

 October 28-29, 2025

 Orlando, FL




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# Wrong-Way Driving Program Update

Engy Samaan, P.E., M.E., C.P.M.  
Rick Jenkins, P.E.

Transportation Symposium  
Website



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## Agenda

1. Wrong-Way Driving (WWD) Program Overview
2. Research to Implementation
3. Freeway
  - i. Countermeasures
  - ii. Wrong-Way Vehicle Detection Systems
4. Arterial Countermeasures
5. Education
6. Latest Design Updates



*Confirmed Wrong-Way Driver - Image from FDOT Approved Detection Device*

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## What is Wrong-Way Driving?

- Wrong-Way driving is when a driver enters a one-way or divided roadway travelling the wrong direction
- Wrong-way driving crashes on freeways are 35x more likely to end in fatalities than average crashes
- One fatality is too many!



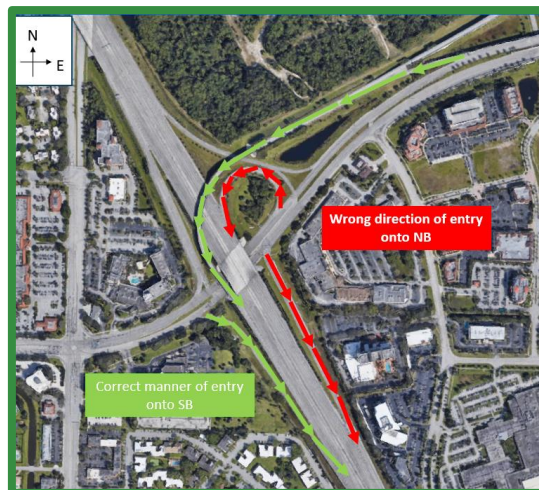
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## What causes wrong-way driving?

- Common causes for wrong-way driving:
  - Driver intoxication
  - Older drivers
  - Driver mental health incidents
  - Driver confusion caused by:
    - Low lighting
    - Lack of signing or confusing signing
    - Roadway geometry
    - Etc.



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## History

NEWS

### Tallahassee teacher killed in crash with bus on Interstate 10



Courts / Law

### Driver In Wrong-Way Crash That Killed 5 Was Intoxicated

### Tampa Officer Hit By Wrong Way Driver

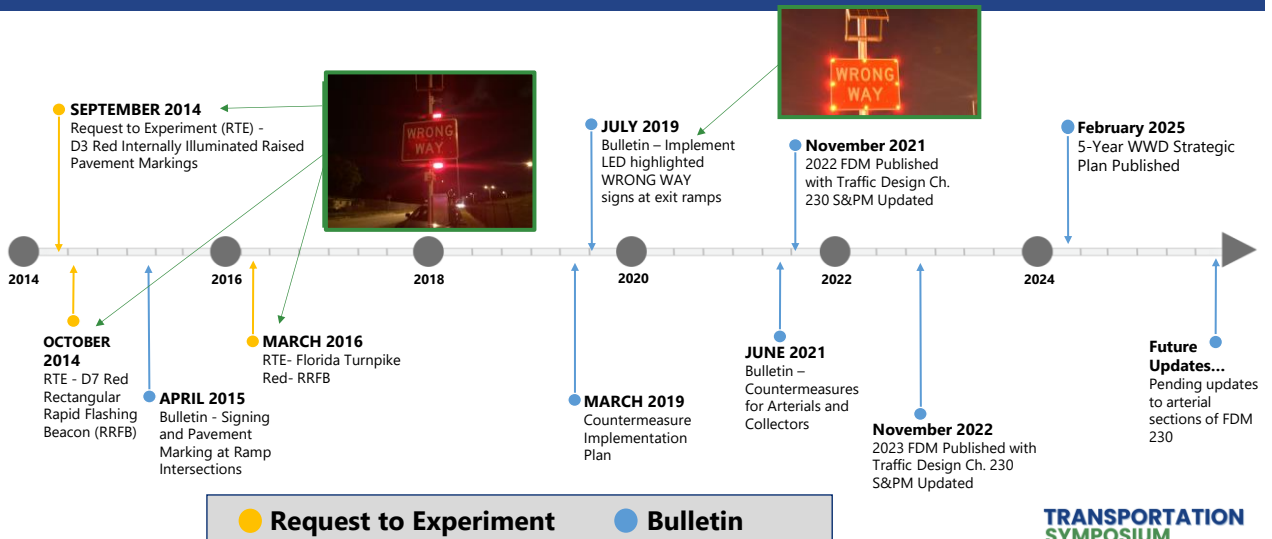
The crash was the latest in an unsettling trend in the Tampa area in which wrong-way drivers have caused crashes, many of them fatal. In most of the cases, alcohol played a role, authorities said.

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## FDOT's WWD Timeline & Initiatives



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## Initial Research vs Current Data

- **280 Statewide freeway wrong-way crashes (2009-2013)**

2009-2013 F+SI%  
70%

2009-2013



■ Fatality ■ Injury ■ PDO

- **269 Statewide freeway wrong-way crashes (2018-2022)**

2018-2022 F+SI%  
63%

2018-2022



■ Fatality ■ Injury ■ PDO

- Reduction in overall and combined rate of fatal plus serious injury crashes

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## Research

### Data-Driven Decisions for WWD Program



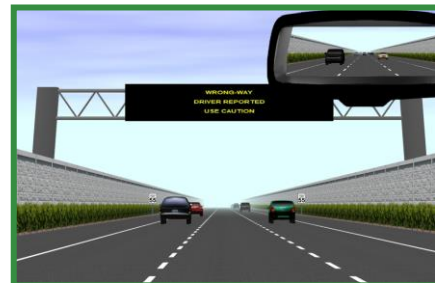
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## Florida Wrong-Way Driving Research

- **Statewide Wrong-Way Driving Crash Study (Apr 2015)**
- **Florida State University**
  - Driving Simulator Studies on Human Factor (Nov 2015)
- **University of South Florida CUTR**
  - Comparing Seven Countermeasures (March 2017)
  - Testing and Evaluating Video Detection Systems for Freeway Mainlines (Nov 2018)
- **Florida International University**
  - Data-Driven Approach for Identifying Hotspots (Nov 2018)
  - Strategies to Mitigate Wrong-Way Driving Incidents on Arterials (Nov 2019)
  - Evaluating the Strategic Response Plan to WWD Events on Freeways (**April 2025**)



*Driving Simulator (FIU)*

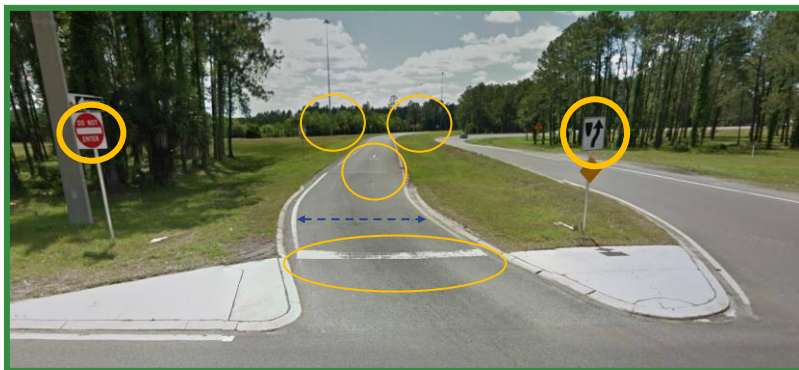
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## Florida State University Research

### Driving Simulator Studies of the Effectiveness of Countermeasures to Prevent Wrong-Way Crashes



#### Driver Cues

- Alcohol impairment limits the number of cues and makes them harder to recognize

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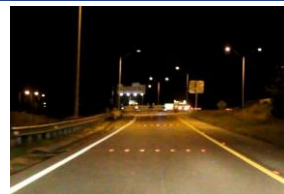
## Evaluated WWD Countermeasures



Updated Signing and Pavement Marking



Red Rectangular Rapid Flashing Beacons (RRFB)



Internally Illuminated Raised Pavement Markers



Light-Emitting Diode (LED) Highlight WRONG WAY signs



Blank-out signs that flash WRONG WAY



Delineators along exit ramps



Wig-wag Flashing Beacons

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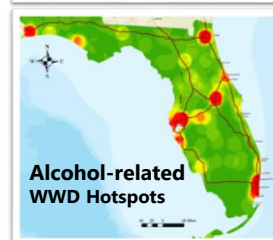
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## FIU Research and Implementation

### Hotspot Research Analysis for advanced countermeasures

- Identified locations for prioritized deployment
- Evaluated demographic and land-use factors including:
  - Impaired Driving
  - Drivers > 65 years old
  - Tourist
  - Density of alcohol establishments
  - Density of Health care facilities
- Evaluated crash event response plans and driver reaction to DMS messaging



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# Freeway Countermeasures

## Countermeasures at Ramps and Intersecting Arterials

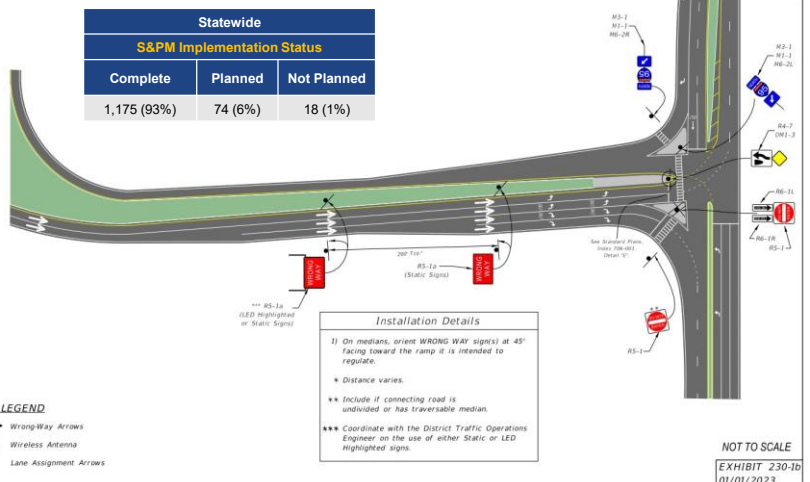
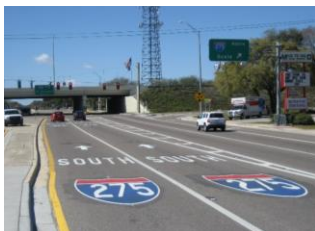


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## Signing and Pavement Marking (S&PM) Countermeasures Deployments –FDM 230.4



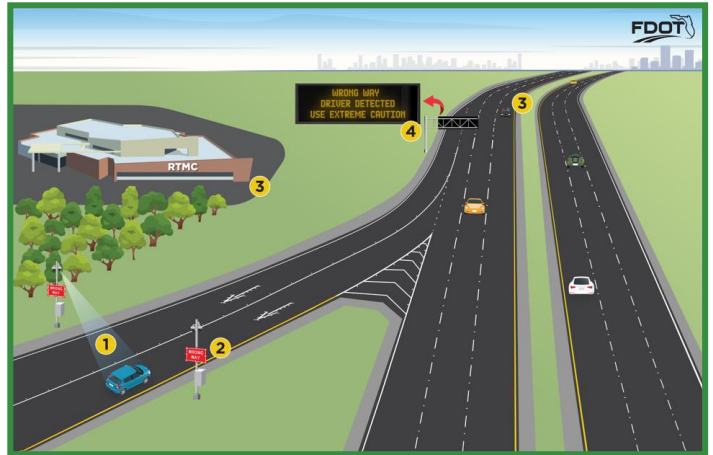
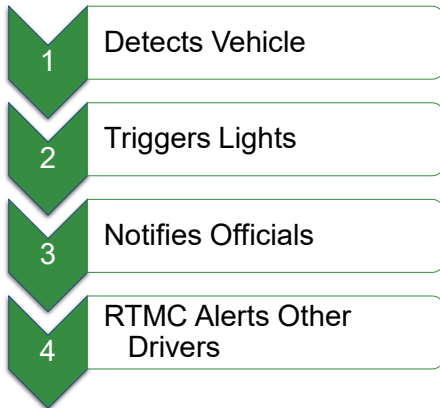
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## Wrong-Way Vehicle Detection System (WWVDS)

### How Wrong-Way Vehicle Detection System Works



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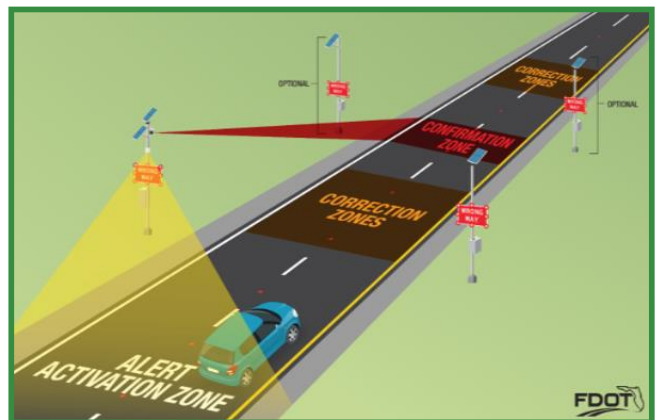
## Wrong-Way Vehicle Detection System (WWVDS)

Statewide		
WWVDS Implementation Status		
Complete	Planned	Not Planned
367 (30%)	650 (53%)	211 (17%)

### January 2025 Standard Specification

#### 660-2.2.1.4 Wrong-Way Vehicle Detection Systems

- Produces an alarm
- One or more detection zones
- Mainline or Ramps
- Must include shoulder monitoring



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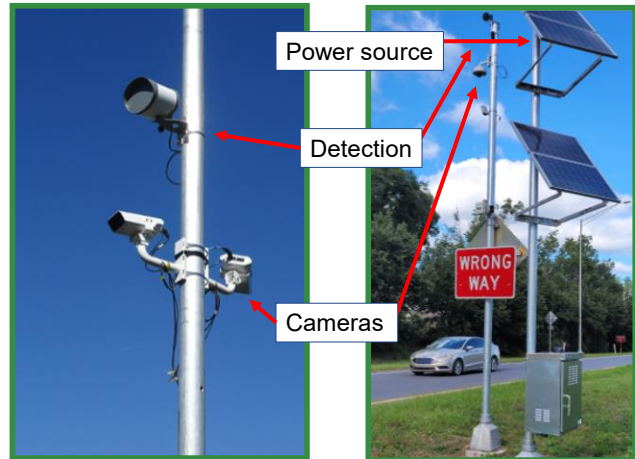
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## Common Features of WWVDS APL Products

- Suppliers must be on FDOT's WWVDS Approved Products List (APL)
- Suppliers' product features:
  - Utility or Solar Power
  - Thermal, Radar, Camera, or LiDAR Detectors
  - Cameras for Verification
  - Alert System

### Wrong Way Vehicle Detection System



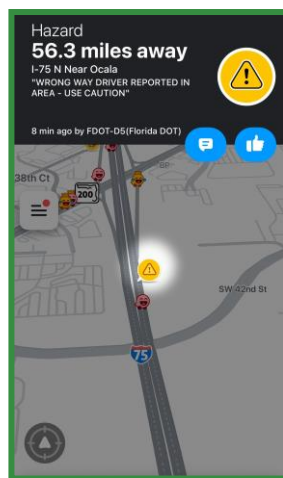
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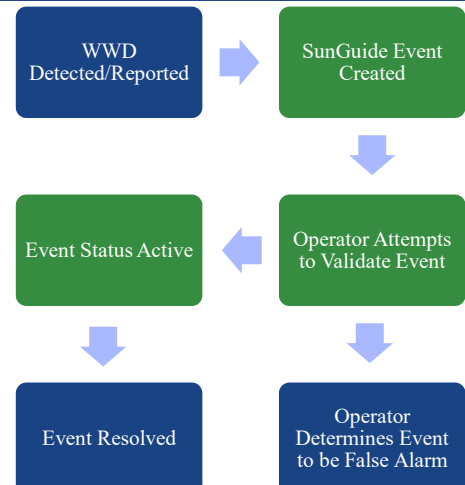
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## WWVDS Alerts to Navigation Providers

- Currently WWVDS alerts to third party navigation providers in the central Florida area
- These alerts warn right-way drivers near detected wrong-way drivers
- Future efforts to be undertaken is to expand Statewide



Green items indicate when event alerts are sent to 3<sup>rd</sup>-parties



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## Countermeasures in Action



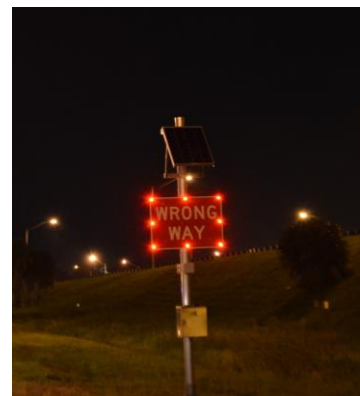
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## Arterial Countermeasures

### Countermeasures on Divided and One-way Arterials



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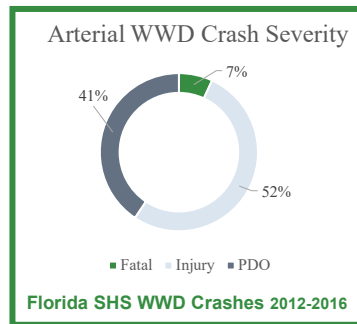
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## Reasons for Arterial Countermeasures

### Arterial (1,890 crashes)

- Over **six (>6x) times more likely** to be in a crash compared to freeway WWD
- About 6 out of 10 crashes end with a person harmed
- Three (3x) times** less likely to be in a **fatal** crash compared to freeway WWD



### WWD on Arterials

- WWD crashes are more frequent on arterial streets than freeways
- Factors include dark conditions, unfamiliarity, unclear signage, and lower traffic volumes

### Design Considerations

- Arterial roadway characteristics could be targeted to mitigate crashes
- Additional countermeasures at points of entry may reduce wrong-way driving

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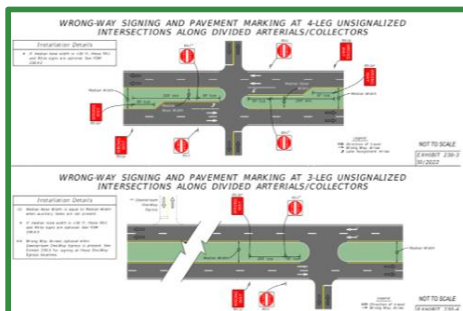
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## Arterial Design Guidance to Deter WWD

### Summary of changes to FDOT Design Manual (FDM):

### 230 Signing and Pavement Marking:

- Wrong-way became branded as FDM 230.4 including the following arterial subsections:

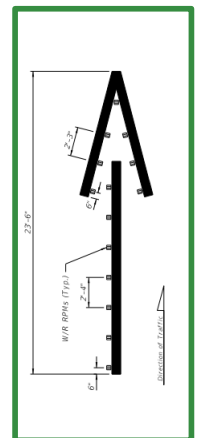


230.4.3 Divided  
Arterials and  
Collectors

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

230.4.5  
Undivided One-  
Way Streets

230.4.6 Two-Way  
Signalized  
Intersections



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## Section 230.4.6 Two-Way Signalized Intersections



BEFORE



AFTER

Intersection in Florida Panhandle Region

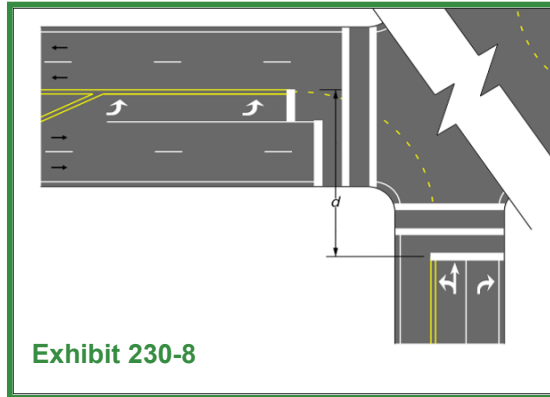


Exhibit 230-8

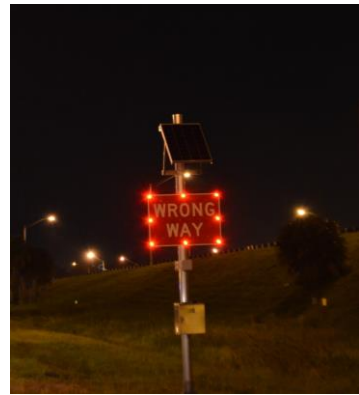
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## Education

### Use of Media Outlets and Social Media



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## Communications and Education

### Types of Communications

- Interviews with Media
- FDOT WWD Website ([fdot.tips/wrongway](http://fdot.tips/wrongway))
- Public Service Announcements and 30-second videos
- Print and digital educational materials
- Social Media

### Content Shared

- Functionality and deployment of engineering countermeasures
- WWD Crash data/history
- Educational tips for road users

### Distribution Methods

- Safe Mobility for Life Resource Center and Social Media
- Data-driven targeted outreach
- Tax Collector toolkits

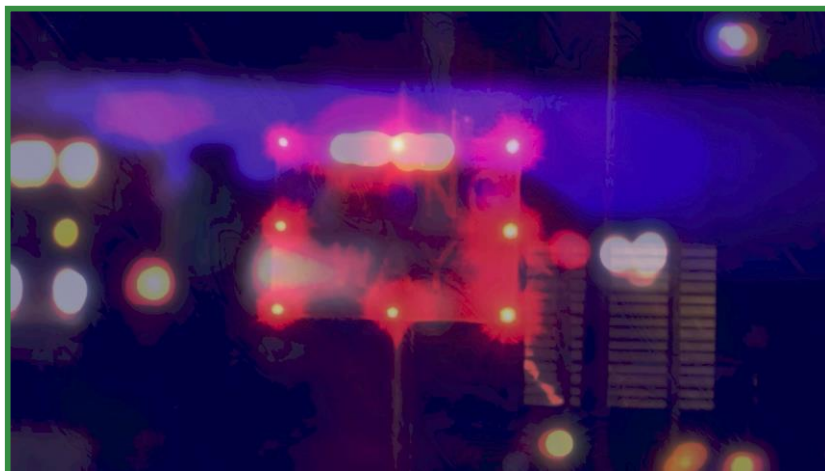


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## Example PSA



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## Types of Communications: Website



FDOT Wrong-Way Driving Website

### Sections

- Research
- Countermeasures
- Education
- Frequently Asked Questions

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## Content Shared: Educational Tips for Road Users

- **FDOT's Safe Mobility or Life Insider Newsletter**
  - Focus on Handling WWD Situations
  - Distributed print and digitally
  - Reached over 3500 people
- **Safe Mobility for Life Social Media Campaigns**



*Social Media Posts on X/Twitter (Above) and Facebook (Right)*



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## Future

### Future: Future Efforts and Plans



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## Future Efforts

- Continued deployment of countermeasures and coordination with stakeholders
- Development of alternative countermeasures to maximize system coverage
- Further exploration of computer vision to assist in detection of wrong-way drivers
- Full before-after study on currently implemented countermeasures on both freeways and arterials

FDOT Remains Open to New Innovative Ideas and Countermeasures



FDOT WWD Strategic Plan

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## Latest Design Updates

Rick Jenkins, P.E. – Roadway Design Office



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## Lessons Learned

We are Listening!

- RPMs in Tire Path
- Changed in June 2023



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## Lessons Learned

- RPMs moved to inside of Arrows

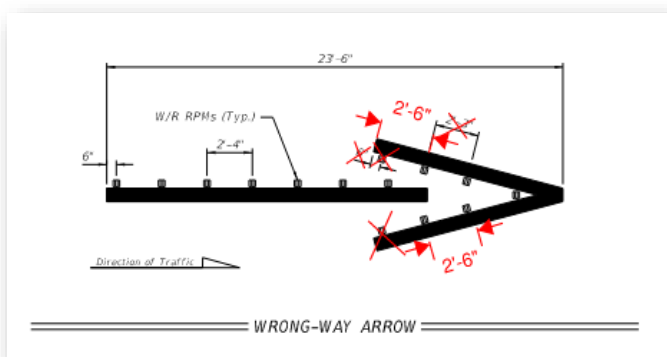


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## Standard Plans Index 706-001



- Reducing number of RPMs

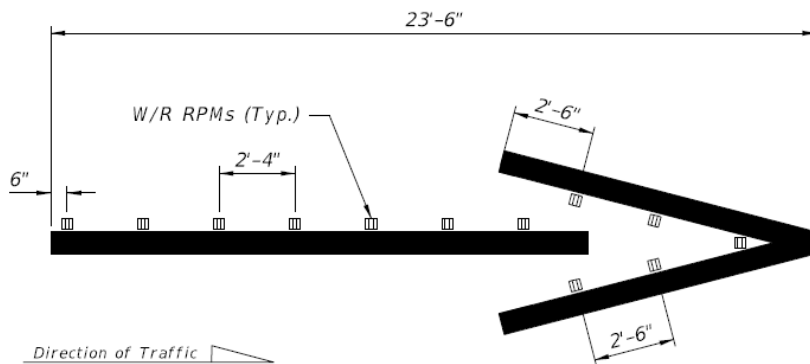
Index 706-001 – Typical Placement of Raised Pavement Markers

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# Standard Plans Index 706-001



# DRAFT

WRONG-WAY ARROW

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## Lessons Learned

We are Listening!

- Too Many Signs
- More Flexibility



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# FDOT Design Manual (FDM) Chapter 230



- FDM Chapter 230 Updates
- Clarify when and where to use criteria
- Markings no closer than 450 feet apart (300 for high risk)
- Guidance for sign placement

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## FDM 230.4 Wrong-Way Signs and Pavement Markings

### 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 for enhanced conspicuity on DO NOT ENTER (R5-1) and static WRONG WAY (R5-1a) sign columns in accordance with **MUTCD Section 2A-18**. Include white retroreflective strips for enhanced conspicuity on standalone ONE WAY (R6-1) sign columns in **Exhibits 230-5, 230-6, and 230-7** in accordance with **MUTCD Section 2A-18**. Orient wrong-way signs in the direction they are intended to regulate. Avoid placement of wrong-way signs in locations that are visible to drivers traveling the appropriate direction. 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.

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# Lessons Learned



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## Arterials and Collectors

Topic #625-000-002  
FDOT Design Manual

### 230.4.3 Divided Arterials and Collectors

This section is intended for unsignalized, stop-controlled connections (i.e., a two-way or one-way side street, commercial driveway, or driveway) along divided arterials or collectors with a full median opening. For connections without a median opening, see [FDM 230.4.4](#). Provide Wrong-Way Arrow pavement markings at unsignalized intersections with median widths of 20 feet or greater.

Provide DO NOT ENTER (R5-1) signs and WRONG WAY (R5-1a) signs on the outside shoulder at all unsignalized intersections. Provide DO NOT ENTER (R5-1) signs and WRONG WAY (R5-1a) signs on the median at unsignalized intersections with median nose widths of 30 feet or greater. (See [Exhibits 230-3 and 230-4](#)). Orient each median sign face at 45 degrees toward the connection it is intended to regulate. For median nose widths less than 30 feet, the median DO NOT ENTER (R5-1) and WRONG WAY (R5-1a) signs are optional. Place each sign as close to the wrong-way roadway as possible while meeting the placement criteria of **Standard Plans, Index 700-101**.

See [Exhibits 230-3 and 230-4](#) for recommended configurations of Wrong-Way Arrow pavement markings, DO NOT ENTER (R5-1) signs, and WRONG WAY (R5-1a) signs.

- FDM 230.4.3 Edits
- Clarification on Section
- Median Nose Widths Less than 30 ft (Signs are Optional)

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# Arterials and Collectors



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## Engineering Judgement

*Commentary: For median nose widths less than 30 feet, median DO NOT ENTER (R5-1) and WRONG WAY (R5-1a) signs should only be considered in high-risk locations (as described below). If placed in these narrower medians, ensure details in the plans clearly specify 45-degree rotation of each sign toward the wrong way movements to reduce visibility to those making proper turning movements.*

At intersections with positive offset left-turns, use DO NOT ENTER (R5-1) signs with dimensions of 48 inches by 48 inches in the median. The outside shoulder DO NOT ENTER is to meet the minimum size per Table 2B-1 of the MUTCD that corresponds to the mainline roadway classification. See **FDM 212.14.4** for further information on offset left turn lanes.

For Context Classifications C1, C2, C3C, and C4 place Wrong-Way Arrow pavement markings in all lanes prior to unsignalized, stop-controlled connection (i.e., side streets, commercial driveways, or driveways) with median widths of 20 feet or greater. For roadways with multiple, closely spaced connections, use engineering judgement to place Space Wrong-Way Arrow pavement markings, no closer than 300 feet. The placement of Wrong-Way Arrow pavement markings must be spaced at 450 feet or greater, except in high-risk locations where the minimum spacing can be reduced to 300 feet. For all other

- FDM 230.4.3 Edits
- Use Engineering Judgement
- Min 450' Pavement Marking Spacing

230 - Signing and Pavement Marking

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## FDM 230.4.3 Divided Arterials and Collectors

Topic #625-000-002  
FDOT Design Manual

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 are typically identified in Safety Studies using factors such as land-use, presence of lighting, history of impaired driving, crash history, and an over-represented population of licensed drivers 25 or younger and 65 or older. Determination of high-risk locations is at the discretion of the District Traffic Operations Engineer (DTOE).

See Exhibits 230-3 and 230-4 for recommended configurations of Wrong-Way Arrow pavement markings, DO NOT ENTER (R5-1) signs, and WRONG WAY (R5-1a) signs.

At intermediate ends of medians, consider the use of KEEP RIGHT assemblies (R4-7 and OM1-3) sign for median nose widths less than 30 feet.

- FDM 230.4.3 Edits
- Coordinate with District Traffic Operations Engineers

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## FDM 230.4.4 One-Way Pairs

### 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 signalized and unsignalized, stop-controlled connection (i.e., side streets, commercial driveways, or driveways) with one-way egress. ONE WAY (R6-1) sign shall be placed on far side median or shoulder depending on facility type.

At driveways controlled by a non-signalized traffic control device with one-way egress, place a Right Turn Lane-Use Arrow in the approach lane, and 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 signalized and unsignalized, stop-controlled connection (i.e.,

- Arterials/Collectors without Median Openings

side streets, commercial driveways, or driveways) with one-way egress. For roadways with multiple, closely spaced connections, space Wrong-Way Arrow pavement markings based on engineering judgement. Space Wrong-Way Arrow pavement markings no closer than 300 at 450 feet or greater, except in high-risk locations where the minimum spacing can be reduced to 300 feet. 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 are typically identified in Safety Studies 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 District Traffic Operations Engineer (DTOE).

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# FDM 230.4.5 Undivided One-Way Streets

## 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. **Space Wrong-Way Arrow pavement markings no closer than 450 feet apart.**
- (4) Add turn and through lane-use arrow on approaches to the one-way street.
- (5) For one-way approaches, place the following signs and pavement markings as illustrated in **Exhibit 230-7**.
- (6) 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.
- (7) Place DO NOT ENTER (R5-1) signs on both sides of the one-way street.
- (8) Place Wrong-Way Arrow pavement markings in all lanes prior to the side street. **Space Wrong-Way Arrow pavement markings no closer than 450 feet apart.**

- Undivided One-Way Streets
- WWD Arrows No Closer than 450 ft

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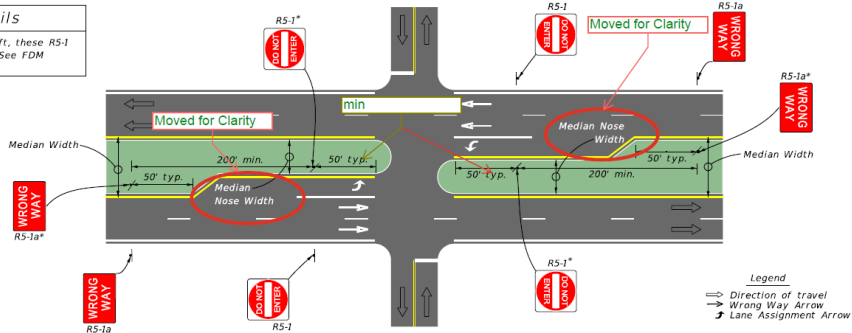
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## FDM Exhibit 230-3 Redline

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

#### Installation Details

\* If median nose width is <30 ft, these R5-1 and R5-1a signs are optional. See FDM 230.4.3



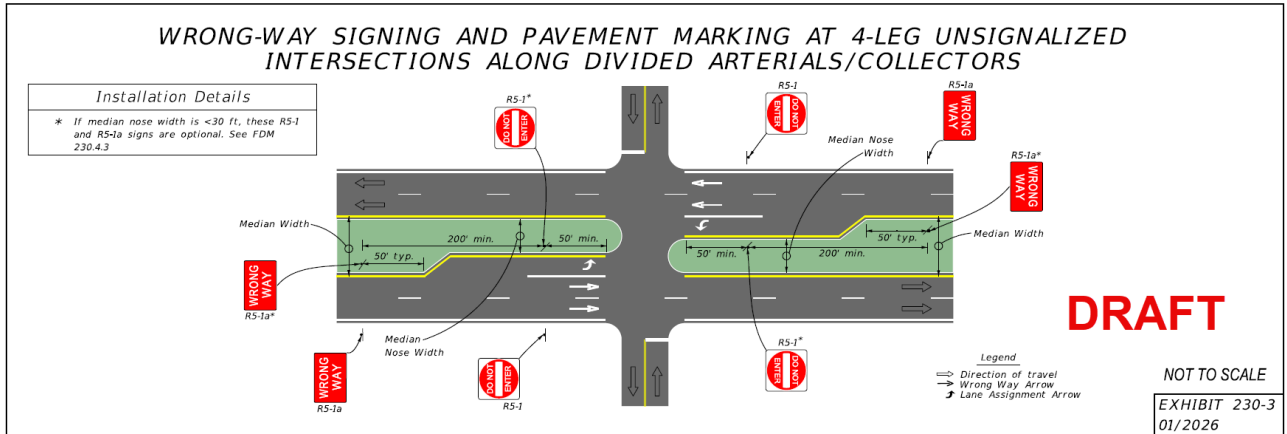
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# FDM Exhibit 230-3 DRAFT



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## Contact Us

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# Q&A




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📅 October 28-29, 2025

📍 Orlando, FL






## DEADLINE

Please be sure to **certify your attendance** before leaving this event or no later than **Friday, November 21<sup>st</sup>**, in order to receive PDH/CEC. Detailed instructions are available on the Transportation Symposium website.

Transportation Symposium Website



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