Florida Department of Transportation Research

Developing Safety Performance Function and Crash Modification Factor for Managed Lanes Separation Treatments

June 2023

Project Number
BE975

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Current Situation

How does a large state with growing traffic volumes maintain the safety and mobility of its traveling public?

Managed lanes are one option. With managed lanes, the use of the lane changes depending on traffic conditions. These can either be a traditional non-reversible lane for each direction of travel or reversible, where the direction of traffic can change depending on traffic needs.

Managed lanes are separated from general-purpose lanes to ensure safety of the drivers. Common separation treatments include barrier separation, buffer separation with pylons, buffer separation with pavement markings, wide buffer separation, and grade separation. Each treatment has varying impacts on the overall safety and operational performance of the managed lanes.

Concurrent Flow Express Lanes along I-75 in Florida.

How do these different lane separators impact safety for both non-reversible and reversible managed lanes?

A team of researchers at Florida International University and Texas Transportation Institute made a concerted effort to make this determination.

Research Objectives

The objective of this project was to quantify the effects of managed lanes separation types on the safety performance of freeway facilities with managed lanes and to develop useful quantitative measures for comparing separation treatment alternatives for managed lanes.

Project Activities

The team analyzed two managed lanes separation types—pylons and concrete barriers. The team estimated safety performance functions, crash modification factors, and severity distribution functions. They also developed several crash models to predict crash frequencies for reversible and non-reversible managed lanes.

Following a comprehensive review of the state-of-practice, performance measures, and studies conducted on managed lanes by different agencies in the United States, the research team collected and processed crash, roadway characteristics, and traffic data from 10 facilities in Florida, Texas, and Georgia. This data included more than 44,000 crashes that occurred on 130 miles of general-purpose lanes and managed lanes from 2015-2019.

Project Conclusions and Benefits

Whether reversible or non-reversible, managed lanes become safer as the separation between them and general-purpose lanes increase. Each foot of additional separation width provides an additional measure of safety.

Some key differences were also found between reversible and non-reversible managed lanes. With non-reversible (i.e., concurrent flow) lanes, as the number of managed lanes increase, the number of crashes on the roadway will also increase. However, the severity of these crashes can be mitigated using pylons and concrete barriers. On the other hand, additional reversible managed lanes actually reduce multi-vehicle fatal injury and multi-vehicle property damage crashes.

The safety performance measures developed in this research can assist the Florida Department of Transportation (FDOT) as well as other transportation agencies when considering future managed lanes initiatives. The project also provides tools for practitioners to better understand how to use the research findings, including sample problems, a spreadsheet application, a geographic information systems (GIS) inventory of managed lane facilities in Florida, and summary sheets on the safety performance of reversible and non-reversible managed lanes.

For more information, please see fdot.gov/research.