The aging of Pennsylvania’s driver population is a serious issue. Drivers age 65 or older now make up 17 percent of the state’s licensed drivers, and the number continues to rise. Pennsylvania DOT undertook a comprehensive research study on improving mature driver safety and addressing the growing mobility challenge. The research approach considered older drivers’ medical condition, crash history, and violations. Analysis yielded hard data that helped PennDOT develop mitigation strategies such as signage improvements and driver improvement programs. Another major accomplishment of this research was a symposium of more than 60 stakeholders representing diverse interests in the state. This partnership-building will speed implementation of recommendations and increase trust and understanding among PennDOT, state law enforcement, and the medical community.

LOUISIANA, MISSISSIPPI, AND KANSAS USE INNOVATIVE SAFETY TOOLS AND TREATMENTS

DOTs test and implement an array of techniques to make roads and work zones safer, with positive results nationwide.

• Edge lines on rural highways. A series of research and implementation studies in Louisiana showed that placing edge lines on rural two-lane highways improves how drivers position their vehicles in the lane and reduces crashes by more than 15 percent. The state calculates an impressive benefit-cost ratio of 19.1.

• Roundabouts. Mississippi DOT studied two signalized intersections converted to roundabouts and found a 38 percent reduction in total crashes and a 60 percent reduction in injury crashes. Benefits extended beyond safety, with reductions in delay, wasted fuel, and idling vehicle emissions. Combined annual user savings were estimated at $806,000.

• Portable plastic rumble strips. Kansas DOT tested the effectiveness of portable plastic rumble strips as a short-term work zone traffic control device. The research showed that drivers reduced their speed as much as 11 mph, and researchers identified possible improvements to the strips and other promising work zone control tools.

The “Sweet Sixteen” state research projects highlighted on these pages were selected by the Research Advisory Committee of the American Association of State Highway and Transportation Officials. They cover four high-value research projects from each of the four AASHTO regions, funded primarily through the programs below.

The State Planning and Research Program. As the nation’s cornerstone state research program, SPR provides federal aid funding to the states to address top concerns and identify solutions at the state level. States further address areas of common concern through the Transportation Pooled Fund Program.

The National Cooperative Highway Research Program. State DOTs commit SPR funding to support and oversee NCHRP, which pools the states’ research dollars to find solutions to transportation challenges identified as critical by the states.

The U.S. Department of Transportation, Research conducted through the Federal Highway Administration and other U.S. DOT channels allows the government to tackle high-priority needs and share new technologies and practices with the states.
**Building Longer-Lasting Roads and Bridges**

**New Hampshire Realizes Millions in Savings by Safely Raising Guardrails**

Resurfacing a roadway section adjacent to a guardrail adds thickness to the pavement and lowers the height of the guardrail relative to the roadway. This can reduce the guardrail’s safety benefits, especially for larger vehicles. However, replacing posts and guardrail sections during resurfacing can be costly. To save on these costs, New Hampshire DOT recently conducted a field evaluation of raising the wooden offset blocks that attach guardrail sections to their posts. Researchers found that raising the guardrail by 3 inches, a method provisionally approved by FHWA and identified in two other states, is as safe and effective as replacement. Since 2009, the use of this method on 27 projects has saved NH DOT more than $5.2 million.

**Iowa Develops Assessment and Repair Protocols for Flood Damage**

In 2011, flooding of the Missouri River caused $63.6 million in damage to infrastructure in western Iowa, including levees, bridge abutments and foundations, roadway pavements and foundations, culverts, and embankment slopes. The extent of the damage was often directly observable, with pavement damage or whole segments of roadway washed away. However, much of the damage was hidden, since it occurred to road and bridge foundations. In the aftermath of the flooding, Iowa DOT sponsored the development of a mitigation decision matrix and technical toolbox to evaluate hidden flood damage and recommend specific repair and mitigation strategies (traditional and innovative alike). A mitigation decision matrix and technical toolbox to evaluate hidden flood damage and recommend specific repair and mitigation strategies (traditional and innovative alike).

**Missouri Finds Efficiencies in Load Rating System for Box Culverts**

The live loading effects of vehicles passing over a box culvert diminish with the thickness of the soil fill placed over the culvert, which helps distribute these loads. Missouri DOT recently conducted research to more precisely determine the live and dead loading effects of trucks on culverts with various fill thicknesses. They found that AASHTO design specifications may be overly conservative in predicting strains and displacements for fill depths of less than 8 feet. Moreover, the research results suggest that culverts with more than 6 feet of fill do not require a load rating. With about 700 such box culverts in the state, the research provided Missouri an immediate savings of $330,000 on ratings. Extended future savings for Missouri—as well as other states that choose to adopt this approach—can be tremendous.

**New Software Improves West Virginia’s Slope Stabilization Design**

To stabilize slopes and prevent landslides and slope failures, especially on bridge embankments, West Virginia DOT often uses driven piles or micropiles. Recently the department developed an improved design procedure for slope stabilization that uses new methods to assess the stability of vulnerable slopes before and after deploying these piles. This includes new software, called P5SLOPE, which allows engineers to more realistically model loads transferred to piles from the soil. Designers can make a more accurate assessment of the effect of a sliding soil mass on bridge foundation performance and choose the best pile size for stabilizing the slope. The new design procedure is more accurate and less labor-intensive than the method it replaces, and will lower the risk of slope failure and associated costs in West Virginia.

**A Greener Transportation System**

**New York State Zeros in on Lead-Based Paint Hazards on Bridges**

Residual lead-based paint is a health and environmental hazard that all states take very seriously. However, using excessively conservative methods for identifying lead hazards when repainting bridges can result in needless (and costly) disposal of nonhazardous waste in specially designated landfills. This led New York State DOT to seek better ways to classify paint waste from bridge painting projects. Researchers conducted field and lab tests on paint and paint waste from bridges across the state, including bridges where lead-based paint had previously been removed. This led to key insights on critical factors for predicting lead content, such as iron traces in waste paint and the specific blasting techniques used for paint removal. Based on this research, updates to NYSDOT’s waste paint specifications are already in place, and the agency reports reductions in hazardous waste generation, decreased administrative and compliance costs, and lower waste and reporting fees.

**Washington State and Montana Make the Most of Reclaimed and Recycled Materials**

DOTs embrace environmental stewardship through reuse and recycling across all areas of operation, from construction to maintenance. Washington State DOT looked to use recycled concrete aggregate as a replacement for natural aggregate in new concrete pavements. After rigorous testing, the recycled aggregate proved to be a viable alternative: At a replacement rate of 45 percent of the natural aggregate, the recycled concrete aggregate showed no significant effects on the new hardened concrete. WSDOT is poised to enjoy significant savings in reduced landfill costs and virgin material requirements. Montana, too, has uncovered potential cost savings—as high as 75 percent—by recycling traction sand applied to winter roadways. A Montana DOT study showed that collecting traction sand in the spring and reusing it in subsequent winters is a practical and cost-effective alternative to landfilling or roadside dumping. Just as important, this practice mitigates the environmental impacts of uncollected sand, such as sedimentation in streams and clogged culverts. Montana’s research also points to opportunities to process the collected sand and mix it with gravel to produce recycled aggregate for new road construction.

**W”e can save money if we’re willing to put innovative technologies to work.”**

Gregory Nadeau
Deputy Federal Highway Administrator

**“Typically, state-sponsored research, including NCHRP, is highly applied ... often leading to new specifications and design guidelines.”**

Robert Skinner
Executive Director, Transportation Research Board