



Florida Department of Transportation

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SECRETARY

ROADWAY DESIGN BULLETIN 21-07 **TRAFFIC ENGINEERING AND OPERATIONS BULLETIN 21-03**

DATE: June 1, 2021

TO: District Directors of Transportation Operations, District Directors of Transportation Development, District Design Engineers, District Construction Engineers, District Structures Design Engineers, District Maintenance Engineers, District Consultant Project Management Engineers, District Roadway Design Engineers, District Traffic Operations Engineers, Program Management Engineers, District Materials Engineers, District Specifications Engineers, District Estimates Engineers

FROM: Michael Shepard, P.E., State Roadway Design Engineer
Trey Tillander, P.E., Director, Traffic Engineering and Operations Office

COPIES: Courtney Drummond, Will Watts, Tim Lattner, Dan Hurtado, Rudy Powell, Trey Tillander, Stefanie Maxwell, Scott Arnold, Paul Hiers, Vern Danforth, Daniel Strickland, Robert Robertson, Lora Hollingsworth, Gevin McDaniel, Kevin Burgess (FHWA), Chad Thompson (FHWA), Bren George (FHWA)

SUBJECT: **Wrong-Way Driving Countermeasures for Arterials and Collectors**

This Bulletin introduces revisions to the *FDOT Design Manual (FDM)* to implement enhanced signing and pavement marking countermeasures for wrong-way driving (WWD) on arterials and collectors. In addition, other changes to the typical signing and marking criteria and exhibits were revised for consistency throughout *FDM 230*.

REQUIREMENTS

1. Delete *FDM, Figure 230.3.1* and replace with Attachment 'A'.
2. Delete item (2) in the second paragraph of *FDM 230.3.1.3* and replace with the following:
(2) Lane-Use Arrows, Wrong-Way Arrows, Messages, and Symbols. Black contrast border is required for design speeds 45 mph and less. Black contrast block is required for design speeds greater than 45 mph. Border or block is to provide a minimum 1.5 inches from message to the outside edge. Provide details of black contrast borders and blocks in the plans. For intricate symbols such as the Helmeted Bicyclist Symbol, use black contrast block for all design speeds.
3. Delete *FDM 230.4* and replace with Attachment 'B'.
4. Delete *FDM 230.6* and replace with Attachment 'C'.

BACKGROUND

The Department conducted a statewide study of crash data from 2012 to 2016 and noted that there were over 1,800 WWD crashes on the state highway system (SHS) arterials and over 250 WWD crashes on freeways. Of the 1,890 WWD arterial crashes, 702 crashes (37%) occurred on 415 miles (3.6% of the statewide arterial centerline miles). Of all WWD crashes on arterials 7% resulted in a fatality and 52.5% resulted in serious injury. The study also found that over 95% of WWD crashes occurred within 450 ft from where the drivers potentially entered the wrong way. More than half of the crashes occurred at or near intersections, and 38% of drivers turned the wrong way at a signalized intersection. For these reasons, FDOT is enhancing the signing and pavement markings at stop-controlled intersections, signalized intersections, and connections along arterials and collectors to mitigate these WWD occurrences.

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.

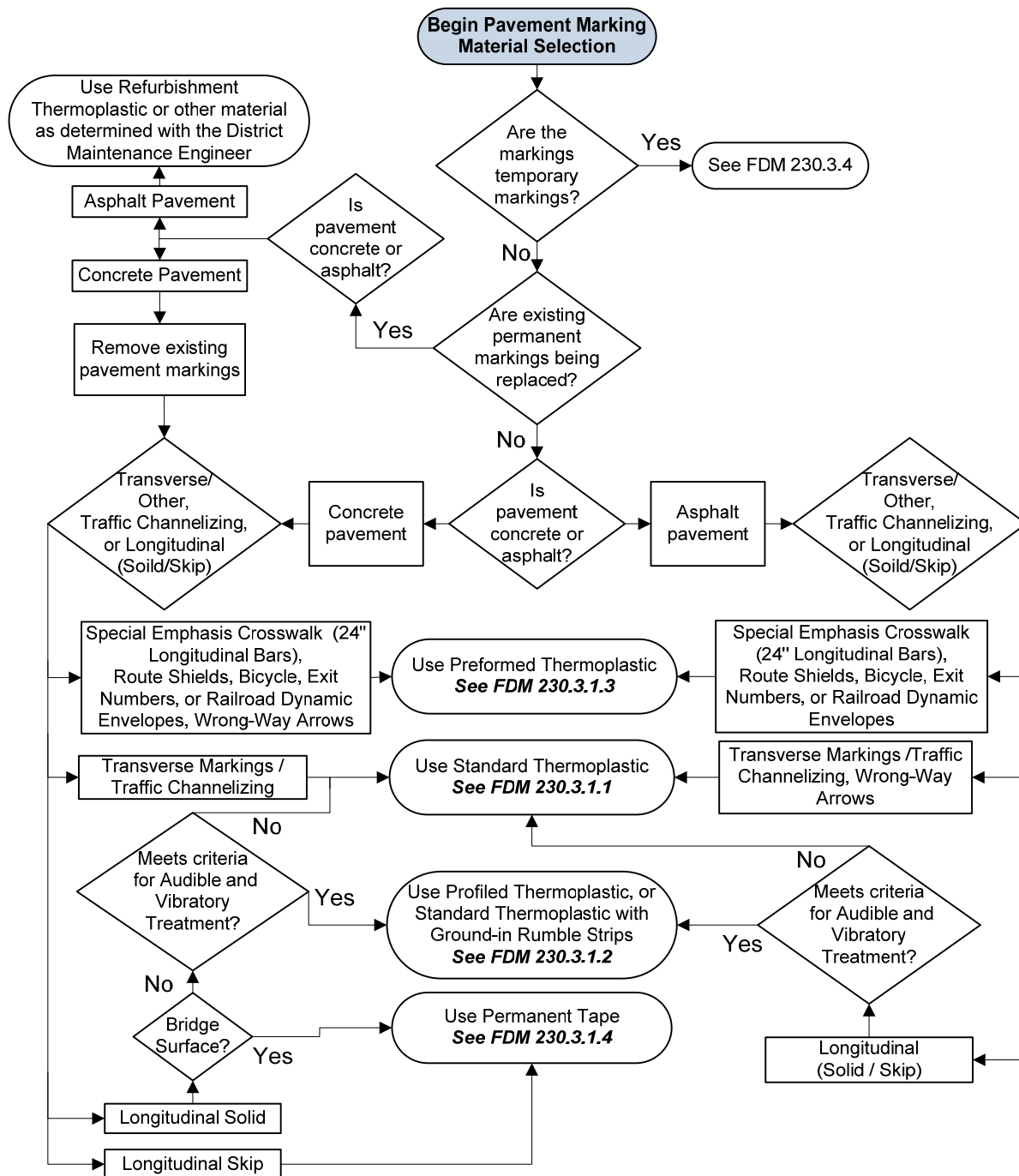
CONTACT

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MS/TT/gjm

Attachment 'A'

Figure 230.3.1 Pavement Marking Material Selection



Attachment 'B'

230.4 Wrong-Way Signs and Pavement Markings

Deploy the enhanced signing and pavement markings in this section to improve positive guidance, to minimize driver confusion, and to reduce wrong-way movements. The height of WRONG WAY (R5-1a) signs must be in accordance with **Standard Plans, Index 700-101**. Include red retroreflective strips on DO NOT ENTER (R5-1) and WRONG WAY (R5-1a) sign columns in accordance with the **MUTCD 2A.21**. Include white retroreflective strips on ONE WAY (R6-1) sign columns in accordance with the **MUTCD 2A.21**. These wrong-way prohibitive signs and pavement markings are used to enhance driver awareness. They are in addition to other required signs and pavement markings that are not shown in exhibits.

230.4.1 Exit Ramp Intersections

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

- (1) Include MUTCD “optional” signs; second DO NOT ENTER (R5-1), second WRONG WAY (R5-1a), and ONE WAY (R6-1) signs.
- (2) Include NO RIGHT TURN (R3-1) and COMBINATION U-TURN & LEFT TURN PROHIBITION (R3-18) signs.
- (3) Use 42 inches by 30 inches WRONG WAY (R5-1a) signs.
- (4) Modify distances between signs and detectors as appropriate for multi-lane ramps.
- (5) Include yellow 2'-4' dotted guide line striping on left edge line and white dotted guide line striping on right edge or lane line for left turns between ramps entrances/exits and cross-streets.
- (6) Include retroreflective yellow paint on ramp median nose where applicable. Include RPMs on ramp median nose in accordance with **Standard Plans, Index 706-001**.
- (7) Include a straight arrow and route 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.
- (8) Include a straight arrow and ONLY pavement message in outside lane approaching the ramp exit.

- (9) Install wrong-way vehicle detection system and a pair of Light-emitting Diode (LED) Highlighted WRONG-WAY (R5-1a) 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 solar powered or AC powered. If powered by AC, provide a power service assembly, conduits, and power conductors from the Highlighted Sign to the local cabinet. The Highlighted Sign must 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 communication devices.

230.4.2 Diverging Diamond Intersections

Signing of Diverging Diamond Intersections is an evolving practice and not explicitly addressed in the MUTCD, however typical signing and pavement markings at diverging diamond crossovers and exit ramp intersections are illustrated in **Exhibit 230-2** and described as follows:

- (1) Include DO NOT ENTER (R5-1), WRONG WAY (R5-1a), and ONE WAY (R6-1) signs.
- (2) Include NO RIGHT TURN (R3-1), NO LEFT TURN (R3-2), and COMBINATION U-TURN & LEFT TURN PROHIBITION (R3-18) signs.
- (3) Include KEEP RIGHT (R4-7), KEEP LEFT (R4-8), and OBJECT MARKER (OM3) signs.
- (4) Use 42 inches by 30 inches WRONG WAY (R5-1a) signs.
- (5) Include white 2'-4' dotted guideline striping for through movements at the crossover location turns as well as at ramp entrances/exits.
- (6) Include retroreflective yellow paint on crossover and ramp median nose where applicable. Include RPMs on ramp median nose in accordance with **Standard Plans, Index 706-001**.
- (7) Include a straight arrow pavement marking in all through lanes for the crossover maneuver in both directions on the downstream side of the crossover intersections.
- (8) Include Wrong-Way Arrow pavement markings in all through lanes for the crossover maneuver in both directions on the upstream side of crossover intersections.
- (9) Include route interstate shield pavement marking in the left turn lane(s) prior to and after the crossover intersection. Refer to TEM, Section 4.2.4 "Route Shields for Wrong-Way Treatment" for additional information.

(10) Include a left turn arrow and ONLY pavement message in exclusive left turn lanes approaching ramp entrances.

See **FDM D217** for more information on Diverging Diamond Interchanges.

230.4.3 Divided Arterials and Collectors

Use Wrong-Way Arrow pavement markings, DO NOT ENTER (R5-1) signs, and WRONG WAY (R5-1a) signs at intersections with median widths of 20 feet or greater. See **Exhibits 230-3** and **230-4** for recommended configurations.

At intersections with positive offset left-turns, use DO NOT ENTER (R5-1) signs with dimensions of 48 inches by 48 inches. See **FDM 212.14.4** for further information on offset left turn lanes.

Place the median DO NOT ENTER (R5-1) sign with the face oriented toward the connection it is intended to regulate. For median nose widths less than 10 feet, the median DO NOT ENTER (R5-1) sign is optional.

For Context Classifications C1, C2, C3C, and C4 place Wrong-Way Arrow pavement markings in all lanes prior to connection (i.e. side streets, commercial driveways, or driveways) controlled by a traffic control device. Place Wrong-Way Arrow pavement markings no closer than 300 ft spacing. For all other Context Classifications, consider placing Wrong-Way Arrow pavement markings as described above where high-risk locations are present. Coordinate with the District Traffic Operations Engineer (DTOE) to evaluate high-risk locations using factors such as land-use, presence of lighting, history of impaired driving, crash history, and an over-represented population of licensed drivers 65 and older. Determination of high-risk locations is at the discretion of the DTOE.

At intermediate ends of medians, consider the use of KEEP RIGHT (R4-7) sign on medians less than 20 feet.

230.4.4 One-Way Pairs and Divided Arterials/Collectors with One-Way Egress

One-Way Egress is a condition where a two-way or one-way side street, commercial driveway, or driveway connects to a one-way arterial/collector or divided arterial/collector without a median opening.

See **Exhibit 230-5** for recommended configurations.

Place a ONE WAY (R6-1) sign at connection (i.e. side streets, commercial driveways, or driveways) controlled by a traffic control device with one-way egress. ONE WAY (R6-1) sign shall be placed on far side median or shoulder depending on facility type.

At driveway controlled by a traffic control device with one-way egress, place a RIGHT TURN ARROW (FTP-55R-06) sign or a LEFT TURN ARROW (FTP-55L-06) sign below the STOP (R1-1) sign. Verify this sign has not already been installed by District driveway permit. At side street connections, place a Mandatory Lane Control (R3-5) sign below the STOP (R1-1) sign.

For Context Classifications C1, C2, C3C, and C4 place Wrong-Way Arrow pavement markings in all lanes prior to connection (i.e. side streets, commercial driveways, or driveways) controlled by a traffic control device with one-way egress. Place Wrong-Way Arrow pavement markings no closer than 300 ft spacing. For all other Context Classifications, consider placing Wrong-Way Arrow pavement markings as described above where high-risk locations are present. Coordinate with the District Traffic Operations Engineer (DTOE) to evaluate high-risk locations using factors such as land-use, presence of lighting, history of impaired driving, crash history, and an over-represented population of licensed drivers 65 and older. Determination of high-risk locations is at the discretion of the DTOE.

230.4.5 Undivided One-Way Streets

For two-way street approaches, place the following signs and pavement markings as illustrated in **Exhibit 230-6**:

- 1) Place the corresponding turn prohibition (R3 Series) symbolic sign on the right-hand side of the approach street.
- 2) Place DO NOT ENTER (R5-1) signs on both sides of the one-way street.
- 3) Place Wrong-Way Arrow pavement markings in all lanes upstream of side street.
- 4) Add turn and through lane-use arrow on approaches to the one-way street.

For one-way approaches, place the following signs and pavement markings as illustrated in **Exhibit 230-7**:

- 1) Place the corresponding turn prohibition (R3 Series) symbolic sign. Where overhead structures exist, consider placement of a secondary turn prohibition sign over the lane or closest to the direction it is prohibiting.
- 2) Place DO NOT ENTER (R5-1) signs on both sides of the one-way street.
- 3) Place Wrong-Way Arrow pavement markings in all lanes prior to side street.

230.4.6 Two-Way Signalized Intersections

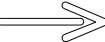


Provide the following signing and pavement markings as illustrated in **Exhibit 230-8** for intersections serving two-way traffic where the distance of the left turn from the side street stop bar to the arterial receiving lane meets or exceeds 60 ft:

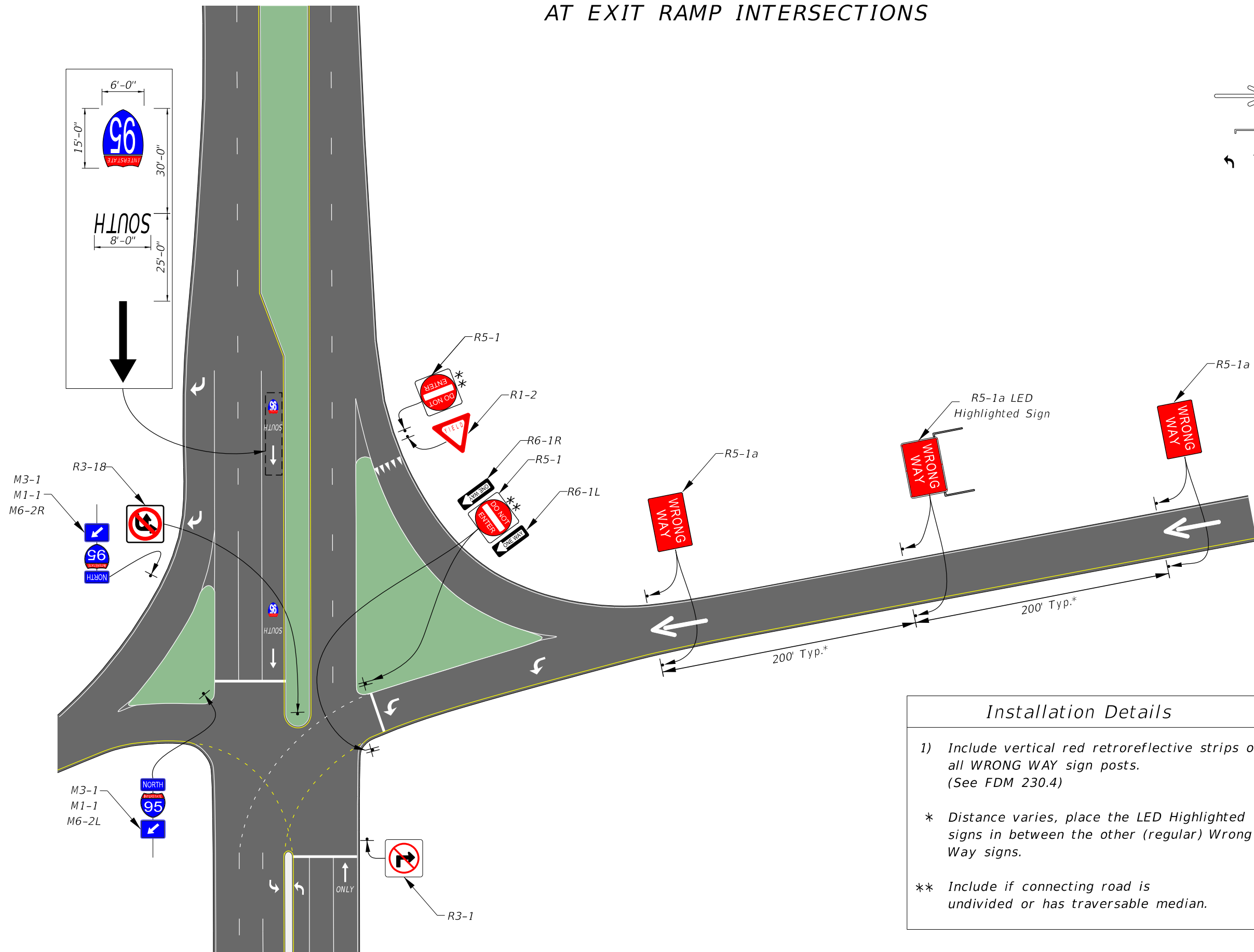
- 1) Place yellow 2'-4' dotted guide center line for left turn movement onto a two-way state route.
- 2) Where design or conditions deem it appropriate to provide enhanced positive guidance for the driver, include yellow 2'-4' dotted guide center line for left turn movement off the state route.
- 3) For multiple left turn lanes, place white 2'-4' dotted guide line for right edge or lane line. For single left turn lane, white 2'-4' dotted guide line may be provided on right edge line.

If a two-way street crosses a one-way street at a signalized intersection, the criteria of **FDM 230.4.5** applies.

STANDARD SIGNING AND PAVEMENT MARKING AT EXIT RAMP INTERSECTIONS

LEGEND

-  Wrong-Way Arrows
-  Wireless Antenna
-  Lane Assignment Arrows



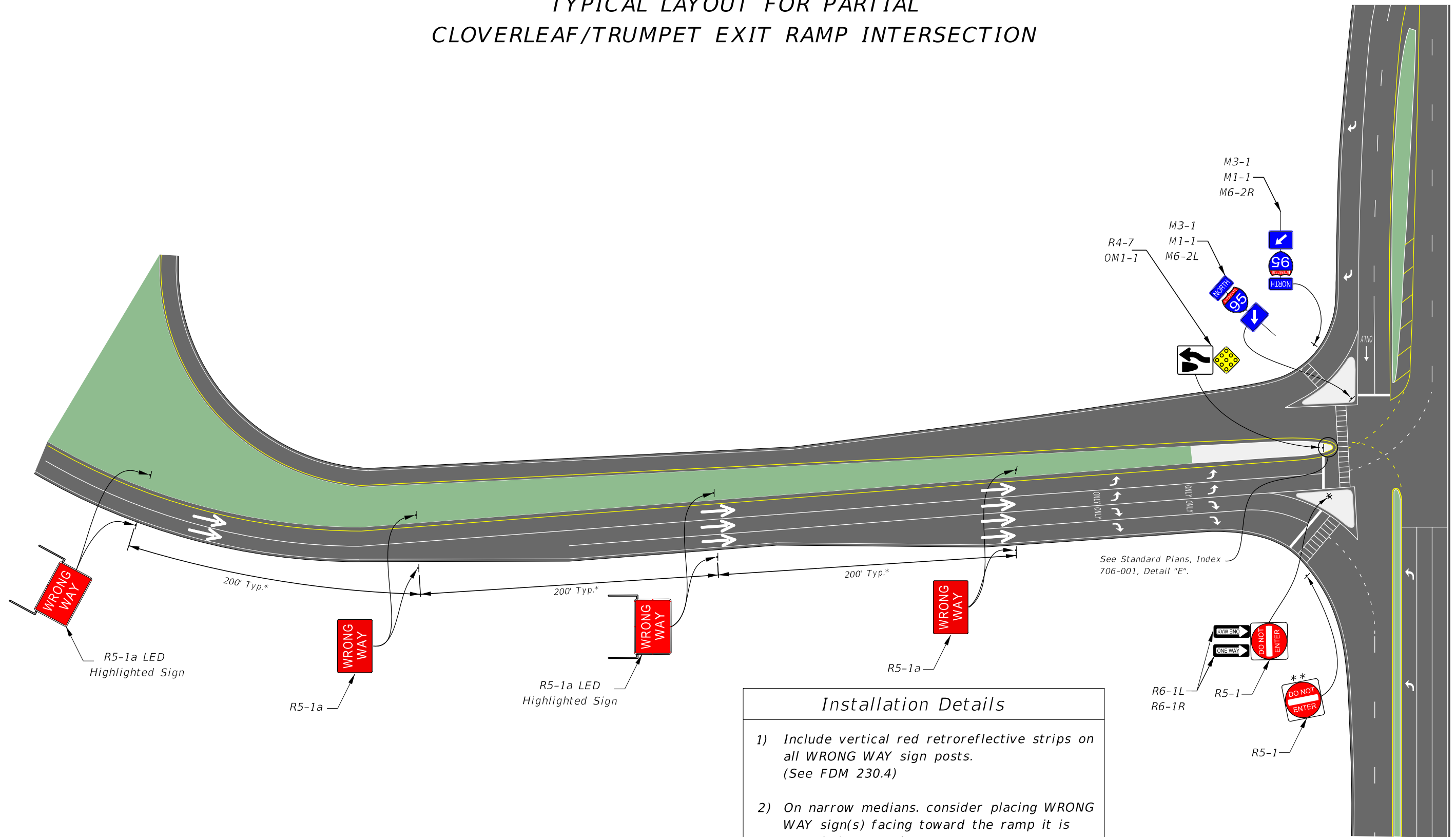
Installation Details

- 1) Include vertical red retroreflective strips on all WRONG WAY sign posts.
(See FDM 230.4)
- * Distance varies, place the LED Highlighted signs in between the other (regular) Wrong Way signs.
- ** Include if connecting road is undivided or has traversable median.

NOT TO SCALE

EXHIBIT 230-1a
06/01/2021

TYPICAL LAYOUT FOR PARTIAL CLOVERLEAF/TRUMPET EXIT RAMP INTERSECTION



Installation Details

- 1) Include vertical red retroreflective strips on all WRONG WAY sign posts. (See FDM 230.4)
- 2) On narrow medians, consider placing WRONG WAY sign(s) facing toward the ramp it is intended to regulate.

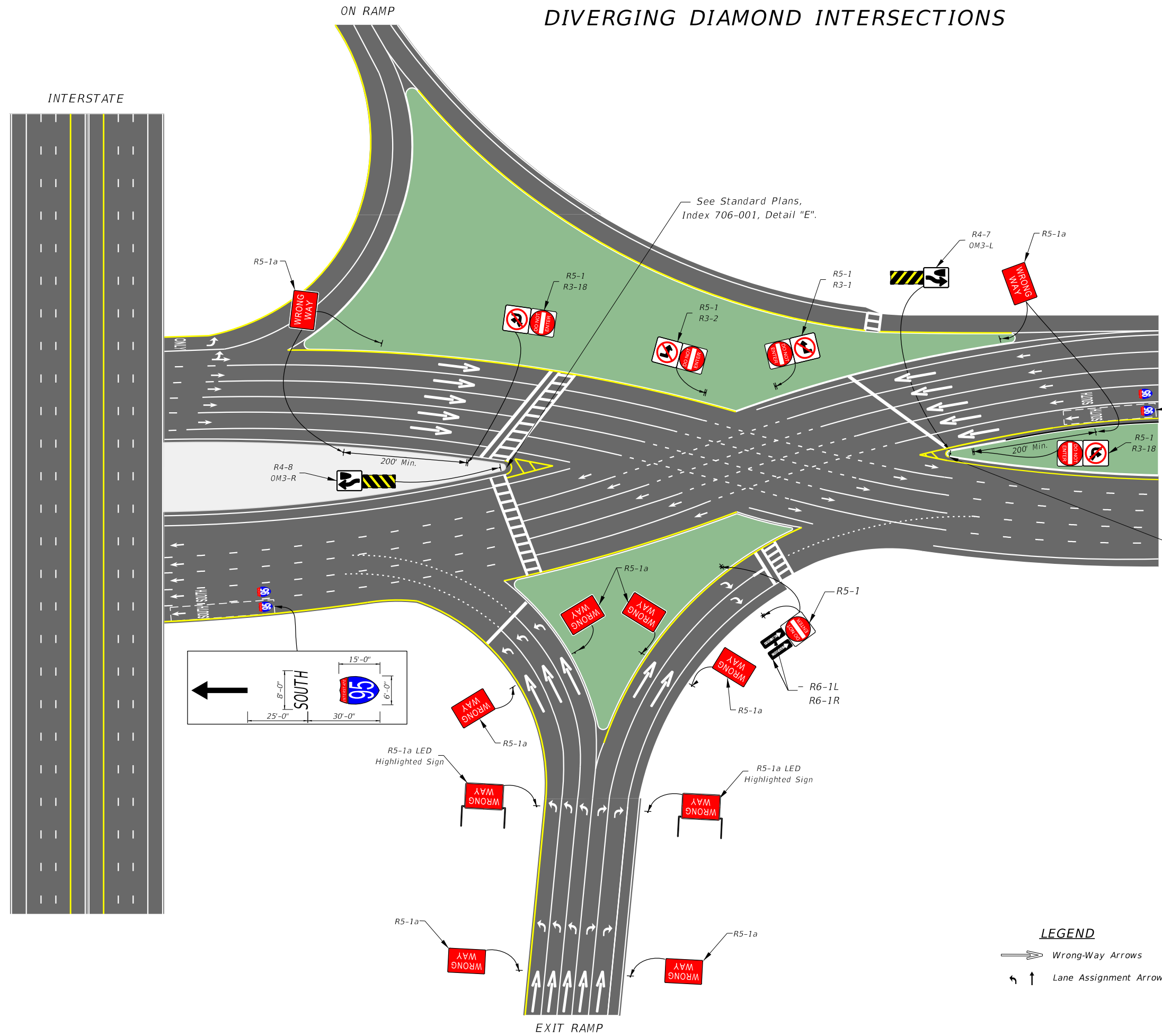
* Distance varies, place the LED Highlighted signs in between the other (regular) Wrong Way signs.

** Include if connecting road is undivided or has traversable median.

- LEGEND**
- Wrong-Way Arrows
 - Wireless Antenna
 - Lane Assignment Arrows

NOT TO SCALE
EXHIBIT 230-1b
 06/01/2021

DIVERGING DIAMOND INTERSECTIONS



See Standard Plans, Index 706-001, Detail "E".

See Standard Plans, Index 706-001, Detail "E".

LEGEND

- Wrong-Way Arrows
- Lane Assignment Arrows

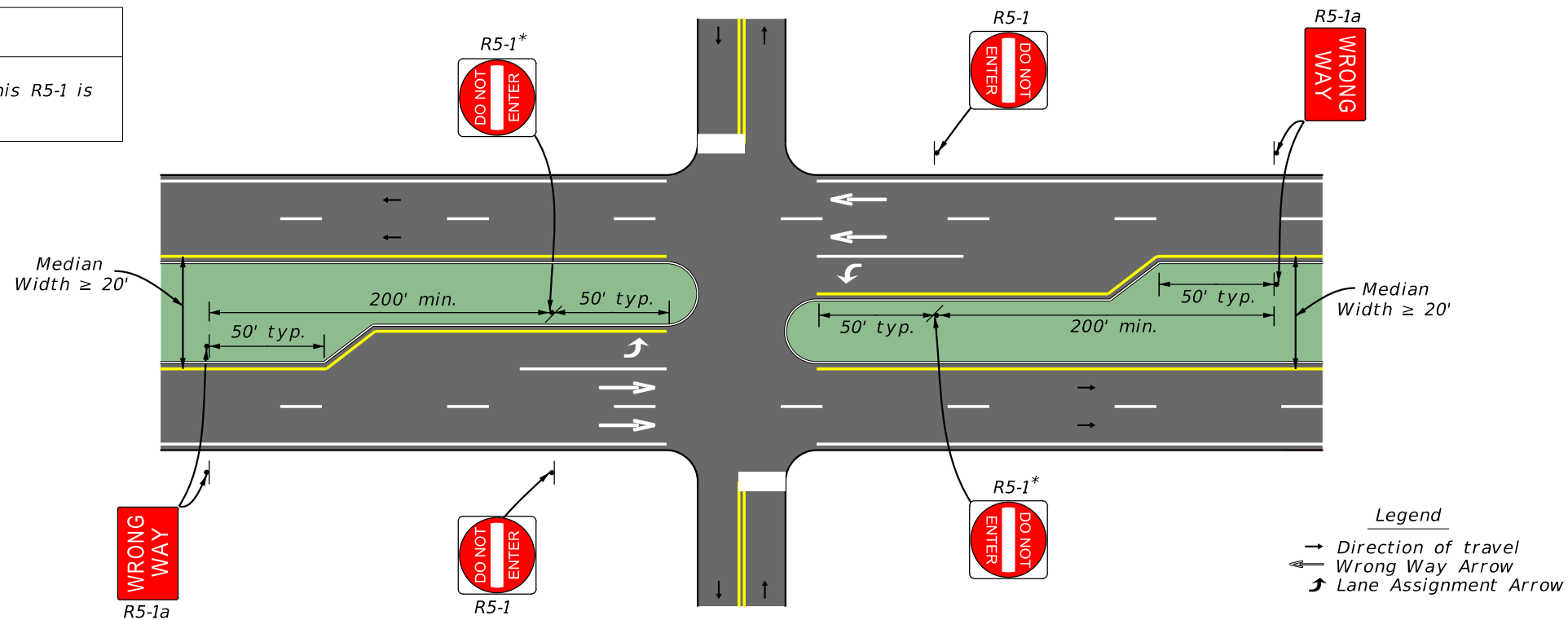
NOT TO SCALE

EXHIBIT 230-2
06/01/2021

WRONG-WAY SIGNING AND PAVEMENT MARKING AT 4-LEG INTERSECTIONS ALONG DIVIDED ARTERIALS/COLLECTORS

Installation Details

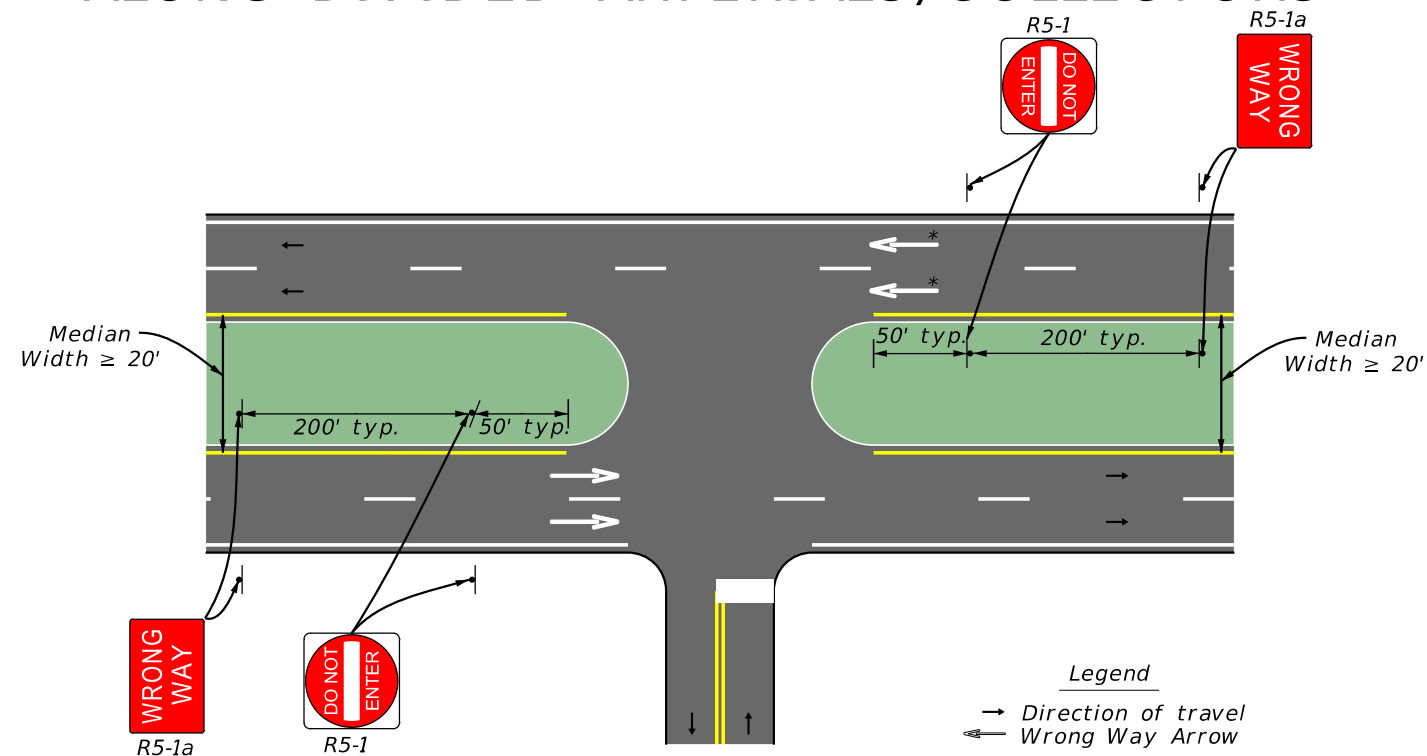
* If median nose width is <10 ft, this R5-1 is optional. See FDM 230.4.3



NOT TO SCALE

EXHIBIT 230-3
06/01/2021

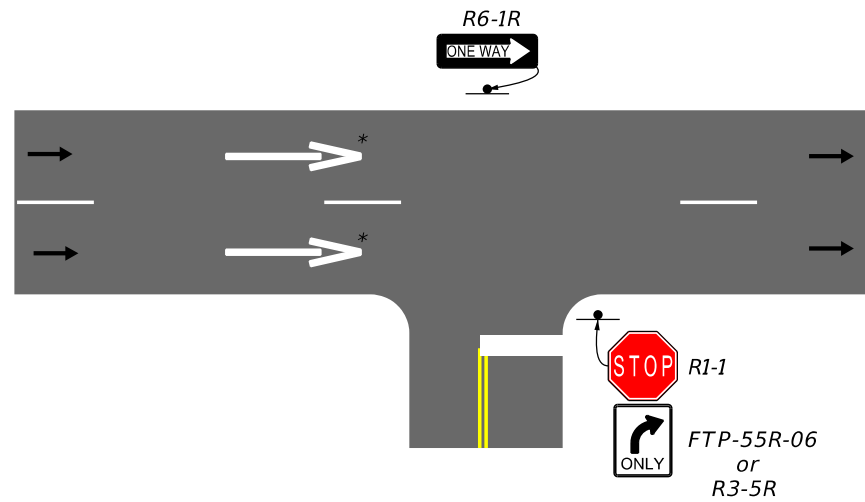
WRONG-WAY SIGNING AND PAVEMENT MARKING AT 3-LEG INTERSECTIONS ALONG DIVIDED ARTERIALS/COLLECTORS



NOT TO SCALE

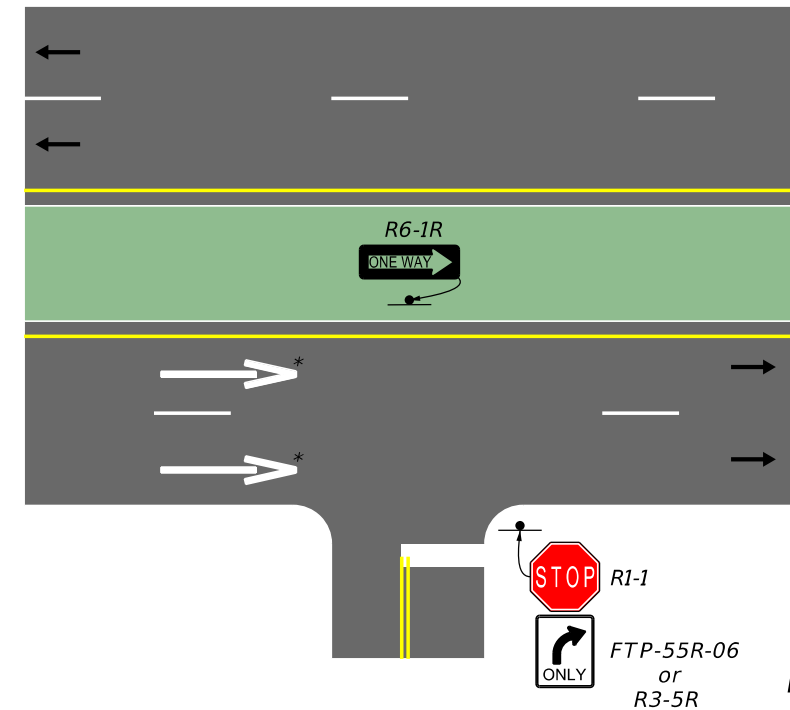
EXHIBIT 230-4
06/01/2021

ONE-WAY PAIRS AND DIVIDED ARTERIALS/COLLECTORS WITH ONE-WAY EGRESS



- Installation Details**
- 1) R6-1 shall be placed on far side median or shoulder depending on facility type.
 - 2) RIGHT TURN ARROW (FTP-55R-06) or LEFT TURN ARROW (FTP-55L-06) typically added by district driveway permit.
 - 3) Mandatory Movement Lane Control (R3-5) sign must be added to side street.
- * See FDM 230.4.4 for how often to place Wrong-Way arrows based on context classification.

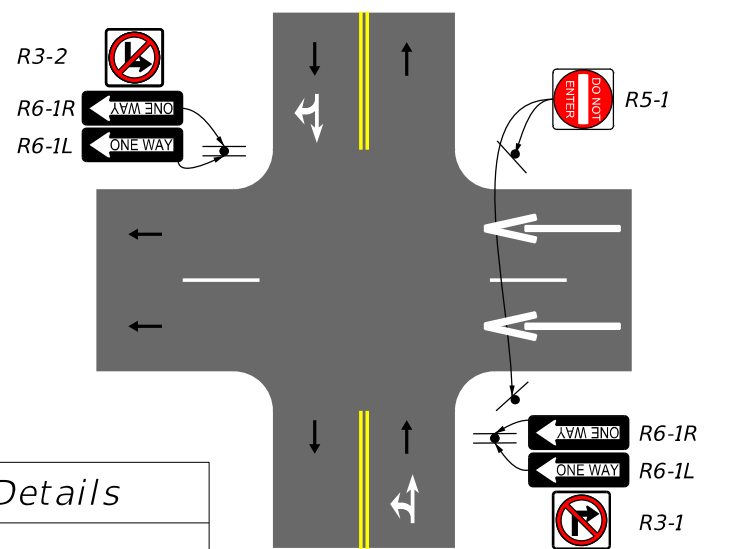
Legend
 → Direction of travel
 ← Wrong Way Arrow



NOT TO SCALE

EXHIBIT 230-5
06/01/2021

TYPICAL TWO-WAY APPROACH TO UNDIVIDED ONE-WAY STREET



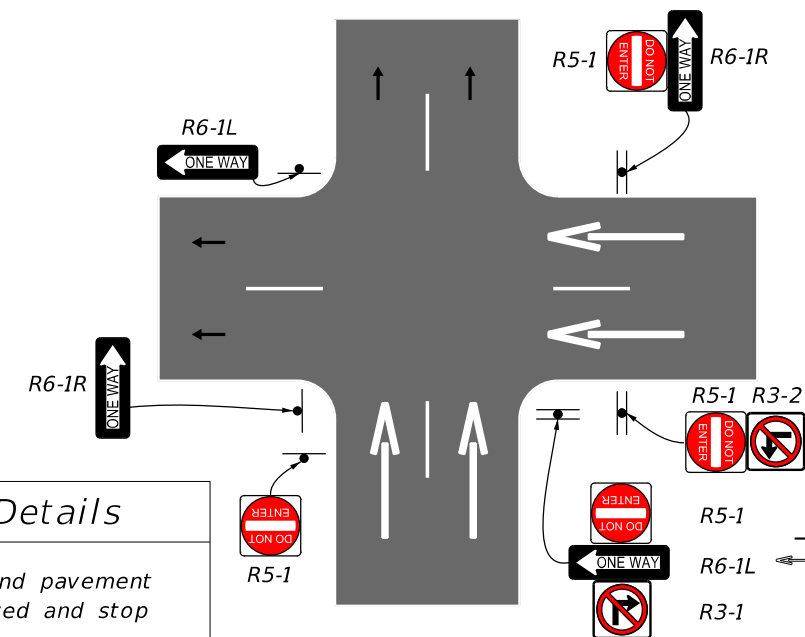
- Installation Details**
- 1) Wrong-Way signing and pavement markings for signalized and stop control.
 - 2) Place Wrong-Way arrows four feet upstream of stop bar, if present.

Legend
 → Direction of travel
 ← Wrong Way Arrow
 ↗ Lane Assignment Arrow

NOT TO SCALE

EXHIBIT 230-6
06/01/2021

TYPICAL ONE-WAY APPROACH TO UNDIVIDED ONE-WAY STREET



- Installation Details**
- 1) Wrong-Way signing and pavement markings for signalized and stop control.
 - 2) Place Wrong-Way arrows four feet upstream of stop bar, if present.

Legend
 → Direction of travel
 ← Wrong Way Arrow

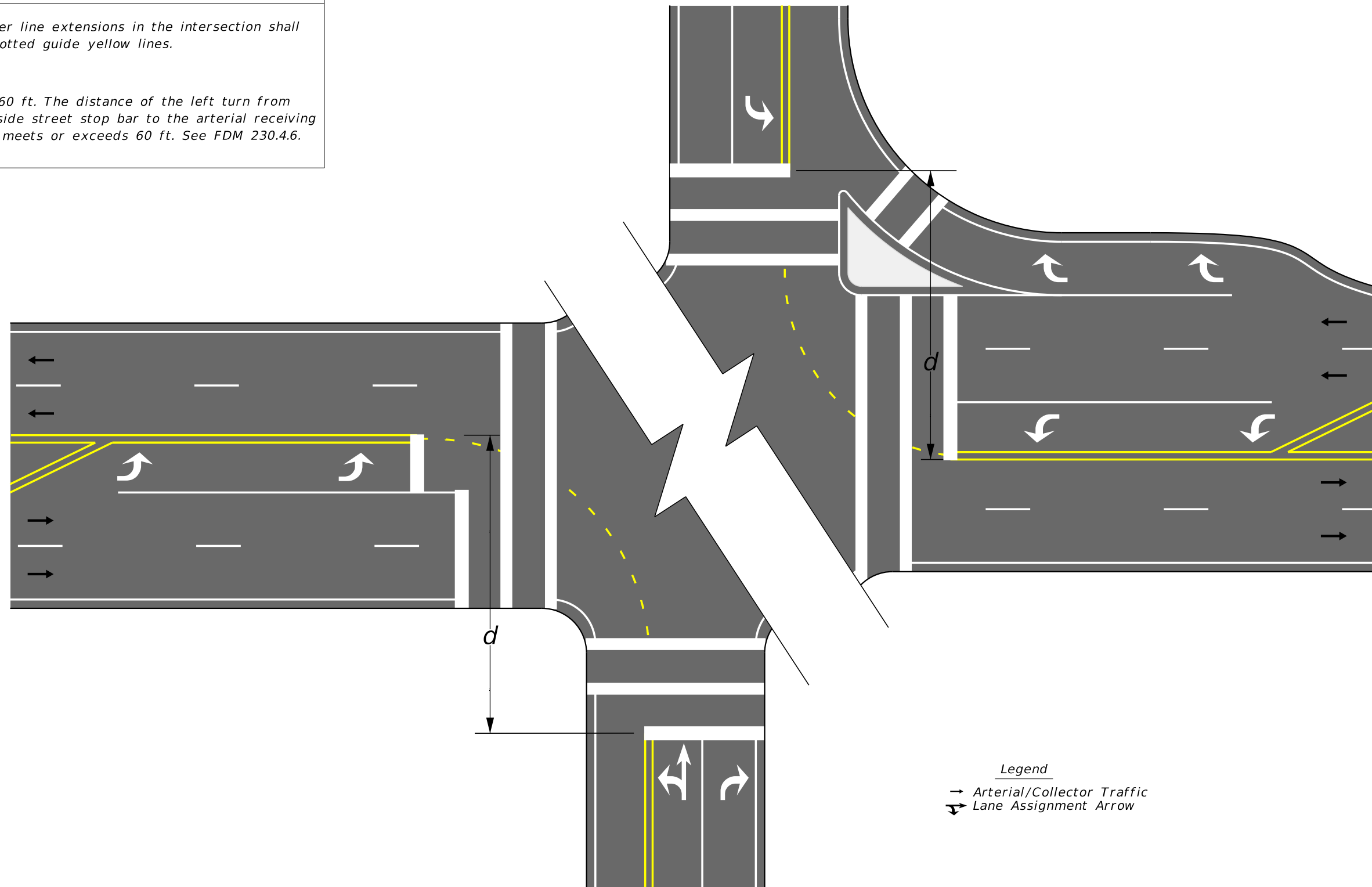
NOT TO SCALE

EXHIBIT 230-7
06/01/2021

TYPICAL DOTTED LINE MARKINGS TO EXTEND CENTER LINE AND LANE LINE MARKINGS INTO SIGNALIZED INTERSECTION

Installation Details

- 1) Center line extensions in the intersection shall be dotted guide yellow lines.
- 2) $d \geq 60$ ft. The distance of the left turn from the side street stop bar to the arterial receiving lane meets or exceeds 60 ft. See FDM 230.4.6.



Legend

- Arterial/Collector Traffic
- ↪ Lane Assignment Arrow

NOT TO SCALE

EXHIBIT 230-8
06/01/2021

Attachment 'C'

230.6 Typical Signing and Pavement Marking Configurations

The following sub-sections describe standard signing and pavement marking applications for midblock crosswalks, Florida scenic trails, median openings along divided arterials/collectors, roadway transitions, stop controlled intersections along divided arterials/collectors, and residential and minor street terminations.

230.6.1 Midblock Crosswalks

Typical signing and pavement markings for stop controlled and signal controlled midblock crosswalks are illustrated in **Exhibit 230-9** and described as follows:

- (1) Include PEDESTRIAN TRAFFIC (W11-2), DIAGONAL ARROW (W16-7p), AHEAD (W16-9p), and STOP HERE FOR PEDESTRIANS (R1-5p) signs
- (1) Include 24" white stop line placed 40 feet plus or minus 10 feet in advance of the marked crosswalk.
- (2) Include 6" solid white lane lines 100 feet in length upstream of each approach and terminating at the stop line.
- (3) Include special emphasis crosswalk markings consistent with **Standard Plans, Index 711-001**.

230.6.2 Florida Scenic Trails

Typical signing and pavement markings for Florida Scenic Trails are illustrated in **Exhibit 230-10** and described as follows:

- (1) Include FLORIDA NATIONAL SCENIC TRAIL 1000 FEET, PEDESTRIAN CROSSING (W11-2), DIAGONAL ARROW (W16-7p), and AHEAD (W16-9p) signs.
- (2) Include FLORIDA NATIONAL SCENIC TRAIL, TRAIL MARKER, and HIKING TRAIL (RS-068) signs.
- (3) Include special emphasis crosswalk markings consistent with **Standard Plans, Index 711-001**.

230.6.3 4-Leg Stop Controlled Intersections Along Divided Arterials/Collectors

Typical signing and pavement markings for stop controlled median openings along divided highways are illustrated in **Exhibit 230-11** and described as follows:

- (1) Include DIVIDED HIGHWAY CROSSING (R6-3), STOP (R1-1), and ONE WAY (R6-1) signs.
- (2) Include YIELD (R1-2) and ONE WAY (R6-1) signs in the median when the median nose width is 30 feet or greater.
- (3) Divided highway signs (R6-3) may be on the same structure with the STOP and ONE WAY signs or on a separate structure.
- (4) See the **MUTCD** and **Standard Plans, Index 711-001** for additional pavement marking details.
- (5) See **FDM 230.4** for Wrong-Way signs and pavement markings.

230.6.4 3-Leg Stop Controlled Intersections Along Divided Arterials/Collectors

Typical signing and pavement markings for 3-leg stop controlled intersections along divided arterials/collectors are illustrated in **Exhibit 230-12** and described as follows:

- (1) Include DIVIDED HIGHWAY CROSSING (R6-3a), STOP (R1-1), and ONE WAY (R6-1) signs.
- (2) Include YIELD (R1-2) and ONE WAY (R6-1) signs in the median when the median nose width is 30 feet or greater.
- (3) Include OBJECT MARKER (OM1-3) as shown and in accordance with **Specification 705** and **Standard Plans, Index 700-010**.
- (4) See the **MUTCD** and **Standard Plans, Index 711-001** for additional pavement marking details.
- (5) Provide sheeting on signs and object markers in accordance with **Specification 993**.
- (6) See **FDM 230.4** for Wrong-Way signs and pavement markings.

230.6.5 Residential and Minor Street Terminations

Typical signing and pavement markings for residential and minor street terminations are illustrated in **Exhibit 230-13** and described as follows:

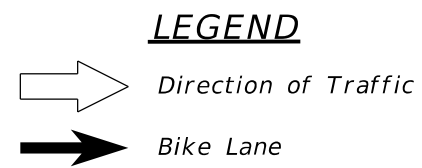
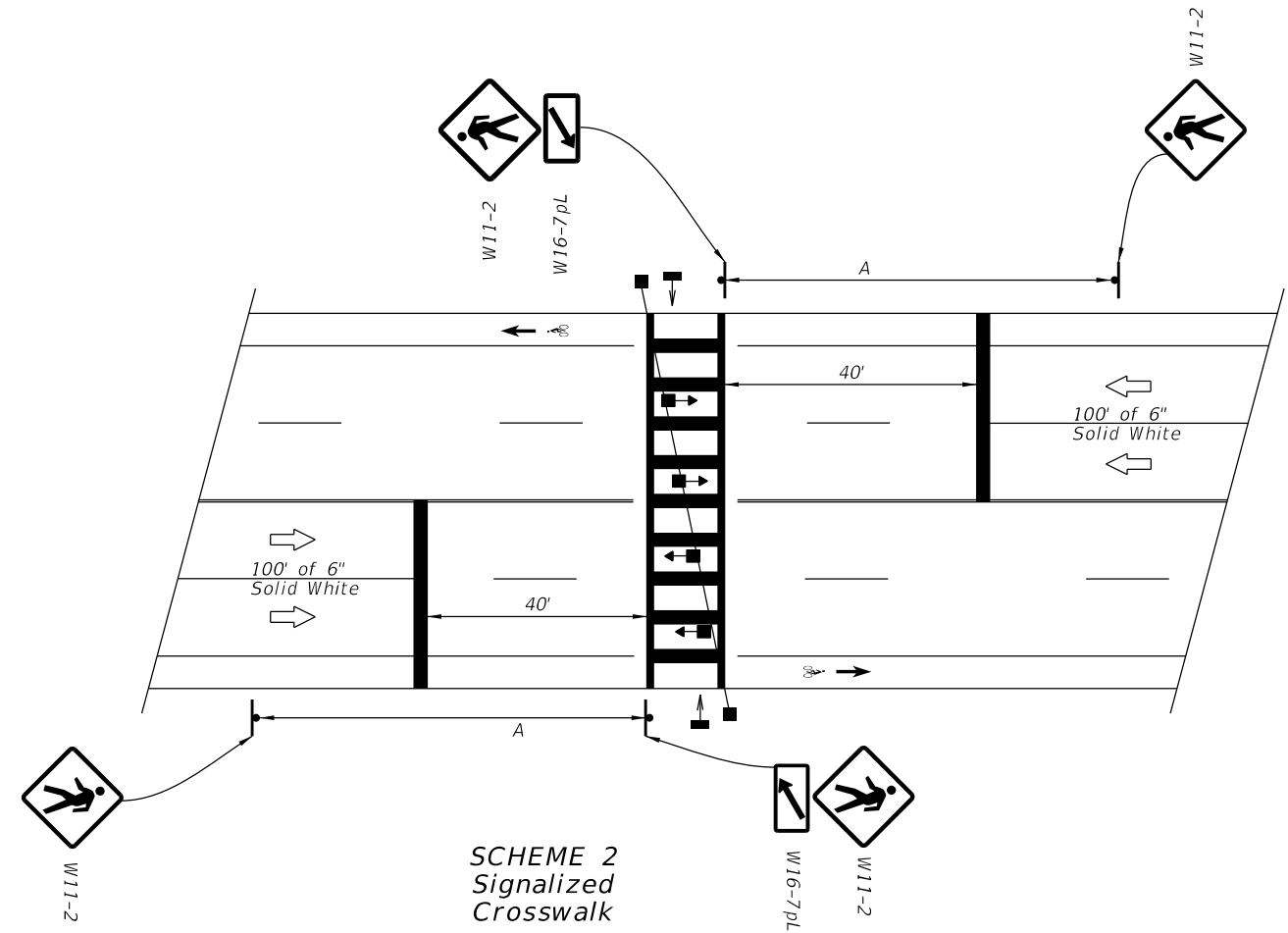
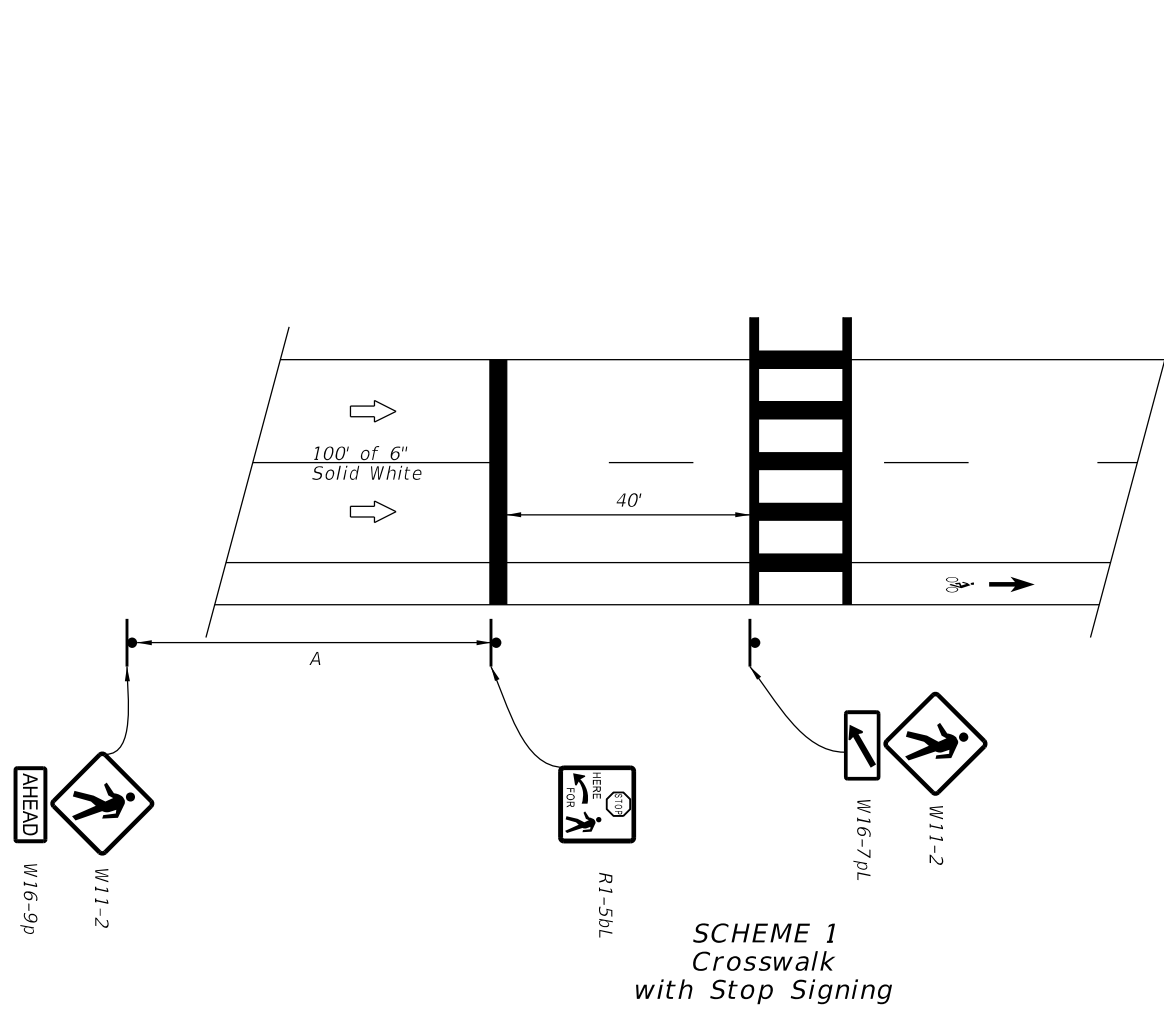
- (1) For minor street terminations, include STOP (R1-1), LARGE ARROW (W1-6), and TWO DIRECTIONAL LARGE ARROW (W1-7), signs. Include OBJECT MARKER (OM1-3) as shown and in accordance with **Specification 705** and **Standard Plans, Index 700-010**.
- (2) For residential street terminations, include DEAD END (W14-1) sign. Include OBJECT MARKER (OM4-3) as shown and in accordance with **Specification 705** and **Standard Plans, Index 700-010**.

230.6.6 Roadway Transitions (2 Lane Undivided to 4 Lane Divided)

Typical signing and pavement markings for roadway transitions from 2-lane undivided to 4-lane divided are illustrated in **Exhibit 230-14** and described as follows:

- (1) Include DIVIDED HIGHWAY (W6-1), DIVIDED HIGHWAY ENDS (W6-2), TWO WAY TRAFFIC (W6-3), DO NOT ENTER (R5-1), KEEP RIGHT (R4-7) and LANE ENDS (W4-2) signs.
- (2) For left roadway centered on existing roadway scheme, include LANE ENDS MERGE LEFT (W9-2L), and RIGHT LANE ENDS (W9-1) signs.
- (3) For right roadway centered on existing roadway scheme, include LANES ENDS MERGE RIGHT (W9-2R), and LEFT LANE ENDS (W9-1L) signs.

TYPICAL SIGNING AND PAVEMENT MARKING FOR MIDBLOCK CROSSWALKS



APPROACH SPEED MPH	A-SUGGESTED DISTANCE (Ft.)
25 Or Less	200
26 To 35	250
36 To 45	300

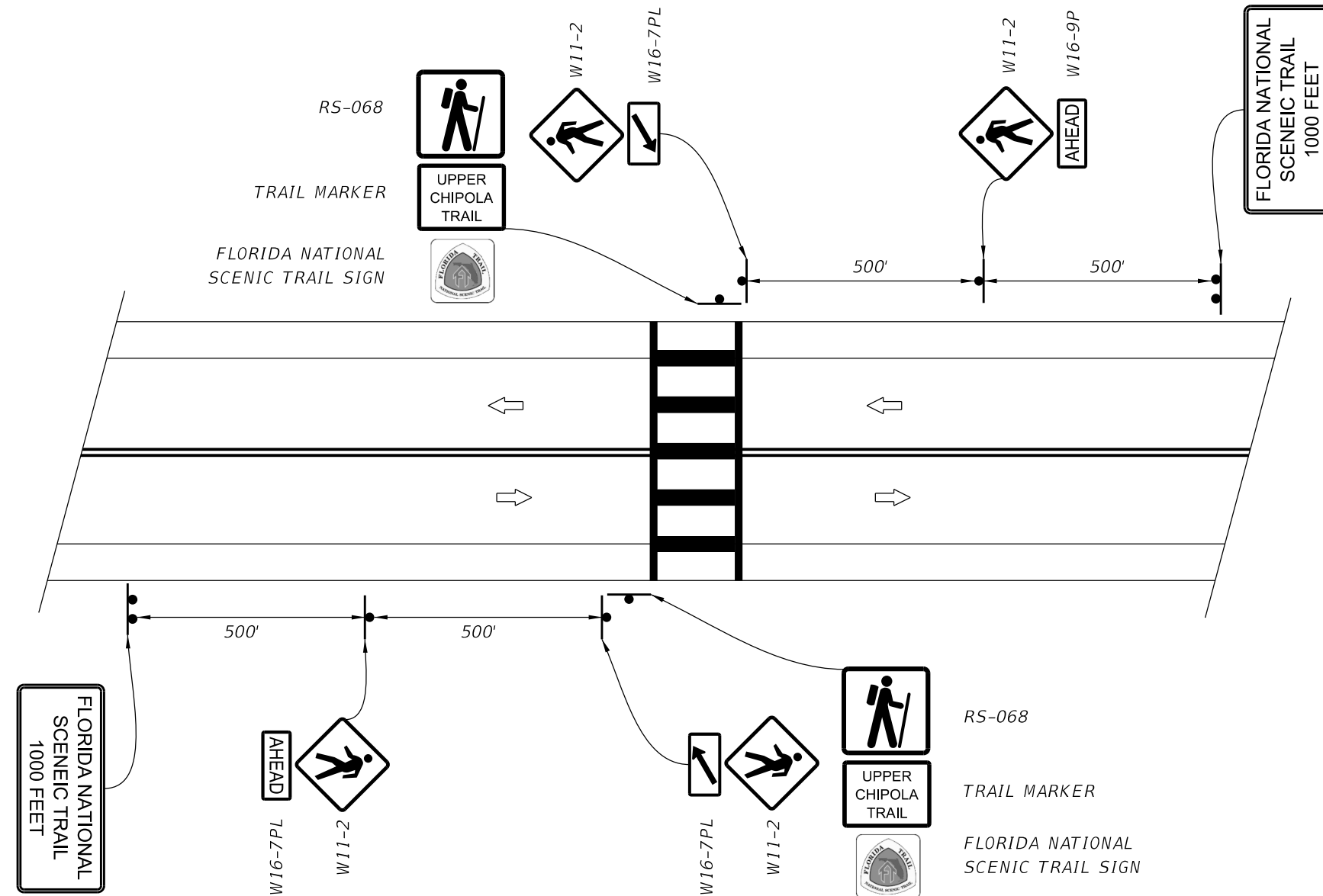
Note:

The details shown do not depict the signing and markings for multi-lane roadways with divided medians. For these applications, additional signs shall be installed on the median side. Minimum width of Mid-Block Crosswalks is 10'.

NOT TO SCALE

EXHIBIT 230-9
06/01/2021

TYPICAL SIGNING AND PAVEMENT MARKING FOR FLORIDA NATIONAL SCENIC TRAILS



NOTE: The FLORIDA NATIONAL SCENIC TRAIL sign will be provided by the US Forest Service.

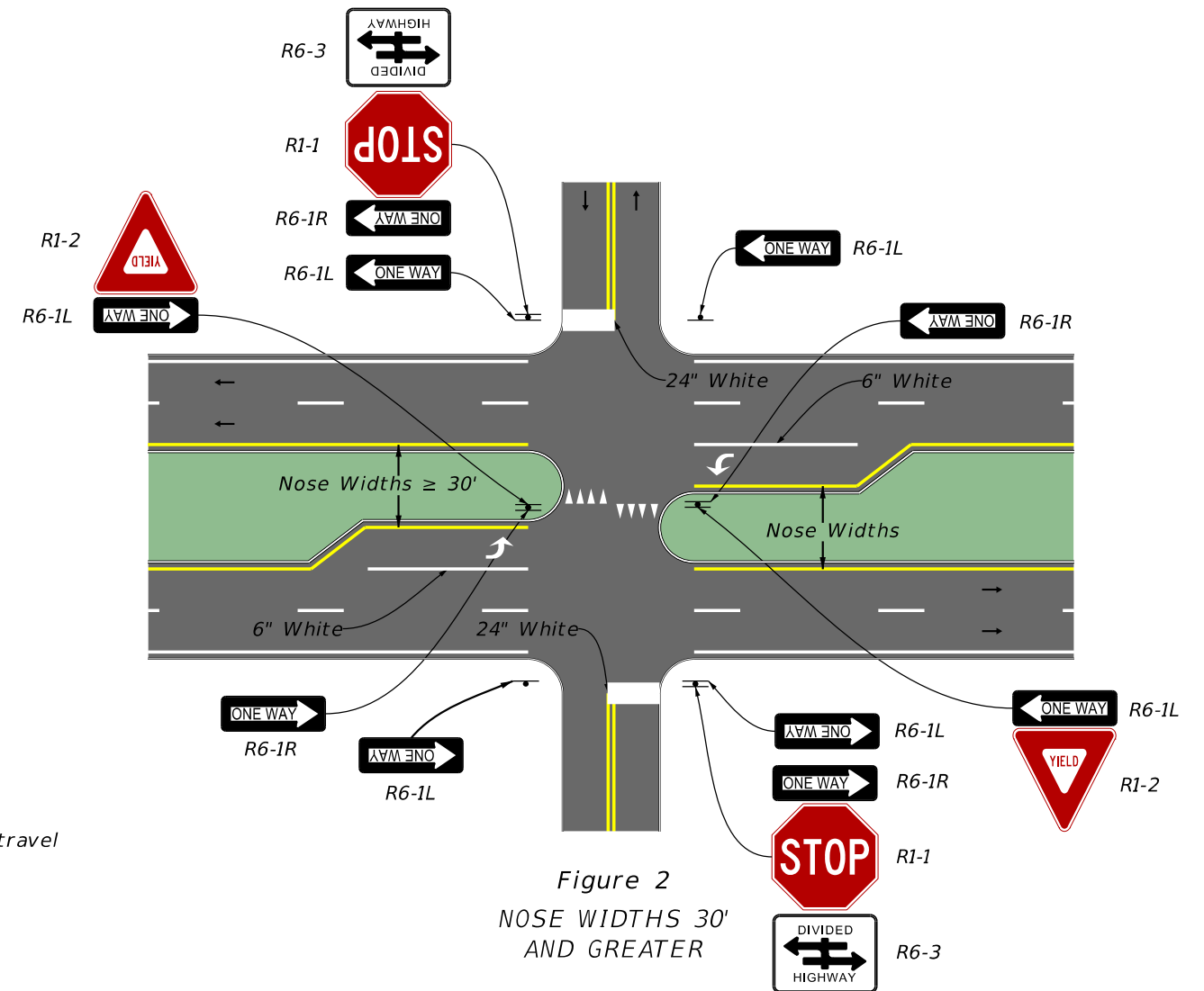
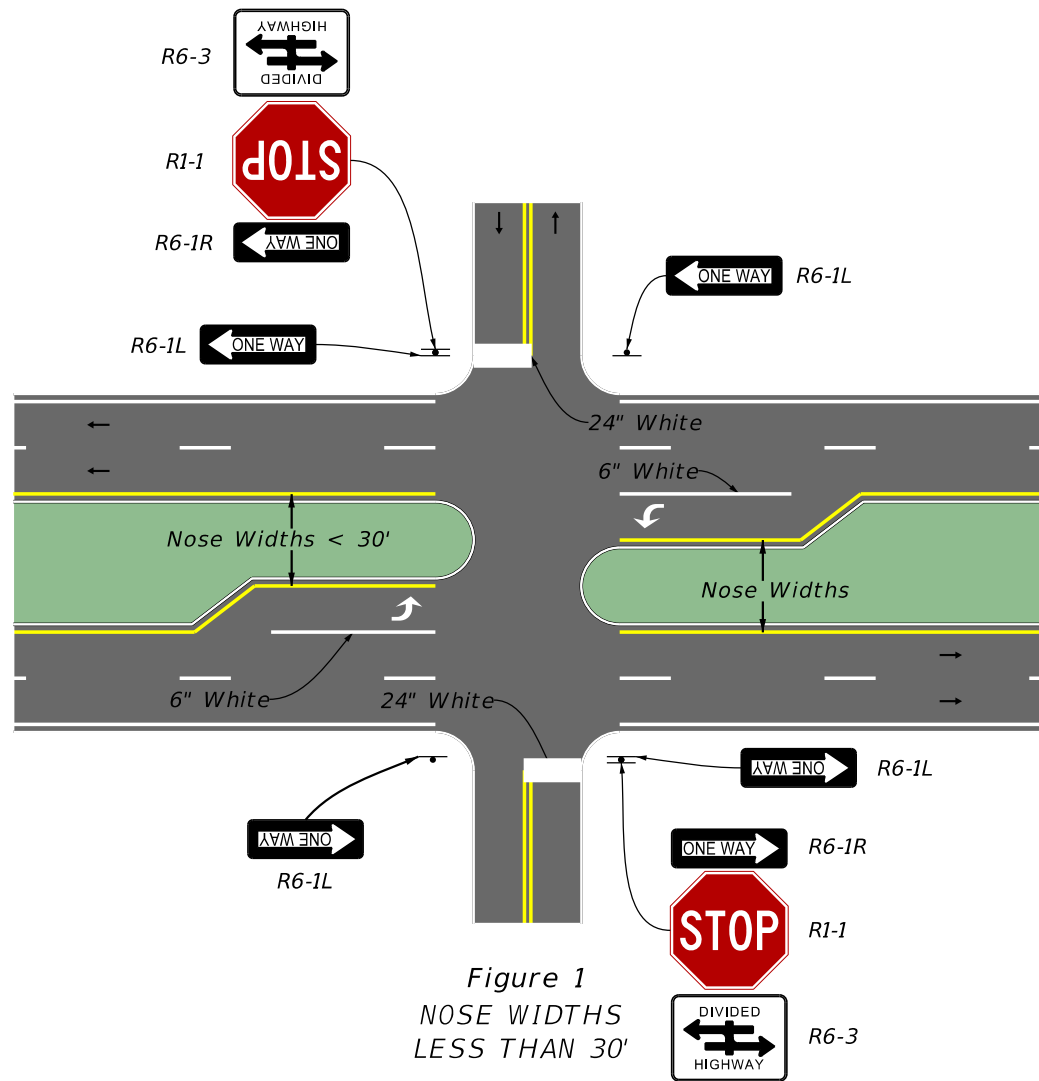
LEGEND
 Direction of Traffic



FLORIDA NATIONAL SCENIC TRAIL SIGN

NOT TO SCALE

TYPICAL SIGNING AND PAVEMENT MARKING FOR AT 4-LEG STOP CONTROLLED INTERSECTIONS ALONG DIVIDED ARTERIALS/COLLECTORS



Legend
→ Direction of travel

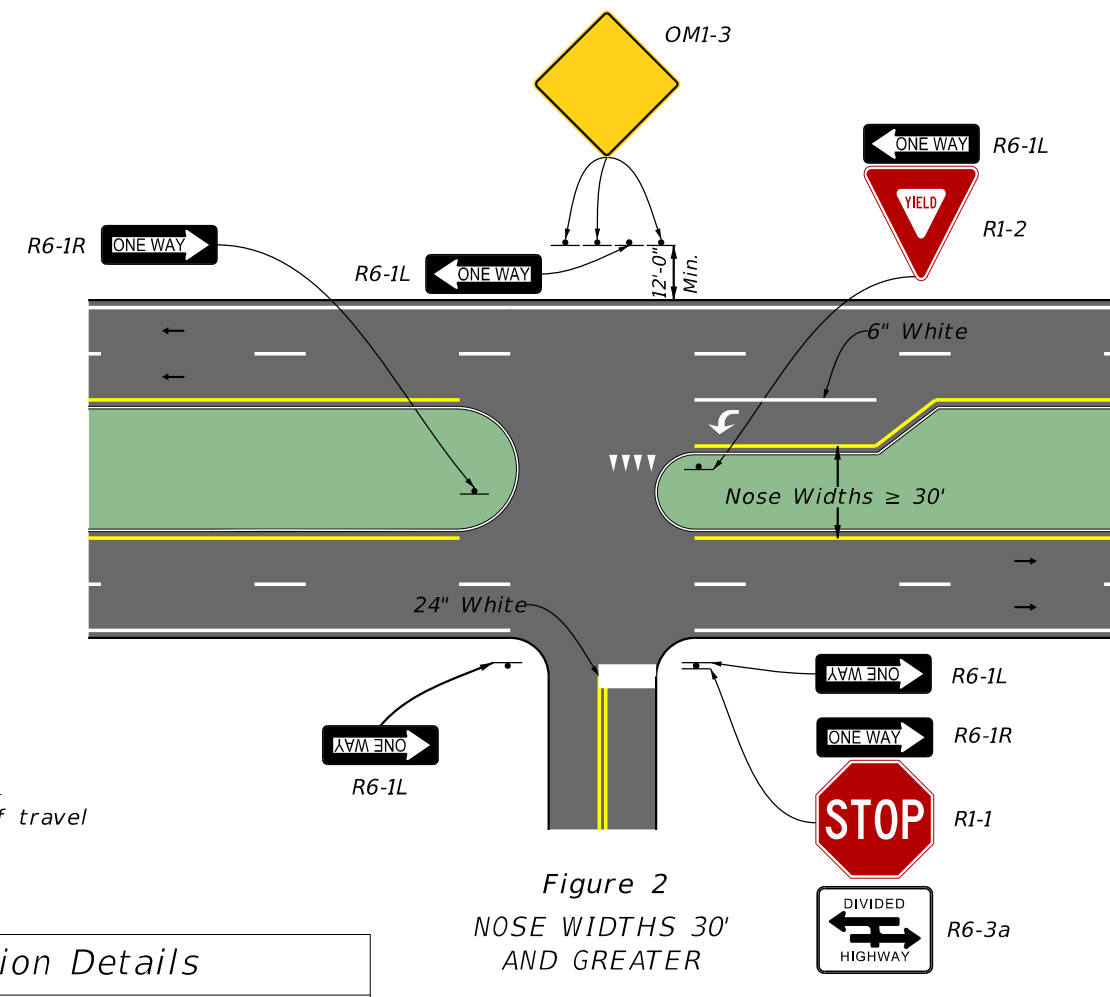
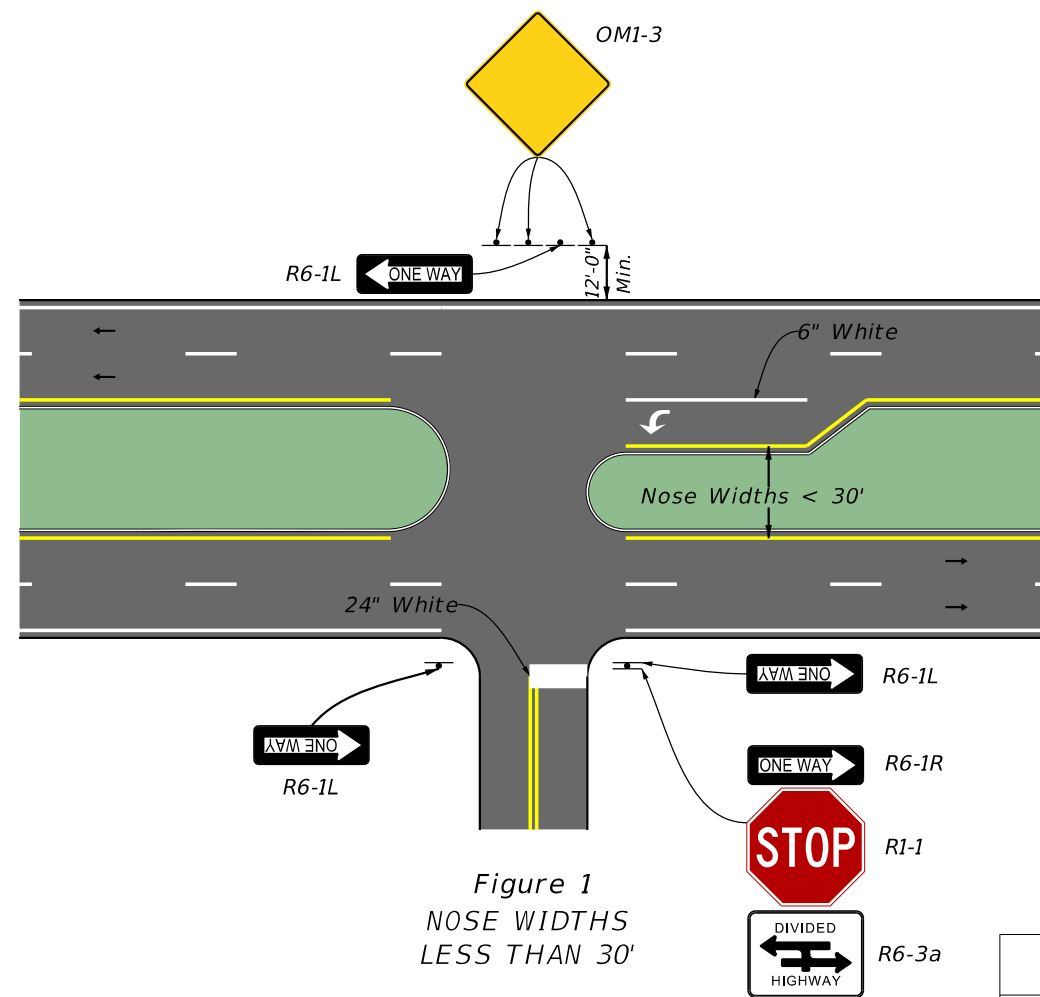
Installation Details

- 1) Divided Highway signs (R6-3) may be on the same structure with the STOP and ONE WAY signs or on a separate structure.
- 2) See the MUTCD and Standard Plans, Index 711-001, for additional pavement marking details.
- 3) For additional signing and pavement marking details to discourage Wrong-Way Driving, see FDM 230.4.3

NOT TO SCALE

EXHIBIT 230-11
06/01/2021

TYPICAL SIGNING AND PAVEMENT MARKING FOR AT 3-LEG STOP CONTROLLED INTERSECTIONS ALONG DIVIDED HIGHWAYS



Legend
→ Direction of travel

Installation Details

- 1) Major streets to be evaluated on a case-by-case basis.
- 2) Install Object Markers in accordance with Index 700-010
- 3) See Index 711-001 for pavement markings.
- 4) Provide sheeting on signs and object markers in accordance with Specification 993.
- 5) For additional signing and pavement marking details to discourage Wrong-Way Driving, see FDM 230.4.3

NOT TO SCALE

EXHIBIT 230-12
06/01/2021

TYPICAL SIGNING AND PAVEMENT MARKING FOR RESIDENTIAL AND MINOR STREET TERMINATIONS

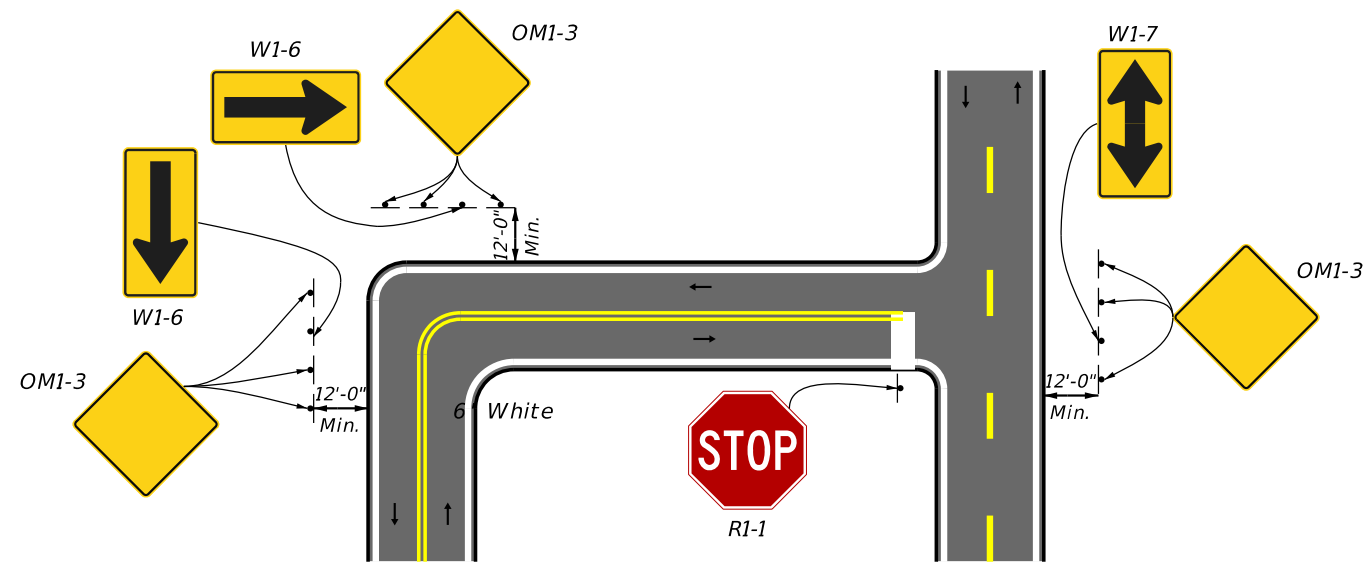


Figure 1
TRAFFIC CONTROLS FOR MINOR
STREET TERMINATION

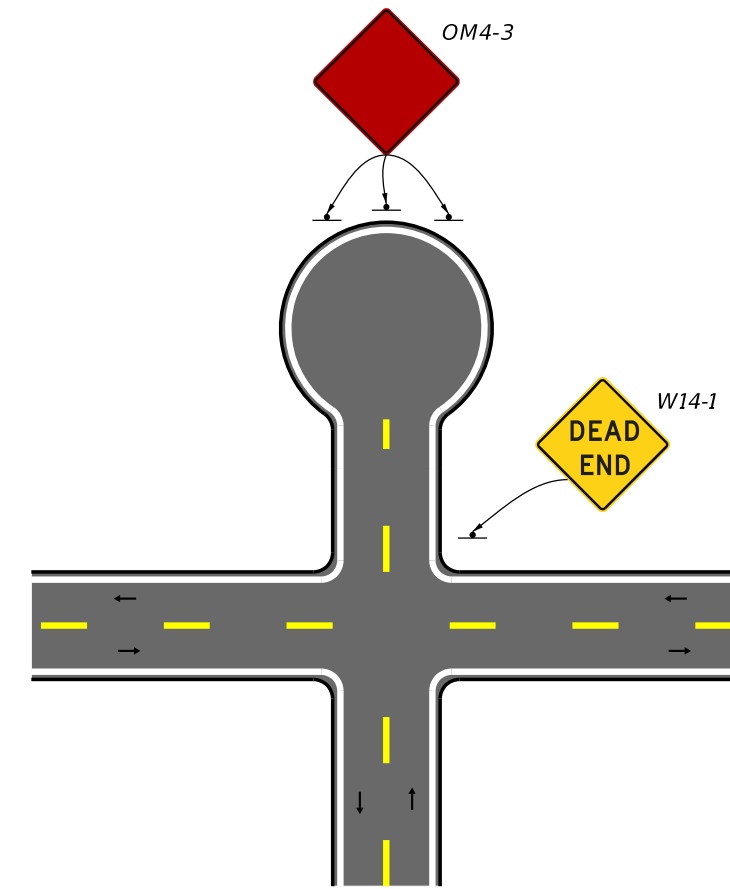
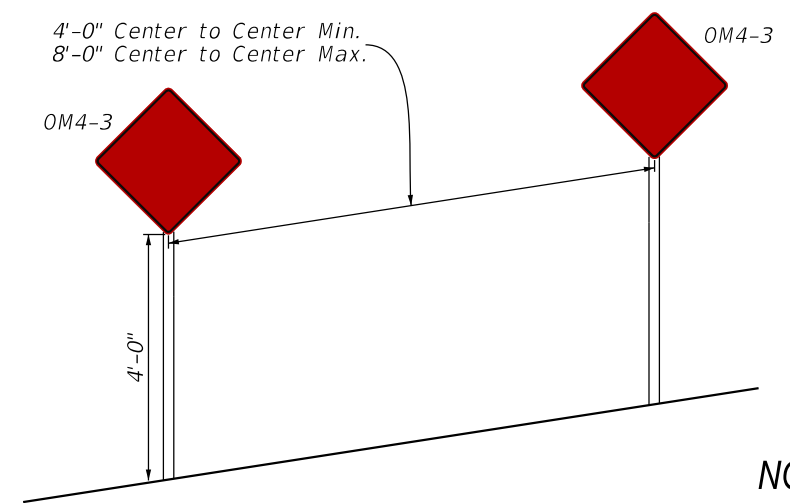


Figure 2
TRAFFIC CONTROLS FOR
CUL-DE-SAC OR DEAD END

Installation Details

- 1) Major streets to be evaluated on a case-by-case basis.
- 2) Install Object Markers in accordance with Index 700-010
- 3) See Index 711-001 for pavement markings.
- 4) Provide sheeting on signs and object markers in accordance with Specification 993.

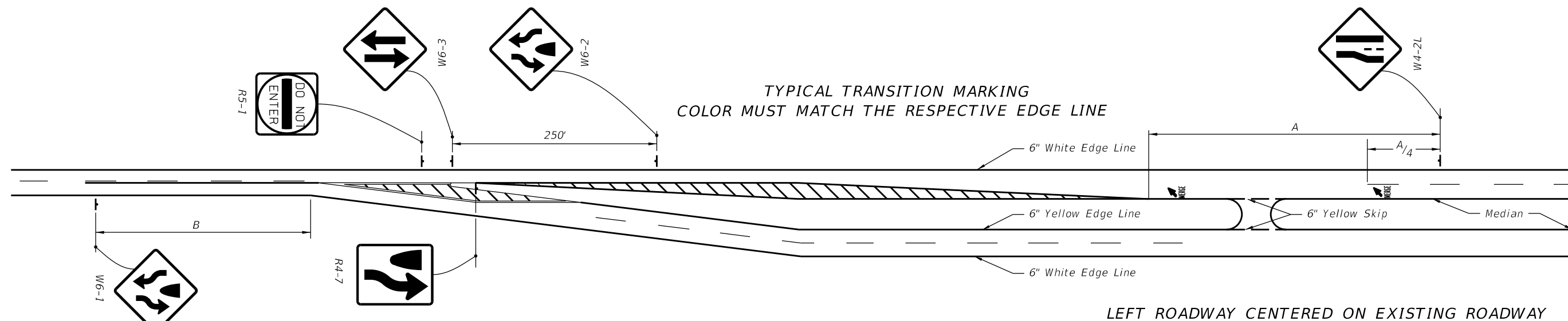
Legend
→ Direction of travel



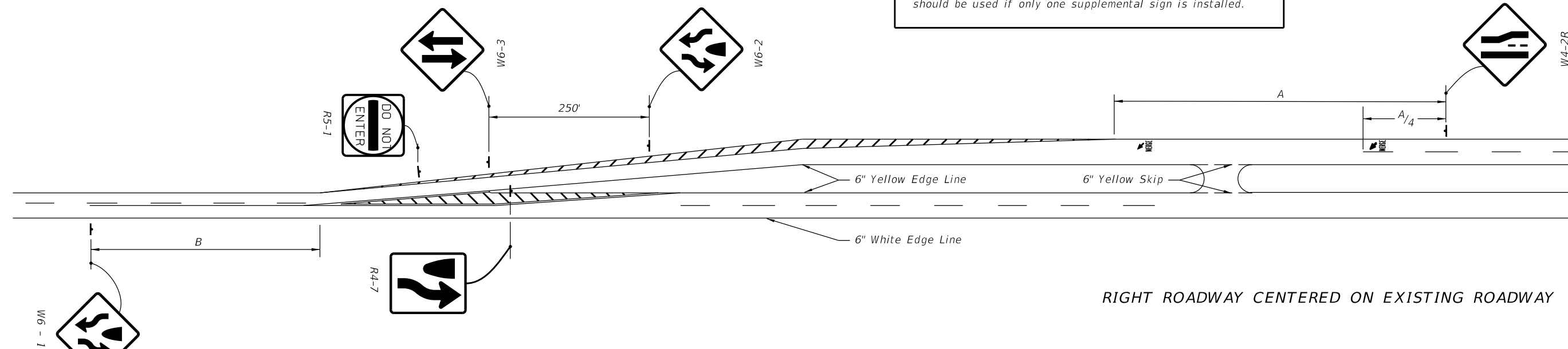
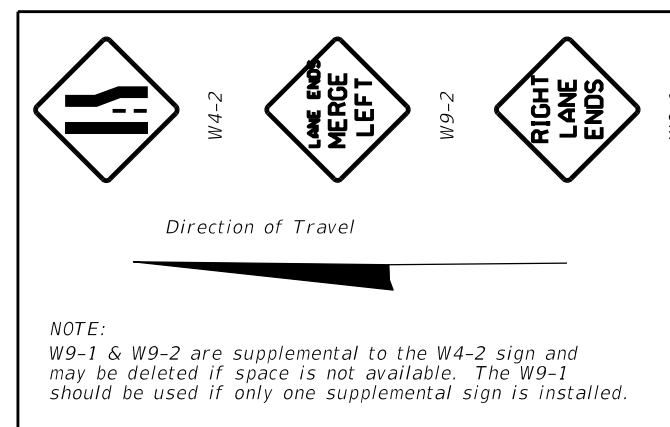
NOT TO SCALE

EXHIBIT 230-13
06/01/2021

TYPICAL SIGNING AND PAVEMENT MARKINGS FOR ROADWAY TRANSITIONS (2 LANE UNDIVIDED TO 4 LANE DIVIDED)



SPEED MPH	"A" (FT.)	"B" (FT.)
60	---	640
55	950	595
50	850	550
45	750	500
40	650	455
30	450	365



SCHEMES FOR TRANSITION - 2 LANE / 4 LANE ROADWAY

NOT TO SCALE