Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Nebraska Rail Crossing Safety Research

Research Objectives

1. Updated NDOT's Nebraska Accident Prediction Model for rail crossings using the latest crash and rail crossing inventory data, and
2. Developed guidelines for improving safety (via uniformity of driver expectations) at urban rail crossings that are not Quiet Zones but are in vicinity of other Quiet Zone crossings

Research Benefits

Realization of benefits from a newly developed crash prediction model that outperforms the existing Nebraska Accident Prediction Model for rail crossings thereby allowing for more informed decisions regarding resource allocation for rail crossings. Guidelines for improving safety of urban crossings that are not Quiet Zone crossings enables Nebraska public agencies to improve public safety and reduce possible liability from crashes at rail crossings.

Principal Investigator

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University of Nebraska

Lead TAC Members

Jodi Gibson, Highway Local Assistance Division Manager

Background

The Nebraska Department of Transportation (NDOT) currently uses the Nebraska Accident Prediction Model for rail crossings to identify and rank crossings that may need scrutiny and perhaps subsequent safety improvements. Developed by the Midwest Research Institute (under contract to HNTB Corp.) in 1999, this crash prediction model was based on 5-year rail crossing accidents and inventory data from September 1993 through August 1998. It updated the previously used 1973 NDOR Hazard Index (a modified version of the NCHRP Report 50 Formula). The model over-predicts (about 10%), and results may not be optimal as many changes have occurred in terms of train and motor vehicle traffic, crash trends, and rail crossing inventory information. Other state DOTs (e.g., Iowa DOT) are in the process of updating their rail crossing crash prediction models. For acceptance and adoption by NDOT, the new model must outperform the existing NDOT Nebraska Accident Prediction Model for rail crossings.

Conclusion

The research objectives of this project were to update Nebraska Department of Transportation (NDOT) 1999 Nebraska Accident Prediction Model for Highway-Rail Grade Crossings (HRGCs) and to develop guidelines using Lancaster County Nebraska HRGCs for improving safety at urban gated HRGCs that are not designated quiet zones but are in the vicinity of quiet zone crossings.

FRA crash and HRGC inventory data were utilized for estimation of the new model after inventory information on 742 HRGCs was updated. HRGC crashes for 2008-2018 period were used for model estimation while 2019 HRGC crashes were used for model prediction validation. After consideration of several different model formulations, a Poisson regression model with scaled parameters was selected as the 2020 Nebraska HRGC Crash Prediction Model.

Lancaster County HRGCs consistency assessment was performed using Federal Railroad Administration's (FRA) Quiet Zone Calculator to analyze gated non-quiet zone HRGCs that are in proximity of designated quiet zone HRGCs. The general guidance on achieving a more consistent driving experience at such HRGCs is to consider the use of Supplemental Safety Measures including the use of mountable medians with reflective traffic channelization devices (vertical panels or tubular delineators) or non-traversable curb medians with or without channelization devices at non-quiet zone gated HRGCs that are in proximity of established quiet zones. A complete update of the statewide HRGC inventory is recommended to remove errors and missing values from the existing database.

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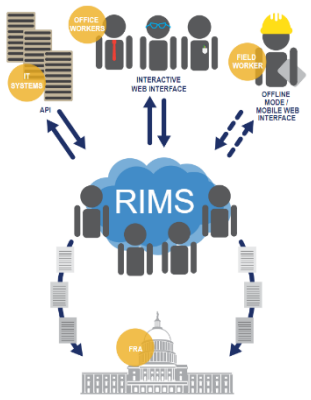
Interested in finding out more?
Final report is available at:
NDOT Research Website



NDOT Recommendations Based Off of Research Project

The research provided a better understanding of what the Department and Nebraska Counties need to update on the statewide Highway Railway Grade Crossings (HRGC) inventory. The research provided a model based on a Poisson regression model with scaled parameters as the Nebraska HRGC Crash Prediction Model. This model will need to be validated after the Department updates the HRGC inventory system for Nebraska's eight Districts, 593 Cities and 93 counties by adding missing values and removing errors in the existing database. This will be a collaboration effort between NDOT, Cities and Counties to complete a developed inventory checklist via field visits, NDOT pathweb (video log browser) and Google Earth when applicable. The validation of the new crash prediction model for rail crossing safety to assess the safety of rail crossings and for resource allocation among competing rail crossings will be useful for public agencies in Nebraska.

- *As provided by Jody Gibson, Lead TAC Member*

Research Readiness Level (RRL) Assessment

RRL 3

Level : Level 3: Development –

Research/Technology developed in an operational environment. Research will need a integration of components and follow a validation (real-world situation).

Technology Transfer

Transportation Research Board (TRB) papers and Publications

- Liu, Huiyuan and Aemal J. Khattak. Vehicular crash exposure rate estimation at highway-rail grade crossings. Paper presented at the 100th annual meeting of the Transportation Research Board, Washington DC, January 2021 (paper 21-03257).

Published Journal Papers And Theses/Dissertation

- Estimation of vehicular exposure at highway-rail grade crossings. Ph.D. dissertation by Dr. Huiyuan Liu; University of Nebraska-Lincoln, August 2020.

This brief summarizes Project SPR-P1 (19) M091
"Nebraska Rail Crossing Safety Research"
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