

Roadway Safety Professional Capacity Building Program



Through engaging peer workshops, the RSPCB Program matches agencies seeking solutions to roadway safety issues with trailblazers who have addressed similar challenges and emerged with a roadmap and noteworthy practices for approaching the issue.



Focus State Roadway Departure Safety Plans and High Friction Surface Treatments Peer Exchange

An RPSCB Peer Exchange

INTRODUCTION

This report summarizes the Focus State Roadway Departure Safety Plans and High Friction Surface Treatments Peer Exchange, held in Birmingham, Alabama, sponsored by the Federal Highway Administration (FHWA) Office of Safety's [Roadway Safety Professional Capacity Building Program](#).

On August 5 and 6, 2014, the FHWA Office of Safety and FHWA Resource Center convened representatives from seven States: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, and Missouri. The purpose of this event was to facilitate the exchange of information between States regarding approaches to roadway departure (RwD) safety, including implementation of RwD Focus State Implementation Plans and High Friction Surface Treatments (HFST). The event consisted of a combination of presentations and facilitated discussions on rumble strips and stripes, curve delineation, HFST, and RwD Safety Implementation Plans. Refer to [Appendix A](#) for the content and agenda of the virtual peer exchange.

To encourage discussion, facilitators organized a SWOT Scramble, where participants provided their observations on the strengths, weaknesses, opportunities, and threats related to the three countermeasures discussed. Discussion themes included: the use of a systemic approach to assess and identify horizontal curve projects; technical challenges associated with HFST applications; and differences in State rumble strip policies.

PEER EXCHANGE PROCEEDINGS

Rumble Strips and Stripes

Missouri Department of Transportation Presentation

Missouri DOT (MODOT) uses centerline and edgeline rumble strips on all major two-lane roads. This presentation described the effectiveness of this policy and highlighted other common safety countermeasures used to prevent and mitigate roadway departure crashes in Missouri, including the use of HFST at high risk curves and the use of median guard cable on interstates. Because MODOT is decentralized, the agency faces challenges in implementing uniform systemic safety strategies—however, MODOT's performance management system creates accountability for safety performance at the district level.



Roundtable Discussion

Following the presentation by MODOT, peer exchange participants had a wide-ranging discussion concerning the application of different types, widths and placements of rumble strips, and differences in State rumble strip policies. The following themes emerged:

- Varying State policies and strategies for the systemic application of rumble strips;
- The relationship between the width of a rumble strip, noise, and rumble strip effectiveness;
- The use of center line rumble strips on two-lane roads;
- State policies to accommodate bicycles on roads with rumble strips;
- The use of raised rumble strips versus milled-in rumble strips; and
- The effects of milled-in rumble strips on pavement deterioration.

In response to some of the issues raised in the discussion, FHWA experts advised participants that the most significant safety impacts occur when centerline and shoulder rumble strips are used in conjunction. The use of centerline rumble strips in passing zones should not be a problem from a safety perspective. Milling a rumble strip into a pavement joint does not accelerate pavement deterioration.

Participants made the following suggestions for FHWA research and support:

- Understanding the effects of the application of rumble strips on thin overlays.
- How to maintain rumble strips when milling on open graded pavement.
- Information on different rumble strip options and their pros and cons.

Rumbles SWOT Scramble Results

Participants shared their observations on the strengths, weaknesses, opportunities, and threats related to rumble strips and stripes.

Strengths	Weaknesses
<ul style="list-style-type: none"> • Significant (>40%) lane departure reductions • Low cost (milled cost is less than raised) • Can be applied through systemic policies • Flexibility in placement 	<ul style="list-style-type: none"> • Noise concerns • Scoring across joint could degrade pavement • Precision of installation • Lack of lane width to install • Need sufficient shoulder depth • Need sufficient quality of pavement • Accommodating cyclists
Opportunities	Threats
<ul style="list-style-type: none"> • Systemic use based on shoulder/lane width • Apply as part of paving program • Use gaps and narrower rumble stripes to accommodate bicycles • Explore “mumbles” • Research durability when applied to different pavement types • Raised rumbles can be used in in some situations • Striping rumble strips for additional reflectivity 	<ul style="list-style-type: none"> • Paved shoulders and rumbles can create a steeper side slope • Complaints about noise • Application on open-graded friction surfaces • Opposition based on maintenance concerns • Insufficient pavement width • Concerns about drivers veering



Delineation

Participants discussed various policies and strategies used to delineate curves, including signage and pavement markings. The discussion included the following themes:

- Processes for upgrading and replacing signs along curves or roadway sections;
- Remedies for oversigning and inappropriate signing along roadways;
- State efforts to meet new Manual on Uniform Traffic Control Devices (MUTCD) standards for signage;
- The use of improved fluorescent paint; and
- Strategies and tools to assess the safety risk of curves.

Delineation SWOT Scramble Results

Participants commented on the strengths, weaknesses, opportunities, and threats related to delineation.

Strengths	Weaknesses
<ul style="list-style-type: none"> • Low cost • Easily deployed • Easy to maintain • Statistically significant reduction in crashes 	<ul style="list-style-type: none"> • Crash reduction factor not as high as other treatments • Require frequent maintenance over time • Applied inconsistently • Chevrons need to be aligned properly • Can infringe on residential property • Replacing signs is labor-intensive • Insufficient road width on some local roads
Opportunities	Threats
<ul style="list-style-type: none"> • Using wider (6") stripes • Policies for removing and replacing existing signing • Training courses on curve signing • Addressing local/county roads • Measuring and maintaining retroreflectivity • Using florescent yellow signs • Use of improved paints with better durability • Increasing use of sleeves on signs • Use HSIP funds for signage projects • Flexible delineators 	<ul style="list-style-type: none"> • Oversigning • Changes to MUTCD standards • Snow plows and farming equipment • Lack of authority to set local road speeds • Agencies don't have money to maintain edge line or can fall behind on maintenance • Expectation to maintain edgelines to minimum performance standards

High Friction Surface Treatments

Georgia Department of Transportation Presentation on HFST

A representative from Georgia DOT gave a presentation on strategies for implementing HFST. Following a successful pilot project, Georgia DOT plans to let a contract to apply HFST at high risk curves on a district-wide basis. To determine where to apply HFST, Georgia DOT reviewed crash data to rank curves by severity and frequency of roadway departure crashes. Georgia DOT then assessed those curves using a ball bank indicator to set advisory speeds and determine where to apply HFST. Georgia DOT also refined its contract specifications for installation of HFST, updating their language on quality acceptance to include pre-installation testing, contractor testing, and agency verification testing.



HFST Roundtable Discussion

Participants discussed HFST implementation. The following themes were discussed:

- Ways to overcome common HFST installation issues;
- Strategies to guide the placement of HFST at high-risk locations;
- Differences in state HFST policies;
- Practices for procuring HFST installation contracts; and
- Tools to assess pavement friction.

HFST SWOT Scramble Results

Participants discussed the strengths, weaknesses, opportunities and threats related to HFST.

Strengths	Weaknesses
<ul style="list-style-type: none"> • Much higher pavement friction • Very effective • Blends in with normal pavement so drivers don't recognize different surface and drive differently • Doesn't add to system of maintenance • Might drain better than normal surfaces • Application technology is advancing • Can be applied systemically 	<ul style="list-style-type: none"> • Uncertainty regarding durability • Installation not fully automated which could hamper uniformity of application • Difficulty determining how and when to apply HFST on ramps • Unknown if HFST specifications should be the same for all pavements or situations. • Pavement condition may need to be assessed in the field before HFST application • Higher cost compared to other pavements • Chevrons are cheaper • Lack of friction testing equipment
Opportunities	Threats
<ul style="list-style-type: none"> • Develop improved specs • Apply HFST systemically • Educate others about how HFST works • Learn from States that have successfully applied HFST systemically • Learn suitable applications based on roadway departure risk and pavement conditions • Improve understanding about best aggregate to use 	<ul style="list-style-type: none"> • Effectiveness may decrease over time • Resistance due to higher costs • Lack of competition among contractors • Potential installation issues • Bad installations can dissuade an agency from wider adoption • Other products may be recognized as HFST that are not • Challenges defining specs for HFST application

Roadway Departure Implementation Plans

FHWA Safety Data Analysis and Focus State Criteria and Implementation Planning

FHWA presented the results of a recent analysis of national fatality data. More than half (56 to 57 percent) of fatalities involve some form of roadway departure. Rollovers, head-on collisions, and/or collisions with trees occur in three quarters of fatal roadway departure events—these crash types are a focus of FHWA's programmatic efforts. Rollover crashes typically involve high speeds. Many take place on rural roads, and 43 percent happen at curves. Head-on collisions frequently occur on undivided, high speed roads in rural areas. Collisions with trees account for half of fixed object crashes. Two-thirds occur in rural areas, and one-half occur at curves.



FHWA also presented the criteria for defining a Roadway Departure Focus State and the process of developing a Roadway Departure Implementation Plan with FHWA support. They explained that a contractor hired by FHWA helps Focus States analyze their crash data and identifies potential benefits by implementing the selected countermeasures. The plan provides both the costs and the benefits (in economic terms) of the proposed selected countermeasures. The plan generally assesses both State- and locally-owned roads in a State.

Georgia Department of Transportation Roadway Departure Implementation Plan Presentation

Georgia DOT representatives described deployment of an Rwd Implementation Plan, which was finalized in 2013. The plan includes the following major components:

- Conducting field reviews of identified high risk locations;
- Developing policy guidelines for rumble strips and delineation;
- Upgrading signage on curves;
- Replacing some old guardrails and removing selected trees and utility poles for clear zones; and
- Assembling contract plans for implementation of other countermeasures, such as HFST.

The Rwd Implementation plan aligns with the strategies identified in the Rwd Emphasis Area of Georgia's Strategic Highway Safety Plan (SHSP). Georgia DOT has set aside approximately \$7 million annually in Highway Safety Improvement Program (HSIP) funding for local roads. Georgia DOT is now planning to hire consultants to track implementation and evaluate projects.

Louisiana Department of Transportation and Development Roadway Departure Implementation Plan Presentation

Louisiana DOTD representatives described how they are implementing an Rwd Implementation Plan. To select curve locations, they first analyze roadway departure crash frequency at curves based on average annual daily traffic (AADT), lane width, and degree of curvature. Then, they rank 2-lane roads by the presence of risk-factors associated with run-off-the-road crashes—including ADT, lane width, shoulder width, and degree of curve. Priority curves are addressed using low-cost safety improvements, such as 6-inch edge lines, chevrons and curve warning signs, and HFST.

Louisiana DOTD incorporated lessons learned from the Intersection Safety Implementation Plan. For example, they learned that unsafe facilities are often atypical and that detailed design specifications are needed to guide efficient implementation of safety improvements.

Roundtable Discussion

Participants discussed challenges of and effective strategies for implementing Rwd Implementation Plans, including the following:

- Incremental implementation of the plan by district or countermeasure;
- Approaches to implementing the plan in more decentralized states;
- Quality and uses of crash data on state and local roads;
- Contracting practices for the systemic implementation of countermeasures;
- Use of HSIP funding to implement safety projects identified in the plans;
- Development of county-level safety plans;
- The use of consultants to analyze safety issues, refine strategies, and create reports; and
- The alignment of plan implementation to State safety performance management systems.



Conclusion and Next Steps

Participants met with colleagues from their State to develop plans to further address RWD safety. They presented a number of strategies that they intend to pursue to improve RWD safety in their respective States, including the following:

- Establishing statewide RWD implementation plans;
- Developing county- or district-level safety plans;
- Revising policies for systemic safety investments for rumble strips and curve delineations;
- Reaching out to education and law enforcement stakeholders to address the behavioral aspects of safety;
- Developing strategies for broadening the application of HFST; and
- Promoting the new applications of rumble strips, such as transverse rumble strips.

CLOSING

A majority of fatal crashes on the nation's roadways are the result of roadway departures. Effective, low-cost countermeasures for addressing roadway departure crashes exist, including rumble strips, high friction surface treatment and curve delineation. Using crash data, State DOTs can apply these countermeasures systemically to cost-effectively reduce safety risks on roadways. During this peer exchange, representatives from seven States had the opportunity to discuss effective strategies and technical challenges related to the implementation of these countermeasures. In addition, State representatives were able to use this exchange to develop action plans for their respective States.



Appendix A: Peer Exchange Agenda

Focus State Roadway Departure Safety Plan and High Friction Surface Treatments Peer Exchange

Birmingham, Alabama

August 5 and 6, 2014

Agenda

Day One

8:00 Welcome

- Welcome to Alabama – Tim Barnett, Alabama DOT
- Peer Exchange Format, Ground Rules, and Goals – Dick Albin, FHWA
- Self-Introductions – All Participants

SWOT Analysis Scramble

- Purpose and Instructions – Cathy Satterfield, FHWA
- HFST Scramble
- Delineation Scramble
- Rumble Strip Scramble
- Discussion of results

Mini-Presentations on Rumble Strips and Delineation

- John Miller, MODOT

RUMBLES Roundtable

- Balancing Safety, Pavements, Bike Access, and Noise
- Center versus Shoulder/Edge Applications
- Options and Effectiveness

12:15 LUNCH

DELINEATION Roundtable

- Countermeasures Options and Combinations
- MUTCD Compliance
- Performance Specifications

Mini-Presentations on Rwd Safety Implementation Plans

- Michael Turpeau, Georgia DOT
- James Chapman, Louisiana DOT
- Q&A

Rwd Implementation Plan and Project Development Roundtable

- Issues on Implementation of the Plan
- Current status
- Barriers to Implementation
- Planning/Programming/Funding
 - SHSP/HSIP/Other
 - MUTCD Compliance
 - Performance Requirements

5:00 WRAP-UP DAY ONE



Day Two

8:00 **Recap of Day 1**

HFST Video Overview Presentation

Mini-Presentation on HFST

- Michael Turpeau, Georgia DOT

HFST Roundtable discussion

- Locating Curves to Treat
- Specifications
- Construction Issues and Quality Control

State Implementation Breakout Groups

Final Report Out and Wrap-Up

12:00 ADJOURN