

SECTION 17 LIGHTING AND ELECTRICAL SYSTEMS

17-01 GENERAL

The Work shall consist of furnishing, installing and testing luminaires containing an integral ballast system, clear high-pressure sodium lamps; photoelectric cells; pull boxes; pole numbers; electrolier standards, mast arms and foundations; in-line fuses; conduit and cable and all other materials and appurtenances in accordance with the Plans and these Standard Specifications. The end result shall be a system complete and in operation to the satisfaction of the Engineer.

17-02 MATERIALS

17-02.01 General

All materials delivered to the job shall be new, best quality of their respective grades, in accordance with these Standard Specifications and packed in their original sealed containers. All materials to be installed shall bear the Underwriters Laboratories, Inc., UL Label.

The Contractor shall use materials mentioned in these Standard Specifications as standard, or an approved equal from the latest edition of the City's Approved Material List, and in no case will a substitute be allowed without written approval of the Engineer.

17-02.02 Foundations

Foundations shall conform to Section 86-2.03, "Foundations," of the Caltrans Specifications and with the Standard Plans except as modified herein. The top four inches (4") of the foundation shall not be placed until the standard is erected and leveled.

17-02.03 Electrolier Standards

Electrolier standards shall conform to Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Caltrans Specifications and with the Standard Plans except as modified herein. See Section 17-02.08, "Painting," of these Standard Specifications for painting requirements. Allen head screws shall be used in all electrolier hand holes covers.

A. Type "15" Standard Electrolier

The light pole shall be all aluminum, one-piece construction, with a classic tapered design with a minimum 8" outside diameter at the base and a minimum 3-7/8" outside diameter at the top, with a minimum thickness of 0.1196".

The luminaire arm shall have a minimum thickness of 0.1196" and shall conform to the Standard Plans.

B. Downtown Decorative Electrolier

The downtown decorative electrolier shall be Sternberg #1130A 508BD4 3810FP4 electrolier or approved equal.

The light pole shall be a 4" diameter, fluted pole with a wall thickness of 0.125", constructed of 6061-T6 structural grade aluminum. The pole shall be welded for single unit construction with a black polyurethane powdercoat finish.

The acorn styled luminaire shall consist of a decorative luminaire base with an integral globe holder/ballast housing and an acorn shaped globe with a spun aluminum hinged roof. Globe material shall be polycarbonate. Internal refractors shall be glass and have an IES Type 3 distribution. The ballast compartment shall have a minimum 0.25" wall thickness.

The base shall be 15" in diameter with a 0.875" minimum floor thickness. It shall be secured with 4 anchor bolts and one ground lug. An access door shall be provided with stainless steel allen head screws.

C. Park Electrolier

The park electrolier shall be Cooper Lighting fixture Traditionaire UTR70SWW55U4, or approved equal. The light pole shall be 8 feet tall, 4" in diameter aluminum with a black anodized finish, Cooper Lighting catalog no. RSA4T08AD, or approved equal.

D. Bollard

The bollard light shall be Cooper Lighting fixture type BSC-36-35-HPS-120-BK-F-PL-L or approved equal. The light shall be square and 36 inches tall. It shall have a 35 watt high pressure sodium, 120 volt light. Color shall be black with polycarbonate lens.

17-02.04 Conduit

Conduits shall conform to Section 86-2.05, "Conduit," of the Caltrans Specifications except as modified herein.

Conduits to be installed under street pavement shall be one and one-half inch (1-1/2") rigid steel conduit conforming to the requirements in Publication UL 6 for Rigid Metallic Conduit. The zinc coating shall be in accordance with ASTM Designation A239 unless otherwise specified.

Conduits to be installed other than under street pavement shall be one and one-half inch (1-1/2") rigid steel conduit or Schedule 40 rigid plastic (nonmetallic) conduit conforming to the requirements in the Underwriters Laboratories Standard for Rigid Nonmetallic Conduit (Publication UL 651). Rigid plastic conduit connections shall be of the solvent weld type. See Paragraph 19-02.07,

"Bonding and Grounding," of these Standard Specifications for grounding in plastic conduit.

17-02.05 Pull Boxes

Pull boxes shall conform to Section 86-2.06, "Pull boxes," of the Caltrans Specifications and with the Standard Plans.

A pull box shall be installed adjacent to all electrolier standards. The pull box shall be a No. 3-1/2 or as otherwise noted on the Plans.

17-02.06 Conductors and Wiring

Conductors and wiring shall conform to Section 86-2.08, "Conductors," and Section 86-2.09, "Wiring," of the Caltrans Specifications. The insulation for No. 10 and larger conductors shall be one of the following:

- A. Type TW polyvinylchloride conforming to the requirements of ASTM Designation D2219.
- B. Type THW or THWN polyvinylchloride.

A standard C-shaped compression connector shall be insulated per method B or the "Wiring Details and Fuse Rating," Detail ES-13, of the Caltrans Standard Plans.

Street light cable shall be stranded copper conductor of sizes as specified on the Plans or in the Special Provisions or Technical Provisions. Minimum conductor sizes shall be No. 8 AWG and No. 10 AWG within the standard. Conductors shall be of consistent wire gauge and insulation unless otherwise specified. Conductors shall have a minimum of two feet (2') of slack in all pull boxes that are located next to the base of each electrolier and at each splice.

A 10-amp in-line fuse shall be installed in the base of each electrolier and be accessible through the hand hole. Fuse holders shall conform to Section 86-2.095, "Fused Splice Connectors," of the Caltrans Specifications.

17-02.07 Bonding and Grounding

Bonding and grounding shall conform to Section 86-2.10, "Bonding and Grounding," of the Caltrans Specifications except as modified herein. Bonding connections shall be made with No. 4 AWG bare copper wire or with copper ground straps of equal cross-sectional area.

The ground electrode for the electrolier standards shall be as shown on the Standard Plans.

Where conductors and wires are installed in nonmetallic conduits, a properly sized, green insulated, No. 8 AWG minimum, copper wire (equipment grounding wire) shall be installed continuously in all circuits from the point of service to each pull box and light standard. The ground wire shall be properly grounded in the

pull box located closest to the service point in accordance with Section 86-2.10, "Bonding and Grounding," of the Caltrans Specifications and Paragraph 17-03.05, "Service Connection," of these Standard Specifications.

17-02.08 Painting

Painting shall conform to Section 86-2.16, "Painting," of the Caltrans Specifications except as modified herein. The prime coats, two required, shall be red iron oxide type primer or approved equal.

The finish coats shall be dark olive black Tnemec paint or approved equal. The finish coat shall be applied in not less than two (2) applications.

Factory finish on new equipment will be acceptable if of proper color, and if equal in quality to the specified finish. The final finish coat on standards and mast arms may be applied in the field.

17-02.09 Luminaires

Luminaires shall conform to Section 86-6.01, "High-Intensity-Discharge Luminaires," of the Caltrans Specifications except as modified herein.

Luminaires shall consist basically of an aluminum housing, photoelectric control receptacle, reflector, prismatic refractor, integral ballast and an adjustable socket capable of producing IES Types II or III. Type IV shall be provided only when required. Glare shields shall not be installed. Distribution type shall be medium, semi-cutoff or as specified on the Plans or Special Provisions or Technical Provisions. Luminaires, complete with lamps, shall be installed on the mast arms in the proper orientation to produce the desired light pattern and shall be completely assembled and connected to the conductor. Each refractor shall be acrylic unless noted otherwise. The integral ballast need not be mounted on a down-opening door.

A. Multiple Circuits

Luminaires for multiple circuits shall have Mogul multiple sockets and internal ballast of the regulator type capable of operating from a multiple 120- or 240-volt circuit as noted on the Plans. The high-pressure sodium luminaires shall be as listed below or an approved equal from the latest edition of the City's Approved Material List.

<u>Lamp Wattage</u>	<u>Primary Voltage</u>	<u>Thomas & Betts</u>	<u>General Electric</u>
<u>Standard Electrolier – Type 15</u>			
70	120	113-562E2-6000A0	M2AR07S1H2AMS21
70	240	113-563E2-6000A0	M2AR07S3H2AMS21
100	120	113-56213-6000A0	M2AR10S1M2AMS31
100	240	113-56313-6000A0	M2AR10S3M2AMS31
150	120	113-56263-6000A0	M2AR15S1M2AMS31
150	240	113-56363-6000A0	M2AR15S3M2AMS31
200	120	125-062J3-0000A0	M2AR20S1A2GMS31
200	240	125-063J3-0000A0	M2AR20S3A2GMS31

<u>Lamp Wattage</u>	<u>Primary Voltage</u>	<u>Thomas & Betts</u>	<u>General Electric</u>
<u>Park Type Electrolier</u>			
70	120	Cooper UTR70SR2554	
<u>Decorative Electrolier</u>			
70	120	Sternberg (medium base socket)	

B. Lamps

Each luminaire shall be equipped with a clear high-pressure sodium lamp of the following ANSI Code Number:

<u>Lamp Wattage</u>	<u>ANSI Code No.</u>
70	S62-ME-70
100	S54-SB-100
150	S55-SC-150
200	S66-MN-200

C. Photoelectric Control

Photoelectric control shall conform to Section 86-6.07, "Photoelectric Controls," of the Caltrans Specifications except as modified herein.

All photoelectric control shall be Type IV. A photoelectric unit shall be supplied for each luminaire, connected to the same voltage as the luminaire.

17-03 CONSTRUCTION

17-03.01 General

All Work shall be in compliance with the requirements of the applicable sections of the Caltrans Specifications and the Standard Plans. In case of conflict, the higher requirement shall govern.

All Work and material shall be protected at all times. Pipe openings shall be closed with protective caps during installation and all materials shall be covered and protected against dirt, water and mechanical or other injury. All materials damaged during the course of construction shall be replaced or repaired to original condition by the Contractor.

The Contractor shall not allow or cause any of his Work to be covered up or enclosed until it has been inspected and approved by the Engineer. Should any of the Work be enclosed or covered up before such inspection, the Contractor shall, at his own expense, uncover the Work and, after it has been inspected and approved, make all repairs with such material as may be necessary to restore all Work to its original and proper condition.

17-03.02 Conduits

Excavating and backfilling shall conform to Section 86-2.01, "Excavating and Backfilling," and Section 86-2.02, "Removing and Replacing Improvements," of the Caltrans Specifications except as modified herein. The maximum width of trench shall be eight inches (8"). Trenching shall not occur in street pavement unless otherwise specified. "Initial Backfill" shall be sand. "Subsequent Backfill" shall be native material free of stones, hard pan lumps, broken concrete or paving material. The backfill material shall be brought to the elevation of the bottom of the subbase material of the sidewalk or pavement. Backfill shall be placed in layers not exceeding eight inches (8") in depth and shall be thoroughly tamped in such a manner as to prevent future settlement. Should the Contractor elect to use all sand backfill, the eight-inch (8") layer construction may be omitted and compaction may be obtained by pounding.

A run of conduit installed without conductors and having a bend of ninety degrees (90°) or more shall have installed within the entire run a No. 12 AWG copper pull wire. The ends of all empty conduits shall be capped.

Connections from metal conduit to nonmetallic conduit shall be made at pull boxes or a minimum of four inches (4") inside electrolier foundations so that the connection will be completely covered by concrete.

Cutting and machining of conduit shall be in accordance with manufacturer's recommendations. Preassembly of sections of conduit shall not be permitted except where jacking is required.

When jacking is required, a galvanized metal pipe sleeve conforming to Section 86-2.05, "Conduit," of the Caltrans Specifications of sufficient diameter to contain the conduit shall be jacked across the required distance. The conduit shall then be threaded through the pipe and connected to the conduit system.

Trench-laid conduit installed outside of street pavement shall be placed not less than eighteen inches (18") below the surface of the ground or sidewalk. The conduit shall be laid over two inches (2") of uniformly spread sand. Native material may be used for backfill around and above the conduit.

Trench-laid conduit installed under street pavement shall be placed not less than thirty inches (30") below the pavement surface. The conduit shall be laid over two inches (2") of uniformly spread sand. A minimum of four inches (4") of the same type of material shall be placed over the conduit. The remaining trench may be backfilled with native material up to subgrade.

The minimum cover requirements for trench-laid conduit installed under street pavement may be reduced to eighteen inches (18") if the conduit is backfilled with controlled density fill (CDF). The CDF shall meet the requirements as specified in Section 10, "Trench Excavation, Backfill and Resurfacing," of these Standard Specifications. CDF shall be placed to three inches (3") below the pavement surface. The top three inches (3") of the trench shall be backfilled with asphalt concrete produced from commercial quality paving asphalt and aggregates. Prior to spreading asphalt concrete, paint binder (tack coat) shall be

applied as specified in these Standard Specifications. Spreading and compacting of asphalt concrete shall be performed by any method which will produce an asphalt concrete surface of uniform smoothness, texture and density.

Conduit installed under street pavement by means of pushing, jacking or boring shall be placed not less than thirty inches (30") below the pavement surface.

17-03.03 Conductors and Wiring

Splicing shall conform to the following methods as specified in Section 86-2.09, "Wiring," of the Caltrans Specifications or approved equal.

Multiple lighting conductors shall only be spliced in pull boxes.

17-03.04 Painting

Failure to comply with any part of the painting specifications shall be sufficient cause for the Engineer to require the Contractor to completely remove all applied coats and reapply required prime and finish coats in accordance with these Standard Specifications.

The Contractor shall provide protective devices such as tarps, screens or covers, as necessary, to protect curb and gutters, glassware, adjacent buildings, parked automobiles, and other property or persons from all cleaning and painting operations. Paint or paint stains, which result in an unsightly appearance on surfaces not designated to be painted, shall be removed or obliterated by the Contractor at his expense and to the satisfaction of the Engineer.

When pole painting is complete, the Contractor shall furnish and install pole identification plates, except on Type "B" streetlight poles. On Type "B" streetlight poles, the Contractor shall furnish and install self-adhesive reflective numbers (white on black) sized two and one-half inch (2-1/2") by one and one-half inch (1-1/2") with one-quarter inch (1/4") spacing between letters/numbers and approved by the Engineer. The Engineer will assign pole identification numbers.

17-03.05 Service Connection

Electrical service installation and materials shall conform to the requirements of the serving utility. Service equipment shall be installed as soon as possible to enable the utility to schedule work well in advance of the completion of the project. Service connections for electroliers served by underground electrical systems will be made at the nearest Pacific Gas and Electric Company secondary box. The Contractor shall provide conduit and wire from the secondary box to the electrolier.

When a circuit serviced from an underground secondary box serves more than one electrolier, the circuit shall be fused at the first pull box from the secondary box. Pull box shall be sized No. 31/2 unless otherwise noted.

The circuit fuse shall be 40-amp for No. 8 AWG wire and shall be installed in an in-line, waterproof holder. Fuses for larger wires will be sized by the Engineer. Both hot legs of 240-volt circuits shall be fused.

Only the one hot leg of 120-volt circuits shall be fused. A ground electrode and ground clamp conforming to Section 86-2.10, "Bonding and Grounding," of the Caltrans Specifications shall be installed in the pull box in which the circuit is fused. The purpose of the ground electrode is to facilitate grounding the circuit when the fuse holder is disconnected, thus eliminating the possibility of energizing the circuit while it is being repaired.

Service connections for electroliers served by overhead electrical systems will be made at a junction box at the base of the service riser pole. The Contractor shall provide the junction box and conduit and wire from the junction box to the nearest electrolier. In all cases where the service is from a riser pole, the Contractor shall install a ground electrode and shall fuse the circuit in this adjacent junction box in accordance with the above requirements. Junction box shall be sized No. 31/2 or larger.

All service connections will be made by Pacific Gas and Electric Company. The Contractor shall bear all costs charged by Pacific Gas and Electric Company for the service connection.

17-03.06 Field Tests

Field tests shall conform to Section 86-2.14, "Testing," of the Caltrans Specifications except as modified herein.

The Contractor shall be responsible for maintaining the lighting system during the functional test period.

17-03.07 Pole Identification Plates

The Engineer will assign pole identification numbers. The Contractor shall furnish and install pole identification plates. The letters/numbers shall be white reflective, Highway Gothic "B", 1-3/4" tall, spaced 5/8" apart. The letters/numbers shall be mounted vertically on 3" x 12" x 0.080 aluminum plates with 1/2" radius corners and 5/16" holes punched 1/2" in from the top and bottom. The color of the plates shall be Bottle Green 3M #7725-276 pressure sensitive for installation on green poles; and black pressure sensitive for installation on black poles.