operational throughout the duration of the project.

G. Provide temporary lighting as required to maintain pedestrian, bicycle and vehicle safety throughout the duration of the project, all lights need to be operational during the night.

END OF SECTION