State departments of transportation are committed to using research and innovation to meet the challenge of delivering more efficient and safer transportation systems. The projects on these pages, funded primarily through national programs, are a few among many that exemplify the high return on transportation research investments. The State Planning and Research (SPR) Program, as the nation’s cornerstone state transportation research program, provides federal aid funding to the states to address top concerns and identify solutions at the state level.

The safety projects highlighted here are examples of state DOTs providing “Transportation Excellence through Research.” The projects were compiled from the 2015 High Value Research solicitation carried out by the Value of Research Task Force, part of the American Association of State Highway and Transportation Officials Research Advisory Committee.

Weblink: Research Impacts 2015

Performance Evaluation and Placement Analysis of W-beam Guardrails Behind Curbs
North Carolina

The main objective of this research was to evaluate the safety performance of 27-inch, 29-inch, and 31-inch W-beam guardrails based on the standards of the Manual for Assessing Safety Hardware (MASH). North Carolina Department of Transportation (NCDOT) conducted finite element modeling analysis on W-beam guardrails that were placed at the curb face and at 12 feet from the curb face. The 29-inch guardrail was also evaluated at 6 feet from the curb face. The guardrail impact was modeled using both a 1996 Dodge Neon and a 2006 Ford F250 with impact at 25 and 15 degree angles.

Finite element modeling and simulations were shown to be both effective and efficient and can be used to study crash scenarios that are difficult and/or extremely expensive to conduct with physical crash testing. The results of the project provide a summary of performance and recommendations for future installations and retrofits of installed guardrails.


Comprehensive Study to Reduce Pedestrian Crashes in Florida
Florida

A fifth of Florida pedestrian crashes result in a fatality. Florida Department of Transportation (FDOT) recently conducted research that investigates factors and patterns that are the result of crashes involving pedestrians. Fifteen variables of transportation systems such as pedestrian characteristics, vehicle type, traffic control, as well as roadway and environmental factors were evaluated and cross-referenced by the location of accidents and the severity of the pedestrian’s injury. The research resulted in a mixed-logit based tool that measures pedestrian safety at existing intersections. The modeling tool was able to determine the most dangerous roadway locations for pedestrians. The research concluded that 35 state roadway locations in Florida are responsible for five percent of all pedestrian fatalities and severe injuries.

FDOT will utilize the knowledge gained to enhance existing safety programs and the modeling tool will be used to analyze roadways and intersections to address potential safety concerns. In addition, safety efforts are being implemented at problem intersections. Dozens of lives and millions of dollars will be saved as a result of these FDOT initiatives.


Satellite image of a high crash urban area plotted with injury location.
Methodology for Prioritizing Appropriate Mitigation to Reduce Big Game Animal-Vehicle Collisions on Idaho Highways

Idaho

Vehicle collisions with big game animals are a safety issue for motorists and an ecological concern for wildlife populations. The resulting damage costs millions of dollars each year. To find a solution, the Idaho Transportation Department (ITD) and researchers at Utah State University collaborated with the Idaho Fish and Game Department (IFGD) to create a comprehensive Geographic Information System (GIS) database. The database pulls together data on wildlife-vehicle collisions (WVCs), carcass data collected by ITD maintenance staff, and information on wildlife habitat and movement corridors. The collected data was used to identify problem areas to form a statewide map which will aid future mitigation projects and WVC reduction plans. Following the report's release, ITD Environmental Section staff conducted training in each of the department's six districts. The training included how to use the GIS tool to pinpoint issues addressed in the report and prevent future accidents.


Evaluation of IdaShield Safety Benefits at Highway-Rail Crossings in Idaho

Idaho

The Idaho Transportation Department (ITD) contracted with the University of Idaho’s National Institute for Advanced Transportation Technologies (NIATT) to assess the impact of an object marker called the “IdaShield”. Installed at passive (non-signalized) railroad crossings statewide in the early 1990’s, the IdaShield is a highly reflective diamond-grade reflective crossbuck. Mounted below the crossbuck is a “shield” of red and white reflective strips. The project was implemented to improve motorist’s visibility and safety at highway-rail crossings.

The ITD and NIATT team analyzed before-and-after crash data, conducted a web-based survey of highway users, and developed a driving simulation that assessed driver response to different sign configurations. The results determined there was a 38.6 percent reduction in crashes following the installation of the IdaShield. Sixty-three percent of the drivers surveyed felt that the IdaShield was beneficial. Following the successful completion of the study, ITD has begun working with FHWA to add the IdaShield as an approved object marker in the Manual of Uniform Traffic Control Devices (MUTCD).


Acknowledgment of Sponsorship & Disclaimer

Acknowledgment: This document was developed by the Value of Research Task Force of the AASHTO Research Advisory Committee and produced by the Louisiana Transportation Research Center.

Disclaimer: The opinions and conclusions expressed or implied in the reports are those of the research agencies. They are not necessarily those of the AASHTO or the program sponsors.
Operational and Safety Characteristics of Lane Widths
South Carolina

The current South Carolina Highway Design Guide allows little leeway on lane widths for new projects. South Carolina Department of Transportation (SCDOT) evaluated their design standards for travel lane widths and auxiliary lane widths for the purpose of determining the safety and operational effects. The project was initiated with Clemson University and conducted in two phases. Phase A consisted of a field study using mobile laser and video technologies to collect data. The data was analyzed across crash history and traffic volumes to understand the effect of travel-lane dimensions on safety and operations. Phase B consisted of a follow-on driving simulator test of travel-lane management treatments such as lane configurations, redistribution of lane and shoulder width, and operation effects of smaller two-way, left turn lanes (TWLTL).

Data determined narrower widths on rural roads tended to increase crash rates, particularly on roads with large traffic volumes and high speeds. Urban roadways did not indicate significant relationships with changes in lane width; however, driveway density was a significant variable increasing crashes with increased density. Findings for low-speed, low-volume roadways indicated that narrow lanes (10 feet) actually decreased crashes.

The results of this research should have significant benefits for SCDOT and users of the state’s highways. Benefits include potential cost savings as it relates to safety and operations. Revisions to lane width design will allow more flexibility that will benefit all phases of construction, maintenance, and design. More flexible design standards should lead to more sustainable facilities as well.


Study of High-Tension Cable Barriers on Michigan Roadways
Michigan

Median-crossover crashes often lead to serious injury or death. In recent years, high-tension cable median barriers have emerged as a cost-effective alternative to conventional barriers in preventing such crashes. Based on successes in other states, Michigan Department of Transportation (MDOT) has installed over 300 miles of cable barriers on state highways.

Crash data was collected prior to and after cable median installation. An economic analysis was conducted to assess the overall cost of the system along with safety benefits. The time before expected benefits equalled costs was almost half the barrier’s expected design life. Barriers contained 97 percent of the vehicles that hit them and reduced fatal and serious injury by 33 percent. New design tools were developed based on site-specific factors including annual snowfall, traffic volume, median width and road geometry.

To help educate drivers about the success and safety benefits of cable median barriers, the researchers also developed content for public outreach messaging, including an update to MDOT’s brochure on cable median barriers.

Rural Safety Mitigation Tool-Box (Syntheses of Iowa Research to Address Rural Safety)

Iowa

In Iowa, 67 percent of highway fatalities are the result of roadway departure crashes. As a way for agencies to implement lane-departure crash countermeasures, an updateable web-based “tool-box” was created that allows agencies to target related specific concerns. To achieve this, information was compiled and recorded for three main topics relevant to Iowa: roadway departures, rural intersections, and rural speed management. Within each main topic, a list of resources, references, and countermeasures was provided. Information included speed impacts, reported crash modification factors, costs, usage within Iowa and Iowa-specific guidance. Cost factors are included in the synthesis, so local public agency (LPA) engineers can evaluate low-cost safety improvement alternatives for rural Iowa roadways. Successful utilization of this resource should result in the reduction of rural roadway fatalities.

More information can be found at http://ctre.iastate.edu/research-synthesis/.

Roadside Safety Device Testing Program

Texas

The researchers developed three longitudinal barrier system standards to ensure accordance to the Manual for Assessing Hardware (MASH) criteria for roadside safety. The system standards implemented were the metal-beam guard fence, metal-beam guard fence with downstream terminal anchor, and metal-beam guard fence with low-speed transition.

The project focused on implementation of the appropriate barrier system to minimize the risk of injury to vehicle occupants by decreasing the amount of intrusion into the passenger compartment, and revised design criteria for minimum rail height.

Based on these recommendations, standard detail sheets were developed for each system and implemented for use statewide as nonproprietary alternative methods for barrier safety systems.

More information can be found at http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/9-1002-12-8.pdf