FACT SHEET

Optimizing Future Work Zones in New England for Improved Safety and Mobility

RESEARCH PROJECT TITLE
Optimizing Future Work Zones in New England for Improved Safety and Mobility

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MORE INFORMATION
To view the full final report on the NETC website, click here.

The New England Transportation Consortium, a cooperative effort of the transportation agencies of the six New England States, funded this research. Through the Consortium, the states pool professional, academic and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region's transportation system.

The NETC is hosted by the University of Vermont Transportation Research Center

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Introduction: What was the Problem?

In a 2013 American Society of Civil Engineers (ASCE) report, America's infrastructure received an overall rating of "D+". It was estimated that more than $3.6 trillion is needed by 2020 to fix the infrastructure problems. It is anticipated that there will be a growing number of work zones in New England in the coming years due to highway and bridge construction and maintenance activities. Work zones often require lane/shoulder closure or lane shift that lead to traffic congestion and increased crash risk, particularly rear-end and angle crashes due to stop-and-go traffic and unsafe merge behaviors. This research aims to improve the safety and mobility of highway work zones utilizing advanced simulation tools and innovative data sources.

Methodology: What was done?

This study focuses on highway work zone speed and merge control strategies. It innovatively utilizes the Naturalistic Driving Study (NDS) data for analyzing work zone crash and near-crash event characteristics, and generates useful insights into how crashes and near crashes develop and occur in work zones. It also develops and applies a Virtual Reality (VR) driving simulator for investigating various work zone speed control strategies. Additionally, this study proposes a New England Merge (NEM) control, which is compared to no control, early merge, late merge, and signalized merge based on VISSIM simulation and Surrogate Safety Assessment Model (SSAM) analysis.

Conclusion: What are the next steps?

The analysis of the NDS crash data suggests that distraction is the most important endogenous factors contributing to work zone crashes and near crashes followed by fatigue driving and speeding. Stop-and-go traffic, sudden slowdown of lead vehicle, and unsafe merging maneuvers of vehicles in adjacent lanes are identified as top exogenous factors. The results of the VR driving simulation, a comprehensive literature review, and a questionnaire all suggest that radar speed sign/dynamic speed display can effectively reduce traffic speed in work zones. The NEM control performs significantly better than no control, early merge, and late merge under medium to extremely heavy traffic conditions in terms of both safety and mobility. It also consistently outperforms signalized merge under all flow conditions. It can be readily implemented when all vehicles are connected and automated. Without connected and autonomous vehicles, this method is still practical given driver compliance and proper law enforcements, which are also required by the early merge and late merge strategies that have been field implemented.

What are potential impacts?

The comprehensive literature review and the NDS data analysis results can help traffic engineers understand the causes of work zone crashes and the pros and cons of various speed and merge control methods. The VR driving simulator is a cost-effective tool for evaluating work zone control strategies. The NEM control has great potential to improve work zone safety and mobility and to be implemented in the near future.