Electric Vehicle (EV) Chargers on Steel Poles

1. Scope

This standard covers the requirements for the installation of electric vehicle (EV) chargers on steel poles served by the Seattle City Light (SCL) overhead Looped Radial distribution system.

For EV chargers on wood distribution poles, see SCL 0098.51.

For EV chargers on curbside pedestal, see SCL 0098.61.

2. Application

This standard is intended for use by SCL engineers, crews, and contractors responsible for designing and installing SCL-owned EV chargers on steel poles located on the opposite side of the street from the existing OH Looped Radial distribution system.

This standard is applicable only to areas with no underground service ordinance.

The SCL Electrification and Strategic Technology Division owns and manages the EV chargers and the steel poles onto which these are attached.

Luminaires will not be installed at locations where SCL Streetlight Engineering or the Seattle Department of Transportation determines that the additional luminaire will conflict with existing streetlighting, result in over-lighting, or be otherwise undesirable.

SCL Streetlight Engineering owns and manages the luminaire bracket arms and fixtures.

This standard applies to the EVSE LLC model 3704 family of EV chargers or an SCL-approved equivalent.

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3. Requirements

3.1 Codes, Permits, and Approvals

All installations shall meet or exceed all applicable structural and clearance requirements of the latest revision of the National Electrical Safety Code (NESC), as well as SCL construction standards. In case of conflict, the most stringent requirement will prevail.

Electrical service to provide power to EV chargers, installed by the EV contractor, shall meet or exceed all requirements of the latest revision of the National Electrical Code (NEC).

3.2 Foundation Installation

The EV charger contractor (contractor) shall install the cast-in-place foundation per the steel pole manufacturer's instructions in addition to meeting the requirements stated in this section.

Foundations shall only be installed in planting strips.

Foundations shall be augured and constructed against undisturbed soil.

Foundations shall be installed with a bolt pattern oriented parallel and perpendicular to the curb.

Foundations shall conform to the requirements shown in Figure 3.2a through Figure 3.2c.

For installation on level ground or a slope, the top of the finished cast-in-place foundation shall be level with grade.

Where foundations are installed on a slope, the foundation depth shall be measured using the shortest bearing surface.

Figure 3.2a. EV Charger Steel Pole Foundation, On Level Ground

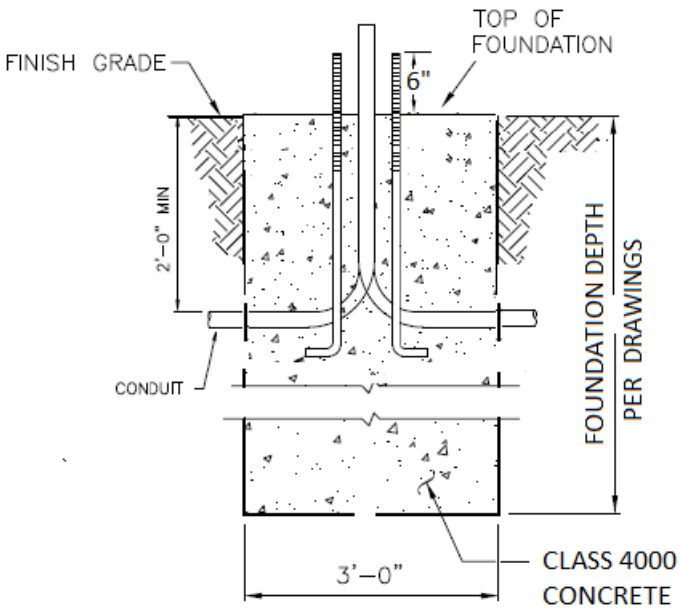


Figure 3.2b. EV Charger Steel Pole Foundation, On an Incline

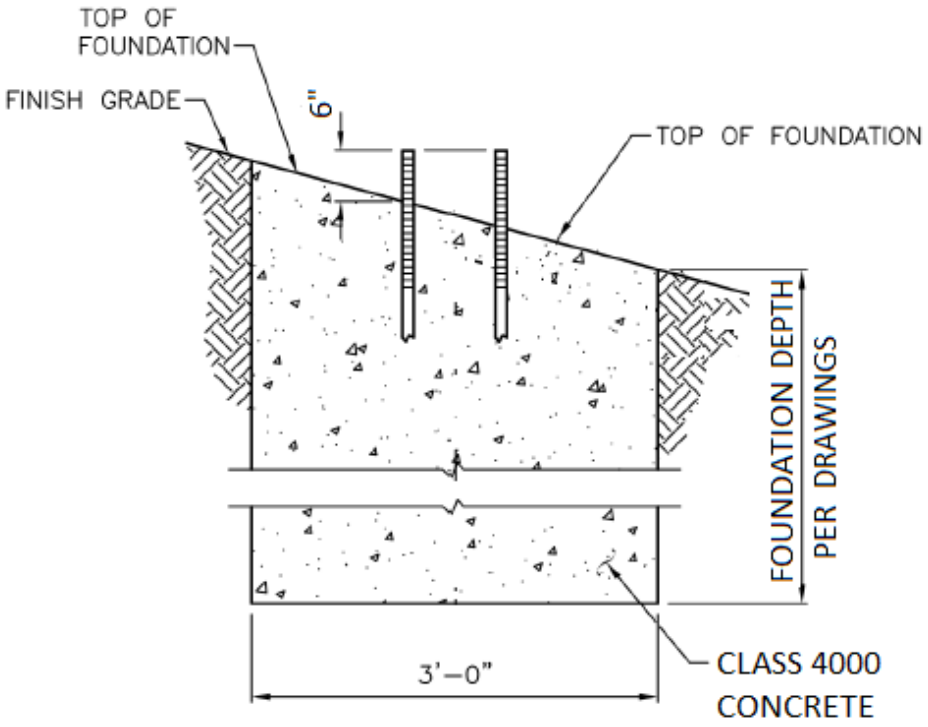
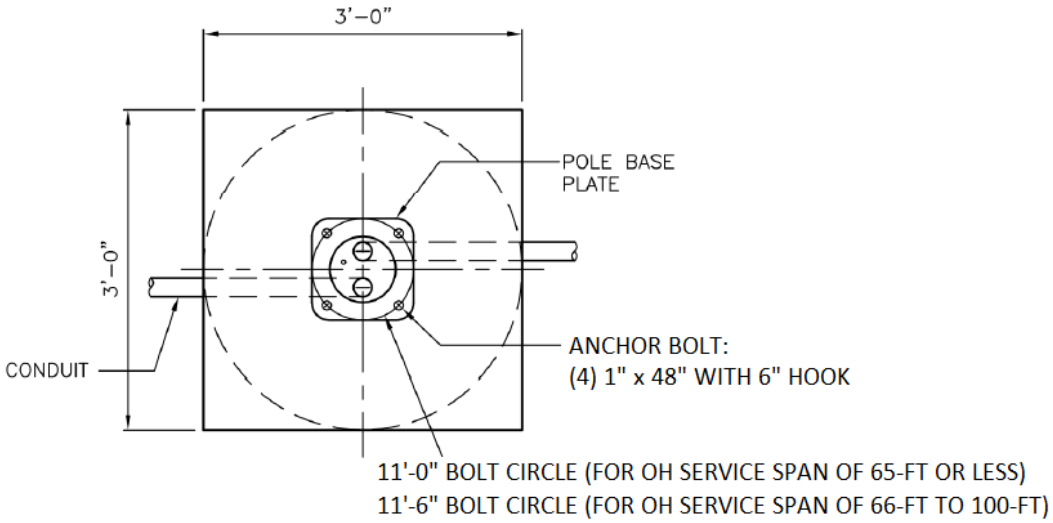


Figure 3.2c. EV Charger Steel Pole Foundation, Plan View



Each foundation shall be poured in one continuous pouring operation.

Concrete shall have a minimum compressive strength at 28 days of 4000 psi in accordance with the American Association of State Highway and Transportation Officials (AASHTO) T 22 standard.

Concrete shall be placed against undisturbed earth within a dry hole. Should a dry hole not be maintained, the installer shall select a method of concrete placement which does not adversely impact the strength or durability of the concrete as approved by SCL Construction Management or the Engineer.

In unstable ground, the installer shall install Sonotube, caisson, or other approved form material to provide undisturbed concrete placement. Backfill between the form material and undisturbed earth shall be controlled density fill (CDF).

Conduit shall be installed in the foundation per figures 3.2a and 3.2c.

Conduit shall be 2-inch Schedule 40 PVC (Stock No. 734530). Below-grade conduit ends shall extend a minimum of 6 inches beyond the foundation into native soil, parallel to the roadway. Both ends of the conduit shall be covered with a pressure-fit end cap to prevent debris intrusion and secured with duct tape (do not glue).

Conduit shall extend 1 inch above the top of the foundation base plate.

3.3 Anchor Bolt Installation

Anchor bolts and its installation shall be as specified by the steel pole manufacturer.

Anchor bolts shall be set securely in place and held in a vertical position with the specified bolt projection and at the specified bolt circle to match the exact bolt pattern for EV charger steel poles.

Prior to placing the concrete, all projecting anchor bolts shall be taped and protected with a corrosion protection tape from a point 6 inches below the top of the foundation to the top of the bolt. Tape shall conform to the requirements of SCL 7366.35.

The tops of each bolt shall all be at the same elevation and be a minimum of 6-inches above the top of the foundation. See figures 3.2a and 3.2b.

A steel template shall be used at the lower end, and a wood or steel template shall be used at the upper end of the anchor bolts, to maintain the correct bolt pattern and spacing until the concrete has set.

Anchor bolts shall not be altered in any way after fabrication.

Bending of anchor bolts is unacceptable and will be cause for removal and replacement of the entire foundation.

Where required, the bolt circle shall be measured by SCL Construction Management or Engineer prior to pouring the concrete. The steel pole manufacturer specifies the following:

- 11.0-inch bolt circle for an overhead service span of 65 ft or less.
- 11.5-inch bolt circle for an overhead service span between 66 ft and 100 ft.

Immediately after the concrete is placed, the location of the anchor bolts shall be checked with a template conforming to the bolt pattern of the EV charger pole.

Immediately after the concrete is placed, anchor bolts and conduit shall be cleaned to remove any concrete splatter and mortar.

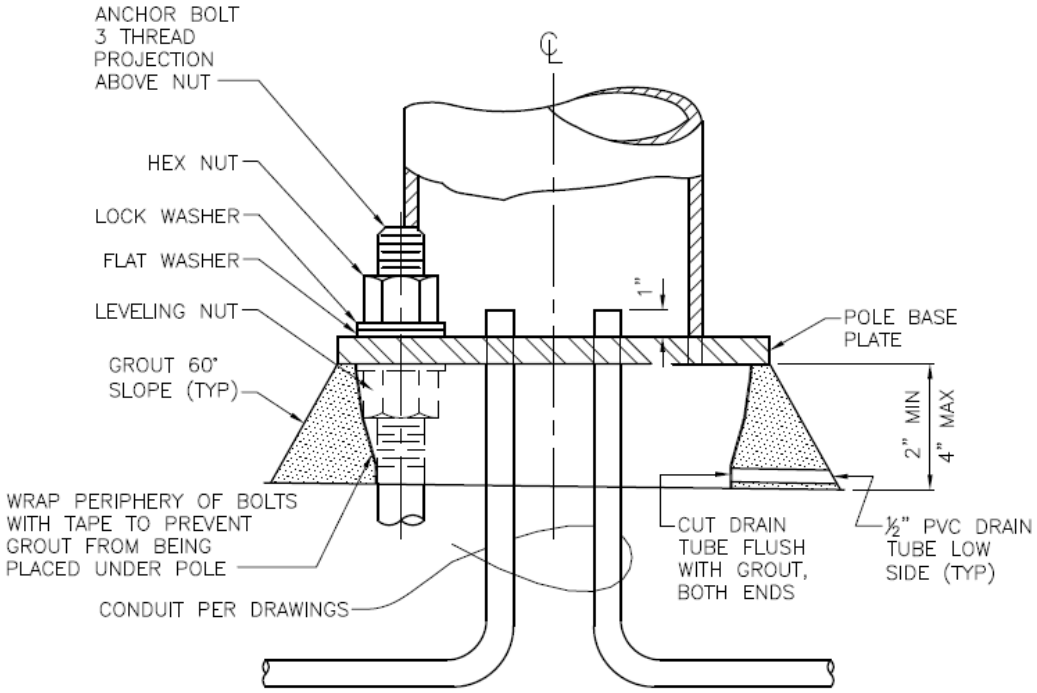
Concrete shall be float-finished, edged, and brushed where necessary. Adjusting anchor bolts to make them fit the hole-pattern in the base plate will not be allowed after concrete has begun to set.

3.4 Pole Mounting, Grouting and Drain Holes

Mounting, grouting and drain holes shall be installed to meet the requirements of SCL 1716.34 and per Figure 3.4.

Before placing grout, concrete should be cleaned, roughened, and moistened with water to ensure proper bonding.

Figure 3.4. Requirements for Pole Mounting, Grouting and Drain Holes



The clearance between the bottom of the leveling nut and the top of the foundation shall be 1-inch nominal with a tolerance of 1/8 inch.

3.5 Equipment Mounting, Orientation, and Attachments

The contractor shall be responsible for the mounting of the following:

- EV chargers and associated equipment on the steel poles
- Streetlight bracket arms and luminaire (see SCL standards 5723.47, 5723.61, and 5723.71 respectively for residential, collector arterial, and principal arterial luminaires)

Equipment mounting and orientation shall be as shown in figures 3.5a through 3.5d.

The load center shall be mounted on the back side of the pole, facing away from the road. See Figure 3.5a.

The communications gateway shall be mounted on the side of the load center. The contractor shall connect AC power wire to the gateway.

The communications gateway shall be installed such that the opening and closing of the load-center door is unimpeded. See Figure 3.5b.

The load center shall be mounted to the factory-drilled pole using a pre-drilled section of steel C-channel as shown in Figure 3.5c. The contractor shall drill or punch holes in the back of the load center to match the holes in the C-channel.

The load center and C-channel shall be fastened to the factory-drilled pole using 1/2"-13 thread size stainless-steel hex head bolts. Load-center holes shall be sealed or grommeted to prevent water intrusion.

Each EV charger shall be mounted on the factory-drilled pole, oriented120 degrees to either side of the load center, using a pre-drilled section of steel C-Channel See figures 3.5b and 3.5d.

The contractor shall fasten the C-channel to the factory-drilled holes using the following bolts:

- Top bolt: 1/2"-13 thread size, 2-inch long stainless-steel flat-head bolts with an 82-degree countersink angle
- Bottom bolt: 1/2"-13 thread size, 2-inch-long stainless-steel hex-head bolts

To meet the requirements of the American Disabilities Act (ADA), the following mounting requirements shall also be followed:

- 40 inches above the top of the curb to the RFID reader and EV charger connector
- 29 inches from the face of the curb to the center axis of the steel pole.
- 18 inches from the face of the curb to the closest edge of the EV charger

Figure 3.5a. EV Charger Steel Pole, Overview

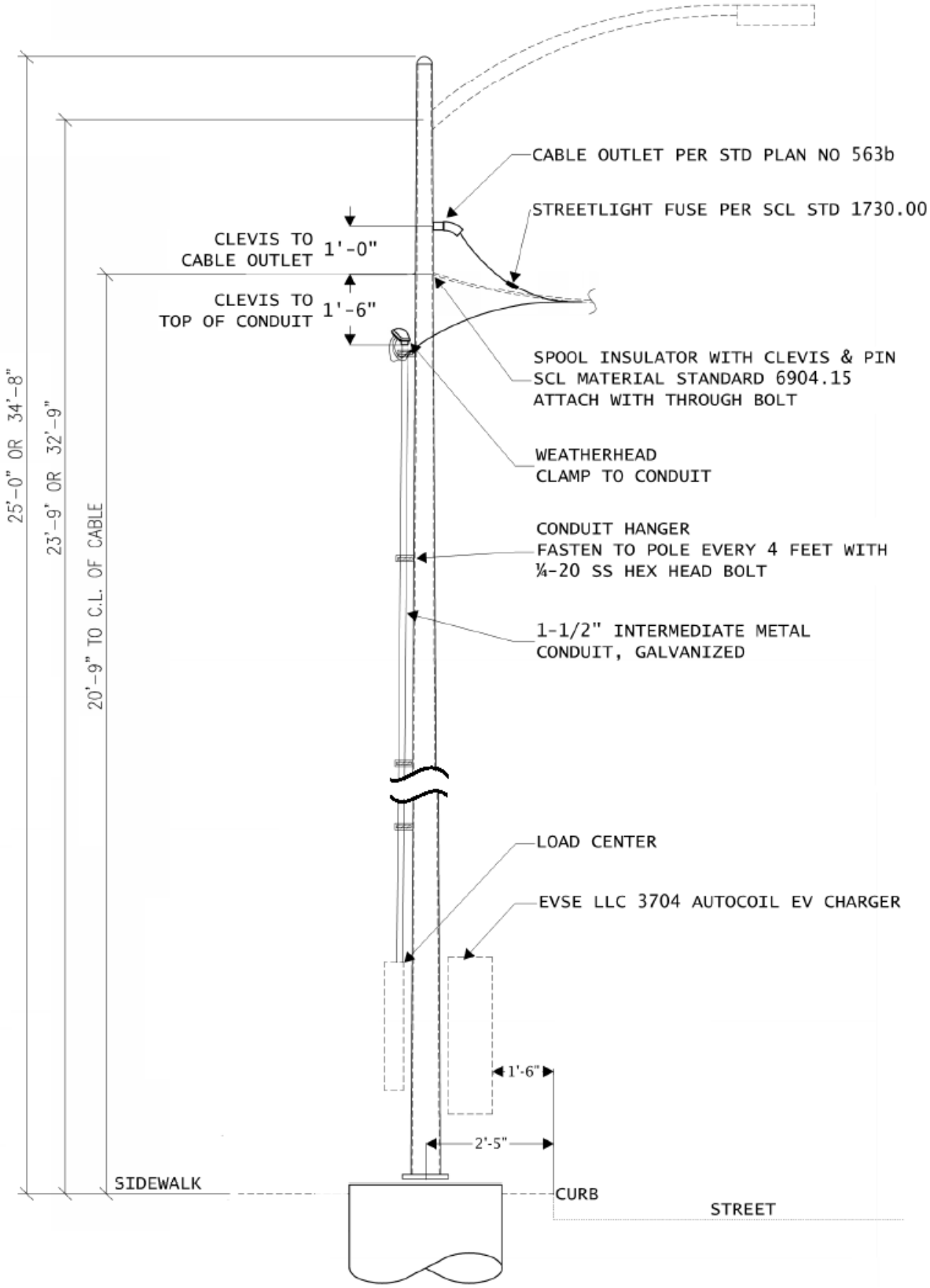


Figure 3.5b. EV Charger Orientation

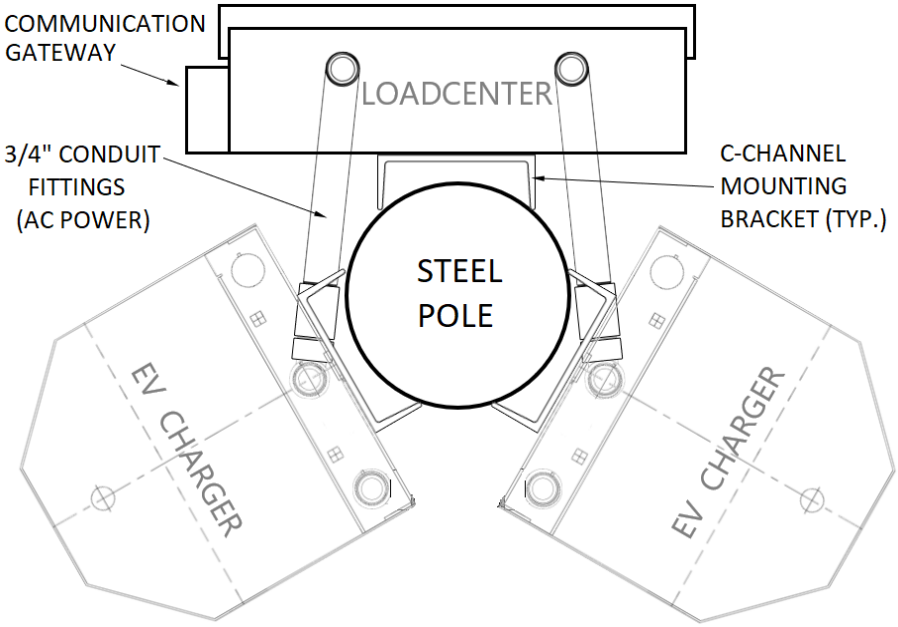


Figure 3.5c. Load-Center, C-Channel Mount

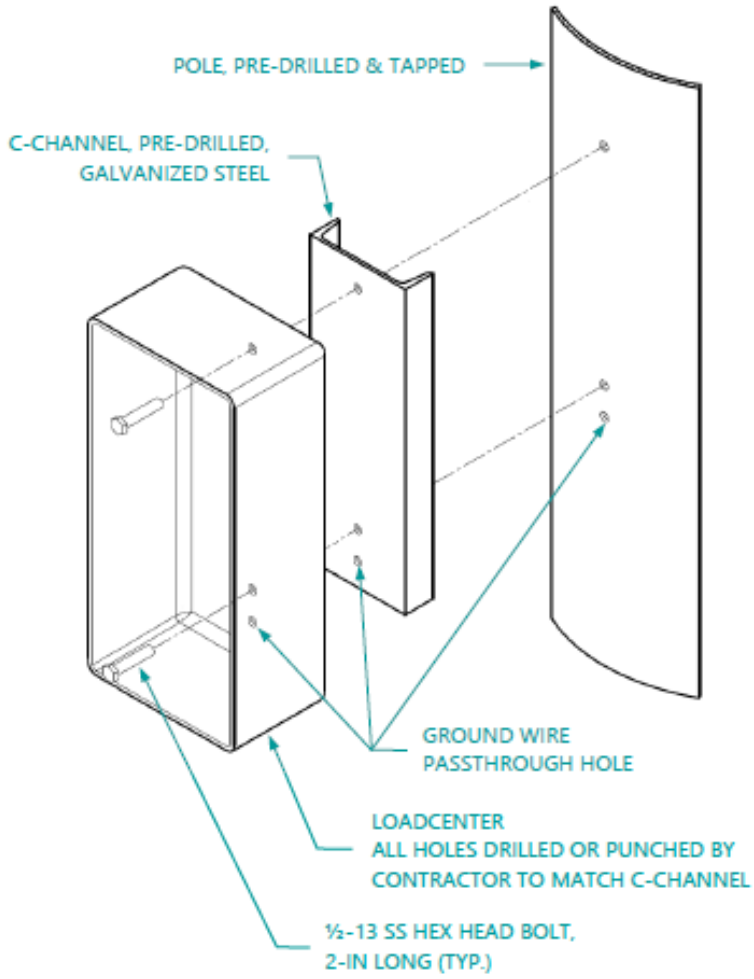
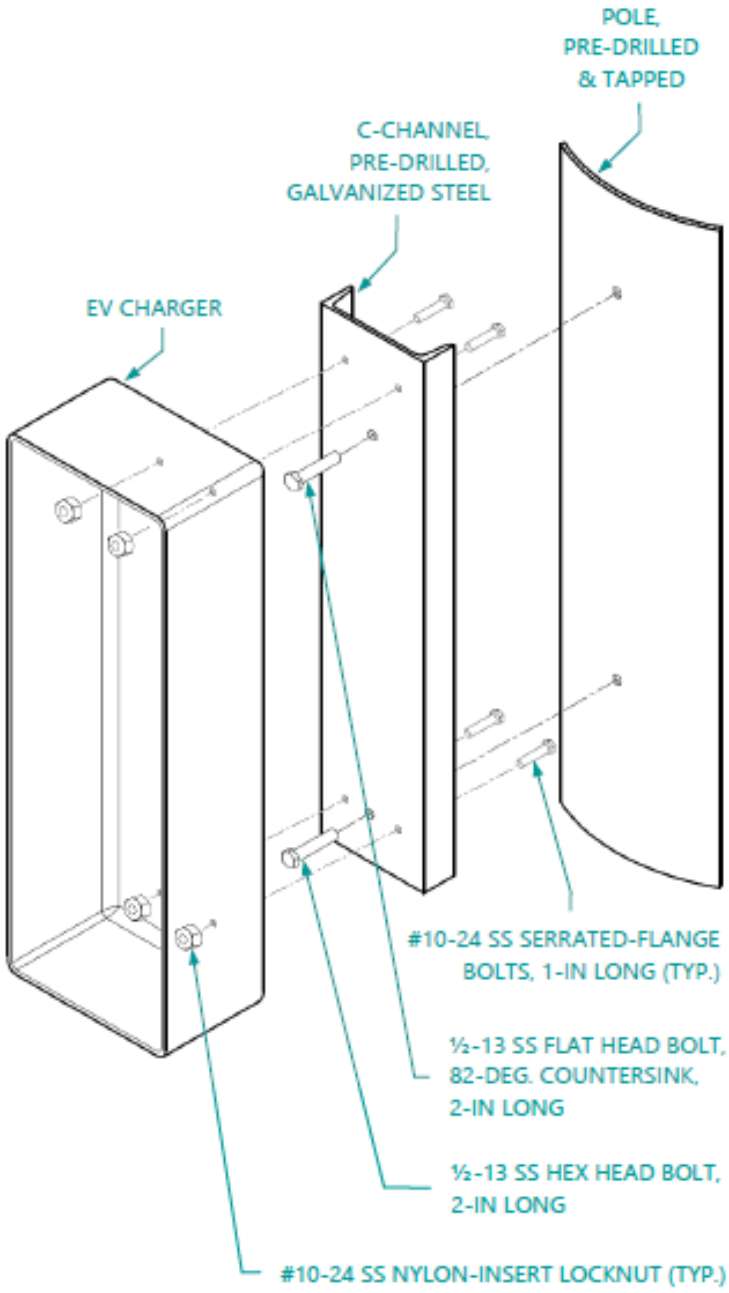


Figure 3.5d. EV Charger, C-Channel Mount



3.6 Electric Service, Wiring, and Fusing

Electric service voltage will be overhead single phase, 120/240 Vac. See Figure 3.5a.

The service drip loop shall be the point of demarcation.

Service drops shall not exceed 1/0 in conductor size.

Service drops shall not exceed 100 ft in length.

A service disconnect switch is required for each EV charger location.

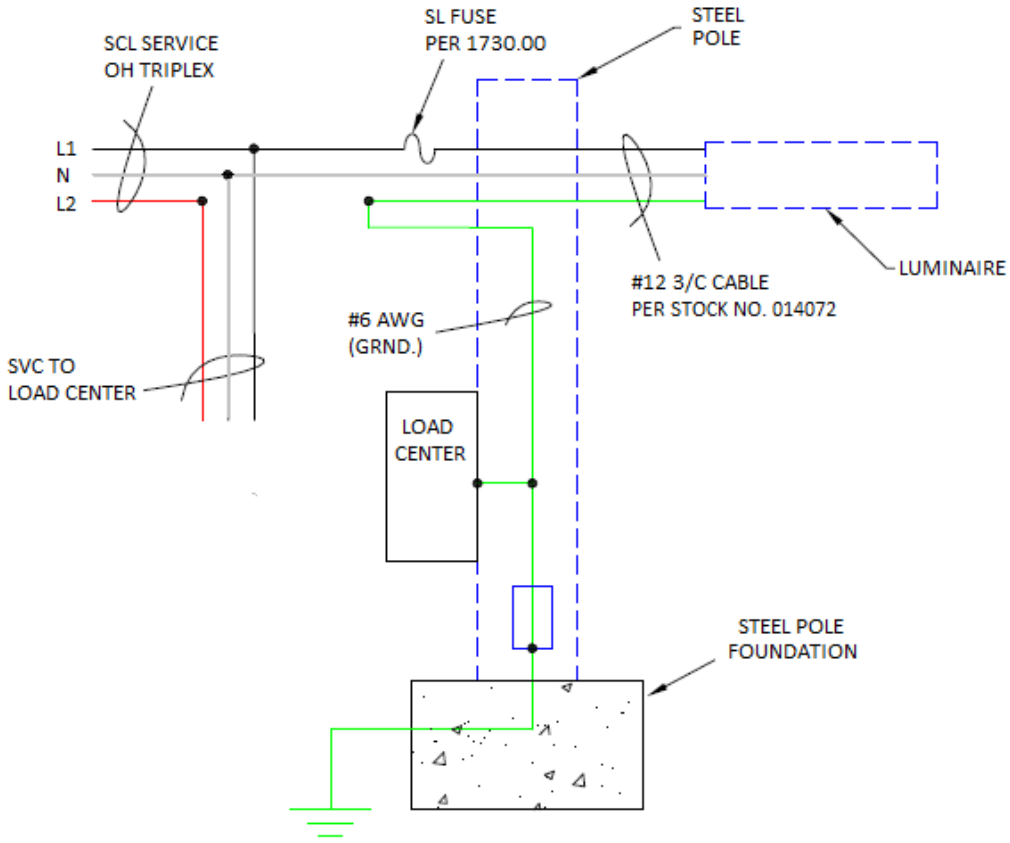
The disconnect switch shall be integrated into the EV charger load center setup.

SCL crews shall install the service drop (SCL 6007.50) and make the final connections for power to the EV charger and streetlight. This includes installation of an inline fuse (SCL 1730.00) for streetlight service at its drip loop. See Figure 3.6.

The contractor shall install all electrical service equipment and wiring on the steel poles. This includes the following:

- Clevis with spool insulators (Stock No. 014328) installed onto factory pre-drilled bolt hole.
- 1-1/2-inch Intermediate Metal Conduit (IMC) to create a continuous, liquid-tight wire raceway between the load center and the weatherhead. The top of the IMC shall be 18 inches minimum below the service clevis. See Figure 3.5a.
- Service conductor (per NEC) between the load-center and the weatherhead. A 3-ft coil beyond the weatherhead shall be provided for SCL crews to make the final connections.
- Streetlight wiring between the luminaire and the steel pole outlet, located above the service strike. A 3-ft coil beyond the outlet shall be provided for SCL crews to make the final connections. See Figure 3.5a and Figure 3.6.
- 3/4-inch IMC and wiring (per NEC) between the load-center and each EV charger. See Figure 3.5b.

Figure 3.6. Streetlight One-Line Wiring Diagram



3.7 Grounding and Bonding

The contractor shall install all conductive equipment and materials, including the steel pole and steel conduit shall be connected to an equipment grounding conductor or effectively grounded and bonded per the National Electrical Safety Code (NESC).

A solid copper ground wire, #4 AWG minimum, shall be installed and routed inside the pole into the concrete foundation from conductive equipment to the ground rods using an exothermic weld (Cadweld or equivalent).

For streetlight grounding, an insulated #6 AWG grounding wiring shall be installed from the luminaire and routed inside the steel pole to the load-center and ground rods. See Figure 3.6.

A minimum of two copper-clad ground rods (5/8 inch by 8 ft) shall be installed 8-ft apart to achieve 25 ohms or less. Additional ground rods may be required.

Ground rods shall be driven in firm, undisturbed earth to achieve 12 inches of cover.

3.8 Signage and Identification (ID) Tags

Identification of equipment attachments is necessary to assist in repair, restoration, and coordination of work on the pole by SCL or other customers who shares the pole.

Instruction signage for EV charging shall not be larger than 12 in by 18 in.
Signage shall contain, at a minimum, the site identification name or ID code and the EV charger customer service contact information.

SCL ID Tags shall be installed on each EV charger enclosure. ID tags shall contain, at a minimum, a SCL logo, the site ID name or number, and a SCL contact phone number for emergency, information, or notification.

All signage and ID tags shall be installed flush with its mounted surface or on brackets per Seattle Standard Plan No. 601c.

3.9 Aesthetics

Equipment aesthetics and coloring shall meet the requirements of the Authority Having Jurisdiction (AHJ).

3.10 Inspection

Inspection points are put in place to ensure conformity to SCL requirements. Inspection by an SCL Electrical Reviewer is required for the following points:

- Grounding and bonding inspection and test
- Fixture wiring
- Foundations, poles, and fixtures
- Equipment installation and clearances
- Conduit and handhole, if installed

4. Construction Notes

For installation instructions for the EV charger, see “User Manual and Installation Guide Model 3704-IG-001” provided by the manufacturer.

The contractor shall use 3/4-inch galvanized rigid metal conduit (RMC) or IMC conduit fittings to create a continuous, liquid-tight wire raceway between knockouts at the bottom or back of the load-center and AC power cable access knockout at the bottom-center of each charger. See Figure 3.6b.

The contractor shall install and connect AC power wire between the load-center and the charger(s) as per manufacturer's instructions.

5. References

American Association of State Highway and Transportation Officials (AASHTO); T 22 standard

City of Seattle Standard Plans for Municipal Construction; Standard Plan No. 601c

EVSE, LLC; "User Manual and Installation Guide Model 3704-IG-001"

National Electric Code (NEC), NFPA-70; 2011 Edition, National Fire Protection Association, Quincy, MA, 2010

National Electrical Safety Code (NESC), C2-2012 Edition; Institute of Electrical and Electronics Engineers (IEEE), Inc., New York, NY, 2011

SCL Construction Standard 1730.00; "Streetlight Fusing Schedule, Individual"

SCL Material Standard 5723.47; "Streetlight Luminaire, LED, Side-Mount, Residential"

SCL Material Standard 5723.61; "Streetlight Luminaire, LED, Side-Mount, Collector Arterial-grade"

SCL Material Standard 5723.71; "Streetlight Luminaire, LED, Side-Mount, Principal Arterial-grade"

SCL Construction Standard 6007.50; "600 V, Aluminum, Overhead, Triplex and Quad Service Drop Cable"

SCL Material Standard 6904.15; "Insulator, Polymer Spool and Steel Clevis and Angle Bracket"

SCL Material Standard 7366.35; "Tape, Corrosion Protection"

6. Sources

Borek, Tom; SCL Streetlight Engineer and subject matter expert for 0098.71

Neuansourinh, Ponet; SCL Standards Engineer, originator, and subject matter expert for 0098.71

Orenberg, Jacob; SCL Sr Capital Project Coordinator and subject matter expert for 0098.71

SCL Construction Standard 0095.06; "Non-Ionizing Electromagnetic Radiation (NIER) Report Requirements."

SCL Construction Standard 0451.01; "Grounding Electrodes for Distribution Poles"

SCL Material Standard 6404.45; "Cable, Streetlight, Pole and Bracket, 3/C, 600 V"

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