

## SECTION 611

### ACCEPTANCE PROCEDURES FOR TRAFFIC CONTROL SIGNALS AND DEVICES

#### **611-1 Description.**

This Section sets forth Contract acceptance procedures for installations of traffic control signals and devices and for equipment purchase contracts.

#### **611-2 Acceptance of Traffic Control Signal and Device Installations.**

**611-2.1 Partial Acceptance:** The Engineer may make inspection for partial acceptance under the Contract in accordance with 5-10 of a complete traffic control signal and device installation upon its completion in accordance with the Contract Documents and at such time that other parts of the total Contract are at a stage of completion that either require or allow the installation to operate in a manner which is in accordance with the Contract Documents. Before inspection for partial acceptance, the Engineer will require the satisfactory completion of all field tests of completed installations in accordance with the requirements of 611-4. The Engineer will make inspection for partial acceptance in accordance with 5-10 in company with a Contractor's representative and, when applicable, a representative of the agency designated to accept maintenance responsibility.

**611-2.2 Final Acceptance:** The Engineer will make inspection for final acceptance of traffic control signal and device installations as part of all work under the Contract in accordance with 5-11, only after satisfactory completion of all field tests of completed installations and on the basis of a comprehensive field inspection of all equipment installations. Submit Form 750-010-02, Submittal Data – Traffic Control Equipment for each cabinet location, to the Engineer. The Engineer will make the final inspection with a Contractor's representative and a representative of the agency designated to accept maintenance responsibility. The Engineer will submit the approved form to the District Traffic Operations Engineer and place a hard copy in the cabinet at each location. Transfer warranties and guarantees on equipment to the Department in accordance with Section 608. For traffic signal installations, submit form 700-010-22, Final Acceptance of Traffic Signal Installation(s) and Transfer of Maintenance, to the Engineer.

**611-2.3 As-Built Documentation:** As a condition precedent to acceptance under 611-2.1 or 611-2.2, submit as-built drawings for all installations, signed and sealed by a Professional Engineer or Professional Surveyor and Mapper registered in the State of Florida, along with supplemental as-built information using Feature Import Templates used for the Department's ITS Facility Management (ITSFM) System. Feature Import Templates can be found on the Department's web site: [http://www.fdot.gov/traffic/ITS/Projects\\_Telecom/ITSFM/ITSFM.shtm](http://www.fdot.gov/traffic/ITS/Projects_Telecom/ITSFM/ITSFM.shtm).

**611-2.3.1 Submittal Requirements:** Submit as-built plans for review by the Engineer. As-built plans must be PDF files, in the same scale as the Contract Plans, and formatted on 11 inch by 17 inch sheets. Signing and pavement marking plan sheets may be used instead of signalization plan sheets, if a substantial number of changes from the original Plans must be recorded. If, in the opinion of the Engineer, the changes cannot be clearly delineated on the existing drawings, clearly delineate all changes on 11 inch by 17 inch detail sheets, enlarged 200% from the reproductions.

Submit fiber optic splicing diagrams detailing all cable splices, terminations, equipment port assignments, and optical circuit path names within the communication network. Include cable manufacturer, type, strand count, and cable sequential

reading at each pull box entrance/exit, each side of the splice enclosure, and at patch panel terminations.

As-built submittals must include an inventory of all traffic control signals and devices, and support structures. The inventory must include horizontal position geographic coordinate data collected using Differential Global Positioning System (DGPS) equipment. The inventory must include the manufacturer, model, and serial number for each device or completed assembly. Submit coordinate data for pull boxes as well as conduit and cable at 100 foot intervals including changes in direction. All support structures, equipment cabinets and other fixed location features must be assigned a unique site ID name to create a common association between the as-built plans, inventory forms, and the ITSFM system. Include data for all components listed in 611-2.3.2, except those listed in 611-2.3.2.2 and 611-2.3.2.5.

Aerial photographs may be submitted with as-built plan submittals to provide supplementary information. The aerials should not include extra features such as the right of way, baseline, or roadway edges. The aerials may be used as a base for the as-built plans with mile post and offset dimensions. Make any corrections resulting from the Engineer's review, and resubmit as-built plans as a condition precedent to acceptance of the installation.

**611-2.3.2 Components:** As a minimum, identify all traffic control devices, poles, support structures, cabinets, pull and splice boxes, hubs, conduit duct banks, access points, and power services, and utility demarcation points.

**611-2.3.2.1 Conduit and Cable:** Identify all conduit and cable with unique line styles for routing (conduit, electrical, and joint-use trenched) that are clearly identified in a legend on each plan sheet. Identify the type of cable (example - 7 conductor signal cable) and label the number of conductors, fiber strands or other identifying features of the cable. For conduit duct banks, clearly note conduit and innerduct size, length, and number of runs.

**611-2.3.2.2 Loops and Detection Zones:** Identify the location of all installed loops (including the distance from the stop bar for the advance loops), the path of each loop to the pull box, the loop window and the path of the loop lead-in to the controller cabinet. Identify the device location and the approximate detection area for detection systems that are not embedded in or under pavement.

**611-2.3.2.3 Pull Boxes:** Label unused and out of service pull boxes clearly. Show distances to each pull box from the nearest edgeline, stop bar, or other permanent feature. If an edgeline is not near a pull box or would not clearly identify its location; a fixed monument may be used (example - FDOT pole or structure).

**611-2.3.2.4 Poles:** Identify poles from the nearest edgeline of both approaches. If an edgeline is not near a pole or would not clearly identify its location, a fixed monument may be used.

**611-2.3.2.5 Signal Heads:** As-built plans must show the final location of signal heads. Each signal head shall be identified by its corresponding movement number.

**611-2.3.2.6 Cabinet:** The type of cabinet and inventory of internal components must be documented. Controller manufacturer along with the controller model number shall be submitted for all traffic signal cabinets. A cabinet corner "blow up" shall be submitted detailing pull box locations with all conduit and cable.

**611-2.3.3 Compensation:** All costs incurred in submitting as-built documentation are incidental to the other items of work associated with traffic control signals and devices.

**611-2.4 Installation Inspection Requirements:** Meet the requirements of Section 105.

### **611-3 Signal Timing.**

Set the timing of a traffic signal or system of traffic control devices in accordance with the Contract Documents, unless approved otherwise in writing by the Engineer.

### **611-4 Field Tests of Installations.**

Perform the following tests in the presence of the Engineer and, when applicable, a representative of the agency designated to accept maintenance responsibility.

**Continuity:** Test each signal head circuit, pedestrian detector circuit, vehicle detector loop circuit, and interconnect signal circuit for continuity.

**Functional:** Perform a functional test that demonstrates that each and every part of the installation functions as specified.

**Induced Voltage on traffic signal connections:** Measure the voltage between each signal head indication field terminal and the AC neutral circuit in the controller cabinet during the off (dark) state of each signal head indication. Ensure that the voltage does not exceed  $2 V_{AC, RMS}$ . If this value is exceeded, take the following action to reduce the value to  $2 V_{AC, RMS}$ :

1. Check for loose or broken connections in the signal head circuit from the controller cabinet to the signal heads.
2. If (1) above does not correct the problem, connect additional neutral circuits between the signal head and the controller cabinet.

**Inductive Loop Assembly:** An inductive loop assembly is defined as a loop plus the lead-in cable. Measure and record the series resistance of each inductive loop assembly. Ensure that the resistance does not exceed  $10 \Omega$ . Perform an insulation resistance megger test, at  $500 V_{DC}$ , for each inductive loop assembly at the cabinet in which the inductive loop assembly is terminated. Do not connect the inductive loop assembly to the cabinet terminal strips during the test, except for the drain wire of a shielded lead-in cable. Insulation resistance is defined as the resistance between one wire of the lead-in cable and a ground rod or bussbar. Record the insulation resistance of each inductive loop assembly. Ensure that the resistance is equal to or greater than  $100 M\Omega$ .

Perform the 48 hour test only after achieving acceptable results from the other tests listed in 611-4.

#### **48 Hour Test for Traffic Signal installations:**

1. Before beginning the 48 hour test, place all new signal installations (no existing signals) in flash for 48 to 336 hours. The length of the flash period will be determined by the Engineer.
2. Continuously operate each new or modified traffic signal installation or system for not less than 48 hours. If unsatisfactory performance of the system develops, correct the condition, and repeat the test until obtaining 48 hours of satisfactory continuous operation.
3. During the 48 hour test period, the Contractor is fully responsible for the signal or signal systems. Provide a responsible representative (technically qualified) who can monitor signal operation and troubleshoot any malfunctions within a one hour period.

When coordination is specified in the Contract Documents, provide a two hour training session on the operation and programming of the coordination features of the controller units during the 48 hour test. Arrange the time and place of the training session with the Engineer.

4. Perform a 48 hour test for flashing beacon installations in the same manner as for traffic signal installations.

5. Start the 48 hour test on a Monday, Tuesday, or Wednesday. Ensure the 48 hour test does not include weekends, Holidays, or Special Events.

6. Start the 48 hour test between 9:00 AM and 2:00 PM.
7. Before the 48 hour test, install and have standing by all equipment specified in the Contract Documents.

### **611-5 Contractor's Warranty Period for Installations.**

**611-5.1 General Requirements:** Repair or replace any defective components or work of the installations for a 90 day period after final acceptance.

**611-5.2 Contractor's Responsibilities:** During the warranty period, the Contractor is responsible for the following:

1. Repair or replacement of equipment that fails to function properly due to defective materials or workmanship.
2. Upon notification by the Engineer of a malfunction, restore the equipment to proper operating condition within 12 hours after notification by the Engineer.

If the Contractor fails to restore the equipment to proper operating condition within 12 hours after notification, the Engineer has the authority to have the remedial work performed by other forces. The Contractor is responsible for all incurred costs of the work performed by other forces. Remedial work performed by other forces does not alter any of the requirements, responsibilities or obligations of this warranty.

3. In the event that the equipment does not function or malfunctions due to defective materials or workmanship, the Contractor is liable for any impairment to the safety of pedestrian and vehicular traffic resulting from such malfunction.

**611-5.3 Department's Responsibilities:** During the warranty period, the Department is responsible for the following:

1. Electrical energy costs which are paid for by the local maintaining agency.
2. All adjustments, such as timing, necessary for the normal operations of equipment.
3. Documentation of the individuals involved and the time of Contractor notification upon failure or malfunction of equipment.
4. Repair or replacement of any part of the installation damaged as a result of natural causes or those resulting from vehicular or pedestrian traffic not associated with Contractor activities.

### **611-6 Manufacturer's Tests and Certifications.**

For materials which may not require formal testing, the Engineer reserves the right to require certifications from the manufacturer of such equipment and material, to the effect that they meet all Specification requirements, and, in the event of questionable equipment or material, to require that such material or equipment be tested at no expense to the Department.

The Engineer reserves the right to withhold any payments which may be due; if the Engineer determines that the equipment does not meet the Specifications or evaluation criteria.

### **611-7 Contracts for Purchase of Equipment.**

**611-7.1 Acceptance Tests Required:** For each unit of equipment furnished under purchase contracts (furnish only), the Engineer will perform the following tests:

1. Visual inspection within 5 days after delivery.
2. Operational tests which determine whether the equipment performs in accordance with the requirements of the Contract Documents. The Engineer will complete such tests within 15 days after delivery. If the equipment is listed on the Department's Approved

Product List (APL), the Engineer may verify the APL Certification number in lieu of the operational tests.

**611-7.2 Eligibility for Payment:**

The Department will base payment for equipment furnished under purchase contracts on satisfactory completion of the visual inspection and operational tests required by 611-7.1.

Before any payment will be made for each functional group, deliver to the Engineer and receive from the Engineer acceptance of all units of each functional group of equipment required to be furnished by the Contract Documents. The Department will make separate payment for a staged delivery of each functional group of equipment only when staged delivery is specified in the Contract Documents.

**611-7.3 Equipment Failing to Pass Acceptance Tests:**

When any unit of equipment fails to pass the acceptance tests, correct the deficiencies (by repair or replacement), at no expense (including all freight costs) to the Department, to attain compliance. If the original Contract Time has expired, the Department will charge and continue to assess liquidated damages in accordance with 8-10 until final acceptance of the equipment. Upon compliance with such correction requirements, the Engineer will perform tests on the equipment as specified above and will determine their eligibility for payment.

The Department will not assess liquidated damages during the acceptance test period in 611-7.1. The Department will allow only one acceptance test exclusion with regard to liquidated damages assessment per lot of units required to be delivered.