

## 0-6769: Wrong Way Driving Countermeasures

### Background

Even though wrong way driving (WWD) crashes on controlled-access highways are infrequent (less than 1 percent of all traffic crashes in Texas), they result in severe injuries and fatalities, and continue to occur despite more than 50 years of research and countermeasure implementation. Questions remained about which countermeasures actually catch the attention of wrong way drivers and are effective at getting them to self-correct before reaching the main lanes, especially those drivers that are driving under the influence of alcohol. In addition, recent implementations of WWD countermeasures and mitigation methods in several locations in Texas provided the opportunity to assess the effectiveness of these tools in actual operational environments. The Texas Department of Transportation (TxDOT) also posts wrong way driver warning messages on dynamic message signs (DMSs); however, no guidance existed about the design of these types of messages.

### What the Researchers Did

Researchers reviewed the state of the practice regarding WWD in the United States and Texas. Researchers then designed and conducted two closed-course studies to determine the effectiveness of select WWD countermeasures on alcohol-impaired drivers. In addition, researchers obtained preexisting data from several Texas agencies that had installed WWD countermeasures and/or mitigation methods on their road network. Using these datasets, researchers assessed the effectiveness of the implemented strategies in actual operational environments. Researchers also used the focus group discussion method to obtain motorists' opinions regarding the design of wrong way driver warning messages that can be displayed on DMSs. Based on the focus group findings and accepted message

design principles, researchers developed two single-phase wrong way driver warning messages that can be posted on DMSs.

### What They Found

Researchers found that alcohol-impaired drivers tend to look less to the left and right and more at the pavement in front of the vehicle. In addition, researchers confirmed that alcohol-impaired drivers concentrate their glances in a smaller area within the forward-driving scene.

Making a WRONG WAY sign larger (i.e., oversized), adding red retroreflective sheeting on the WRONG WAY sign support, or adding red flashing light-emitting diodes (LEDs) around the border of a WRONG WAY sign (Figure 1) did not improve the ability of the alcohol-impaired participants to locate WRONG WAY signs. However, participants thought these three countermeasures caught their attention more than the lowered WRONG WAY signs and the normal-size WRONG WAY signs without a conspicuity element. In addition, data from the US 281 test corridor in San Antonio showed that WRONG WAY signs with red flashing LEDs around the border were effective at reducing WWD events.

**Research Performed by:**

Texas A&amp;M Transportation Institute

**Research Supervisor:**

Melisa D. Finley, TTI

**Researchers:**Steven Venglar, TTI  
Vichika Iragavarapu, TTI  
Jeff Miles, TTI  
Eun Sug Park, TTI  
Scott Cooner, TTI  
Stephen Ranft, TTI**Project Completed:**

8-31-2014



**Figure 1. WRONG WAY Sign with Red Flashing LEDs around the Border.**

Researchers found that lowering the height of the white-on-red signs did not improve the ability of alcohol-impaired participants to locate signs, identify the background color, or read the legend compared to the standard sign height. In addition, researchers could not confidently conclude whether lowered signs were effective at reducing WWD events.

Researchers modified the design of the current retroreflective raised pavement marker (RRPM) wrong way arrow used by TxDOT in an effort to reduce the occurrence of damaged or missing RRPMs. Researchers found that a modified wrong way arrow design performed as well as the current design.

Researchers determined that wrong way driver warning messages should be comprised of an alert (WARNING), problem (WRONG WAY DRIVER), and validation (REPORTED). The location of a wrong way driver is difficult to determine, monitor, and update due to the dynamic nature of the situation. Thus, location information should not be included in wrong way driver warning messages.

### **What This Means**

The findings from this research effort show that a wide variety of countermeasures and mitigation methods are needed to combat WWD on controlled-access highways. Researchers believe that low-cost traditional and innovative traffic control device countermeasures are effective at reducing WWD events. However, based on the findings of this research and anecdotal evidence, researchers suspect that these countermeasures will not attract the attention of or be understood by highly intoxicated drivers. Therefore, WWD detection systems are also needed. Based on the findings of this research effort, researchers developed guidelines for TxDOT districts where WWD has been identified as an issue.

Researchers also made recommendations regarding the design and display of wrong way driver warning messages on DMSs.

Future WWD research efforts should focus on the use of connected vehicle technology. Connected vehicles and their integration with transportation infrastructure provide new approaches to WWD detection, warning, and intervention that will help practitioners further reduce the occurrence and severity of WWD crashes.

### **For More Information**

**Project Manager:**

Darrin Jensen, TxDOT, (512) 416-4728

**Research Supervisor:**

Melisa D. Finley, TTI, (979) 845-7596

Technical reports when published are available at <http://library.ctr.utexas.edu>.

Research and Technology Implementation Office

Texas Department of Transportation

125 E. 11th Street

Austin, TX 78701-2483

[www.txdot.gov](http://www.txdot.gov)

Keyword: Research