



# Systemic Approach to Wrong Way Driving Safety: Effective Practices Brief

## IOWA DOT

***Wrong way driving crashes occur randomly and less frequently than other crash types; however, they often involve multiple vehicles and result in multiple fatalities and/or serious injuries.***

Many transportation agencies currently implement wrong way driver detection and deterrence tools and practices, but the variety of potential tools and practices vary, are often expensive, and are, in some cases, adopted as “spot treatments,” typically at the corridor scale. The wide variety of tools and price factors are significant barriers to adoption, and disconnected implementation has a high potential for limited results.

Recent research has found that risk factors for wrong way driving do not limit themselves to high-volume corridors. A AAA Foundation for Traffic Safety’s analysis of National Highway Traffic Safety Administration Fatality Analysis Reporting System (FARS) data for divided highways found that the following risk factors were associated to a greater degree with wrong way drivers than their right way driver counterparts:

- Imputed Blood Alcohol Content (BAC) – risk increases with BAC
- License status – risk increases for drivers with suspended or revoked licenses
- Driver’s age – risk increases for those ages 70 and over
- Vehicle age (based on model year) – risk increases with the age of the vehicle

On average there are **432 deaths annually** from wrong way driving crashes on controlled-access highways (2010–2018).<sup>1</sup>

This is a **20% increase** over previously reported data from 2004–2009.<sup>2</sup>

<sup>1</sup> AAA Foundation for Traffic Safety

<sup>2</sup> National Transportation Safety Board

Further, wrong way driving is not limited to divided highways or freeways and should be considered along prioritized arterials where wrong way driving crashes occur more frequently (though with a lower risk of fatality due to slower travel speeds).

### THE SYSTEMIC APPROACH

A systemic approach to wrong way driving considers an agency’s entire roadway system. The approach holistically applies proven methods, physical improvements, and technologies to mitigate wrong way driving. These countermeasures can integrate into existing approaches and programs for safety and help achieve agency safety objectives.

Recent agency experience among four states (California, Florida, Iowa, and Michigan) highlights a range of proven and emerging countermeasures that respond to different roadway characteristics (such as interchange type) as well as demographic and land use factors. Many of these treatments are low-cost countermeasures, and readily implemented without substantial investment in technology.

Though infrequent, wrong way driving crashes come at high costs from serious injuries and fatalities. Reducing these crashes through a systemic approach to wrong way driving countermeasures can yield highly cost-effective safety benefits, and agencies can learn from and adopt the practices of states leading a systemic approach to wrong way driving. This brief focuses on the effective practices of Iowa DOT.

### **Why the Focus?**

Around 2010, a Multidisciplinary Safety Team, consisting of law enforcement, fire, and other local agencies who regularly share information on construction issues and incidents, met in the Ames region and suggested that 911 calls for wrong way driving incidents had been occurring too frequently (an average of at least one call every two to three weeks along a 25-mile stretch of US 30 between Boone and Nevada, Iowa). The team invited an ITS engineer from Iowa DOT to review the issue, which catalyzed an ongoing, decade-plus-long focus on wrong way driving data, first in Ames, and gradually statewide, especially through deployment of detection and camera technologies. For example, around 2017, the same sense that too many 911 calls were taking place in the Cedar Rapids region expanded the examination of wrong way driving to the metro area's I-380, US 30, and IA-100.

### **Approach Taken**

Iowa DOT used existing traffic cameras and additional cameras installed for the purpose of monitoring interchanges flagged as problematic to identify the contributing factors to wrong way driving entries onto freeways. Iowa DOT took advantage of new cameras provided by vendors for testing purposes.

By 2018–19, Iowa DOT had allocated new funding to cameras, pavement markings and signs, and collaborated with Iowa State University to study experimental detection techniques with existing cameras. Iowa DOT used a recent study from Auburn University to develop a network screening process that ranked all interchanges in Iowa for wrong way driving potential. The network screening and scoring methodology prioritized 36 at-grade intersections

and 129 interchanges statewide, for a total of 165 locations, 62 of which included a camera with video analytics for wrong way driving detection. Pavement markings, signs, and the select locations for cameras began installation in 2021. Sites selected for cameras exhibited a high probability for wrong way entry and would allow Iowa DOT to collect better data on the causes of the problem.

### **Careful Study – Simple Solution**

In 2019, local law enforcement observed a significant instance of wrong way driving at a newly constructed interchange in Dyersville. A camera confirmed the high rate of wrong way entries and subsequently helped evaluate the efficacy of a series of trial countermeasures. After experimentation with upwards of 10 countermeasures over roughly one year, Iowa DOT identified that adding “RAMP” under the “DO NOT ENTER” sign to be successful at deterring wrong way drivers. These drivers had been willfully ignoring the “DO NOT ENTER” sign as they desired to access a location visible beyond the sign.

### **Outcomes and Benefits**

Prior to the 2021 deployment of systemic countermeasures, Iowa DOT collected several months of before data and, by summer 2023, about two years of after data. The following countermeasures have shown positive results, as Iowa DOT continues to study its deployments:

- Enhanced signing (size and placement) and pavement markings for partial cloverleaf interchanges – 93% reduction in wrong way driving events





- Enhanced signage (DO NOT ENTER and RAMP signs in post-anchored perforated square steel tube legs) placed at ramp terminal – 91% reduction in wrong way driving events



- Addition of acceleration lane at 4-lane divided highway at-grade intersection – 71% reduction in wrong way driving events



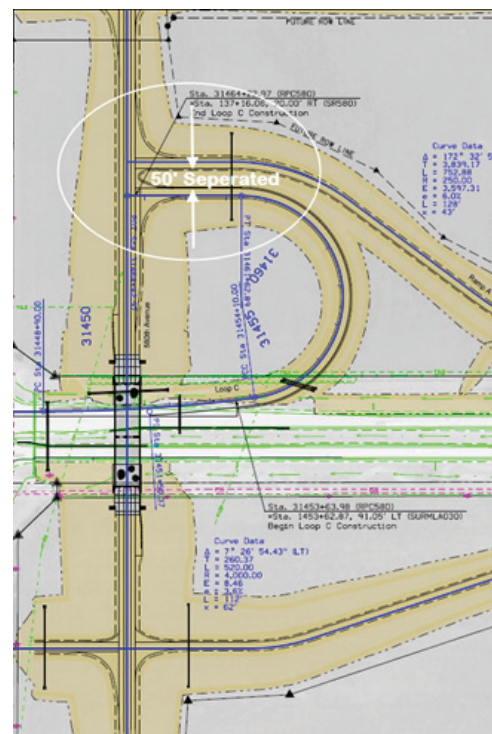
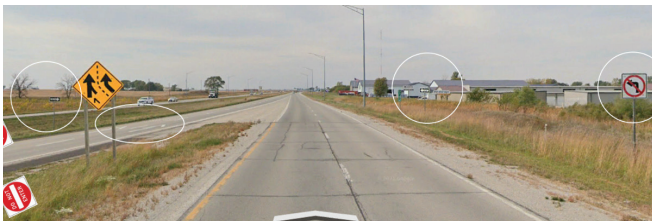
- Enhanced signage (change left turn arrow to straight arrow in advance of exit ramp) – 76% reduction in wrong way driving events



Iowa DOT has implemented several policy changes based on its experience with countermeasure deployment:

- Design change to partial cloverleaf interchanges to avoid inadvertently creating wrong way driving opportunities whereby the on/off ramps are changed from placement next to one another, only separated by paint to placement 50 feet apart, separated by a depressed median.

- Enhanced signage at entrance ramp terminal (MUTCD Treatment 2B-19) – 62% decrease in wrong way driving events



- Disconnect power to a luminaire at 4-lane divided highway at-grade intersection – 55% reduction in wrong way driving events during the night

- Enhanced signage and pavement markings for partial cloverleaf interchanges have been incorporated into design standards.
- All wrong way driving calls that come into the traffic management center now get coded specifically as wrong way driving events, which increases awareness. Wrong way driving alerts are posted to all dynamic message signs within a 10-mile radius.

### **Further Investigation**

At the 62 sites that include a camera with video analytics, Iowa DOT is examining the effectiveness of the corresponding countermeasures and what next steps might be taken if the results are insufficient.

Three of the 62 cameras are trailer-mounted and can be redeployed quickly to investigate additional problem areas. Findings from the first round of systemic deployments will inform a newly funded second round of countermeasures. Iowa DOT has allocated additional funding in 2024 for approximately 100 new locations consisting of interchanges and at-grade intersections with high-speed roadways that were not part of the initial 2021 deployment.

### **Additional Conclusions**

Iowa DOT's approach has relied greatly on studying perceived or suspected wrong way entry points through video. Video has enabled the department to verify problems and determine which countermeasure is most effective at addressing the underlying cause. The ability to share video has increased internal awareness and appreciation for the problem. Indeed, "video is worth a million words." Vendors' willingness to supply cameras for testing has been critical.

## RESOURCES

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[Partial Cloverleaf Enhanced Signing and Pavement Markings Design Standard](#)