

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 22-475 (project 591) | August 2022

Reliability-based Traffic Safety Risk Assessment of Traffic System in Hazardous Driving Conditions to Promote Community Resilience



the ISSUE

For decades, work zone traffic safety under adverse weather conditions has been a serious concern for drivers and transportation agencies. Natural hazards often cause disruptions on roads and bridges and work zones during the construction and maintenance. Existing studies on work zone traffic safety with statistical approaches are limited by the availability of data from historical crashes. To date, there is no comprehensive simulation framework to assess traffic safety on roads with work zones under adverse driving environments by considering both multi-vehicle and single-vehicle crashes.

the RESEARCH

To fill this gap, this study presents an integrated framework to evaluate traffic safety in work zones under adverse driving conditions by considering specific work zone configuration, weather, and road surface conditions. A new risk index is introduced to assess the traffic safety risk of work zones by integrating the risks of multi-vehicle crashes and single-vehicle crashes. Traffic safety of a typical work zone under different weather conditions is studied to demonstrate the proposed framework. The impacts of the differential speed limits and truck proportion on the work zone traffic safety are also investigated.

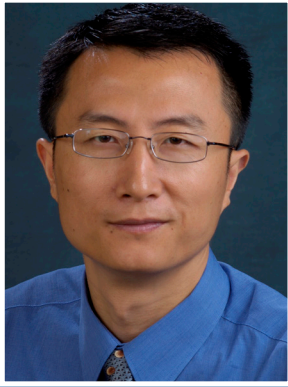


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Project Title

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the FINDINGS

Results show that adverse weather may increase the crash risk in work zones. The effect of differential speed limits on work zone traffic safety is found to be insignificant while the truck ratio influences work zone safety in rainy and snowy weather by primarily affecting multi-vehicle crash risks.

the IMPACT

The research provides an integrated tool with more accurate consideration of various adverse driving conditions, including those in work zones. With improved traffic planning and emergency response efforts based on the proposed model, road users will experience lower traffic safety risks even under adverse driving conditions. As a result, it is expected that drivers in work zones will experience safer and smoother traffic on traffic networks even when the driving conditions become adverse or hazardous.

For more information on this project, download the main report at <https://www.ugpti.org/resources/reports/details.php?id=1094>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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