FHWA Wrong-Way Driving Workshop
Innovative Countermeasures
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State Traffic Engineering & Operations
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Traffic Engineering and Operations
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2014
- SEPTEMBER 2014
  Request to Experiment (RTE) - D3 Red Internally Illuminated Raised Pavement Markings

2015
- OCTOBER 2014
  RTE - D7 Red Rectangular Rapid Flashing Beacon (RRFB)
- APRIL 2015
  Bulletin - Signing and Pavement Marking at Ramp Intersections

2016
- MARCH 2016
  RTE - Florida Turnpike Red- RRFB
- NOVEMBER 2015
  (FSU) - Driving Simulator Studies on Human Factor

2017
- MARCH 2017
  (CUTR) - Comparing Seven Countermeasures

2018
- NOVEMBER 2018
  (CUTR) - Testing and Evaluation Video Detection Systems for Freeway Mainlines
- MARCH 2018
  (FIU) - Data-Driven Approach for Identifying Hotspots
- JULY 2019
  Bulletin – Implement LED highlighted WRONG WAY signs at exit ramps

2019
- NOVEMBER 2018
  (FIU) - Strategies to Mitigate Wrong-way Driving Incidents on Arterials
- MARCH 2019
  Countermeasure Implementation Plan

2020
- NOVEMBER 2019
  (FIU) - Strategies to Mitigate Wrong-way Driving Incidents on Arterials

2021
- JUNE 2021
  Bulletin – Countermeasures for Arterials and Collectors
- NOVEMBER 2021
  2022 FDM Published with Traffic Design Ch. 230 S&PM Updated

2022
- NOVEMBER 2022
  2022 FDM Published with Traffic Design Ch. 230 S&PM Updated

- Request to Experiment
- Bulletin
- Research Projects
Agenda

- Evaluated WWD Countermeasures
- Wrong Way Vehicle Detection System (WWVDS)
- Signing and Pavement Marking (S&PM) Countermeasures Deployments
- LED Highlighted Wrong-Way Signs Countermeasures Deployments
- Wrong Way Driving Safety Countermeasures Dashboard
- Reasons for Arterial Design Guidance
- Recommendations
FDOT’s WWD Initiative

FDOT’s Vision Zero target

FDOT’s Vital Few

Safety  Mobility  Innovation  Workforce

Bar Density

Alcohol-related WWD Hotspots
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
Wrong Way Vehicle Detection System (WWVDS)

January 2022 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

660-2.2.1.4 Wrong Way Vehicle Detection Systems: Wrong way vehicle detection systems produce an alarm output when a vehicle is detected traveling in the wrong direction and may consist of more than one detection zone and may use any of the technology types. For both mainline and ramp installations, the detection system must monitor all lanes for one direction, including shoulders. The wrong way detection system must not interfere with other vehicle presence or traffic data detection systems.
How Wrong Way Vehicle Detection System Works

1) Detects Vehicle
2) Triggers Lights
3) Notifies Officials
4) RTMC Alerts Other Drivers

- Detects Vehicle: Signs located on the exit ramps use system to detect vehicle traveling the wrong way.
- Triggers lights: Flashing lights are turned on along sign border to alert the driver he/she is traveling in the wrong direction.
- Notifies officials: Detection system sends alert immediately to operators at an FDOT Regional Transportation Management Center (RTMC) and law enforcement officials.
- Alerts other drivers: RTMC system broadcasts a wrong-way driver alert on message boards along the freeway.
## Signing and Pavement Marking (S&PM) Countermeasures Deployments

### Statewide

<table>
<thead>
<tr>
<th>Number of Off-Ramps</th>
<th>Complete</th>
<th>Planned</th>
<th>Not Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,232</td>
<td>1,080 (88%)</td>
<td>121 (10%)</td>
<td>31 (3%)</td>
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Status as of 2/22/22

### Diagrams

- **TYPICAL LAYOUT FOR DIAMOND INTERCHANGE EXIT RAMP**

- **Installation Details**:
  1. Reflective paint, reflective chevrons, and chevron in stops appropriate for multi-lane ramps.
  2. Install sequential chevrons at a minimum of 400 feet.
  3. Include sequential chevrons as shown in the hazard plan.
  4. Include a turn exit in fill-in or fill-completion marks.
  5. Include for connecting road to:
     - Reflective paint
     - Reflective chevrons
     - Chevron in stops

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**Dual Left Arrows in Left Turn Lanes pointing to an off ramp**

**Remove Turn Arrows; place "Straight arrows, ONLY Shield"**
LED Highlighted Wrong-Way Signs Countermeasures Deployments

- Turn-around rates show the effectiveness of the LED-highlighted WRONG WAY signs

- Florida Turnpike Enterprise:
  - Latest: 35 off-ramps currently operational
  - 159 confirmed WWD events during Oct 2014-March 2021
  - 98% turn-around rate

<table>
<thead>
<tr>
<th>Statewide</th>
<th>Number of Off-Ramps</th>
<th>LED Highlighted Wrong Way Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Completed</td>
</tr>
<tr>
<td></td>
<td>1,232</td>
<td>65 (5%)</td>
</tr>
</tbody>
</table>

Status as of 2/22/22
Once CO receives Executive Alert of a WWD crash occurring
- SunGuide Executive Alerts
- SunGuide Chronology Reports
- FHP Crash Reports and Press Releases

Analysis of the crash is conducted summarized into one diagram

Analysis includes:
- Map outlining the travel of wrong-way driver
- Narrative of the event
- Countermeasure Deployment details for ramps that were identified as potential points of entry
- Travel diagrams for each ramp showing how the WWD could have entered the ramp
WWD Stopped by FHP on 10/6/2021

- At 2:15pm, the video analyst for WWD detection alerted to a WWD on I-75 SB, Exit 101.
- The TMC staff notified FHP and posted DMS messages to alert other drivers to the presence of the WWD.
- FHP stopped the WWD near MM 104. No incidents or crashes were caused due to this WWD.
Reasons for Arterial Design Guidance

Florida SHS WWD Crashes 2012-2016

**Arterial** (1,890 crashes)

- Over six (>6x) times more likely to be in arterial WWD crash than freeway
- About 6 out of 10 arterial WWD crashes end with a person harmed

**Freeway** (285 crashes)

- Three (3x) times more likely to be in fatal crash on freeway than arterial
- About 7 out of 10 arterial WWD crashes end with a person harmed
Arterial research identified roadway characteristics we could target to mitigate large portion of crashes.

Research identified crashes occur very close to point of entry so if we can correct the point of entry, wrong-way driving may be largely reduced.

**WWD Freeway:**
- Draw more media attention
- Often involve more vehicles
- Can cause extended closures
- Result in more fatalities per crash

**WWD Arterial:**
- WWD crashes are more frequent on arterial streets than freeways
Summary of major changes to:
FDOT Design Manual (FDM) 230 Signing and Pavement Marking

- FDM 230.4: Converted to **Wrong-Way Signs and Pavement Markings**
  - Now includes both interchanges and arterials/collectors

- Added FDM 230.4.3 **Divided Arterials and Collectors**
- Added FDM 230.4.4 **One-Way Pairs and Divided Arterials/Collectors with One-Way Egress**
- Added FDM 230.4.5 **Undivided One-Way Streets**
- Added FDM 230.4.6 **Two-Way Signalized Intersections**

Link: [https://www.fdot.gov/roadway/fdm/default.shtm](https://www.fdot.gov/roadway/fdm/default.shtm)
Section 230.4.6 Two-Way Signalized Intersections

Thomasville Hwy (US 319/ SR 61) and Bradfordville Rd

Exhibit 230-8
Leveraging Partnerships and WWD Knowledge

**National Guidance**
- AASHTO Innovation Initiative
- Road Safety Foundation Award

**Florida Next Steps**
- Education - Safe Mobility for Life, FAQ
- Engineering - innovative countermeasures
- Enforcement - FHP and Law Enforcement Coordination
WWD Countermeasures Dashboard

519 Total Wrong Way Crashes
255 Total Alcohol Related Crashes
156 Total PDO Crashes
252 Total Injury Crashes
111 Total Fatal Crashes

Crash Summary by District (2011-2019)

Crashes by Year and Severity
Thank You!