

0-6992: Traffic Safety Improvements at Low Water Crossings

Background

Texas leads the nation in flood-related deaths. Most of these deaths occur when motorists drive through moving water. Motorists attempt to cross a flooded roadway because they often do not realize how deep the water is in the crossing. This problem is particularly acute at nighttime during heavy storms when it is difficult to see that water is over the roadway. The National Weather Service reports that it takes only 18–24 inches of moving water to sweep away a truck and 6 inches of moving water to sweep a high-profile vehicle and a small car off the roadway.

Because it is impractical to raise or remove all low water crossings (LWCs) across the state, low-cost means exist to better alert the driving public to the risks of LWCs.

What the Researchers Did

As part of this project, the researchers explored how the Texas Department of Transportation (TxDOT) might use easy, low-cost countermeasures to improve safety at LWCs. Countermeasures were focused on enhanced delineation techniques, improved flood-detection sensors, active and passive warning device deployment, and connected vehicle technology integration to increase driver awareness of LWCs. The researchers used the results of this implementation to propose improvements at four LWCs in Texas.

What They Found

The most critical situation is the flooded roadway condition at night. To achieve long-range warnings of flooded roadway conditions at night, the researchers recommended the following treatments:

- TxDOT should apply raised retroreflective pavement markers (RRPMs) at a minimum of 500 ft outside of the potential flooded area on either side.
- For two-lane two-way roads, TxDOT should use yellow RRPMs along the centerline area.
- For multilane undivided highways, TxDOT should apply yellow and white RRPMs along the centerline and lane line, respectively.
- For divided highways, TxDOT should implement white RRPMs on the lanes.

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Project Completed:

11-30-2020

- Spacing of the RRPMS should be the minimum allowable for the roadway type and marking configuration. This minimum spacing will offer the greatest visibility of the flooded condition by providing a more continuous line of RRPMS that would then be broken by the flooded condition.
- At problematic locations, RRPMS could be used along the edge line markings to provide additional warning and guidance.

The researchers also recommend that TxDOT consider experimenting with internally illuminated raised pavement markers at problematic locations where drivers regularly drive through high water conditions and drive off the roadway.

In addition, the researchers demonstrated two potential connected automated systems for use at flooded LWCs: one integrated with TxDOT’s LoneStar Traffic Management System software and another designed as a standalone system for deployment at an isolated LWC. Proof-of-concept testing at The Texas A&M University System RELIS Campus demonstrated that the applications could provide advanced warnings and alerts to drivers directly in their vehicles.

The researchers also developed candidate enhanced pavement marking strategies for use at LWCs. The researchers developed plans for both two- and four-lane facilities. Unfortunately, due to travel restrictions caused by the COVID-19 outbreak, the researchers were unable to collect post-deployment evaluation data at the deployment sites. The researchers will continue to work with TxDOT district staff to conduct post-deployment data after implementing the proposed enhancements.

What This Means

The researchers identified the following qualitative benefits associated with the outcomes of this research project:

- Improved safety.
- Increased level of knowledge by TxDOT personnel on the issues and technologies for use at LWCs.
- Increased quality of life for Texas motorists and TxDOT personnel.
- Improved customer satisfaction.
- Use of intelligent transportation system technologies.

For More Information

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 Keyword: Research