



Florida Department of Transportation

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TRAFFIC ENGINEERING AND OPERATIONS BULLETIN 19-03
ROADWAY DESIGN BULLETIN 19-03
PROGRAM MANAGEMENT BULLETIN 19-03
CONSTRUCTION BULLETIN 19-01

DATE: July 3, 2019

TO: District Directors of Transportation Operations, District Directors of Transportation Development, District Traffic Operations Engineers, District Design Engineers, District Consultant Project Management Engineers, District Construction Engineers, District Maintenance Engineers, District Program Management Engineers/Administrators, District Traffic Design Engineers, District Roadway Design Engineers

FROM: Trey Tillander, P.E., Director, Traffic Engineering and Operations Office
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COPIES: Courtney Drummond, Will Watts, Lora Hollingsworth, Joseph Santos, Tim Lattner, Rudy Powell, Khoa Nguyen (FHWA), Kevin Burgess (FHWA), Bren George (FHWA)

SUBJECT: **Wrong-way Driving Advanced Countermeasures at Interchange Exit Ramps**

This bulletin introduces additional minimum requirements for Limited Access Facility exit ramp interchanges throughout the State of Florida. These additional requirements involve updates in the FDOT Design Manual (FDM), Plans Preparation Manual (PPM), Standard Plans for Road and Bridge Construction (Standard Plans), Standard Specifications for Road and Bridge Construction (Standard Specifications), and the Basis of Estimates Manual (BOE).

REQUIREMENTS FOR STANDARD PLANS

1. The following *FY 2019-20 Standard Plans Interim Revision (IR)* is released:

Standard Plans Interim Revision, [Index IR700-120-01](#) (Enhanced Highway Signing Assemblies, Roadside Assembly-7)

2. Sheets 1, 2, and 9 of *Index IR700-120-01* are shown in Attachment 'A'.

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REQUIREMENTS FOR FDM

1. Replace ***FDM 230.4*** with the following:

230.4 Exit Ramp Intersections

The standard for signing and pavement marking and advanced countermeasure installation at exit ramp intersections are illustrated in Exhibit 230-1a and 230-1b. The description of the layouts are as follows:

- 1) Include MUTCD “optional” signs; second DO NOT ENTER, second WRONG WAY sign, and ONE WAY signs.
- 2) Include NO RIGHT TURN and NO LEFT TURN signs.
- 3) Use 3.5 feet by 2.5 feet WRONG WAY signs mounted at four-foot height and include a retroreflective strip on sign supports.
- 4) Include 2-4 dotted guide line striping for left turns between ramps entrances/exits and cross-streets.
- 5) Include retroreflective yellow paint on ramp median nose where applicable.
- 6) Include a straight arrow and route shield pavement marking in left-turn lanes extending from the far-side ramp intersection through the near-side ramp intersection to prevent premature left turns. Refer to TEM, Section 4.2.4 “Route Shields for Wrong Way Treatment” for additional information.
- 7) Include a straight arrow and ONLY pavement message in outside lane approaching the ramp exit.
- 8) Install a pair of Light-emitting Diode (LED) Highlighted Wrong-Way Signs. For long ramps or for ramps with limited sight distance, two sets of the pairs of Highlighted Signs may be used, as illustrated in ***Exhibits 230-1a*** and ***230-1b***. The Highlighted Sign assembly may be powered by either solar or line power. If line power is used, include the power service assembly and conduit and cable from the Highlighted Sign to the service point. The Highlighted Sign shall be integrated back to the District’s Traffic Management Center (TMC). Connectivity between the Highlighted Sign and the TMC may be provided by either fiber optic or wireless communications. If fiber optic communications are used, include the fiber optic cable, conduit, and transmission equipment. If wireless communications are used, include the antenna and transmission equipment.

2. Replace ***FDM Exhibit 230-1*** with the corresponding exhibits in Attachment ‘B’.

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REQUIREMENTS FOR PPM

1. Replace *PPM, Volume 1, Chapter 7, Section 7.2.11* with the following:

7.2.11 Exit Ramp Intersections

The standard for signing and pavement marking and advanced countermeasure installation at exit ramp intersections are illustrated in Figures 7.2.1 and 7.2.2. The description of the layouts are as follows:

- 1) Include MUTCD “optional” signs; second DO NOT ENTER, second WRONG WAY sign, and ONE WAY signs.
- 2) Include NO RIGHT TURN and NO LEFT TURN signs.
- 3) Use 3.5 feet by 2.5 feet WRONG WAY signs mounted at four-foot height and include a retroreflective strip on sign supports.
- 4) Include 2-4 dotted guide line striping for left turns between ramps entrances/exits and cross-streets.
- 5) Include retroreflective yellow paint on ramp median nose where applicable.
- 6) Include a straight arrow and interstate shield pavement marking in left-turn lanes extending from the far-side ramp intersection through the near-side ramp intersection to prevent premature left turns. Refer to TEM, Section 4.2.4 “Route Shields for Wrong Way Treatment” for additional information.
- 7) Include a straight arrow and ONLY pavement message in outside lane approaching the ramp exit.
- 8) Install a pair of Light-emitting Diode (LED) Highlighted Wrong-Way Signs. For long ramps or for ramps with limited sight distance, two sets of the pairs of Highlighted Signs may be used, as illustrated in **Figures 7.2.1** and **7.2.2**. The Highlighted Sign assembly may be powered by either solar or line power. If line power is used, include the power service assembly and conduit and cable from the Highlighted Sign to the service point. The Highlighted Sign shall be integrated back to the District’s Traffic Management Center (TMC). Connectivity between the Highlighted Sign and the TMC may be provided by either fiber optic or wireless communications. If fiber optic communications are used, include the fiber optic cable, conduit, and transmission equipment. If wireless communications are used, include the antenna and transmission equipment.

2. Replace *PPM Figures 7.2.1* and *7.2.2* with the corresponding figures in Attachment ‘C’.

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REQUIREMENTS FOR SPECIFICATIONS

1. The specifications for Wrong Way Vehicle Detection Systems (WWVDS) are provided in Modified Special Provision (MSP) 660. This MSP shall be used on affected projects with letting dates prior to January 2020. See Attachment 'D' for a draft of this MSP. This bulletin serves as approval to incorporate this MSP into project specification packages. No further approval is needed.
2. Standard Specifications will be available for use on affected projects with letting dates in or after January 2020.

REQUIREMENTS FOR BOE

1. Pay Item 660-7 has been added to the BOE for the WWVDS, including the cabinet and wireless communications between the WRONG WAY signs, if needed; it does not include the sign or post assembly.
2. Include the pay item for the appropriate number of sign assemblies: 700-6- Highlighted Sign, per Assembly. Static Signs, without highlights, are paid under 700-1- Single Post Sign, per Assembly.
3. Include applicable pay items for power if needed: service assembly, conduit, conductor, etc. Include applicable pay items for wireless and/or fiber optic communications from the WWVDS to the TMC: conduit, fiber, etc.
4. Include applicable pay items for pavement markings.

COMMENTARY

Though WWD crashes occur randomly and less frequently than other crash types, they often involve multiple vehicles, resulting in multiple fatalities and/or serious injuries. Despite installing the required DO NOT ENTER and WRONG WAY signs and pavement markings (wrong-way arrow, etc.) per the Manual on Uniform Traffic Control Devices (MUTCD), as well as the higher Signing and Pavement Marking Standards per FDM Section 230.4 and Roadway Design Bulletin 15-08/Traffic Operations Bulletin 03-15, wrong-way entry onto limited access facilities continues to be a recurring phenomenon.

The FDOT conducted a statewide study and identified the off-ramps which could be associated with WWD crashes. The 1,447 off-ramps (1,282 service off-ramps and 165 system-to-system off-ramps) on the State Highway System were ranked. Based on a risk analysis, 520 off-ramps were found to occur in the WWD hotspots. FDOT evaluated several countermeasures and found

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the highlighted WRONG WAY signs to be the one of the most effective countermeasure to warn a wrong-way entering motorist. The FDOT intends to expedite the deployment of this advanced WWD countermeasure at the 520 off-ramps with deployment at the remaining off-ramps following closely behind.

To assist the Districts with expediting the implementation of the new standard WWD advance countermeasure, \$10M in HSID (Highway Safety Intersection) funding and \$5M in Highway Safety Improvement Program (HSIP) funding has been made available in FY 2019/2020 and FY 2020/2021, respectively. The use of HSIP funding for the new standard WWD advanced countermeasure for sites that were approved based on statewide screening for intersection and lane departure sites is eligible as a systemic countermeasure and does not require further safety analysis or justification. In addition, to assist with the expedited implementation, the State Traffic Engineering and Operations Office has provided the Districts with lists of all ramps prioritized from highest to lowest risk, and, where applicable, associated with programmed design and/or construction projects.

IMPLEMENTATION

The requirements of this bulletin are effective immediately on all design-bid-build projects for which design development is less than 90% complete (Phase III Submittal). These requirements should be employed on projects beyond 90% complete where implementation will not adversely impact the production schedule.

The requirements of this bulletin are effective immediately on all design-build projects for which the final Request for Proposal (RFP) has not been released. Implementation of this bulletin for design-build projects for which the final RFP has been released is at the discretion of the District.

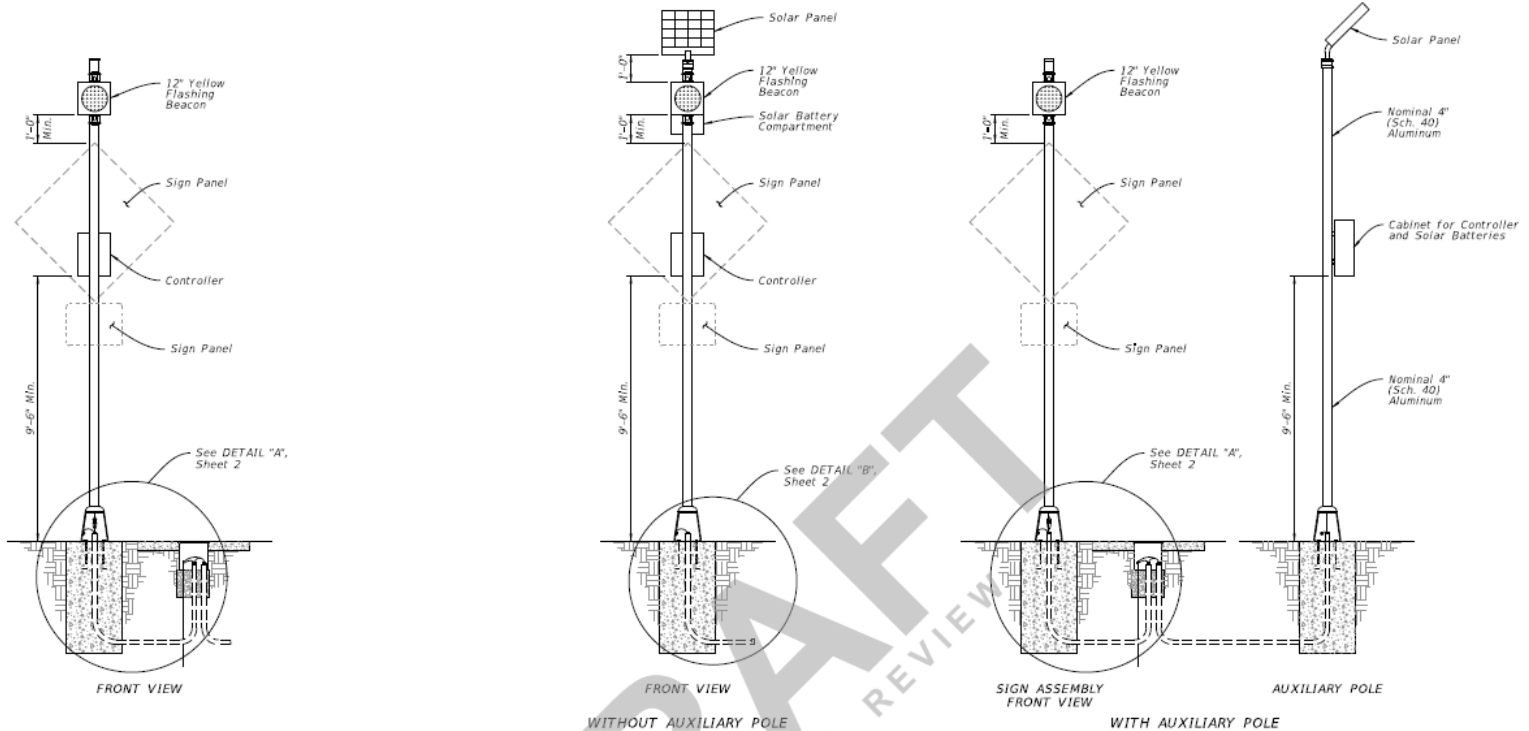
At the discretion of the District, the requirements of this Bulletin may be incorporated into ongoing construction contracts. The addition of this work will require supplemental design details and revisions to be developed for successful implementation. This work should be coordinated between District Transportation Development and Operations.

CONTACT

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ATTACHMENT 'A'

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POWER CONFIGURATION 'A'
CONVENTIONALLY-POWERED
 (Type A1 Shown)

POWER CONFIGURATION 'B'
SOLAR-POWERED
 (Type B1 Shown)

GENERAL NOTES:

1. Install sign assemblies based on Alpha-Numeric Type designation shown in the Plans (e.g., Type A1). Assembly Type is based on Power Configuration 'Alpha' Identification shown above and Numerical Identification shown on Sheet 3 thru 8.
2. Install sign panel and wind beam in accordance with Index 700-010 and Specification 700.
3. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.
4. Meet the requirements of Specification 646 for aluminum poles and transformer bases.
5. Install a concrete slab around all flashing beacon assemblies on slopes 6:1 or greater. The minimum slab dimension is 4'-0" by 5'-0".
6. When wire entry holes are drilled in the sign column, use a bushing or rubber grammet to protect conductors.

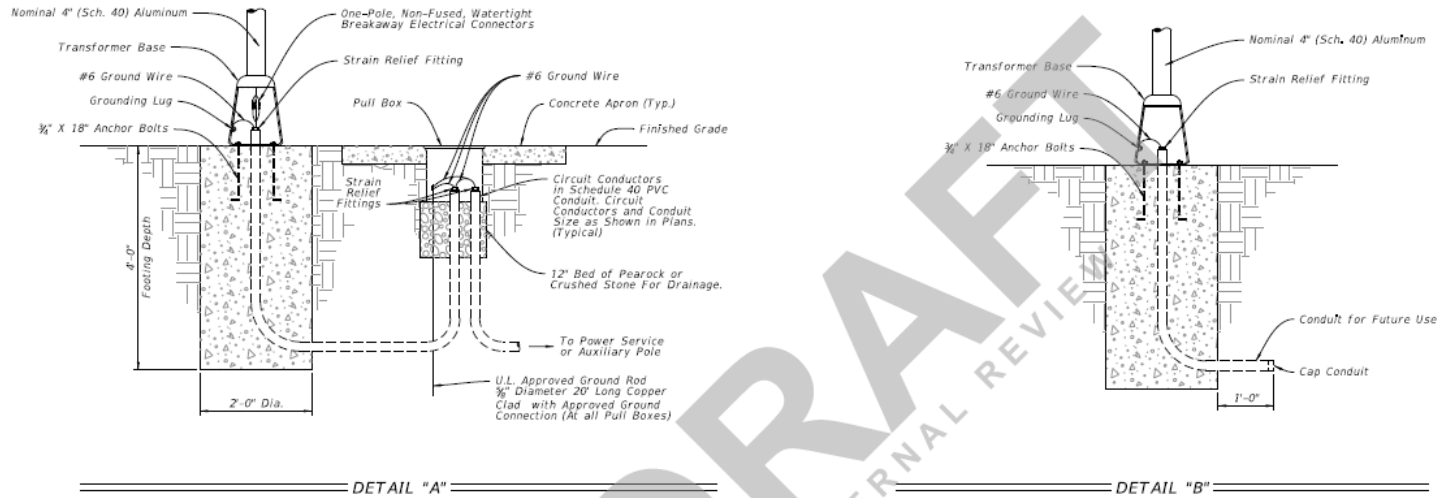
POWER CONFIGURATION 'B' NOTES:

1. Install a separate pole for mounting the solar panel, controller and batteries for all flashing beacon assemblies with solar panels, controllers and batteries weighing more than 170 lbs.
2. Install the auxiliary pole as close to the right of way boundary as possible.
3. Install the auxiliary pole so that the height is the same as the column for the beacon assembly.
4. Orient solar panel to face South for optimal exposure to sunlight.
5. The controller and the solar batteries may be located in the same compartment.

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1	General Notes and Contents
2	Conduit, Wiring, and Foundation Details
3	Roadside Sign Assembly-1
4	Roadside Sign Assembly-2
5	Roadside Sign Assembly-3
6	Roadside Sign Assembly-4
7	Roadside Sign Assembly-5
8	Roadside Sign Assembly-6
9	Roadside Sign Assembly-7
10	Overhead Sign Assembly

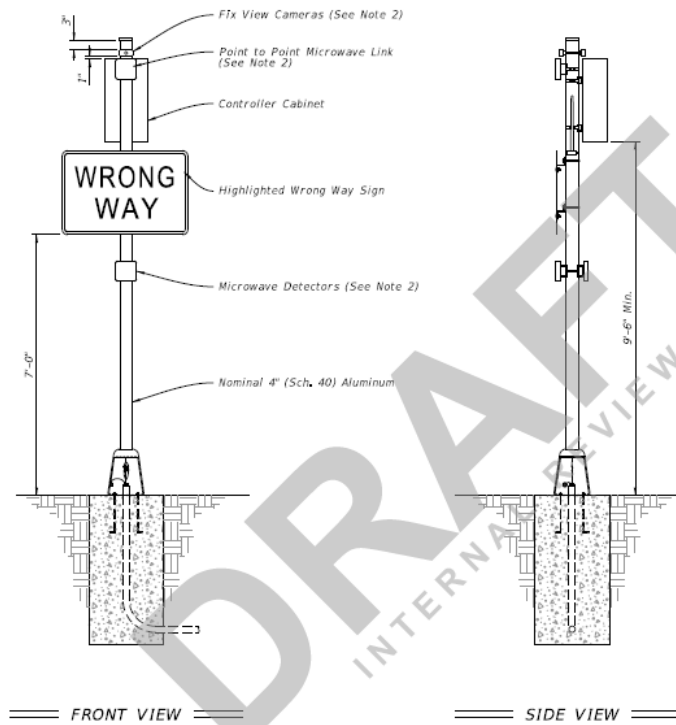
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CONDUIT, WIRING, AND FOUNDATION DETAILS

LAST REVISION 11/ /19	DESCRIPTION: Added Roadside Sign Assembly-7	FY 2019-20 STANDARD PLANS	ENHANCED HIGHWAY SIGNING ASSEMBLIES	INDEX 700-120	SHEET 2 of 10
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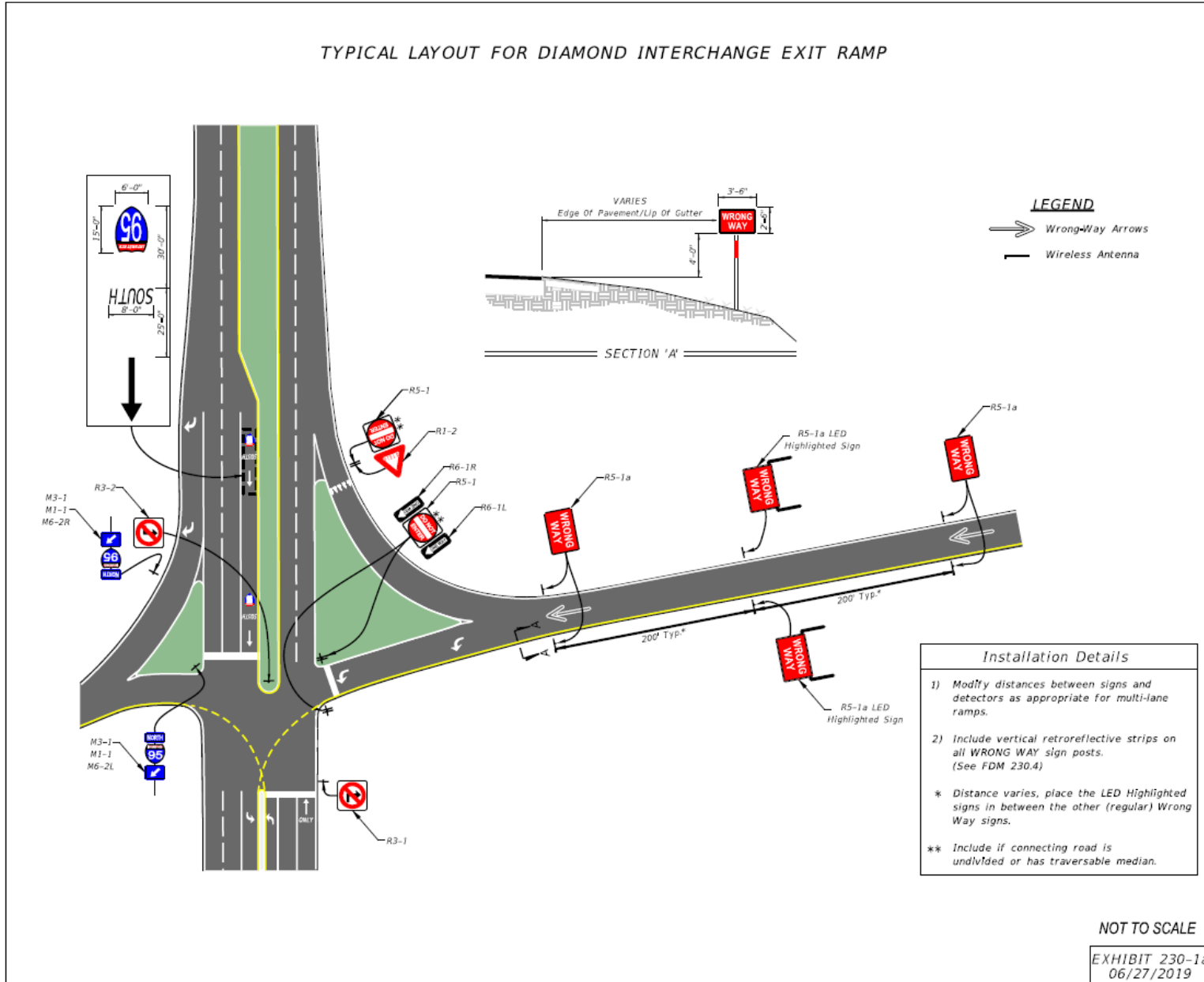
- NOTES:**
1. Type A7 Assembly (Conventionally-Powered) is shown. Type B7 Assemblies (Solar-Powered) Similar.
 2. Install cameras, point to point microwave link, microwave detectors, and antennas in accordance with the manufacturer's instructions.

ROADSIDE SIGN ASSEMBLY-7

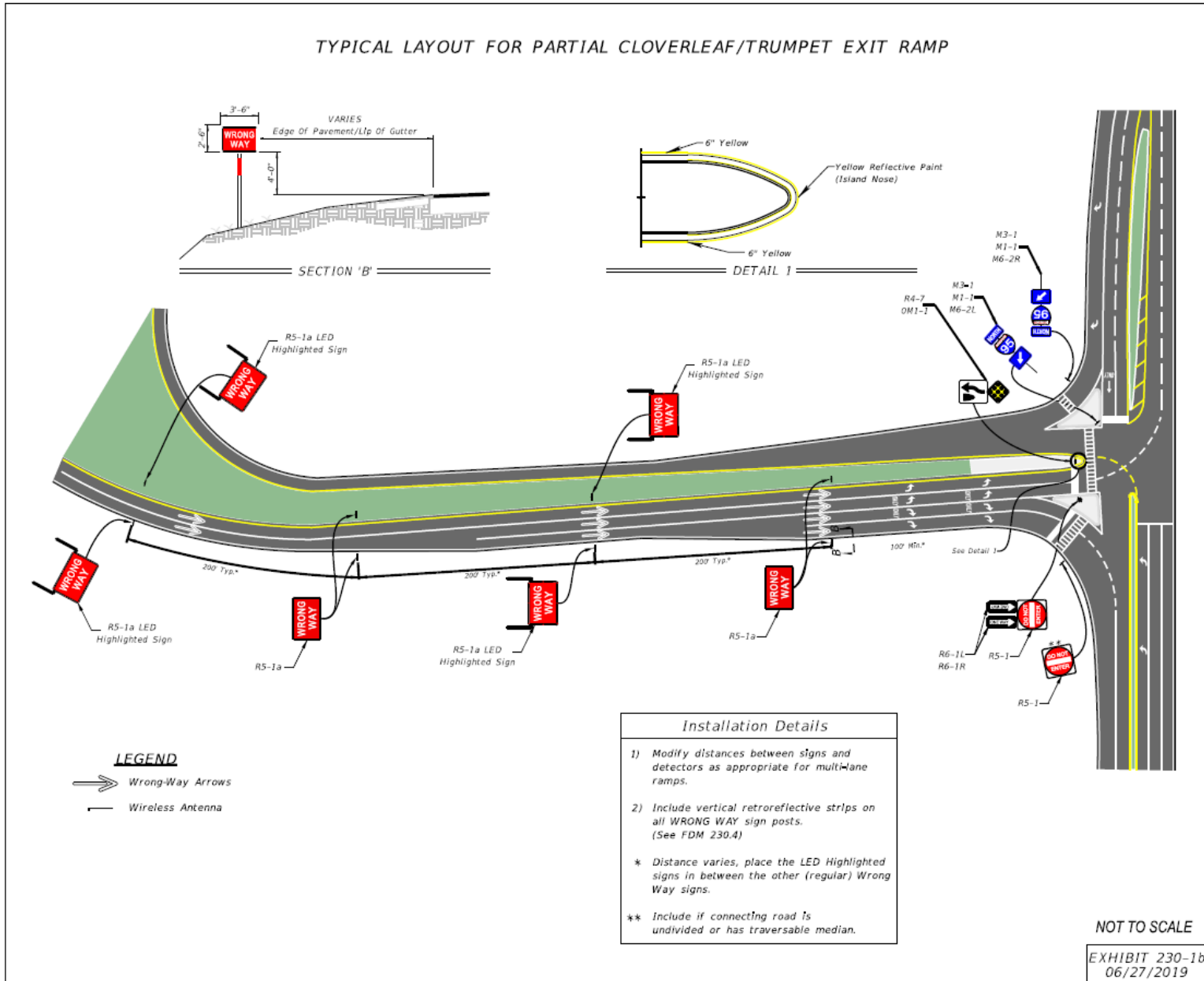
LAST REVISION 05/ /19	DESCRIPTION: Added Roadside Sign Assembly-7	 FY 2019-20 STANDARD PLANS	ENHANCED HIGHWAY SIGNING ASSEMBLIES	INDEX 700-120	SHEET 9 of 10

ATTACHMENT 'B'

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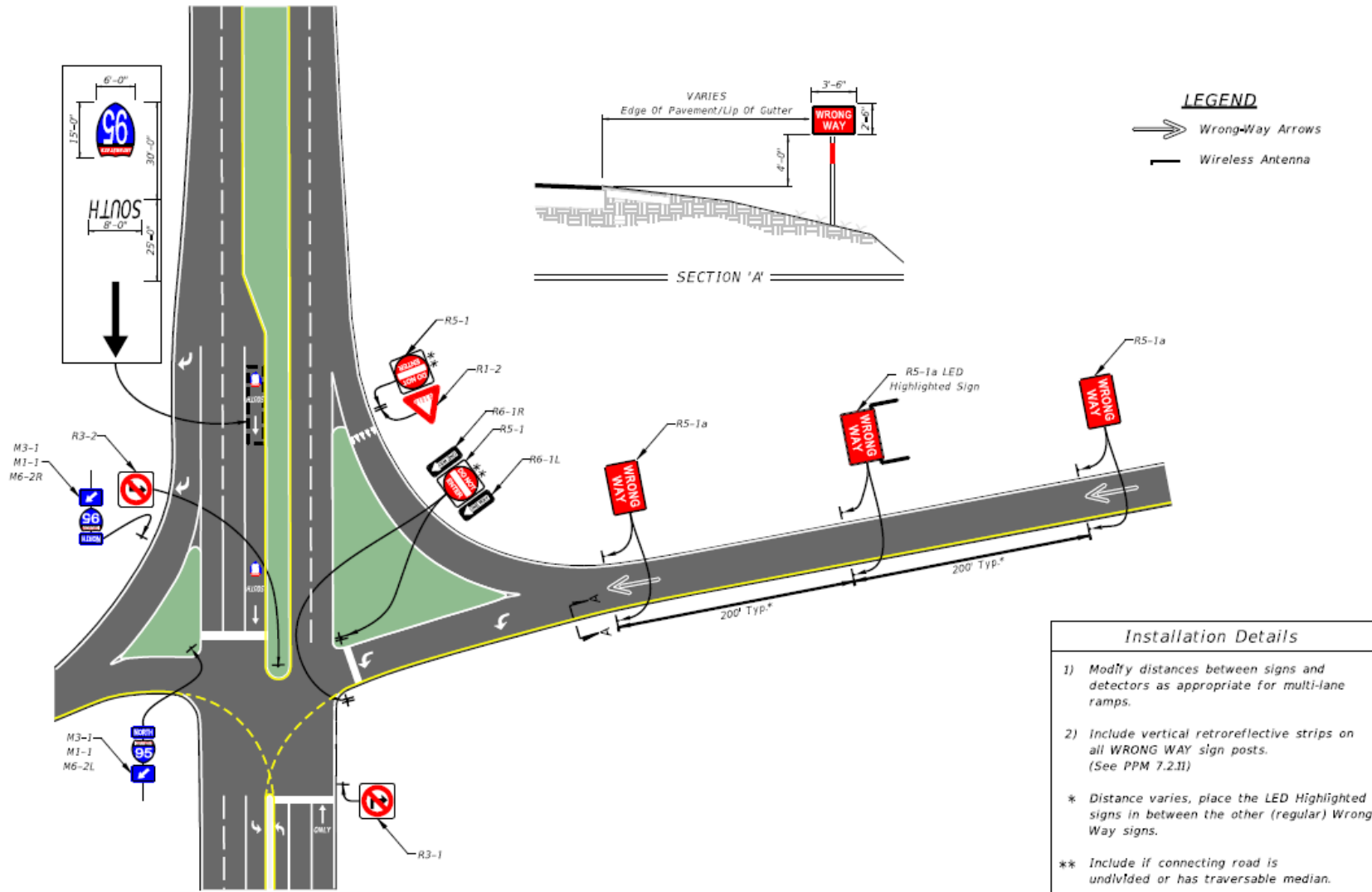


ATTACHMENT 'C'

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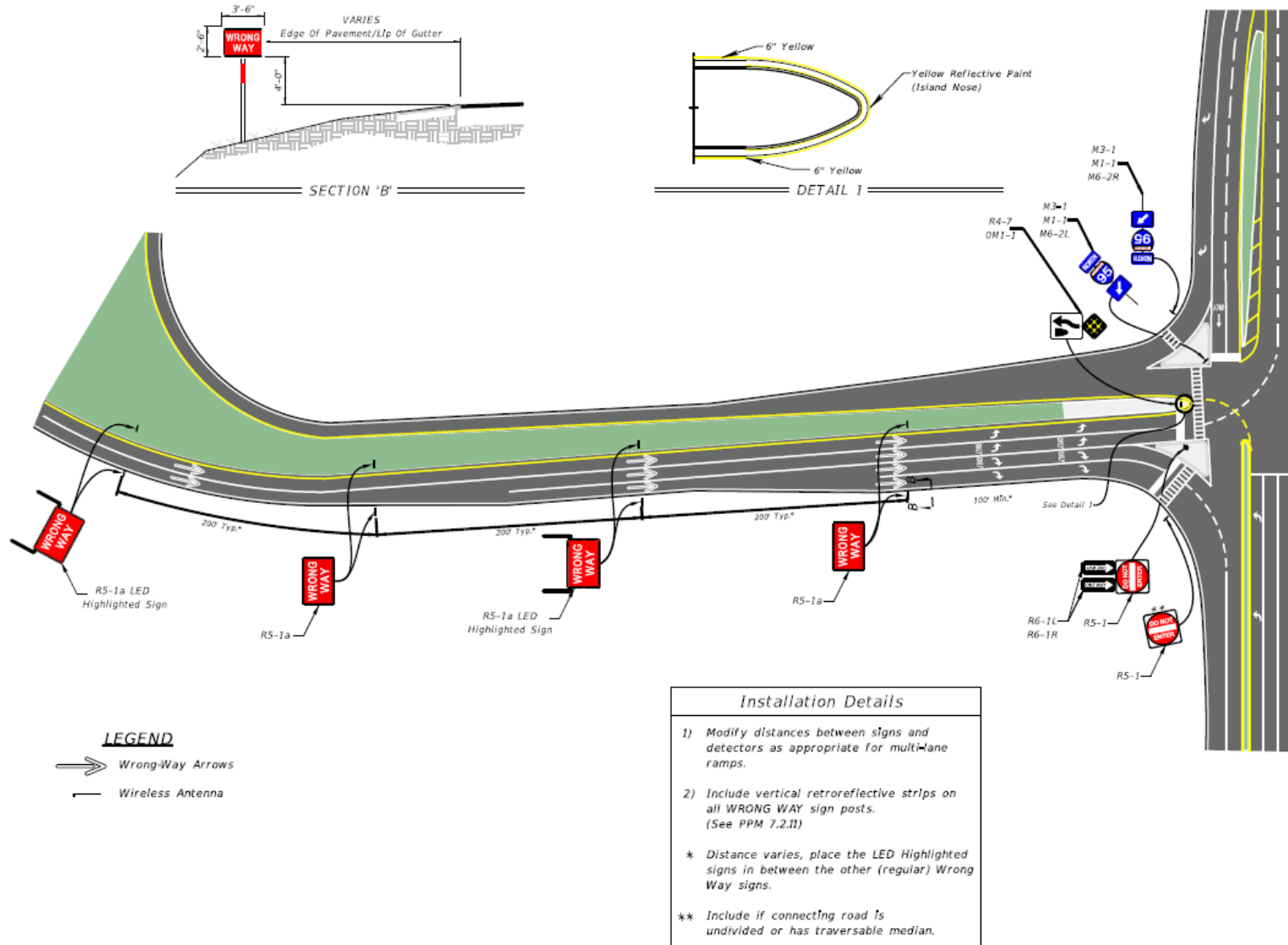
Figure 7.2.1 Typical Layout for Diamond Interchange Exit Ramp



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Figure 7.2.2 Typical Layout for Partial Cloverleaf/Trumpet Exit Ramp



ATTACHMENT 'D'

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VEHICLE DETECTION SYSTEM – WRONG WAY

(REV 7-2-19)

SUBARTICLE 660-2.1.1 is expanded by the following new Subarticle:

660-2.1.1.4 Wrong Way Vehicle Detection Systems: Wrong way vehicle detection systems (WWVDS) produce an alarm output when a vehicle is detected traveling in the wrong direction. The WWVDS may consist of more than one detection zone. The WWVDS must not interfere with other vehicle presence detection or traffic data detection systems. For both ramp and mainline applications, the WWVDS must monitor all lanes for one direction including shoulders, and meet the detection accuracy levels and false positive output performance requirements herein.

SUBARTICLE 660-2.1.2 is expanded by the following new Subarticles:

660-2.1.2.6 Wrong-Way Detectors: A wrong-way vehicle detector may use any of the technology types listed in section 660-2.1.2 and must fulfill the requirements for the respective detector type described in the corresponding section.

660-2.1.2.6.1 Configuration and Management: Provide a WWVDS with software that allows local and remote configuration and monitoring. Ensure that the system can display detection zones and detection activations.

Ensure that previously defined WWVDS configuration parameters are editable.

Ensure that the WWVDS controllers support an on-board real-time clock/calendar with on-board battery backup or the controller's internal time clock can be configured to synchronize to a time server using the network time protocol (NTP) in order to maintain the current local date/time information. For NTP, the synchronization frequency must be user-configurable and permit polling intervals from once per minute to once per week in one-minute increments. For NTP, the controller must allow the user to define the NTP server by internet protocol (IP) address.

Ensure that the WWVDS retains its programming in nonvolatile memory. Ensure that the WWVDS configuration data can be saved to a local computer and restored from a saved file. Ensure that all communication addresses are user programmable.

Ensure that the WWVDS software offers an open Application Programming Interface (API) or software development kit available to the Department at no cost for integration with third party software and systems.

660-2.1.2.6.2 Communications: Ensure that major components of the WWVDS (such as the sensor and any separate hardware used for contact closures), include a minimum of one serial or Ethernet communications interface.

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Ensure the serial interface and connector conforms to Telecommunication Industry Association (TIA)-232 standards. Ensure that the serial ports support data rates up to 115200 bps; error detection parity bits (i.e., none, even, and odd); and stop bits (1 or 2).

Ensure that wired Ethernet interfaces provide at a minimum a 10/100 Base TX connection. Verify that all unshielded twisted pair/shielded twisted pair network cables and connectors comply with TIA- 568.

Ensure wireless communications are secure and that wireless devices are Federal Communications Commission (FCC) certified. Ensure that the FCC identification number is displayed on an external label and that all WWVDS devices operate within their FCC frequency allocation.

Ensure cellular communications devices are compatible with the cellular carrier used by the agency responsible for system operation and maintenance at time of installation. Ensure cellular communication devices can provide 4G LTE communications.

Ensure the system can be configured and monitored via one or more communications interface.

For WWVDS installed on ramps, ensure the device sends an alert and a sequence of images for up to ten seconds to the Traffic Management Center (TMC) that covers a configurable time before and after the wrong-way vehicle detection.

660-2.1.2.6.3 Cabinet: If the WWVDS requires a cabinet, ensure the cabinet meets the applicable material requirements listed in Section 676.

SUBARTICLE 660-2.2.1 is expanded by the following new Subarticles:

660-2.2.1.3 TERL Wrong Way Detection Verification: To verify conformance with the accuracy requirements in this Section, the WWVDS must be evaluated at the Department's Traffic Engineering Research Laboratory (TERL). Under controlled conditions at the TERL facility, the WWVDS must be capable of meeting the detection accuracy of 100% and zero false positive readings, using a sample size of 200 vehicles.

660-2.2.1.4 Wrong Way Detection Field Test Requirements: Submit a test plan for the field acceptance test (FAT) to the Engineer for approval. The test plan must include a detection accuracy test and false positive detection test for each location in the project. The Engineer reserves the right to witness all FATs.

ARTICLE 660-3 is expanded by the following:

660-3.7 Wrong Way Vehicle Detection Systems Installation: Install in accordance with the Contract Documents and manufacturer's recommendations.

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ARTICLE 660-5 is deleted and the following substituted:

660-5 Method of Measurement.

The Contract unit price for each inductive loop detector and per assembly for loop assembly 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 Contract unit price for each component of an MVDS, VVDS, WMDS, AVI, or WWVDS will 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.

For WWVDS that activate a highlighted sign or other devices, equipment necessary to activate signs or devices are included with the WWVDS. The highlighted signs and other incidentals will be paid separately under the applicable pay items. Only one WWVDS will be paid per exit ramp, regardless of the number of signs or components used.

ARTICLE 660-6 is expanded by the following:

660-6 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 660-7 Vehicle Detection System - Wrong Way - each.