



*Florida Department of Transportation*

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GOVERNOR

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JARED W. PERDUE, P.E.  
SECRETARY

September 21, 2022

Khoa Nguyen  
Director, Office of Technical Services  
Federal Highway Administration  
3500 Financial Plaza, Suite 400  
Tallahassee, Florida 32312

Re: State Specifications Office  
Section: **660**  
Proposed Specification: **6600100 Vehicle Detection System.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

The changes are proposed by Matt DeWitt from the Traffic Engineering and Operations Office to provide references to Section 995 material requirements. Deleted unnecessary references, updated field acceptance test requirements for wrong way vehicle detection systems, method of measurement to clarify payment of highlighted signs per Sections 700. The changes to Section 660 are associated with the proposed changes to Section 995.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to [daniel.strickland@dot.state.fl.us](mailto:daniel.strickland@dot.state.fl.us).

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**VEHICLE DETECTION SYSTEM**  
(REV ~~97-1520~~-22)

ARTICLE 660-1 is deleted and the following substituted:

**660-1 Description.**

Furnish and install a vehicle detection system in accordance with the Contract Documents and this Section. ~~Use vehicle detection systems and loop sealant that meet the requirements of Section 995 and are listed on the Department's Approved Product List (APL).~~ Meet the requirements of Section 603.

SUBARTICLE 660-2.1 is deleted and the following substituted:

**660-2 Materials.**

**660-2.1 General:** ~~All equipment shall be permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number. Meet the requirements of Section 603.~~ Meet the following requirements:

- Traffic Data Detection System- Microwave\* .....Section 995
  - Vehicle Detector- Microwave\* .....Section 995
  - Vehicle Detector- Video\* .....Section 995
  - Vehicle Loop Detector\* .....Section 995
  - Wireless Magnetometer Assembly\* .....Section 995
  - Automatic Vehicle Identification\* .....Section 995
  - Wrong Way Vehicle Detection Systems\* .....Section 995
  - Loop Sealant\* .....Section 995
  - Highlighted Signs\* ..... Section 995
- \*Use products listed on the Department's APL.

SUBARTICLE 660-3.1 is deleted and the following substituted:

**660-3.1 Installation Requirements for all Detectors:** Install, configure, and demonstrate a fully functional vehicle detection system as shown in the Plans. Connect all field equipment to the existing communication network, and provide all materials specified in the Contract Documents. Install all equipment in accordance with this Section and the manufacturer's recommendations.

~~Ensure that~~ Install above-ground detectors ~~can be mounted on existing poles or sign structures, or on new poles,~~ as shown in the Plans. Furnish and install the power cable and the communication cables in accordance with the manufacturer's recommendation. Ensure that the cables comply with NEC sizing requirements and meet all other applicable standards, specifications, and local code requirements.

Do not install communication cables in the same conduit or pull boxes as power cables carrying voltage greater than 24 V<sub>DC</sub>/V<sub>AC</sub> or current in excess of 1.5 amps.

Cut all wires to their proper length before assembly. Do not double back any wire to take up slack. Neatly lace wires into cables with nylon lacing or plastic straps. Secure cables

with clamps and provide service loops at all connections. Label all field wiring cables in the cabinet.

In the event that power to the vehicle detection system or a subcomponent thereof is interrupted, ensure that the equipment automatically recovers after power is restored. Ensure that all programmable system settings return to their previous configurations and the system resumes proper operation.

SUBARTICLE 660-3.2.10.3 is deleted and the following substituted:

**660-3.2.10.3 Loop Detector Turn-on:** Connect the loop assemblies to the appropriate inductive loop vehicle detectors and tune the detectors in accordance with the manufacturer's instructions. Separate the operating frequencies of vehicle detectors, in adjacent lanes, by at least 2 kHz. ~~Verify operation in accordance with 660-2.2.1.~~

SUBARTICLE 660-4.4 is deleted and the following substituted:

**660-4.4 Wrong Way Vehicle (WWVDS) Detection System:** Submit a test plan for the field acceptance test (FAT) to the Engineer a minimum of 30 calendar days before commencement of testing for review and approval; tests cannot commence or be scheduled until test plans are approved by the Engineer for approval. For each testing phase, test plans must include descriptions of test procedures; test form with areas for test result recording, test conductor, and witness signatures; pass/fail criteria; and test schedule.

Conduct a field acceptance test for each ramp being monitored by a WWVDS. Test all local system functions using the installed WWVDS equipment as detailed in the Plans and as approved by the Engineer. Testing must demonstrate that:

1. All wiring and local configurations are correct.
2. The WWVDS is detecting vehicles driving the wrong way, in all ramp travel lanes and any paved shoulders 8 feet or wider, while ignoring vehicles traveling in the correct direction. A true positive rate of 95% or greater must be achieved using the methodology described in Section 660-4. A false positive rate of 1% or less must be achieved using the methodology described in Section 660-4.
3. The WWVDS is activating all wrong way highlighted signs on the ramp upon detection of a vehicle traveling in the wrong direction and sign activation occurs before the vehicle reaches the sign.

If any WWVDS fails to pass its field acceptance test, correct the unit, or substitute another unit in its place, then repeat the test.

If a unit has been modified due to a field acceptance 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. If a failure pattern develops, the Engineer may direct that design and construction modification be made to all units without additional cost to the Department or extension of the Contract Time.

**660-4.4.1 True Positive Testing:** Conduct this test on a closed ramp using Contractor-provided test vehicles. Test each lane and paved shoulder 8 feet or wider by driving two types of test vehicles traveling at two travel speed ranges the wrong direction. For this testing,

the small vehicle shall be a FHWA Class Group 2 (passenger car) vehicle, and the large vehicle shall be a FHWA Class Group 3 (pick-ups and vans) or Class Group 5 (two-axle truck) vehicle.

Each ramp lane shall be subjected to the following test vehicle runs; each ramp paved shoulder 8 feet or wider must only undergo test runs described in #1 and #2.

1. Five runs of a small vehicle traveling between 10 and 15 miles per hour.
2. Five runs of a large vehicle traveling between 10 and 15 miles per hour.
3. Five runs of a small vehicle traveling 35 miles per hour or greater.
4. Five runs of a large vehicle traveling 35 miles per hour or greater.

Calculate the true positive rate using the following formula:

$$\underline{TPR = TP/N * 100}$$

Where TPR = True positive rate %.

TP = Cumulatively for all test runs, the total number of times the WWVDS correctly detected the wrong way vehicle and activated the highlighted signs.

N = Total number of test vehicle runs.

**660-4.4.2 False Positive Testing:** Conduct this test on a ramp open to the traveling public. Test the WWVDS by monitoring a minimum of 300 total vehicles traveling in the correct direction of travel passing through the WWVDS detection zones. At least 150 vehicles shall be monitored during daylight hours and at least 150 vehicles shall be monitored at night. The Engineer may reduce minimum volume requirements under low volume conditions if necessary.

Calculate the false positive rate using the following formula:

$$\underline{FPR = FP/N * 100}$$

Where:

FPR = False positive rate %.

FP = Total number of times the WWVDS activated for a vehicle traveling in the correct direction.

N = Total number of vehicles traveling in the correct direction.

ARTICLE 660-6 is deleted and the following substituted:

#### **660-6 Method of Measurement.**

The ~~quantity to be paid will be the plan quantity~~~~Contract unit price~~ for each inductive loop detector and per assembly for loop assembly ~~completed and accepted.~~~~will include all equipment, materials as specified in the Contract Documents, and all labor, equipment, and miscellaneous materials necessary for a complete and accepted installation.~~

— The ~~quantity to be paid will be the plan quantity~~~~Contract unit price~~ for each ~~component of an~~ MVDS, VVDS, WMDS, AVI or WWVDS ~~will completed and accepted.~~~~include furnishing, placement, and testing of all materials and equipment, and for all tools, labor, equipment, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the work.~~

— ~~Activation of highlighted signs installed as a component of an WWVDS will be included in the cost of the detection system.~~ The highlighted signs ~~and incidentals related~~

~~to for a WWVDS the sign~~ will be paid for ~~separately~~ in accordance with Section 700. Only one WWVDS will be paid per exit ramp, regardless of the number of signs ~~or components used~~.

ARTICLE 660-7 is deleted and the following substituted:

**660-7 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section including furnishing, placement, and testing of all materials and equipment, and for all tools, labor, equipment, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, warranty documentation, and incidentals necessary for a complete and accepted installation.

Payment will be made under:

Item No. 660-1	Inductive Loop Detector - each.
Item No. 660-2	Loop Assembly – per assembly.
Item No. 660-3	Vehicle Detection System - Microwave - each.
Item No. 660-4	Vehicle Detection System - Video - each.
Item No. 660-5	Vehicle Detection System - Wireless Magnetometer - each.
Item No. 660-6	Vehicle Detection System - AVI - each.
Item No. 660-7	Vehicle Detection System - WWVDS - each.
Item No. 660-8	Traffic Data Detection System - Microwave - each.
Item No. 660-9	Traffic Data Detection System - Video - each.

**VEHICLE DETECTION SYSTEM.**  
**(REV 9-15-22)**

ARTICLE 660-1 is deleted and the following substituted:

**660-1 Description.**

Furnish and install a vehicle detection system in accordance with the Contract Documents and this Section. Meet the requirements of Section 603.

SUBARTICLE 660-2.1 is deleted and the following substituted:

**660-2 Materials.**

**660-2.1 General:** Meet the following requirements:

Traffic Data Detection System- Microwave* .....	Section 995
Vehicle Detector- Microwave* .....	Section 995
Vehicle Detector- Video* .....	Section 995
Vehicle Loop Detector* .....	Section 995
Wireless Magnetometer Assembly* .....	Section 995
Automatic Vehicle Identification* .....	Section 995
Wrong Way Vehicle Detection Systems* .....	Section 995
Loop Sealant* .....	Section 995
Highlighted Signs* .....	Section 995

\*Use products listed on the Department's APL.

SUBARTICLE 660-3.1 is deleted and the following substituted:

**660-3.1 Installation Requirements for all Detectors:** Install, configure, and demonstrate a fully functional vehicle detection system as shown in the Plans. Connect all field equipment to the existing communication network, and provide all materials specified in the Contract Documents. Install all equipment in accordance with this Section and the manufacturer's recommendations.

Install above-ground detectors on poles or sign structures, as shown in the Plans. Furnish and install the power cable and the communication cables in accordance with the manufacturer's recommendation. Ensure that the cables comply with NEC sizing requirements and meet all other applicable standards, specifications, and local code requirements.

Do not install communication cables in the same conduit or pull boxes as power cables carrying voltage greater than 24 V<sub>DC</sub>/V<sub>AC</sub> or current in excess of 1.5 amps.

Cut all wires to their proper length before assembly. Do not double back any wire to take up slack. Neatly lace wires into cables with nylon lacing or plastic straps. Secure cables with clamps and provide service loops at all connections. Label all field wiring cables in the cabinet.

In the event that power to the vehicle detection system or a subcomponent thereof is interrupted, ensure that the equipment automatically recovers after power is restored. Ensure

that all programmable system settings return to their previous configurations and the system resumes proper operation.

SUBARTICLE 660-3.2.10.3 is deleted and the following substituted:

**660-3.2.10.3 Loop Detector Turn-on:** Connect the loop assemblies to the appropriate inductive loop vehicle detectors and tune the detectors in accordance with the manufacturer's instructions. Separate the operating frequencies of vehicle detectors, in adjacent lanes, by at least 2 kHz.

SUBARTICLE 660-4.4 is deleted and the following substituted:

**660-4.4 Wrong Way Vehicle (WWVDS) Detection System:** Submit a test plan for the field acceptance test (FAT) to the Engineer a minimum of 30 calendar days before commencement of testing for review and approval; tests cannot commence or be scheduled until test plans are approved by the Engineer. For each testing phase, test plans must include descriptions of test procedures; test form with areas for test result recording, test conductor, and witness signatures; pass/fail criteria; and test schedule.

Conduct a field acceptance test for each ramp being monitored by a WWVDS. Test all local system functions using the installed WWVDS equipment as detailed in the Plans and as approved by the Engineer. Testing must demonstrate that:

1. All wiring and local configurations are correct.
2. The WWVDS is detecting vehicles driving the wrong way, in all ramp travel lanes and any paved shoulders 8 feet or wider, while ignoring vehicles traveling in the correct direction. A true positive rate of 95% or greater must be achieved using the methodology described in Section 660-4. A false positive rate of 1% or less must be achieved using the methodology described in Section 660-4.
3. The WWVDS is activating all wrong way highlighted signs on the ramp upon detection of a vehicle traveling in the wrong direction and sign activation occurs before the vehicle reaches the sign.

If any WWVDS fails to pass its field acceptance test, correct the unit, or substitute another unit in its place, then repeat the test.

If a unit has been modified due to a field acceptance 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. If a failure pattern develops, the Engineer may direct that design and construction modification be made to all units without additional cost to the Department or extension of the Contract Time.

**660-4.4.1 True Positive Testing:** Conduct this test on a closed ramp using Contractor-provided test vehicles. Test each lane and paved shoulder 8 feet or wider by driving two types of test vehicles traveling at two travel speed ranges the wrong direction. For this testing, the small vehicle shall be a FHWA Class Group 2 (passenger car) vehicle, and the large vehicle shall be a FHWA Class Group 3 (pick-ups and vans) or Class Group 5 (two-axle truck) vehicle.

Each ramp lane shall be subjected to the following test vehicle runs; each ramp paved shoulder 8 feet or wider must only undergo test runs described in #1 and #2.

1. Five runs of a small vehicle traveling between 10 and 15 miles per hour.

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  4. Five runs of a large vehicle traveling 35 miles per hour or greater.
- Calculate the true positive rate using the following formula:

$$TPR = TP/N * 100$$

Where  $TPR$  = True positive rate %.

$TP$  = Cumulatively for all test runs, the total number of times the WWVDS correctly detected the wrong way vehicle and activated the highlighted signs.

$N$  = Total number of test vehicle runs.

**660-4.4.2 False Positive Testing:** Conduct this test on a ramp open to the traveling public. Test the WWVDS by monitoring a minimum of 300 total vehicles traveling in the correct direction of travel passing through the WWVDS detection zones. At least 150 vehicles shall be monitored during daylight hours and at least 150 vehicles shall be monitored at night. The Engineer may reduce minimum volume requirements under low volume conditions if necessary.

Calculate the false positive rate using the following formula:

$$FPR = FP/N * 100$$

Where:

$FPR$  = False positive rate %.

$FP$  = Total number of times the WWVDS activated for a vehicle traveling in the correct direction.

$N$  = Total number of vehicles traveling in the correct direction.

ARTICLE 660-6 is deleted and the following substituted:

#### **660-6 Method of Measurement.**

The quantity to be paid will be the plan quantity for each inductive loop detector and per assembly for loop assembly completed and accepted.

The quantity to be paid will be the plan quantity for each MVDS, VVDS, WMDS, AVI or WWVDS completed and accepted.

The highlighted signs for a WWVDS will be paid for in accordance with Section 700. Only one WWVDS will be paid per exit ramp, regardless of the number of signs.

ARTICLE 660-7 is deleted and the following substituted:

#### **660-7 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section including furnishing, placement, and testing of all materials and equipment, and for all tools, labor, equipment, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, warranty documentation, and incidentals necessary for a complete and accepted installation.

Payment will be made under:



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Item No. 660-7	Vehicle Detection System - WWVDS - each.
Item No. 660-8	Traffic Data Detection System - Microwave - each.
Item No. 660-9	Traffic Data Detection System - Video - each.