EXPECTED IMPLEMENTATION JULY 2021

DRAFT

ACCEPTANCE PROCEDURES FOR TRAFFIC CONTROL SIGNALS, DEVICES, AND INTELLIGENT TRANSPORTATION SYSTEM DEVICES (REV 2-19-21) (2-23-21) (7-21)

SUBARTICLE 611-2.2 is deleted and the following substituted:

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.

SUBARTICLE 611-2.2 is expanded by the following:

611-2.2.1 Traffic Control Signal and Device Installation: 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.

611-2.2.2 Intelligent Transportation System Device Installation: The Engineer will make the final inspection with a Contractor's representative and a representative of the agency designated to accept maintenance responsibility. Transfer warranties and guarantees on equipment to the Department in accordance with Section 608. Final acceptance of ITS installation is contingent on successfully completing the ITS Acceptance Test section.

SUBARTICLE 611-2.3 is deleted and the following substituted:

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 and Attribute Forms used for the Department's ITS Facility Management (ITSFM) System. Feature Import Templates can be found on the Department's web site: https://www.fdot.gov/traffic/itsfm.

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 and content 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, at a minimum, 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. Submit the ITSFM electronic files in any of the following software formats:

1. As-built Plans – Design Files (DGN) and Portable Document Format (PDF)
2. Feature Import Templates – Spreadsheet format (XLSX)
3. Feature Attribute Forms – Portable Document Format (PDF)
4. Differentially Corrected GPS files – (COR)
5. GPS Export Files – Comma-Separated Values (CSV)
6. Photos – Joint Photographic Experts Group (JPG)

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 (communication, 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, material, 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. Payment for ITSFM files will be compensated as specified in this Section.

ARTICLE 611-4 is deleted and following substituted:

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.

611-4.1 Traffic Control Signal and Device Installation:

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 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 Ω. 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 MΩ.

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.

611-4.2 Intelligent Transportation System Device Installation: Test all stand-alone functions of the ITS devices as detailed in the Contract Documents and as approved by the Engineer.

For the managed field Ethernet switch (MFES), complete FDOT Form Number 750-040-07 for all installed field switches or other procedure approved by the Engineer.

For the closed-circuit television (CCTV) camera, complete FDOT Form Number 750-040-08 for all installed CCTV cameras or other procedure approved by the Engineer.

For microwave vehicle detection system (MVDS), complete FDOT Form Number 750-040-09 for all installed MVDS sensors or other procedure approved by the Engineer.

For ITS devices without official FDOT forms, evaluate ITS devices as per Contract Documents and as approved by the Engineer.

Complete approved data forms and turn them over to the Engineer for approval. Provide a minimum notice of 10 calendar days prior to all tests to permit the Engineer or their representative to observe each test.

If any unit fails to pass its stand-alone test, correct the unit, or substitute another unit in its place, then repeat the test.

If a unit has been modified as a result of a stand-alone test failure, prepare a report describing the nature of the failure and the corrective action taken and submit it to the Engineer prior to re-testing the unit. If a failure pattern develops, the Engineer may direct that modifications be made to all units without additional cost to the Department or an extension of the Contract Time.

ARTICLE 611-5 is deleted and the following substituted:

611-5 ITS System Acceptance Test.

After the stand-alone tests have been completed and approved by the Engineer, perform the System Acceptance Test in the presence of the Engineer and, when applicable, a representative of the agency designated to accept maintenance responsibility.

Conduct an approved 30-day System Acceptance Test during which all ITS Systems, Sub-Systems and, at a minimum, all control, monitoring, and communication functions of the field equipment are evaluated from a Transportation Management Center (TMC). Complete the System Acceptance Test documentation and turn them over to the Engineer for approval.

During the 30-day test period, limit device outages to 10% or less, a minimum of a single unit if less than 10 devices or the allowable threshold required in the Contract Documents, whichever is less. Should an outage of more than 10% of the total number of devices occur, a single unit or more if less than 10 devices or the allowable threshold in the Contract Documents, then the System Acceptance Test has failed.

Upon the failure of the System Acceptance Test, the 30-day testing window shall pause until all devices are fully functional. In addition to pausing and extending the test period by the number of days lost by failure and repair time, the Engineer has the option of restarting the full 30-day test.

Upon the successful completion of the System Acceptance Test, the Engineer will submit to the Contractor a letter of approval stating the first and last day of the 30-day system test period.

ARTICLE 611-6 is deleted and the following substituted:

611-6 Contractor's Warranty Period for Installations.

611-6.1 General Requirements: Repair or replace any defective components or work of the installations for a 90-day period after final acceptance.

611-6.2 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. If 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.

611-6.3 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.

ARTICLE 611-7 is deleted and the following substituted:

611-7 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.

SECTION 611 is expanded by the following new Articles.

611-8 Contracts for Purchase of Equipment.

611-8.1 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.

611-8.2 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.

611-8.3 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 regarding liquidated damages assessment per lot of units required to be delivered.

611-9 Method of Measurement.

611-9.1 General: Measurement for payment will be in accordance with the following work tasks.

611-9.2 ITSFM Sub-surface Documentation: The Contract unit price per mile of documented conduit, cable, boxes, vaults, enclosures, and all other subsurface utilities will include furnishing all hardware, tools, and materials and all data collection, verification, and submission as specified in this Section and the Contract Documents, and all labor, travel, MOT, programs, training, equipment, and other requirements necessary for a complete and accepted documentation submission. Payment for facilities located underground will be based on the linear length of the project as stated in the Contract Documents regardless of the length or number of conduits, cables, enclosures, or other subsurface facilities documented. No allowance will be made for sweeps or vertical distances below the ground.

611-9.3 ITSFM Location Documentation: The Contract unit price per location, will include documenting all above ground ITS Facilities at, or associated with, an ITS location as specified in this Section and the Contract Documents, and all labor, travel, training, equipment, programs, MOT, and other requirements necessary for a complete and accepted documentation submission. Payment for location documented will be based on the ITS location including cabinets, poles, utility hardware such as meter cans, utility demarcation sites, disconnects, etc., as well as all ITS devices, auxiliary devices, and other items, attributes, and fields called for in the ITSFM documentation and Contract Documents, regardless of the type or number of devices installed.

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611-10 Basis of Payment.

Price and payment will be full compensation for all work costs incurred in submitting ITSFM requirements including, all data gathering, data entry, transportation, protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Item No. 611- 1- ITSFM Sub-surface Documentation – per mile

Item No. 611- 2- ITSFM Location Documentation - each