

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL QA INSPECTION MANUAL

**QUALITY ASSURANCE GUIDELINES FOR
CONTRACTOR FURNISHED ELECTRICAL MATERIALS**

**Issued by:
Division of Materials Engineering and Testing Services
Office of Roadway Materials Testing
Electrical Testing Branch**



FORWARD

The Federal Highway Administration's (FHWA) Federal-Aid Policy Guide, Title 23 - The Code of Federal Regulations, requires that each State Highway Agency (SHA) develop a quality assurance program which will assure that the materials and workmanship incorporated into each Federal-aid highway construction project are in conformity with the requirements of the approved plans and specifications, including approved changes.

All references in this manual are to the 2010 Caltrans Standard Specifications and Standard Plans.

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A. PURPOSE

It is the policy of the Department of Transportation to review, inspect, and test as required, all electrical materials prior to their incorporation into State construction projects and permits. The purpose of these guidelines is to help clarify the roles and responsibilities of the various parties involved in an inspection and to document the procedures used. This manual may also be used by manufacturers, vendors and contractors as a resource to understanding the electrical quality assurance (QA) inspection and testing guidelines used by Caltrans.

The main function of the State's inspection and testing process is to provide quality assurance. Quality control (QC) is the responsibility of the Manufacturer. Based on the contractual requirements and the type of material, inspections are performed at the Caltrans laboratory or the source of manufacturer.

It is not the intent of the State policy to relieve the Contractor of his responsibility for the suitability of materials used on the contract. Rather, it is the intent to avoid schedule delays and extra costs that may occur if non-compliant electrical materials are delivered to the job site.

Where discrepancies exist between these guidelines and the contract specifications, the specifications will take precedent.

B. ADMINISTRATIVE PROCEDURE

The Division of Materials Engineering and Testing Services (METS) through the Office of Structural Materials (OSM), and the Office of Roadway Materials Testing (ORMT), has been assigned primary responsibility to inspect and test Contractor furnished materials prior to incorporation into State construction projects

ORMT is responsible for inspecting all electrical materials. OSM is responsible for all other materials.

ORMT utilizes a Filemaker database to administer the contractor-furnished electrical material inspection program. This database is maintained by a staff electrical inspector assigned by the supervisor. All contracts assigned to the inspection staff reside on this database. Filemaker is the primary tool for documenting the status of ORMT electrical inspections. Forms required by staff inspectors are available on the database. They are listed below and samples are included in the Appendix.

- TL-8610E: "Request for List of Suppliers"
- TL-8620E: "Request for Material Details"
- TL-608E: "Electrical Materials Requiring Inspection"
- TL-28E: "Notice of Material to be inspected at Jobsite"
- TL-29E: "Electrical Test Report"
- Shipping Record (No Form# assigned)

The Contractor Furnished Material (CFM) electrical QA inspection process is initiated upon construction approval, as indicated by the flow chart in Figure 1. The first step in the process is to

determine if a CEM 3101 (“Notice of Materials to be Used”) has been submitted. If a CEM 3101 has been provided the inspector transmits a TL-8620E (“Request for Material Details”) to the contractor. If there is no CEM 3101 a TL-8610E (“Request for List of Suppliers”) is sent to the contractor.

Based on the information provided on the TL-8610E, a TL-8620E is generated. The inspector will then determine the inspection requirements for all electrical material listed on the TL-8620E and then generate a TL-608E (“Electrical Materials Requiring Inspection”) and transmit it to the contractor. The contractor will then notify the manufacturer to contact ORMT to coordinate inspections. For electrical material that will be inspected in the field by the resident engineer’s staff inspectors, a TL-28E (“Notice of Material to be inspected at Jobsite”) will be generated and transmitted to the contractor.

A TL-29E (“Electrical Test Report”) is generated for material that is inspected by the TransLab QA inspector. This report is transmitted to the resident engineer and the contractor, documenting the Pass/Fail results of the inspection. Per the contract special provisions, inspections are based on a 30 day cycle from the receipt of material or in the case of source inspections, notification that material is ready for inspection. A Shipping Report (See Appendix) is transmitted to the manufacturer providing notification that material is ready to be picked up.

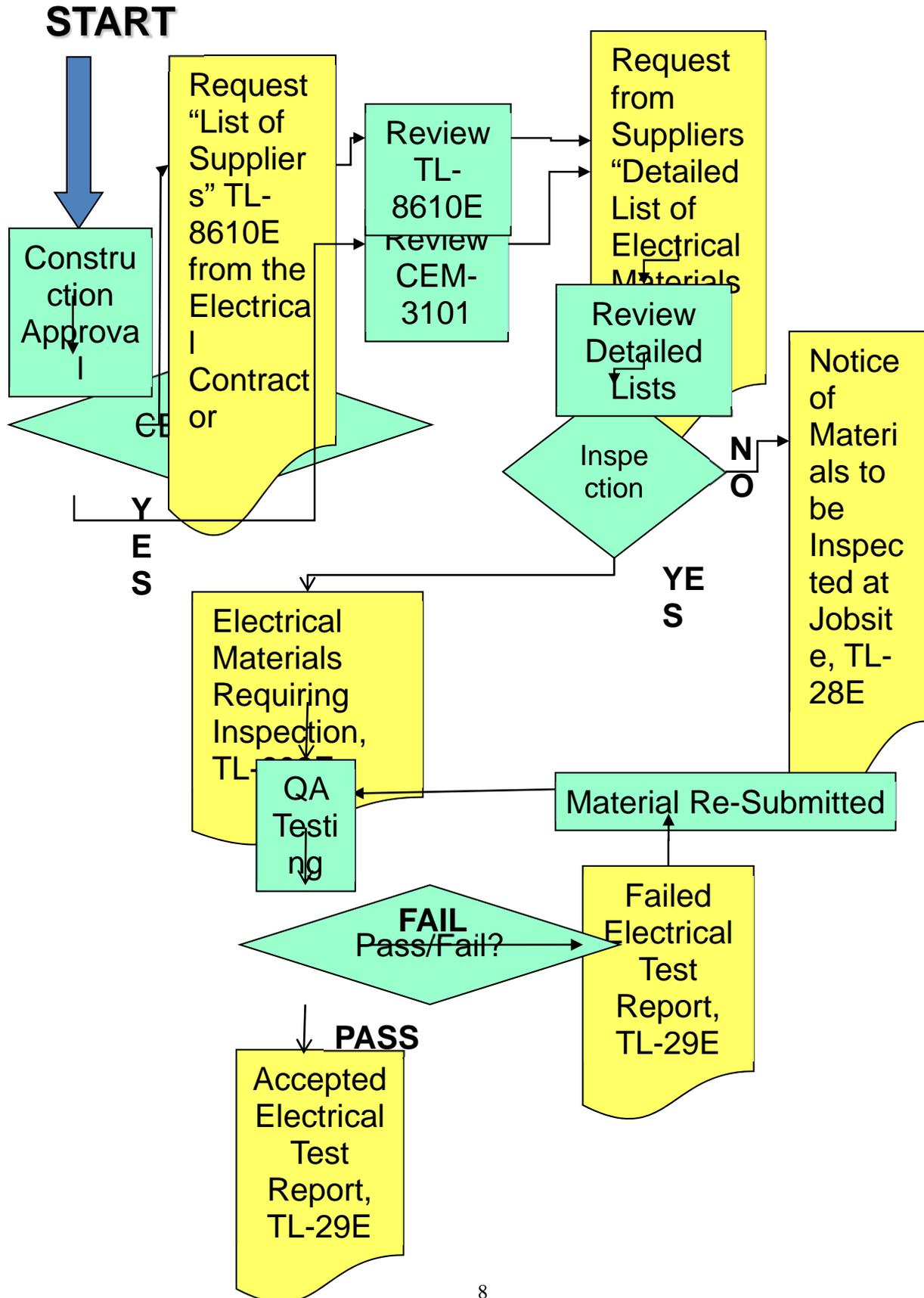
The “TL” documents and the Shipping Report described in the above paragraph are generated by the Filemaker database based on input from the ORMT inspector. The documents transmitted via email to the respective customers. Inspectors also maintain a project folder containing hardcopies of all relevant information. The Filemaker database records for each contract and the individual project folders are archived per METS’ retention policy.

Contractor furnished electrical materials that are tested by the TransLab are typically used on projects that are currently under construction. Therefore, when material arrives for test at the TransLab, a 30 day time limit to complete the testing is usually specified in the Caltrans contracts or special provisions.

Note that there is additional detail associated with the flow diagram of Figure 1. This detailed information is provided in Section “D” of this document “Roles and Responsibilities”.

Figure 1:

Contractor Furnished QA



C. GENERAL INFORMATION

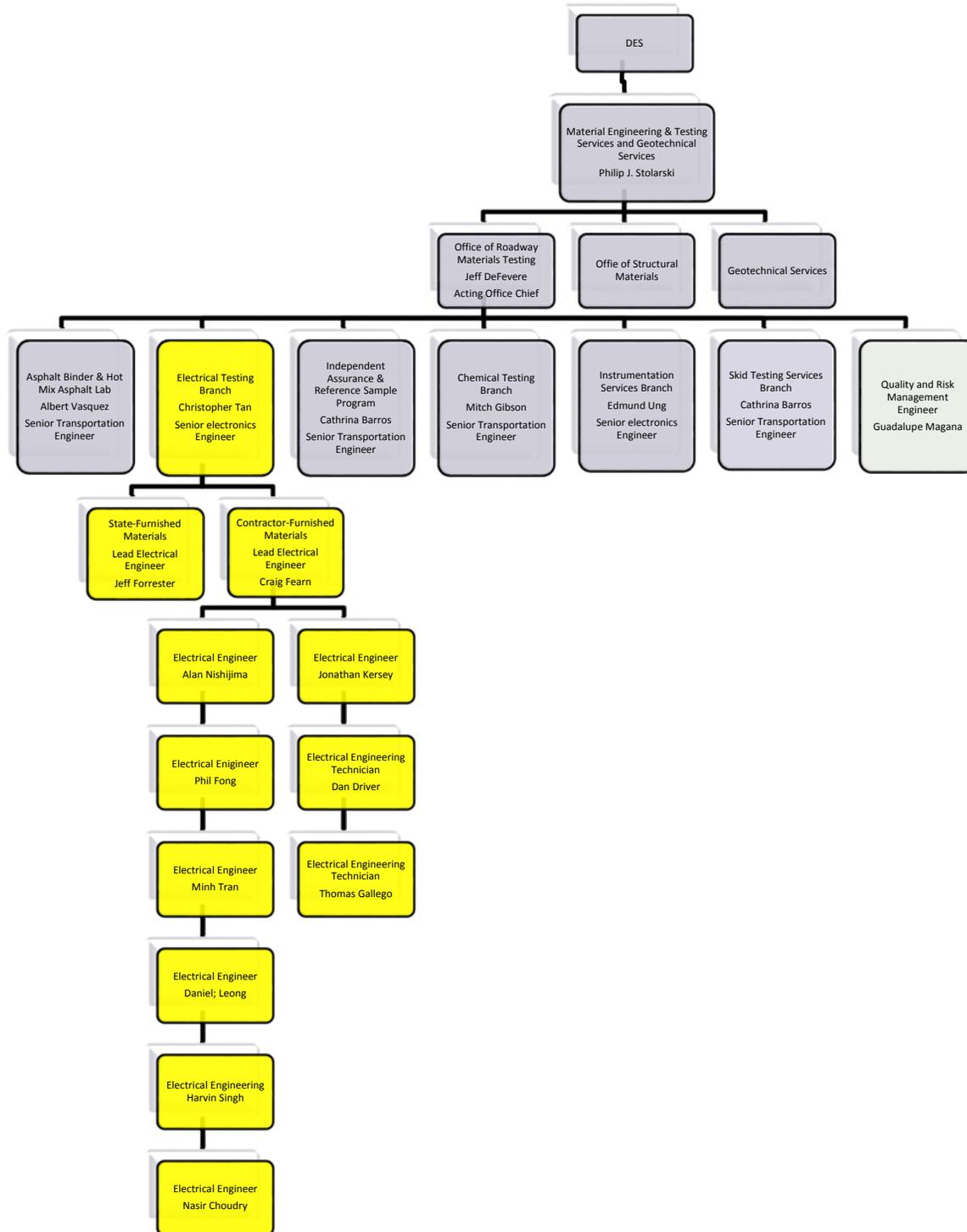
Division of Materials Engineering and Testing Services (METS)

METS is located at 5900 Folsom Boulevard, Sacramento, CA 95819-4612. METS is comprised of three offices: Office of Roadway Materials Testing (ORMT), Office of Structural Material (OSM) and Geotechnical Services.

METS provides:

1. The methods, tests and processes necessary to select and evaluate materials used in all phases of highway construction and maintenance on California Highways.
2. Inspection, sampling, and testing of materials for compliance with contract requirements and coordination of these efforts throughout Caltrans.
3. Development of standards and specifications for the proper selection, sampling, and testing of materials.
4. Consultation with Caltrans Headquarters and District units on matters related to materials.
5. Material pre-qualification testing and new material evaluation.

The following chart shows the organization structure within METS and the relationship of the Electrical Testing Branch. Note the Electrical Testing Branch is highlighted in yellow:



D. ROLES AND RESPONSIBILITIES

The following outlines the roles and responsibilities of the organizations and personnel that are involved in the Electrical QA inspection process.

D.1 RESIDENT ENGINEER

When a contract has been approved, the RE is responsible for informing the Contractor in writing that the Standard Specifications require that the RE be furnished a list of the Contractor's source of materials. Form, CEM-3101, "Notice of Materials to be Used", is to be furnished to the Contractor as soon as possible, preferably at the pre-construction meeting.

Once this form is completed and returned by the Contractor, the RE forwards it to OSM with sufficient lead-time to permit proper sampling, testing, and inspection of the materials furnished in advance of their use.

Note that OSM provides the administrative function of receiving and distributing CEM-3101s to ORMT. The OSM administrator delivers hard copy CEM-3101s to the lead engineer of the electrical inspection branch.

It is very important that the RE makes sure that the Contractor supplies prompt and complete information including complete addresses of the suppliers. When available, the supplier's phone number, fax number and email address should also be included.

In the event ORMT is unable to inspect the materials, the inspection may be assigned back to the RE since it may be more appropriate to perform the inspection at the job site. In this event, the RE will be notified by the use of form TL-28, "Notice of Materials to be Inspected at Jobsite" (see Appendix). The RE will then have the option to accept the material or to request additional assistance from ORMT.

D.2 GENERAL CONTRACTOR

The General Contractor is ultimately responsible for making sure that all contractual agreements are met. This includes ensuring that his subcontractors are adhering to the Contract Plans, Special Provisions, Standard Specifications and Plans.

The General Contractor may delegate the responsibility of filling out Form CEM-3101, but this does not relieve them of ultimately fulfilling the Standard Specification's requirement that the RE be furnished a list of the materials that will be supplied for the contract.

When an Electrical Subcontractor is not used on a construction project, the General Contractor shall adhere to the guidelines administered under section D.3, "Electrical Contractor".

D.3 ELECTRICAL CONTRACTOR

The Electrical Contractor, when directed by the General Contractor, will be responsible for filling out Form CEM-3101, "Notice of Materials to be Used"(see Appendix), which was supplied by the RE.

It is important that the Contractor supply complete material information including the complete addresses of the suppliers. When available, the supplier's phone number, fax number and email address should also be included. This form is to be returned to the RE.

The Electrical Contractor may be notified by ORMT, via Form TL-8620E "Request For Material Details" (see Appendix), that additional information will be required with regards to the electrical materials that are to be furnished. Typically, this will require furnishing the quantity, model, make, and any other relevant information. This information should be e-mailed, mailed or faxed to ORMT in a timely manner. Upon review of this information, ORMT will transmit a Form TL-608E "Electrical Materials Requiring Inspection" and a TL-28E "Notice of Materials to be Inspected at Jobsite" to notify the Electrical Contractor as to which materials will require inspection and which will be accepted on a Certificate of Compliance.

The Electrical Contractor shall then contact ORMT to arrange for sampling, testing and inspection of the materials per section 6 and section 86-2.14 of the Standard Specifications. The Electrical Contractor shall also understand that the QA inspection does not relieve him of the full responsibility, for incorporating in the work, materials that comply with the Contract Plans and Specifications, nor does it preclude the subsequent rejection of materials found to be unsuitable.

When requested by ORMT, the Electrical Contractor shall be responsible for obtaining a Certificate of Compliance from the manufacturer. This Certificate of Compliance shall be sent to the RE.

D.3.1 Testing of Material

The Contractor shall notify ORMT when the electrical materials are ready for inspection. The Contractor shall allow up to 30 calendar days for testing in accordance with section 86-2.14 of the Standard Specifications. Short term Contracts and Permits will be addressed on a case by case basis. Testing will be based on ORMT Inspection procedures for each type and model of electrical equipment. These procedures may be referenced in ORMT's "Electrical QA Guidelines and Testing Methods" manual. This manual is on file in the electrical branches library.

D.3.2 Approval/Disapproval

If the submitted materials are found to be compliant with the Contract Plans, Special Provisions, Standard Specifications and Plans and all other pertinent specifications, the material will be approved and noted as compliant on the TL-29E "Electrical Test Report" (see section D.7). If the submitted materials are found to be non-compliant, then a failed TL-29E will be generated (see section D.3.5 for re-testing).

The TL-29E will be emailed to the RE with a cc. to the electrical contractor and manufacturer.

D.3.3 Change in Specifications

Changes to the State Specifications will be treated as a new compliance review.

D.3.4 Changes to Submitted Materials

Any changes made by a Vendor or Manufacturer to a material or its components shall require proper documentation and notification. Any change where the results affect the attributes of the final material will be treated as a new submittal.

D.3.5 Request for Re-Testing

If, during the course of a contract, ORMT finds that the Contractor's material does not meet the requirements of the Specifications, ORMT will request re-testing of the material in accordance with section 86-2.14 of the Standard Specifications. With ORMT approval, the Contractor may request to correct defective materials at METS Lab facility. Re-testing has same 30-day window as the initial testing.

D.3.6 Shipping and Handling

All shipping, handling, insurance, and transportation costs incurred to carry out required QA testing shall be borne by the Contractor as stated in the Standard Specifications, section 86-2.14A.

D.4 OFFICE of STRUCTURAL MATERIALS (OSM)

OSM will receive the form CEM-3101 from the RE. OSM will review the form for any electrical materials that are to be used on the contract. If electrical materials are encountered, then a copy of the CEM-3101 will be forwarded to the ORMT lead engineer. The lead engineer will review the CEM-3101 to verify the listing of pertinent electrical material and will forward the CEM-3101 to the responsible electrical inspector.

OSM's only role in the electrical inspection process is to administer CEM-3101s. Any contact from internal or external customers regarding the inspection of electrical material will be passed on to ORMT. Under no circumstances will OSM generate a TL-28 "Notice of Material to be Inspected at Jobsite", or a TL-29E "Electrical Inspection Report".

D.5 OFFICE of ROADWAY MATERIALS TESTING

ORMT is responsible for the electrical QA inspections. Therefore, the information contained in these guidelines is focused on the operation of ORMT as it pertains to the Electrical QA Inspection Program.

D.5.1 Contractor Furnished Electrical Material

Contractor furnished electrical material is categorized as either (1) Requiring source inspection or (2) Authorized to be accepted on a certificate of compliance (COC).

A multi-Tiered system is used to ensure that electrical material that is considered to be safety critical is properly inspected. Tier 1 material is the most safety critical and requires 100% testing. Tier 2 materials may be sample tested based on the discretion of the ORMT inspector. (If implemented, sampling is based on ANSI/ASQ Z1.4 guidelines.) Tier 3 material is normally accepted on a

Certificate of Compliance (COC) and is comprised of “commodity” items such as conduit and wiring. Following is a categorized listing of electrical material.

TIER-1—100% Testing

- Close Circuit Television (CCTV) Cabinets
- Light Emitting Diode (LED) Extinguishable Message Signs (EMS)
- Service Enclosures

TIER-2—Sample Testing

- Closed Circuit Television (CCTV) Systems
- Battery Back-up System (BBS) Cabinets
- Highway Advisory Radio (HAR) Systems
- LED Traffic Signal Modules
- LED Pedestrian Modules
- Roadway Luminaires
- Flashing Beacon Control Assemblies (FBCA)
- Internally Illuminated Street Name Signs (IISNS)
- Sign and Lighting Controls
- Telephone Demarcation Cabinets (TDC)
- Sign Lighting Fixtures
- Accessible Pedestrian Systems (APS)

TIER-3—Accept on a Certificate of Compliance

- Battery Backup System Batteries
- Electrical Conduit
- Conductors/Cable
- Loop Wire
- Pedestrian Push Buttons (Non-Accessible)
- Pull Boxes
- Microwave Vehicle Detection Systems (MVDS)
- Vehicle Signal Faces
- Pedestrian Signal Faces
- Programmed Visibility Signal Faces
- Flashing Beacon Signal Faces

D5.2 Approved Product Lists (APL)

METS maintains APLs for specific electrical material. The APL process was developed to pre-qualify

this material for installation on CALTRANS right of way. APL testing is more rigorous than the source inspections performed during sample testing of contractor-furnished electrical material. Material appearing on the APL has been previously submitted by the manufacturer for testing by METS. Material found to satisfy CALTRANS' requirements is then listed on the APL. The use of material listed on the APL will streamline the inspection process and ensure the timely delivery of compliant material.

Link to the Approved Product Lists (Pre-Qualified Products Lists):

<http://www.dot.ca.gov/hq/esc/ttsb/electrical/>

It should be noted though, that specifying material listed on the APL does not eliminate the requirement for source inspections. The normal sampling plan (ANSI/ASQC Z1.4) will still be applied by METS for all specified electrical material including items listed on the APL

The use of material that is not on the APL may result in a longer testing schedule by METS. This is based on the more rigorous inspections required for material that has not been pre-qualified. The additional time required for the testing of replacement material should also be considered if non-APL listed material is being supplied.

Manufacturers must submit material directly to METS for APL testing. Material submissions by contractors or local agency representatives will not be considered for inclusion on the APL. Material listed in the APL typically has a unique CALTRANS identification or part number that is established by the manufacturer and verified by METS inspectors. Note that the APL process is typically not associated with the inspection of material for an active construction project due to the additional schedule requirements for testing. The procedures for submitting APL-related material will not be described in this document. Contact the ORMT lead engineer regarding the APL process.

D.5.3 ORMT In-Processing of New Contracts

The process described in the following paragraphs specifically relates to capital projects which comprise the bulk of the workload for ORMT electrical inspectors. Inspections are also performed on oversight contracts, permits and minor contracts. The primary difference with these other contracts is that they are not listed in the HQ Office Engineer (OE) contract database. The OE database provides detailed contract information for capital construction contracts including the award and construction approval dates, contractor information and electronic copies of the contract plans and special provisions. When ORMT is requested to provide electrical inspection support for contracts not listed in the OE database, this information must be obtained from District construction personnel prior to initiating the contract assignment process described in this section.

Hardcopy contract plans and special provisions are provided by HQ Office Engineer and delivered to METS. The supervisor will assign a staff member to receive and review the new contracts. This staff member is typically a Transportation engineer, electrical.

Contract plans and special provisions are typically delivered prior to construction approval and are not assigned to METS inspectors until this milestone occurs. These documents are maintained in the electrical branch's library.

The reviewer will evaluate the plans and special provisions to determine if electrical material requiring inspection has been specified. If there is no electrical material requiring inspection, the contract will set be aside and the documents will be disposed of. For contracts that contain electrical material, the reviewer will create a project file and enter the job into the CFM Filemaker database.

The reviewer will identify contract anomalies including State-furnished material issues and the specification of non-standard material. Depending on the severity of the issues, the reviewer has the authority to contact the resident engineer and/or the project designers. Minor issues are documented and noted in the project file.

The contract is assigned a ranking from 1-3 based on the complexity of the contract. A "1" is the least complex. This ranking is noted in the project file and is used by the lead engineer in assigning contracts to individual inspectors.

The project files are placed in the CFM library awaiting inspector assignment. The reviewer will notify the supervisor and lead engineer via email that the contract is ready to be assigned.

The lead engineer will review the project file and will assign the contract to an electrical inspector. The lead engineer will update the Filemaker database to reflect the contract assignment. The project folder will then be placed in the inspector's mailbox, an email notification will be provided of the assignment.

A flow chart of the process described in this section appears in Figure 2.

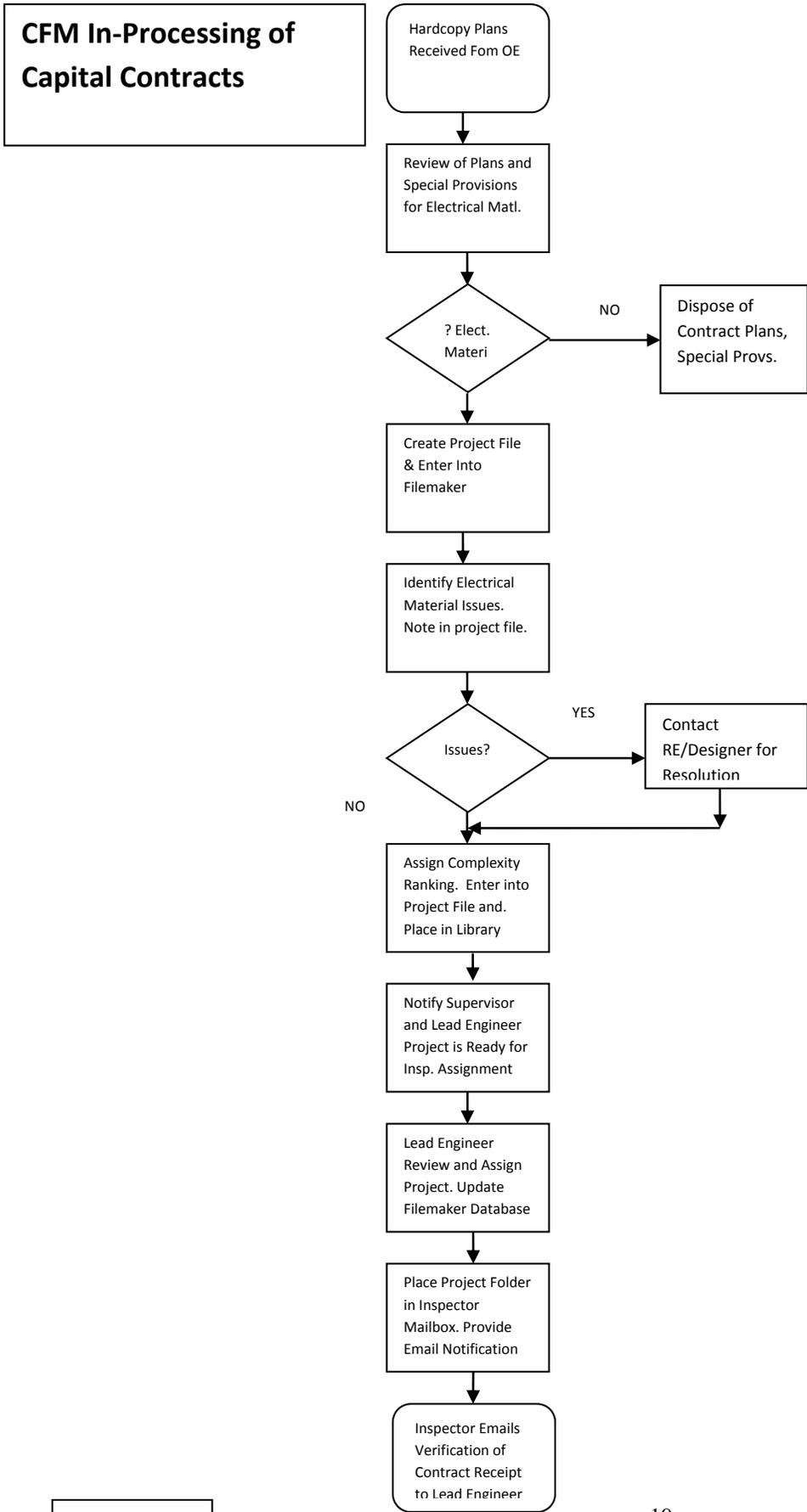


Figure 2

D.5.4 Determination of inspection Site

Electrical material inspections are performed at the Tranlab and the source of manufacture. Material that requires specialized test equipment located at the Tranlab must be tested at the Tranlab. This test equipment includes specialized test fixtures, the light tunnel and environmental chambers that are not available at the manufacturers' site. The following material falls under this category:

- LED Traffic Signal Modules
- Pedestrian Signal Modules
- CCTV Camera Systems
- LED Roadway Luminaires
- Accessible Pedestrian Systems
- Sign Lighting Fixtures

Electrical material that is of a large physical size or subject to damage during transit is inspected at the source of manufacture. This includes the following material:

- Extinguishable message signs (EMS)
- CCTV/Multipurpose 334 cabinets
- Electric service cabinets
- Telephone demarcation cabinets

The remaining material that is inspected by METS may be inspected either at the Tranlab or at the manufacturer's location. This decision is based on the specific contract requirements and on the construction schedule. The RE may request the METS inspector travel to the source of manufacturer if the shipping delays adversely affect the construction schedule. A flowchart of the process to determine the inspection site appears in Figure 3.

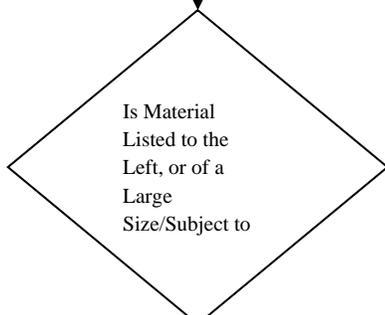
Determining Inspection Site

Referencing the Contract Plans and Special Provisions and the Material Identified in the TL-608E (Electrical Materials Requiring Inspection), Identify all Electrical Material Requiring Inspection



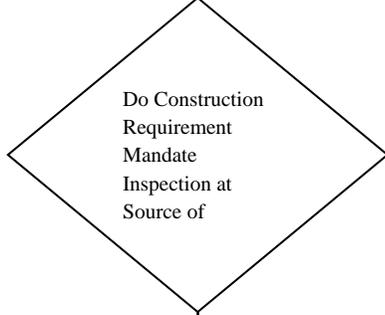
Perform Inspection at Translab

- Pedestrian Signal Modules
- CCTV Camera Systems
- LED Roadway Luminaires
- LED Traffic Signal Modules
- Accessible Pedestrian Systems
- Sign Lighting Fixtures



Perform Inspection at Manufacturer's Site

- Extinguishable message signs (EMS)
- CCTV/Multipurpose 334 cabinets
- Electric service cabinets
- Telephone demarcation cabinets



Perform Inspection at Manufacturer's Site

Perform Inspection at Translab

Figure 3

D.5.5 ORMT Inspection Process

After the inspection site has been determined. ORMT will then inspect the material to insure that it is in compliance with the Contract Plans, Special Provisions, Standard Specifications and Plans. ORMT will perform the inspection in a timely manner as specified in section 86-2.14 of the Standard Specifications, and consistent with the current workload.

D.5.5.1 Inspections Performed at the Translab:

- a. As a result of receiving a TL-608E (Electrical Material Requiring Inspection), the manufacture will arrange to ship the material to the Translab. This will be coordinated with the ORMT inspector. The manufacturer will be responsible all shipping costs to/from the Translab, per the Standard Plans section 6 and section 86-2.14.
- b. Upon delivery, the manufacturer shall provide a material list that will be signed by the receiving inspector and placed in the project file.
- c. Perform visual inspection of packages/shipping containers for damage. Document scope of damage in inspection file. If damage is significant, do not accept shipment and return to sender. Inform the manufacturer of the issues via email.
- d. After unpacking, verify the model, type and quantities of equipment against the TL-608E. In the event of a discrepancy, contact the equipment manufacturer via email for resolution.
- e. Referencing the appropriate test procedures, perform the inspection.
- f. Evaluate measured/observed test results against contractual requirements. It is recommended that failed tests be repeated at least once to verify results.
- g. Document test results and retain data in inspection file. This data will be used to generate the final test report.
- h. Fill out the inspection barcode tags, and affix to equipment that has passed inspection. Document inspection barcode numbers in project file and include them on the test report (TL-29E).
- i. Re-package equipment in preparation for delivery. Generate a shipping record (Appendix 1) for release of material to customer.
- j. Notify customer to arrange pick-up/delivery of material. Ensure manufacturer's representative (driver) signs a copy of the shipping record. Retain a copy in the project file.
- k. The inspector will generate and distribute a test report within three business days. The Test report will be addressed to the RE with a cc. to the manufacturer and the electrical sub-contractor.
- l. Figure 4 is a flow chart of the process described in this section.

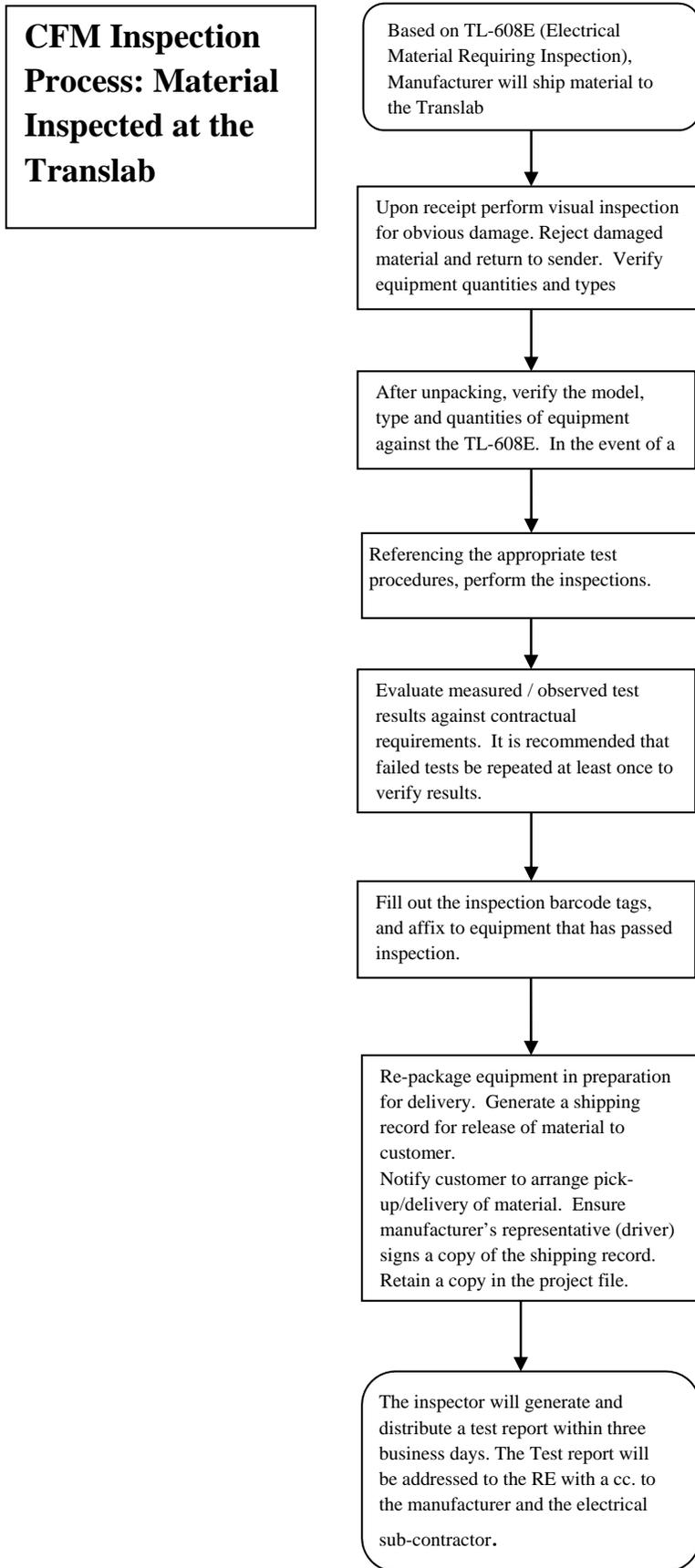


Figure 4

D.5.5.2 Inspections Performed at the Source of Manufacturer

- a. The manufacturer will notify the lead engineer that material is ready for inspection. The lead engineer will inform the responsible inspector to arrange for travel for the source inspection.
- b. The manufacturer will provided a list of material ready for inspection via email. The inspector shall verify the model, type and quantities of equipment against 8610E. In some cases the inspection may only address a portion of the material that is being supplied. The inspector shall maintain records in the project file to ensure that all electrical material has been properly inspected prior to installation.
- c. In the event the inspector is conducting inspections for material assigned to projects assigned to other inspectors, it is the responsibility of the travelling inspector to contact the responsible inspector to obtain all documents required to perform the inspections.
- d. In coordination with the lead engineer and manufacturer, the inspector will establish the inspection/travel schedule. The lead engineer will notify the supervisor via email of the pending travel request. The inspector will then submit a travel request to the supervisor.
- e. Once on-site coordinate inspections with the manufacturer's liaison.
- f. Verify model, type and quantities of equipment against the TL-608E (Electrical Materials Requiring Inspection). In the event of discrepancy, notify manufacturing liaison for resolution.
- g. Referencing the appropriate test procedures, perform the inspection.
- h. Evaluate measured / observed test results against contractual requirements. It is recommended that failed tests be repeated at least once to verify results.
- i. In the event of a failed test or discrepancy, it is recommended that the inspector consult with the manufacturers' representative to verify the failures. It is left to the discretion of the inspector whether to allow the manufacturer to correct minor issues while the inspector is on-site. It is recommended that failed tests be repeated at least once to verify results.
- j. Document test results and retain data in inspection file. This data will be used to generate the final test report.
- k. Fill out the inspection barcode tags, and affix to equipment that has passed inspection. Document inspection barcode numbers in project file and include them on the test report (TL-29E).
- l. Fill out the inspection barcode tags, and affix to equipment that has passed inspection.
- m. Upon returning to METS the inspector will generate and distribute a test report within three business days.
- n. Figures 5 and 6 are the flow chart of the process described in this section.

**CFM Inspection
Process: Material
Inspected at the Source
of Manufacturer**

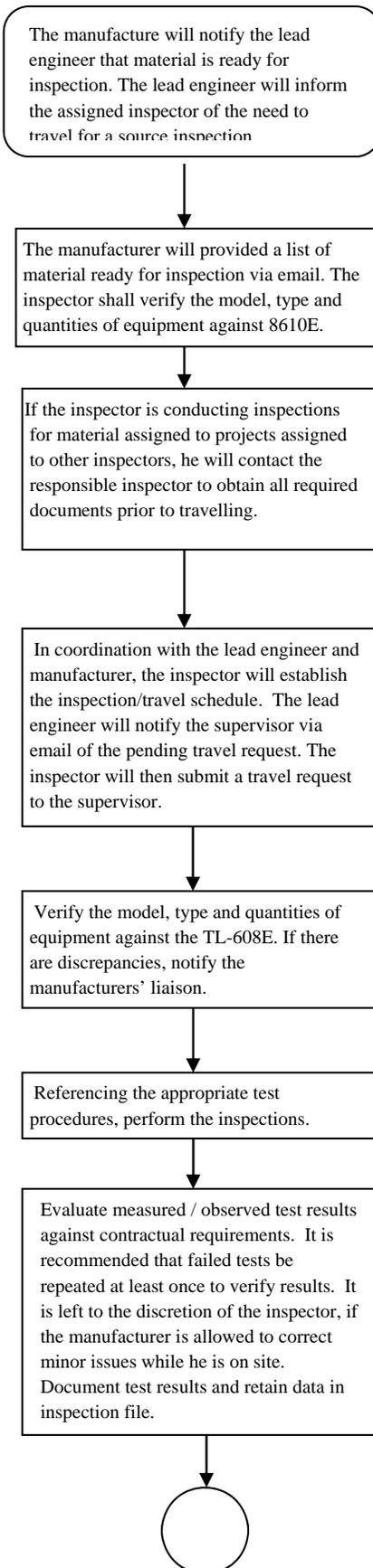


Figure 5

**CFM Inspection
Process: Material
Inspected at the Source
of Manufacturer (cont.)**

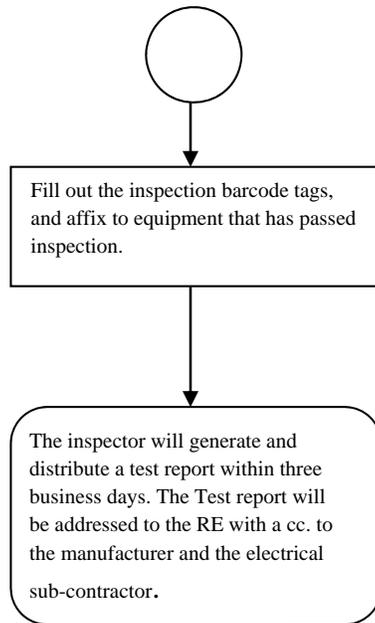


Figure 6

In some instances, ORMT may not be able to inspect the materials at METS lab and inspection may be assigned back to the RE. In this event, the RE will be notified by the use of form TL-28, "Notice of Materials to be Inspected" (see Appendix). The RE will then have the option to accept the material or request further assistance from ORMT.

D.6 MANUFACTURER/VENDOR/SUPPLIER

D.6.1 Quality Assurance at the Manufacturer's Facility

ORMT may request to visit a manufacturer's facility. ORMT may further elect to conduct an audit of the manufacturing process during the visit per section 6-3.05, "Plant Inspection" of the Standard Specifications.

D.6.2 Certificates of Compliance

A Certificate of Compliance shall be furnished prior to the use of any materials for which the Standard Specifications or the Special Provisions require a certificate to be furnished. In addition, when so authorized in the Standard Specifications or Special Provisions, the Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance (section 6-3.05E). Note that these materials may be sampled and tested at any time, and the State reserves the right to refuse to permit the use of material solely on the basis of a Certificate of Compliance.

As an example, conduit is one of the materials that may be accepted on the basis of a Certificate of Compliance. Prior to shipping conduit to the job-site, a Certificate of Compliance shall be sent to the RE.

The Certificate of Compliance must be in a form acceptable to the RE and signed by a responsible officer of the company manufacturing the material. An example of an acceptable Certificate of Compliance is provided in the Appendix.

D.6.3 Manufacturing Documentation

Final material test procedures and test equipment used by the manufacturer shall be documented. Upon request, copies of this documentation shall be provided to ORMT for review. This documentation shall include any schematics, plans, theory of operation and operational procedures.

D.6.4 Testability

Manufacturers are encouraged to design materials in a way that facilitates thorough and comprehensive testing without proprietary equipment.

D.6.5 Design/Specification Changes

Manufacturers are encouraged to suggest specification and/or design changes that improve the quality of the material and/or lower its cost.

D.7 ELECTRICAL TEST REPORT PROCEDURES

D.7.1 Electrical Test Report Process

Findings by ORMT shall be reported to the Contractor, Vendor and the RE in a TL-29E “Electrical Test Report” (see Appendix). In the case of a non-compliant item, the electrical test report will specify any deviations from the Contract Plans, Special Provisions, Standard Specifications and Plans.

D.7.2 Testing Criteria

All material reviewed will be tested and evaluated per the Contract Plans, Special Provisions, Standard Specifications and Plans.

D.7.3 Distribution

The electrical test report will be emailed to the RE and Contractor within three working days from the completion of testing. When requested, an original paper copy will be sent by regular mail.

D.7.4 Contact with ORMT

The Contractor/Vendor/Manufacturer shall direct all information and/or inquiries that involve testing, testing results, quality assurance inspection and defective electrical materials to ORMT.

D.8 MATERIAL SUBMITTAL GUIDELINES

D.8.1 Shipments to ORMT

When requested by ORMT, shipments shall be made based on the following guidelines:

- a. Sample quantities will be determined using “ANSI/ASQ Z1.4 Normal Sampling Plan” (see Appendix).
- b. All materials are to be new. Used, shopworn, demonstration units, prototype or discontinued models are not acceptable.
- c. Materials shall not be shipped until the delivery has been coordinated with ORMT.
- d. A 48-hour advance notice of shipping of materials to ORMT is required.

D.8.2 Disposition of Tested Materials

Materials will be returned as specified in section 86-2.14 of the Standard Specifications.

D.8.3 Shipment Labeling

Shipment labels shall appear on all outer boxes. Shipment labels shall contain the following

information:

- a. Contractor name and phone number
- b. State Contract number
- c. Vendor name and phone number
- d. Material description
- e. Quantity in box
- f. Outer boxes shall be plainly marked:

**"ATTN: ELECTRICAL TESTING, MS-5"
5900 FOLSOM BLVD, SACRAMENTO, CA 95819-4612**

D.8.4 Serial Number List

If applicable, each box shall contain a listing of materials serial numbers contained within the box. If all serial numbers of materials included within the box are consecutive, a range of serial numbers may be provided.

E. GENERAL INSPECTION GUIDELINES

E.1 ELECTRICAL QA INSPECTOR'S RESPONSIBILITIES AND AUTHORITY

The Electrical QA Inspector will be responsible for the inspection of electrical material for compliance with the Contract Plans, Special Provisions, Standard Specifications and Plans. Inspection is not intended to provide quality control of the material. Quality control is the responsibility of the Manufacturer. The Electrical QA Inspector is authorized to reject such material that does not comply and to approve such material that does comply. Approved material that later proves defective or unsuitable for the work can be rejected by the State prior to installation. It is critical that the Electrical QA Inspectors insure that the Contract Plans, Special Provisions, Standard Specifications and Plans are fully met before approving the shipment of any material, except as provided below.

While it is the policy of the Department of Transportation to avoid unnecessary delays to the Contractor, the Electrical QA Inspector should not accept material unless the material complies with specifications. Test data submitted by the manufacturer should be properly identified with the material and checked for compliance. All required testing should be completed before acceptance. All inspections must be conducted in a timely manner to avoid construction delays. Every effort should be made to eliminate legitimate complaints that inspections have delayed the schedule of the Contractor's work.

The Electrical QA Inspector should not accept deviations from specifications or changes in plan details without proper authorization from the RE. Assurances from a fabricator, verbal instructions from a designer etc. are not acceptable authority unless confirmed through the RE.

When in doubt, abide by the Contract Plans, Special Provisions, Standard Specifications and Plans. In case of doubt as to interpretation, get advice from your supervisor. All verbal communications must be documented.

The Electrical QA Inspector should be aware that specifications are continually being changed and modified as the need arises. Therefore, specific references to certain numbered specifications or test methods found in this manual should always be verified by referring to current job specifications and special provisions, which will always supersede any references in these inspection guidelines.

E.2 PERSONAL KNOWLEDGE

The Electrical QA Inspector should have a thorough knowledge of the work and materials under consideration. Difficult and unusual problems encountered during the progress of the inspection should be referred to the supervisor for advice. Proprietary information gained by an Electrical QA Inspector must not be divulged to authorized personnel.

E.3 TEST SAMPLES

Test samples of materials intended for use on state projects must be taken by, or under the direct supervision of a State representative, unless otherwise specifically authorized by ORMT.

This is a policy that must be applied uniformly to all vendors and manufacturers. Similarly, the acquisition of materials for sampling must be under the control of the State Electrical QA Inspector and must not be left to the Vendor or Manufacturer.

Sample quantities will be determined using “ANSI/ASQ Z1.4 Normal Sampling Plan by Attribute” (see Appendix).

E.4 SAFETY REGULATIONS

Electrical QA inspection activities should adhere to the regulations of the location in which the work is being done. Safety and security rules issued for the vendor’s or manufacturer’s personnel apply equally to employees and agents of others engaged in the work. Special safety equipment when required will be furnished by the Department to the Electrical QA Inspector. Complete understanding and careful practice of existing safety rules and regulations should be adhered to at all times. Be alert both for your own safety as well as the safety of others around you.

E.5 PUBLIC COMMUNICATION

Communication affecting the work should always be maintained on a friendly but discrete basis. The requirements of the Department of Transportation must be thoroughly but concisely explained. Electrical QA Inspectors will interact with many manufacturers and vendors, and have access to information regarding production processes, some of which may be considered confidential and proprietary. Therefore, Electrical QA Inspectors must never divulge one plant's production processes to another.

E.6 SUBSTITUTED MATERIALS

Where specifications indicate that "or equal" materials may be used, the burden of proof as to equality will remain with the Contractor. Substitute materials will not be considered unless accompanied by the manufacturer's written guarantee of compliance and complete test reports. Suggested tests to prove equality should be obtained from the manufacturer by the Contractor and approval obtained concerning proof tests in advance from ORMT. Additional proof may be required over that offered by the vendor or manufacturer.

E.7 BORDERLINE MATERIALS

The acceptance or rejection of borderline material is a subject requiring the highest degree of judgement on the part of the Electrical QA Inspector. Therefore, they must carefully consider their recommendation to the RE. In cases of doubt, the Electrical QA Inspector should refer the matter to their supervisor.

E.8 UNUSUAL SITUATIONS

Situations involving unusual or doubtful conditions of a serious nature shall be discussed with the supervisor before any final action is taken. The Electrical QA Inspector should avoid public discussion of such problems and should not proceed with inspection until authorization is received from the Electrical QA Inspector's supervisor.

E.9 REPORTING REJECTIONS

Rejection of any material will be reported to the Contractor, Vendor and the RE. The Electrical QA Inspector will document all reasons for rejection in the electrical test report.

E.10 TIMELY CORRECTION OF ERRORS AND MISTAKES

At times, errors or mistakes may be made. Experience has shown that when a good relationship exists between industry and the state representative, a satisfactory rectification can be more easily achieved.

It is the duty of the Electrical QA Inspector to inform the Contractor of any deviation from specifications or plans as soon as the error is discovered. It cannot be overemphasized that prompt action, as early as possible, will benefit the State, Vendor, Manufacturer and Contractor.

E.11 REPORTS

In general, each Electrical QA Inspector will prepare an electrical test report. In addition, certain special reports of investigations and rejections may be necessary. All reports must be concise, complete, and submitted on a timely basis to the Contractor, Vendor and the RE. Late submission of reports must be avoided. The Electrical QA Inspector must recognize that proper documentation is one of the most important functions in the overall inspection process.

E.12 MARKINGS

The first order of business when inspecting materials is to verify that they are properly marked and identified in accordance with the reference specification. If materials are not properly marked, they will not be accepted.

E.13 MANUFACTURER'S QUALITY CONTROL

The Electrical QA Inspector must understand the difference between quality control and quality assurance. The manufacturer or fabricator should exercise sufficient quality control on their material to insure compliance with all the requirements of the specifications. This shall be a continual effort on the part of the manufacturer and is considered to be synonymous with the manufacturing or fabrication process. Quality assurance is the responsibility of the Electrical QA Inspector.

F. ELECTRICAL MATERIALS REQUIRING INSPECTION

Electrical QA inspection and testing procedures will be dependant on the Caltrans Contract Plans, Special Provisions, Standard Specifications and Plans. Final testing and evaluation will require most samples to be tested and evaluated at ORMT Lab.

GENERAL GUIDELINE

1. Check of the model type, operational characteristics, design etc. for compliance with the Special Provision requirements.
2. Evaluate material for damage and obvious defects.

F.1 BATTERY BACKUP SYSTEM BATTERIES

F.1.1 Specifications

- a. Standard Specifications, section 86- 3.02.
- b. Contract Plans and Special Provisions

F.1.2 Frequency of Sampling and Testing

- a. Accept on a Certificate of Compliance (Standard Specifications, section 6-3.05E)
- b. ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.1.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.1.4 Marking Requirement

Standard Specifications, section 86- 3.02.

F.1.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.1.6 Remarks

BBS batteries are typically accepted on a Certificate of Compliance.

F.2 BATTERY BACKUP SYSTEM CABINET

F.2.1 Specifications

- a. Standard Specifications, section 86- 3.02.
- b. Contract Plans and Special Provisions

F.2.2 Frequency of Sampling and Testing

- a. Accept on a Certificate of Compliance (Standard Specifications, section 6-3.05E)
- b. ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.2.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.2.4 Marking Requirement

N/A

F.2.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.2.6 Remarks

BBS cabinets are typically accepted on a Certificate of Compliance.

F.3 ELECTRICAL CONDUIT

F.3.1 Specifications

- a. Standard Specifications, section 86-2.05
- b. Contract Plans and Special Provisions
 1. Type 1, rigid steel conduit UL Publication 6
 2. Type 2, rigid steel conduit conforms to Type-1 with 0.9-mm polyvinyl chloride or polyethylene exterior coating
 3. Type 3, rigid non-metal conduit conforms to UL-Publication 651
 4. Type 4, liquid tight flexible metal conduit shall be listed by UL suitable for use as the grounding conductor
 5. Type 5, Intermediate steel conduit (IMC) shall conform to UL Publication 1242

F.3.2 Frequency of Sampling and Testing

- a. Accept on a Certificate of Compliance (Standard Specifications, section 6-3.05E)
- b. ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.3.3 Manufacturer’s Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.3.4 Marking Requirement

UL label

F.3.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.3.6 Remarks

Conduit is typically accepted on a Certificate of Compliance. The Certificate of Compliance shall indicate quantity of each size and type of conduit (Type 1, 2, 3, 4 or 5)

F.4 PULL BOXES

F.4.1 Specifications

- a. Standard Specifications, sections 86-2.06
- b. Standard Plans, ES-8, ES-9B, ES-9C, ES-9D
- c. Contract Plans and Special Provisions

F.4.2 Frequency of Sampling and Testing

- a. Accept on a Certificate of Compliance (Standard Specifications, section 6-3.05E)
- b. ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.4.3 Manufacturer’s Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.4.4 Marking Requirements

- a. Standard Specifications, section 86-2.06B “Cover Markings”
- b. Contract Plans and Special Provisions

F.4.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.4.6 Remarks

Conduit is typically accepted on a Certificate of Compliance.

Check the following:

- a. Contract Plans and Special Provisions
- b. Material (metal, portland cement concrete or non-PCC material)
- c. Required cover marking (Standard Specifications, section 86-2.06B)
- d. Pull box dimensions (Standard Plans, ES-8, ES-9B, ES-9C, ES-9D)

F.5 CONDUCTORS AND CABLE

F.5.1 Specifications

- a. Standard Specifications, section 86-2.08
- b. American Wire Gage (AWG)
- c. ASTM designation B3 and B-8 (Copper Wire)
- d. Contract Plans and Special Provisions
- e. Standard Specifications, section 86-5.01A(4)
- f. Loop detector cable see ASTM B-286 Table -1

F.5.2 Frequency of Sampling and Testing

- a. Accept on Certificate of Compliance
- b. ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.5.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.5.4 Marking Requirements

Standard Specifications, section 86-2.08A

F.5.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.5.6 Remarks

Conductors and cable are typically accepted on a Certificate of Compliance.

Check the following:

- a. Check Contract Plans and Special Provisions for type of conductor or cable required
- b. Check conductors and cables for identification, section 86-2.08A
- c. Series circuit conductors see Standard Specifications, section 86-2.08C
- d. Signal cable, Standard Specifications, section 86-2.08D

- e. Multiple circuit conductors, Standard Specifications, section 86-2.08B, (Type TW, THW, USE, RHH or RHW)

F.6 CCTV CABINET

F.6.1 Specifications

- a. Standard Specifications, section 86-3.04. Contract Plans and Special Provisions

F.6.2 Frequency of Sampling and Testing

- a. 100% testing for compliance
- b. For modification or design change, sample shall be one of each type

F.6.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.6.4 Marking Requirements

Contract Plans and Special Provisions.

F.6.5 Method of Notification

Electrical Test Report.

F.6.6 Remarks

Check Contract Plans and Special Provisions for specialized equipment.

F.7 SERVICE EQUIPMENT ENCLOSURE

F.7.1 Specifications

- a. Standard Specifications, section 86-2.11
- b. Contract Plans and Special Provisions
- c. Requirements of the serving utility
- d. Standard Plans, ES-2A, ES-2B, ES-2C, ES-2D, ES-2E and ES-2F

F.7.2 Frequency of Sampling and Testing

- a. 100% testing for compliance
- b. For modification or design change, sample shall be one of each type

F.7.3 Manufacturer's Test Reports and/or Certifications

- a. Utility approval (see note 1 on ES-2B and ES-2C)
- b. A Certificate of Compliance, certifying the coating system complies with Standard Specifications, section 86-2.16 "Painting", (periodic paint samples shall be taken for California Test Method 645 on 100 mm x 200 mm x 0.6 mm test specimens)

F.7.4 Marking Requirements

Standard Plans (note 6 and 7 on ES-2B and note 12 and 13 on ES-2C)

F.7.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.7.6 Remarks

Check Contract Plans and Special Provisions for the following:

- a. Type of service enclosure (Type SCE-I, SCE-II, Type IIA, Type IIB, Type III-AF, Type III-BF, Type III-CF or pole-mounted service installations)
- b. Cabinet material
- c. Metered or unmetered
- d. Circuit breakers (single pole, double pole and operating voltage)
- e. Check for phenolic engraved nameplates indicating functions and cabinet location
- f. Type of photoelectric control (Type I-V)
- g. Enclosure must meet the requirements of the Standard Specifications, section 86-2.16
- h. Standard Specifications sections 6-3.04 and 6-3.05E

F.8 Highway Advisory Radio

F.8.1 Specifications

Contract Plans and Special Provisions

F.8.2 Frequency of Sampling and Testing

Accept on a Certificate of Compliance (Standard Specifications, section 6-3.05E)

F.8.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.8.4 Marking Requirement

Contract Plans and Special Provisions

F.8.5 Method of Notification

Certificate of Compliance Request

F.8.6 Remarks

Highway Advisory Radio equipment is typically accepted on a Certificate of Compliance.

F.9 SIGN and LIGHTING CONTROLS

F.9.1 Specifications

- a. Standard Specifications, section 86-2.13
- b. Contract Plans and Special Provisions
- c. Standard Plan, ES-15D

F.9.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.9.3 Manufacturers Test Reports and/or Certificates

Standard Specifications sections 6-3.04 and 6-3.05E

F.9.4 Marking Requirements

As required by the Contract Plans, Special Provisions, Standard Specifications and Plans

F.9.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.9.6 Remarks

- a. Check plans and SSPs for type of sign control (SC-1, SC-2, SC-3, SC-4 and SC-5)
- b. NEMA Type 3R enclosure required for sign control
- c. Enclosure shall be galvanized or cadmium plated
- d. When the sign structure is to be painted, the enclosure shall be painted the same color
- e. Circuit breakers shall meet the requirements of the Standard Specifications, section 86-2.11

F.10 ACCESSIBLE PEDESTRIAN SYSTEMS

F.10.1 Specifications

Contract Plans and Special Provisions

F.10.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.10.3 Manufacturers Test Reports and/or Certificates

Standard Specifications sections 6-3.04 and 6-3.05E

F.10.4 Marking Requirements

As required by the Contract Plans, Special Provisions, Standard Specifications and Plans

F.10.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.10.6 Remarks

Verify that no accessible pedestrian system equipment requires installation in the controller cabinet.

F.11 VEHICLE SIGNAL FACES

F.11.1 Specifications

- a. Standard Specifications, section 86-4
- b. Metal signal sections shall meet the requirements of California Test Method 666
- c. Plastic signal sections shall meet the requirements of California Test Method 605
- d. Institute of Transportation Engineers (ITE) Publication ST-017A, Equipment and Material Standards
- e. Standard Plans, ES-4A, ES-4B, ES-4C, ES-4D and ES-4E

F.11.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.11.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.05E and 86-4

F.11.4 Marking Requirements

As required by Contract Plans, Special Provisions, Standard Specifications and Plans

F.11.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.11.6 Remarks

Check the following:

- a. Painting process, Standard Specifications, section 86-2.16
- b. Glass lens only, Standard Specifications, section 86-4.01A

- c. Exposed hardware of Type 304 or 305 stainless steel (hinge pins and door latches)
- d. All interior screws and fittings shall be stainless steel or steel with a corrosion resistant plating or coating
- e. Signal mounting assemblies as called for on Contract Plans
- f. 40mm standard weight galvanized steel pipe required for signal mounting assemblies

F.12 LOOP WIRE

F.12.1 Specifications

- a. Standard Specifications, section 86-5.01
- b. American Wire Gage (AWG)
- c. ASTM designation B3 and B-8 (Copper Wire)
- d. Contract Plans and Special Provisions
- e. ASTM B-286 Table -1

F.12.2 Frequency of Sampling and Testing

- a. Accept on Certificate of Compliance
- b. ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.12.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.12.4 Marking Requirements

Standard Specifications, section 86-2.08A

F.12.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.12.6 Remarks

Loop wire is typically accepted on a Certificate of Compliance.

Check the following:

- a. Check Contract Plans and Special Provisions for type of conductor or cable required

F.13 MICROWAVE VEHICLE DETECTION SYSTEM

F.13.1 Specifications

Contract Plans and Special Provisions

F.13.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan (If inspection is required)

F.13.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications sections 6-3.04 and 6-3.05E

F.13.4 Marking Requirements

Contract plans and special provisions.

F.13.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.13.6 Remarks

Check Contract Plans and Special Provisions to ensure that control hardware and software has been provided.

F.14 PROGRAMMED VISIBILITY VEHICLE SIGNAL FACES

F.14.1 Specifications

- a. Standard Specifications, section 86-4.02
- b. Contract Plans and Specifications

F.14.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.14.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.14.4 Marking Requirements

As required by the Contract Plans, Special Provisions, Standard Specifications and Plans

F.14.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.14.6 Remarks

Check the following:

- a. Painting process, Standard Specifications, section 86-2.16
- b. Mounting assemblies
- c. Exterior hardware, Standard Specifications, section 86-4.01A
- d. Interior hardware, Standard Specifications, section 86-4.01A
- e. Contract Plans and Special Provisions

F.15 PEDESTRIAN SIGNAL FACES

F.15.1 Specifications

- a. Standard Specifications, sections 86-4.03
- b. Standard Plan, ES-4B
- c. Contract Plans and Specifications
- d. ITE publication ST-017A and California Test Method 606

F.15.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.15.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.15.4 Marking Requirements

As required by the Contract Plans, Special Provisions, Standard Specifications and Plans

F.15.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.15.6 Remarks

Check the following:

- a. Paint process, Standard Specifications, section 86-2.16
- b. Exterior hardware, Standard Specifications, section 86-4.01B
- c. Interior hardware, Standard Specifications, section 86-4.01B
- d. Contract Plans and Special Provisions for mounting assemblies and type of pedestrian signal face (Type-A, Type-B or Type-C)

F.16 FLASHING BEACON SIGNAL FACES

F.16.1 Specification

- a. Standard Specifications, section 86-4.09
- b. Contract Plans and Special Provisions
- c. Standard Plans, ES-7K and ES-7L

F.16.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.16.3 Manufacturer's Test Reports and/or Certification

Standard Specifications, sections 6-1.07 and 86-4.09

F.16.4 Marking Requirements

As required by the Contract Plans, Special Provisions, Standard Specifications and Plans

F.16.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.16.6 Remarks

Check the following:

- a. Paint process, Standard Specifications, section 86-2.16
- b. Exterior hardware. Standard Specifications, section 86-4.01B
- c. Interior hardware, Standard Specifications, section 86-4.01B
- d. Lens (glass only)
- e. Contract Plans and Special Provisions for mounting assembly and lens color (red or amber) also signal head size (200mm or 300mm)

F.17 PEDESTRIAN PUSH BUTTON ASSEMBLIES

F.17.1 Specifications

- a. Standard Specifications, section 86-5.02
- b. Standard Plan, ES-5C
- c. Contract Plans and Specifications

F.17.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.17.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.17.4 Marking Requirements

As required by the Contract Plans, Special Provisions, Standard Specifications and Plans

F.17.5 Method of Notification

F.17.6 Remarks

- a. Check painting process, Standard Specifications, section 86-2.16
- b. Check Contract Special Provisions and Plans for push button type A, B or C, also pedestrian push button sign requirements

F.18 LIGHTING

F.18.1 Specifications

- a. Standard Specifications, section 86-6, and Standard Plan, ES-10
- b. Contract Plans and Special Provisions
- c. LED Luminaires, Standard Special Provisions section 86-6.02, Standard Plans, ES-10.
- c. High pressure sodium luminaires, section 86-6.01 and Standard Plan, ES-10
- d. Low pressure sodium luminaires, section 86-6.02 (Contract Plans and Special Provisions)
- g. Soffit luminaires, section 86-6.03 and Standard Plans, ES-9E, ES-9F and ES-10
- h. Wall luminaires, section 86-6.03 and Standard Plan, ES-10
- i. Pedestrian crossing fixtures, section 86-6.04 and Standard Plans, ES-12A and ES-12B
- j. High mast lighting, Contract Plans, Special Provisions and Standard Plan, ES-6J
- k. Transformers, section 86-6.09
- l. Induction sign lighting (ISL) fixtures, Standard Specifications section 86-6.07 and Standard Plan, ES-15A
- m. Internally illuminated street name sign, section 86-6.09, and Standard Plan, ES-7P
- n. Photoelectric controls, section 86-6.07, and Standard Plans, ES-7N and ES-14B

F.18.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.18.3 Manufacturer's Test Reports and/or Certifications

- a. Certificate of Compliance conforming to section 6-3.05E for each lot of integral ballast luminaires and external ballast luminaires, Standard Specifications, section 86-6.01A
- b. Manufacturer shall furnish a certificate of cyclic loading for all luminaires to be mounted on horizontal mast arms (California Test Method 611)
- c. Standard Specifications section 6-3.04 and 6-3.05E

F.18.4 Marking Requirements

- a. Manufacturer's name
- b. Catalog number
- c. Type (high-pressure sodium, ISL)
- d. Type of ballast (regulator lead type, lag type regulator, etc.)
- e. Luminaire wattage

F.18.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.18.6 Remarks

- a. Check Contract Plans and Special Provisions for type and number of lighting materials required
- b. Luminaires (HID Types), check for: 1) wattage (200, 310, etc.) 2) Voltage (120, 240, or 480), 3) Type of ballast
- c. LED Luminaire verify operating voltage and roadway type for isolux requirements
- d. Photoelectric control units, Contract Plans and Special Provisions

F.19 EXTINGUISHABLE MESSAGE SIGNS (EMS)

F.19.1 Specifications

- a. Contract Special Provisions
- b. Contract Plans
- c. Standard Plans, ES-14A, ES-14B and ES-14C

F.19.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.19.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.19.4 Marking Requirements

As required by the Contract Plans, Special Provisions, Standard Specifications and Plans

F.19.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.19.6 Remarks

Inspect the EMS per Standard Plans ES-14A, ES-14B and ES-14C and per Special Provisions

F.20 LIGHT EMITTING DIODE (LED) TRAFFIC SIGNAL MODULES

F.20.1 Specifications

Standard Specifications, section 86-4.01D

F.20.2 Frequency of Sampling and Testing

Standard Specifications, section 86-4.01D(1)(c)(i)

F.20.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.20.4 Marking Requirements

Standard Specifications, section 86-4.01D(2)(a)

F.20.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.20.6 Remarks

Verify LED Traffic Signal Modules are listed on the Caltrans' Qualified Products List

F.21 CLOSED CIRCUIT TELEVISION EQUIPMENT

F.25.1 Specifications

- a. Contract Special Provisions
- b. Standard Plans, ES-16A, ES-16B and ES-16C

F.21.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.21.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, section 6-3.04 and 6-3.05E

F.21.4 Marking Requirements

As required by the Contract Special Provisions

F.21.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.21.6 Remarks

Check for the following:

- a. Verify manufacturer and Model specified in the Special Provisions

- b. Test CCTV materials as per the Special Provisions and Specifications

F.22 TELEPHONE DEMARCATION CABINETS (TDC)

F.22.1 Specifications

- a. Standard Plans, ES-3D, ES-3E, ES-3F and ES-3G
- b. Contract Plans and Specifications

F.22.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.22.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications, sections 6-3.04 and 6-3.05E

F.22.4 Marking Requirements

As required by the Contract Special Provisions

F.22.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.22.6 Remarks

Check the Following:

- a. Welding
- b. Cabinet material
- c. Paint/Coating
- d. Model of cabinet (Type A, B or C)

F.23 FLASHING BEACON CONTROL ASSEMBLY

F.23.1 Specifications

Contract Plans and Special Provisions

F.23.2 Frequency of Sampling and Testing

ANSI/ASQ Z1.4 Normal Sampling Plan

F.23.3 Manufacturer's Test Reports and/or Certifications

Standard Specifications sections 6-3.04 and 6-3.05E

F.23.4 Marking Requirements

Contract plans and special provisions.

F.23.5 Method of Notification

Electrical Test Report or Certificate of Compliance Request

F.23.6 Remarks

Check Special Provisions for the following:

- a. Type of flasher control unit (one-or-two circuit)
- b. Dimming circuit requirements
- c. Switching to dimming circuit by photoelectric control or time switch
- d. Type of sign lighting fixture (fluorescent, incandescent)
- e. Enclosure NEMA-3R (painted or galvanized)

F.24 SPECIALTY MATERIAL

(Contact ORMT for items not listed in these guidelines)

APPENDIX

GLOSSARY

APL	Approved Product List
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWS	American Welding Society
BBS	Battery Backup System
CCTV	Closed Circuit Television
CEM-3101	Notice of Materials to be Used (Formerly HC-30)
CFM	Contractor Furnished Material
CMS	Changeable Message Sign
EMS	Extinguishable Message Signs
FBCA	Flashing Beacon Control Assembly
FHWA	Federal Highway Administration
IMC	Intermediate Metallic Conduit
ITE	Institute of Transportation Engineers
LED	Light Emitting Diode
METS	Division of Materials Engineering and Testing Services
MIL STD	Military Standard
MS	Mail Stop
NEMA	National Electrical Manufacturers Association
OE	Office Engineer
ORMT	Office of Roadway Materials Testing
OSM	Office of Structural Materials
PCC	Portland Cement Concrete
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
QPL	Qualified Products List
RE	Resident Engineer
SHA	State Highway Agency
SSP	Standard Special Provisions
TDC	Telephone Demarcation Cabinet
TEES	Transportation Electrical Equipment Specifications
TL-28	Notice of Materials to be Inspected
TSCES	Traffic Signal Control Equipment Specifications
UL	Underwriters Laboratories

QA Testing Sampling Plan Normal Sampling Plan (ANSI/ASQ Z1.4) Table for Inspection by Attributes

<u>Description</u>	Contract Quantity	Testing Sample Size	<u>Critical</u>		
			Aql	Acc	Rej
All Electrical Materials	1 - 8	1	10	0	1
	9 - 15	2	10	1	2
	16 - 25	3	10	1	2
	26 - 50	5	10	1	2
	51 - 90	5	10	1	2
	91 - 150	8	10	2	3
	151 - 280	13	10	3	4
	281 - 500	20	10	5	6
	501 - 1200	32	10	7	8

Notes: **General Inspection I**
Aql = Acceptable Quality Level
Acc = Acceptance Numbers
Rej = Rejection Numbers

 DEPARTMENT OF TRANSPORTATION	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION Division of Materials Eng. and Testing Services Office of Roadway Materials Testing Electrical QA Inspection Branch 5900 Folsom BLVD Sacramento, CA 95819-4612
	Date: 12/3/2008
Attention: Sam Gallardo Phone: (310) 609-0264 Fax: (310) 609-0288	From: Jonathan Kersey Phone: (916) 227-6495 Fax: (916) 227-7026 Email: jonathan_kersey@dot.ca.gov
Contract: 07-178504	Number of Pages: 2 (including title page)
<p align="center">TL-28 Electrical, "Notice of Materials to be Inspected at Jobsite"</p> <p>This TL-28E is for the following ELECTRICAL Materials:</p> <ul style="list-style-type: none"> Conduit Conductors Splice Vaults Pull Box(es) Fiber Optic Cable <p>Comments:</p>	
<p>CC: 1. Contractor: Dynalectric Attn: Jake McGinley Fax: (714) 484-2389</p> <p>2. Supplier: Attn: Fax:</p> <p>D-7 Electrical Constr., Fax: 562-926-2915</p>	

STATE OF CALIFORNIA - BUSINESS, TRANSPORTATION AND HOUSING AGENCY

DEPARTMENT OF TRANSPORTATION
 Division of Materials Eng. and Testing Services
 Office of Roadway Materials Testing
 Electrical QA Inspection Branch
 5900 Folsom BLVD
 Sacramento, CA 95819-4512



NOTICE of MATERIALS to be INSPECTED at JOBSITE

TO: 1. **Resident Engineer:** Sam Gallardo
 Phone: (310) 609-0264
 Fax: (310) 609-0288

Date: 12/3/2008

2. **Contractor:** Dynalectric
 Attn: Jake McGinley
 Phone: (714) 828-7000
 Fax: (714) 484-2389

Contract: 07-178504

District 07	County LA	Route 105	KP or PM R1.2/R1.6
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Comments:

The ELECTRICAL material(s) listed on the cover sheet and/or on the attached sheet(s) will not be inspected prior to delivery to the jobsite. The materials indicated may be accepted on Certificates of Compliance unless the Resident Engineer (RE) requests inspection or testing.

We recommend the Certificates of Compliance, which satisfy Section 6-1.07 of the Caltrans Standard Specifications, be provided to the RE. An example of a Certificate of Compliance, which meets Caltrans' requirements, can be found at the following website:

<http://www.dot.ca.gov/hq/esc/ttsb/electrical/pdf/COC.pdf>

CC: Supplier:
 Attn:
 Phone:
 Fax:

D-7 Electrical Constr., Fax: 562-926-2915

Christopher Fax, Chief
 Electrical Testing Branch

X _____

Inspector: Jonathan Kersey
 Transportation Engineer, Electrical

Phone: (916) 227-6495

Fax: (916) 227-7026

Email: jonathan_kersey@dot.ca.gov

TL-28E (05/01/15)

 <p>DEPARTMENT OF TRANSPORTATION</p>	<p>STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION Division of Materials Eng. and Testing Services Office of Roadway Materials Testing Electrical QA Inspection Branch 5900 Folsom BLVD Sacramento, CA 95819-4612</p>
	<p>Date: 6/23/2008</p>
<p>Supplier: Jam Services, Inc. Contact: Carol Kokanour Phone: (925) 455-5267 Fax: (925) 455-5271</p>	<p>From: Jonathan Kersey Phone: (916) 227-6495 Fax: (916) 227-7026 Email: jonathan_kersey@dot.ca.gov</p>
<p>Contract: 06-420504</p>	<p>Number of Pages: 3 (including title page)</p>
<p>COMMENTS: REQUEST FOR MATERIAL DETAILS</p> <p>Our branch is responsible for assisting the Caltrans Resident Engineer with the testing and inspection of Contractor-furnished Electrical materials.</p> <p>We are requesting information for the electrical material(s) you will be supplying for the contract listed above. Please see the attached sheets for further information.</p> <p>Please feel free to call or email me if you have any questions.</p> <p>Thank you for your assistance, Jonathan Kersey</p>	
<p>CC: 1. Resident Engineer: Larry Allred Fax: (559) 243-3545</p> <p>2. Contractor: Elijah Electric Attn: Luis Martinez Fax: (209) 577-0483</p>	

 DEPARTMENT OF TRANSPORTATION	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION Division of Materials Eng. and Testing Services Office of Roadway Materials Testing Electrical QA Inspection Branch 5900 Folsom BLVD Sacramento, CA 95819-4612
	Date: 8/13/2009
Attention: Moaid Laymoun Phone: (408) 254-5838 Fax: (408) 254-5822	From: Linda Hill Phone: (916) 227-4419 Fax: (916) 227-7026 Email: linda_g_hill@dot.ca.gov
Contract: 04-272024	Number of Pages: 2 (including title page)
<p align="center">COMMENTS: Electrical Materials Requiring Inspection</p> <p>The Electrical Materials on the attached page will require inspection and testing by the METS Electrical Testing Branch. Final Acceptance will not be given until the material has been inspected and tested. Section 85-2.14A of the Standard Specifications allows up to 30 calendar days to perform material inspection. Therefore, it is critical that the supplier or contractor contact us to arrange for inspection and testing. Acceptance sample testing will be based on ANSI/ASQC Z1.4 (Military Standard 105E, Normal Sampling Plan, Inspection by Attributes).</p> <p>Please feel free to call or email me if you have any questions.</p> <p>Thank you for your assistance, Linda Hill</p>	
<p>CC: Contractor: Bentancourt Construction Attn: Greg Jeppson Fax: (925) 454-1523</p> <p>Supplier: Jam Services, Inc. Attn: Carol Kokanour Fax: (925) 455-5271</p>	

STATE OF CALIFORNIA - BUSINESS, TRANSPORTATION AND HOUSING AGENCY

DEPARTMENT OF TRANSPORTATION
 Division of Materials Eng. and Testing Services
 Office of Roadway Materials Testing
 Electrical QA Inspection Branch
 5900 Folsom BLVD
 Sacramento, CA 95819-4612



NOTICE of MATERIALS to be FURNISHED for INSPECTION

Contractor: Bentancourt Construction

Date: 8/13/2009

Attn: Greg Jeppson

Phone: (925) 454-1521

Fax: (925) 454-1523

Contract: 04-272024

District
04

County
S. CL

Route
280

KP or PM
S.1/7.8

<u>Lot Qty</u>	<u>Qty to be Tested</u>	<u>Manufacturer</u>	<u>Material Type</u>	<u>Material Description</u>	<u>Model #</u>
8	2	GE	LED	12" Green Ball	DRS-GTFSB-20A
12	2	GE	LED	12" Red Ball	DRS-RTFSB-20A
8	2	GE	LED	12" Yellow Ball	DRS-YTFSB-20A
2	2	GE	Luminaire	200W HPS	MDCL2007M21FAC
22	3	GE	Sign Light	80W IL	V3SL80Q1ECSN4GR
3	2	ELECTROTECH	LED	METER ON	
1	1	MCCAIN	354	Cabinet, Modified	

CC: RE: Moaid Laymoun
 Phone: (408) 254-5838
 Fax: (408) 254-5822

Supplier: Jam Services, Inc.
 Attn: Carol Kokanour
 Fax: (925) 455-5271

Christopher Tan, Chief
 Electrical Testing Branch

X _____

Inspector: Linda Hill
 Electrical QA Inspector

Phone: (916) 227-4419

Fax: (916) 227-7026

Email: linda_g_hill@dot.ca.gov

TL-608E (06/01/15)

 DEPARTMENT OF TRANSPORTATION	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION Division of Materials Eng. and Testing Services Office of Roadway Materials Testing Electrical QA Inspection Branch 5900 Folsom Blvd Sacramento, CA 95819-4612				
	Date: 3/2/2010				
Attention: Monas Chaudry Phone: (949) 936-3594 Fax: (949) 936-3585	From: Phil Fong Phone: (916) 227-7029 Fax: (916) 227-7026 Email: phil_fong@dot.ca.gov				
Contract: 12-089614	Number of Pages: 2 (including title page)				
<h2>Service Pedestal Inspection Report</h2> <p>See the attached Material Inspection Report(s).</p> <p>Please feel free to call or email me if you have any questions.</p> <p>Thank you for your assistance, Phil Fong</p>					
<table><tr><td>CC: Contractor: CMV Electric Attn: Bo Fuentes Fax: (909) 931-5701</td><td>Other: Myers Power Products, Inc. Attn: jojo teano Fax:</td></tr><tr><td>Supplier: Walters Wholesale Electric Attn: Ryan Thibault Fax: (714) 784-1712</td><td></td></tr></table> <p>Attn: Fadi Halasoh</p>		CC: Contractor: CMV Electric Attn: Bo Fuentes Fax: (909) 931-5701	Other: Myers Power Products, Inc. Attn: jojo teano Fax:	Supplier: Walters Wholesale Electric Attn: Ryan Thibault Fax: (714) 784-1712	
CC: Contractor: CMV Electric Attn: Bo Fuentes Fax: (909) 931-5701	Other: Myers Power Products, Inc. Attn: jojo teano Fax:				
Supplier: Walters Wholesale Electric Attn: Ryan Thibault Fax: (714) 784-1712					

DEPARTMENT OF TRANSPORTATION
 Division of Materials Eng. and Testing Services
 Office of Roadway Materials Testing
 Electrical QA Inspection Branch
 5900 Folsom Blvd
 Sacramento, CA 95819-4612



ELECTRICAL MATERIAL INSPECTION REPORT

Resident Engineer: Monas Chaudry
 Phone: (949) 936-3594
 Fax: (949) 936-3585

Date: 3/2/2010

Contract: 12-089614

District	County	Route	PM/KP
12	Ora	74	1.85/2.95

<u>Manufacturer</u>	<u>Material Type</u>	<u>Material Description</u>	<u>Model #</u>	<u>Vendor</u>
Myers Power Products	Service Pedestal	Type III-BF		Waters Wholesale Electric
	<u>Lot Qty</u>	<u>Qty Tested</u>	<u>Compliant Units</u>	<u>Non-Compliant Units</u>
	2	2	0	2

MATERIAL MEETS SPECIFICATIONS w/ EXCEPTION(S)

Comments:

QA Inspection Tags Used:

- 1) Type III-BF Electrical Service Equipment Enclosure conforms to 2004 Caltrans Standard Specifications Section 86 -2.11, 2004 Standard Plans ES-2C, ES-2E, Contract Plans Sheet E-3, Note 2 with the following exceptions: Contract plans and Standard Plans call for Lighting Circuit to be metered. Manufactured with un-metered lighting circuit. Exception verified and approved by Fadi Halaseh (Caltrans Electrical Construction)
- 2) Type III-BF Electrical Service Equipment Enclosure conforms to 2004 Caltrans Standard Specifications Section 86 -2.11, 2004 Standard Plans ES-2C, ES-2E, Contract Plans Sheet E-3, Note 2 with the following exceptions: Contract plans and Standard Plans call for Lighting Circuit to be metered. Manufactured with un-metered lighting circuit. Exception verified and approved by Fadi Halaseh (Caltrans Electrical Construction)

CC: Contractor: **CMV Electric**
 Attn: **Bo Fuentes**
 Fax: (909) 931-5701

Supplier: **Waters Wholesale Electric** Other: **Myers Power Products**
 Attn: **Ryan Thibault** Attn: **jajo leano**
 Fax: (714) 764-1712 Fax:

Attn: **Fadi Halaseh**

Christopher Tan, Chief
 Electrical Testing Branch
 Original Signed By _____
 Inspector: **Phil Fong**
 Transportation Engineer, Electrical
 Phone: (916) 227-7029
 Fax: (916) 227-7026
 Email: phil_fong@dot.ca.gov

TL-29E (05/01/10)

Note: Our office is not always informed of change orders or other modifications to the Contract. It is ultimately the Electrical Contractor's responsibility to verify the quantity of items required by a Contract.

SHIPPING RECORD

Shipped From: STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION Division of Materials Eng. and Testing Services Office of Roadway Materials Testing Electrical QA Inspection Branch 5900 Folsom BLVD Sacramento, CA 95819-4612	Date: 2/18/2009	Number of Boxes: 3
	Tested By: Jonathan Kersey	Date Picked Up: 2/19/2009
Shipped To: Wesco - Anaheim 1333 So. State College Pkwy Anaheim CA 92806 Attn:	Carrier:	
	Driver's Name/Signature:	
	Driver's Notes/Comments:	
Contract: 07-217404		
District County Route PM/KP 07 L.A. 5 25.4/26.2		
Lab Comments/Instructions: 1 Qty 85W ISL 2 Qty 310W Luminaire All passed QA inspection		

Form: Shipping