

Chapter 4

Construction Details

Section 86 Electrical Equipment and Materials

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Section 86 Electrical Equipment and Materials

4-8601 General

This section provides guidelines for inspection of equipment and materials specified under Division 10, "Electrical Work," Section 86, "General," of the *Standard Specifications*. Division 10, "Electrical Work," includes electrical requirements and is divided into two sections:

1. Section 86, "General," includes general requirements for submittals and testing of electrical equipment and materials.
2. Section 87, "Electrical Systems," includes construction requirements for electrical systems and requirements for modifying and maintaining existing systems. This section also includes materials, testing, and construction requirements that apply to specific systems.

Electrical work requires specialized knowledge. The districts should retain qualified staff or train sufficient personnel to inspect electrical work.

Electrical work includes:

- Lighting systems
- Sign illumination systems
- Signal and lighting systems
- Ramp metering systems
- Traffic monitoring station systems
- Flashing beacon systems
- Camera systems
- Changeable message sign systems
- Roadway weather information systems
- Temporary electrical systems
- Existing electrical systems
- Other electrical systems

Electrical systems components continue to evolve and may lead to changes in material and construction requirements on successive projects. Verify that the contractor is aware of these changes because even experienced electrical contractors may not be familiar with all of the requirements in the current specifications.

Pay particular attention to the special provisions and maintain communication with the project designer, Maintenance, and Traffic Operations.

Transportation electrical engineers should be assigned as resident engineers on projects where electrical work is predominant. On projects where electrical work is not predominant, qualified personnel with electrical expertise can be made available for assistance to inspect electrical work.

Smaller districts may use transportation electrical engineers in the district Traffic Unit and highway electricians in the Electrical Maintenance Unit for consultation.

4-8602 Before Work Begins

Review Part 4, "Highway Traffic Signals," of the *California Manual on Uniform Traffic Control Devices*; California Code of Regulations, Title 8, "Electrical Safety Orders," (8 CCR 2299 *et seq.*); and Sections 10-1.02, "Work Sequencing"; 56-2, "Overhead Sign Structures"; 56-3, "Standards, Poles, Pedestals, and Posts"; 75-1.02B, "Galvanizing"; 86, "General"; and 87, "Electrical Systems," of the *Standard Specifications* and their related standard special provisions.

Within 15 days after contract approval, obtain from the contractor:

1. A list of proposed equipment and materials to be installed, before the equipment is shipped to the job site.
2. A schedule of values.

Obtain from the contractor confirmation of the vendor's acceptance of the order for the electrical equipment and materials.

Check that materials furnished by the California Department of Transportation (Caltrans) have been ordered and will be ready for timely delivery. Make arrangements with all the necessary parties for pickup and delivery dates and locations. Inspect and inventory all Caltrans-furnished materials to confirm they are delivered in good condition. After delivery, the contractor is responsible for any damage to Caltrans-furnished materials.

Obtain a list of the equipment and materials the contractor proposes to install, as required by Section 86-1.01C, "Submittals," of the *Standard Specifications*. Verify that manufacturers' names, make and model numbers, lot and serial numbers, contract number, and other listings properly identify the materials. Have the Electrical Design Unit recheck the list of equipment and materials to prevent omissions or irregularities.

Verify the receipt and proper distribution of Form CEM-3101, "Notice of Materials to Be Used," which lists electrical materials. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for additional information.

Review Form TL-0028, "Notice of Materials to Be Inspected at Job Site," to determine materials assigned for release at the job site. Obtain test results and the necessary certificates of compliance, including compliance with Buy America requirements, from the contractor at the site. Release or reject the materials in accordance with Chapter 6, "Sampling and Testing," of this manual.

Consult with the Materials Engineering and Testing Service (METS), Structure Design, and Electrical Design when the contractor submits a written request to make a substitution for a product. Obtain a recommendation as to the acceptability of the proposed product. Review Section 6-1.05, "Specific Brand or Trade Name and Substitution," of the *Standard Specifications*. Recommend approval or denial of a substitute for a specified product. Under no circumstances should the supplier or contractor be allowed to negotiate with others for proposed substitutes for products on projects under contract. Process substitutes for a specified product by change order, since it is a change in the specification requirements.

Verify that the contractor submits:

- Three sets of schematic wiring diagrams for each cabinet.
- Manufacturer's equipment maintenance and operations manuals.
- Shop drawings for service equipment enclosures.

Check the condition of electrical materials shown to be salvaged before the contractor arrives on the job site. Document the material's condition using photographs. Review Section 3-904A (4), "Surplus and Salvaged Material," of this manual.

4-8603 Quality Assurance

Obtain the manufacturer's quality control test data for:

- Luminaires.
- Signal heads.
- LED signal modules.
- Visors.
- LED countdown pedestrian signal face modules.
- Accessible pedestrian signals.

Collect certificates of compliance for:

- Signal heads.
- Visors.
- High mast lighting luminaires.

Request the manufacturer's installation instructions and the load-rating test reports for pull boxes.

Verify:

- Luminaires are on the Authorized Materials List for LED luminaires.
- Controller cabinets and battery backup system cabinets are on the Authorized Materials List for traffic signal control equipment.
- LED signal modules are on the Authorized Materials List for LED traffic signal modules.

- Conduit primers are on the Authorized Materials List for organic zinc-rich primers.

Confirm with METS that service equipment enclosures and cabinets have been inspected and tested at the source.

4-8604 Payment

Review the contractor's schedule of values breakdown for completeness and accuracy. Section 9-1.16, "Progress Payments," of the *Standard Specifications* provides details for a cost breakdown of lump sum bid items. Require the contractor to correct any unbalanced unit costs before approving the submittal. You can use this breakdown for progress payments and as a cost basis for change orders. Approve the cost breakdown before making partial payments on lump sum electrical items. For progress payment purposes, keep records of partial payments for each period.

On many projects, electrical systems equipment, and electrical hardware items are eligible for payment as material on hand. On a monthly basis, check the contractor's submittals for materials on hand, and verify that materials incorporated into the work have been removed from the submittals. Refer to Section 3-906E, "Materials on Hand," of this manual for additional information.

Deduct the cost for source inspection of poles for electrical systems according to Section 6-201E, "Material Source Inspection and Testing" of the *Standard Specifications*.