Innovations to Reduce Rural Two-Lane Roadway Departure Crashes

TxDOT GOALS

Deliver the right projects

Focus on the customer

Foster stewardship

Optimize system performance

Preserve our assets

Promote safety

Value our employees

CHALLENGE

Reducing roadway departure crashes on rural two-lane roads is a high priority for the Tyler District. Statistics from the Fatality Analysis Reporting System indicate that more than 25 percent of fatal crashes occur at horizontal curves, with most of these crashes being roadway departures.

SOLUTION

This project developed a web-based network screening tool to identify horizontal curves on rural two-lane roads with the highest potential for safety improvements. The tool incorporates both traditional and non-traditional data sources to prioritize these locations through illustrations.

Key Findings and Methodology:

- Statistical models, aligned with AASHTO Highway Safety Manual methods, analyzed the influence of roadway design and traffic characteristics on crash frequency.
- The analysis revealed significant relationships between curve radius, lane and shoulder widths, and presence of nearby intersections, with these factors explaining roadway departure crash frequency.
- These relationships formed the basis for crash prediction models used in the web-based tool.

PROACTIVE APPROACH

Presented at the 97th Annual Transportation Short Course, the web-based tool prioritizes horizontal curve improvement projects based on:

- Excess crash frequency (observed crashes exceeding predicted crashes)
- Predicted crash frequency
- A combination of both factors

This proactive approach allows the Tyler District to focus its resources on the rural two-lane roadway locations with the greatest potential for safety improvements.

BENEFITS

- **Advanced Safety Knowledge**: This project improves our understanding of how geometric and operational features of horizontal curves impact crash frequency.

Innovations to Reduce Rural Two-Lane Roadway Departure Crashes

- **Data-Driven Prioritization**: The tool provides districts with a data-driven approach to screening and prioritizing potential safety improvements on rural two-lane roadways.

KEY TASKS

- **Comprehensive Network Database:** Developed a database encompassing the Tyler District's entire rural two-lane roadway network (Figure 1).
- **Safety Performance Functions:** Established relationships between crash frequency, traffic volumes, and crash modification factors specific to roadway departure crashes on horizontal curves within the district (Figure 2).
- **Prioritization Framework:** Created a framework to prioritize potential safety improvements based on:
  - Sites with higher crash frequency than expected.
  - Locations exhibiting characteristics linked to high crash frequencies.
- **Web-Based Screening Tool:** Developed a web-based tool to prioritize horizontal curves for potential safety improvements aimed at reducing roadway departure crashes
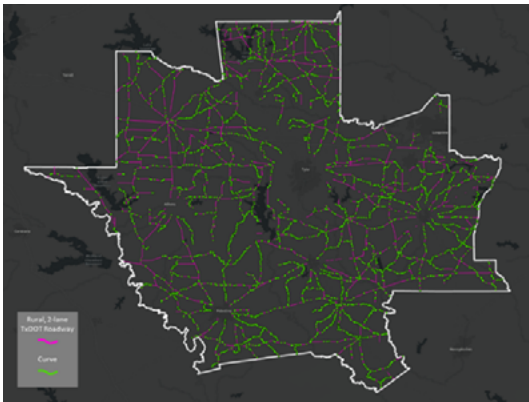

Figure 1. Tyler District rural two-lane roadways and curve segments.
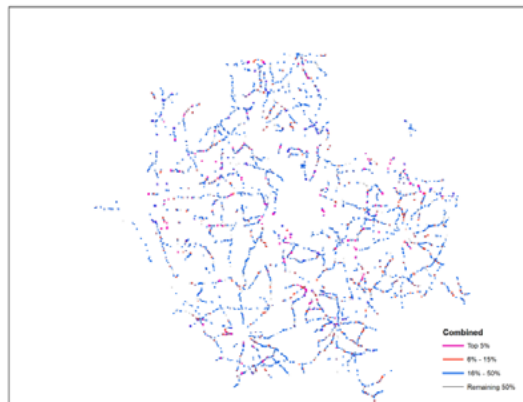

Figure 2. All horizontal curves on rural two-lane roads in the Tyler District categorized based on combined ranking of excess and predicted crash frequencies of roadway departure crashes.

DATA SOURCES

- **Traditional Data**: Roadway inventory, traffic volume, and crash data were used for crash analyses.
- **Non-Traditional Data**:
  - 2022 Wejo data provided speed distributions for horizontal curves and tangent sections.
  - Additional data, like harsh braking events, was also incorporated.

Resources

[Tyler District (txdot.gov)](#)

[Crash Data and Analysis: CRIS Query Tool (txdot.gov)](#)

[Fatality Analysis Reporting System (FARS) (nhtsa.gov)](#)

[Proven Safety Countermeasures: Roadway Departure (dot.gov)](#)

[Safe System Roadway Design Hierarchy (dot.gov)](#)

Contact

Juanita Daniels-West, P.E., Director of Transportation Operations

Ph: (903) 510-9106

[Send an email: from our Contact Us page.](#)