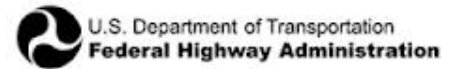




Through engaging peer workshops, the RSPCB Program matches agencies seeking solutions to roadway safety issues with trailblazers who have addressed similar challenges and emerged with a roadmap and noteworthy practices for approaching the issue.



Roadway Departure Six-State Peer Exchange

An RSPCB Peer Exchange

INTRODUCTION

This report summarizes a peer exchange held in September 2013 sponsored by the Federal Highway Administration (FHWA) Office of Safety. FHWA organized the peer exchange at the request of the Virginia Department of Transportation (VDOT). VDOT was looking to confer with their peers regarding specifications, construction and contracting issues on **four roadway departure countermeasures**: Safety Edge, High Friction Surface Treatment (HFST), Rumble Strips, and Curve Delineation.

To accommodate VDOT's request, the FHWA Office of Safety convened representatives from six States: Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. Thirty-two representatives attended the day-and-a-half long peer exchange—the full agenda is available in [Appendix A](#). The peer exchange provided an opportunity for participants to be mentors and gain insights into how the countermeasures mentioned above can be implemented throughout the project development and project delivery processes. The meeting format was as follows:

- Discussions examining countermeasures' strengths, weaknesses, opportunities and threats;
- Short presentations by a lead State for each countermeasure;
- Information sharing on policies, specifications, practices and evaluations;
- Discussions reviewing safety on horizontal curves, including innovative practices, challenges, and use of Intelligent Transportation Systems (ITS); and
- Discussions related to implementation plans, programming projects, funding, contracting options, and troubleshooting during construction.

At the conclusion of the meeting, the States developed a list of actions they would take to improve their safety programs.

PEER EXCHANGE PROCEEDINGS

Virginia State Traffic Engineer Raymond Khoury welcomed participants to the event. Dick Albin, FHWA Resource Center Safety Engineer, introduced the format, ground rules, and goals for the meeting. The peer exchange discussions and presentations focused on the following topics: innovations to get increased implementation of Safety Edge; issues to look for when selecting HFST sites and during HFST installation; strategies and roadblocks to fund local safety projects; and benefits from and challenges of implementing the countermeasures on local roads.

SWOT Scramble

To facilitate discussion a SWOT Scramble was conducted to kick off the meeting. Participants were broken into small groups to spend 20 minutes listing **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats for each of the four key countermeasures.

The overarching theme that emerged from the SWOT Scramble was that better information exchange and experienced peers from other States can help address challenges in getting field staff trained and convincing stakeholders to support safety improvements. The following insights about the four countermeasures also emerged from the small groups:



Safety Edge is a simple, low-cost, systemic solution, but it has been difficult to get buy-in from certain groups.

HFST is a flexible countermeasure that works for many problem locations. Projects are developed quickly and have the potential to lead to great crash reductions. HFST is a success when it is included in Every Day Counts measures and when agencies create related technical information, such as specifications, guidebooks, and demonstrations.

Rumble strips can bring impressive safety benefits and many drivers appreciate rumble strips. However, limited shoulder widths and noise concerns can raise difficulties in getting approvals.

Curve delineation is beneficial but the benefits can be difficult to quantify. Participants raised questions about how increasing speed on a roadway affects delineation. Delineation can be a low-cost initial investment, but there was concern about long-term maintenance.

PEER MINI-PRESENTATIONS

Participants from States recognized as leaders on the four countermeasures gave short peer presentations. Because the countermeasures are not new the presentations summarized below were geared toward getting participants to think about difficulties with the countermeasures—as conversation starters for the roundtable discussions that followed.

Ups and Downs with Rumble Strips in the Bicycling Community

Joey Riddle, Safety Program Engineer, SCDOT

South Carolina successfully implemented rumble strips by providing flexibility within standard drawings to keep four inches between the pavement edge and the outer edge of rumble strips, to provide enough room for bicycles. SCDOT staff coordinated with bike advocacy groups early in the process, which helped gain public acceptance for the project.

The State faced a challenge with the contractor, which had difficulty installing the rumble strips correctly. SCDOT staff created an easy-to-use chart that helped the contractor locate the right placement for the strips. Riddle stressed that it is important to make installation as easy as possible for field crews.

Major Sign Improvement Program to Delineate Curves

Brian Mayhew, Traffic Safety Engineer, NCDOT

NCDOT staff are identifying sites that have not been resurfaced in 12 to 18 months and that do not have resurfacing plans for the next 3 years. These sites are targets for crash reduction measures such as retroreflectivity and wider lanes. State districts support these measures, partly because the markings will be paid for from Highway Safety Improvement Program (HSIP) funds.

The other major project discussed involved updating signage at curves. The signs, primarily chevrons, are being updated under contract—previously State crews were responsible for updated signage installations. There is some concern whether contract installations will result in proper placement, spacing and aiming of chevron signs.

Patience Required to Troubleshoot Safety Edge

Shawn Troy, Safety Evaluation Engineer, NCDOT

NCDOT initially installed Safety Edge on a few road paving projects and proved that this countermeasure was effective. Safety Edge worked in part because NCDOT had a champion in the field to help work through some concerns and challenges. NCDOT found that using Safety Edge does not add to project costs; it is now standard on resurfacing projects.



From its Safety Edge installations NCDOT learned that it is important to get the edge down tight over the first 150 feet—then the rest of the mileage will go smoothly. Crews using a 10-foot paver on a 20-foot road can use a Carlson device to extend the paving area while staying on the road. Other devices that extend the paving area were too wide. Shoulders also need to be pulled back up to cover the Safety Edge.

It was critical to have NCDOT staff in the field with the contractor to resolve issues on the first half-dozen or more Safety Edge projects. Being in the field and patiently helping resolve challenges led to buy-in from contractors and helped move them along the learning curve.

Choosing Locations for HFST and Developing SPFs

Jarrold Stanley, Safety Engineer, KYTC

Kentucky's most recent round of HFST treatment locations came from a list of sites listed in its Roadway Departure Implementation Plan. Each site on the list was inspected to check pavement quality. Kentucky has had excellent success, but shared some advice with the group, including the following:

- Carefully specify materials—dusty bauxite, for instance, can cause adhesion problems;
- Mechanized application provides for better control and uniformity; and
- Ensure that the contractor warranties the work, including establishing a friction goal.

KYTC is now on its third round of location selection of HFST and has found that HFST projects work when they are based on quality crash data. For the first round staff identified the top 30 crashes in the rural States system based on run-off-road and wet weather crash statistics considering curve locations from the roadway database. In the next round staff used the systemic list developed as part of their Implementation Plan. In the most recent round, Safety Performance Functions (SPFs) were developed for total wet crashes and severe wet crashes, factoring in section length and traffic volumes. Staff focus on developing a list of expected versus actual crashes and have selected the top 20 locations to evaluate for the next round of installations.

ROUNDTABLE DISCUSSIONS

Rumble Strips

Participants discussed a variety of ways that their States apply centerline rumble strips. Some States use them on rural lanes and roads over a specified speed limit, or only where crash data indicates that they will be helpful. States that have not identified a problem with head-on crashes have not yet focused on installing centerline rumble strips. State requirements for edge line rumble strips range from being standard, system-wide for roads over certain speed limits, or installed only where needed based on crash data.

The group agreed that bicycle advocacy groups or a staff member responsible for bike issues should field concerns from bicyclists so that feedback can be pooled in one place rather than dispersed throughout an agency. VDOT staff noted that they still need to define the phrase, “accommodation of bicycles.”

Finally, participants noted that it is best to install as many rumble strips as possible in a short amount of time—if there is too much time between installations residents may complain about strips in front of their property without realizing that all properties will soon have strips installed in front of them. It is important to get buy-in from the public from project inception.

Delineation

Participants noted that signage and pavement markings are often easier to install than rumble strips because delineation efforts typically do not garner resistance from residents and bike advocates.



States can use data to identify candidate locations for improved delineation. A rule of thumb that one State used was that if there were 15 or more crashes at a location in the past 5 years that location was put on the hot spot list.

After completing a road safety audit, some States are proceeding with significant delineation projects, including tighter chevron spacing along curves. In Tennessee, delineation wraps are installed on utility poles and trees close to the road to inform drivers of obstacles within the clear-zones. After delineation countermeasures are installed a State may perform further statistical analysis to measure crash reduction.

Safety Edge

Participants discussed challenges and obstacles related to installing Safety Edge. Many States have a policy and/or specifications and standard detail drawings on Safety Edge, but some are finding that installation is not necessarily happening. Either Safety Edge does not make it into project plans or it is not implemented in the field.

Safety Edge has proven to be a difficult sell because the safety benefits are not well understood and are not comprehensively quantified. Kentucky, for instance, is still in a Safety Edge pilot phase. The KYTC safety group must prove that Safety Edge works in every situation. While KYTC staff have had some success building support by attending pre-bid meetings and conducting field visits, overall there has been significant pushback and it may be years before Safety Edge advances out of the pilot phase.

HFST

States have found that HFST is a useful countermeasure in locations where friction is essential, such as curves. VDOT completed eight HFST curve projects over the past year and TDOT will implement HFST after several other resurfacing projects are complete. First-time HFST projects are particularly important. NCDOT received approval to implement HFST and noted that these initial projects had to be done correctly and be considered successes in order to receive approval to do more HFST.

Some participants noted several minor issues to watch for and address on HFST projects. KYTC staff said that the roads treated with HFST shed aggregate for the first few months and needed sweeping—vacuuming is preferred for the first cleanup. SCDOT staff stressed that epoxy will flow into cracks or open-graded surfaces and that agencies need to use a gauge to measure the thickness of the epoxy rather than relying solely on the quantity of epoxy that has been laid—this is particularly critical when the process is not fully automated. SCDOT staff also suggested that agencies perform on-site inspections and make it clear which elements of the project are the contractor's responsibility.

Program Development

Participants from SCDOT, NCDOT, TDOT, and KYTC summarized their implementation plans. The plans varied significantly, but all changed how the agencies were doing business to focus on systemic improvements that have spurred progress in safety efforts across each of the States. Staff found that outside analysis helped them respond to individuals who questioned the plan, particularly the logic of concentrating countermeasures at a small percentage of locations that accounted for a large percentage of associated crashes.

Participants mentioned the following strategies for successful project implementation:

- Prioritize projects by easy wins;
- Address complaints with press releases that emphasize that projects are supported by agency leadership; and
- Get initial buy-in from central office stakeholders before reaching out to districts—if districts have complaints the project will be backed up by leadership at the central office.

The group suggested the following ideas for next steps for FHWA implementation:

- Webinar peer exchanges to share how States have used the plan;
- More face-to-face peer exchanges with focused discussion;
- Help getting the systemic approach message to the locals; and
- More demonstrations and FHWA representatives visiting district offices and the field.



Some participants noted that they have difficulty getting projects designed because safety projects tend to be lower priority in their agencies. Innovative ways to solve this problem were suggested, including the following:

- Using consultants for project design and possibly construction;
- Identifying upfront how each project will be designed; and
- Incorporating USDOT performance measure goals into performance goals for individual projects, such as target fatal crash and overall crash rates. Attaching goals to projects clearly defines expectations for crash reduction efforts and encourages divisions to approach DOT staff for help lowering crashes.

Project Delivery

States are exploring a variety of methods to improve project delivery, including the following:

- Developing on-call contracts for specific measures, such as signs or guardrails, similar to indefinite delivery/indefinite quantity contracts; and
- Implementing safety improvements using design-build contracts.

A few States noted that they find flexibility in implementing spot improvements by using State funds dedicated to roadway safety. One State indicated that it sets aside \$1 million every year for guardrail upgrades, matched with HSIP funds.

Next Steps

During the concluding session of the peer exchange participants discussed the following steps for State DOTs, FHWA Division Offices, and the FHWA Roadway Departure Team to take to move these countermeasures to the next level of implementation:

Rumble Strips

- Investigate using narrow, 4-inch rumble strips;
- Develop a centerline rumble strip policy;
- Learn more about rumble strip retroreflectivity issues;
- Investigate narrower paved shoulders for rural roads;
- Include guidelines and details for crews installing rumble strips;
- Update internal instructional memos to consider more *shall* conditions;
- Prepare educational materials for staff; and
- Use previous research study materials on centerline rumble strips to sway internal opposition.

Delineation

- Develop a systemic low-cost horizontal curve improvement project;
- Move forward with a horizontal curve delineation program; and
- Continue with fog research, and follow up to understand how dynamic speed limit systems and signs work in high-fog areas.

Safety Edge

- Review existing implementation processes for Safety Edge;
- Make Safety Edge standard for resurfacing and new projects; consider changing the name for marketing purposes;
- Finalize a Safety Edge instructional memo and work with the FHWA Division Office to consider a Safety Edge project demonstration;
- Coordinate with the Resource Center and Headquarters to assist contractors installing Safety Edge;
- Continue to market the concept and enforcement of the Safety Edge design directive; and



- Promote Safety Edge to designers and reviewers with presentations at conferences and meetings.

HFST

- Rewrite specifications based on successful peer State examples; explore available HFST resources, including expert presentations and demonstration projects;
- Seek FHWA support including best practices and lessons learned in deploying the HFST specification from the American Association of State Highway and Transportation Officials; and
- Incorporate lessons learned from HFST action plans; continue to monitor sites where HFST is installed and report their experiences.

The following efforts to improve safety were also discussed:

- Conduct post-evaluations of roadway safety programs;
- Pursue a systemic intersection program;
- Outsource design work for HSIP projects;
- Develop performance measures;
- Build relationships with pedestrian and bike coordinators;
- Create a role for an on-call consultant for safety analysis services;
- Organize a peer exchange to discuss safety issues including developing and delivering HSIP-funded projects;
- Invite the Resource Center to more site visits to ensure that countermeasures are installed correctly;
- Develop media synopses and press releases for action plans;
- Develop a 6-year HSIP allocation plan with flexibility for spot improvement projects and systemic projects;
- Create public outreach materials to promote and inform staff and the public about new technologies and methods;
- Develop a plan for innovative contracting to make the HSIP process more efficient;
- Host a peer exchange and a roadway departure workshop; and
- Develop a roadway departure plan.



Appendix A: Agenda

Roadway Departure Peer Exchange
Bristol, Virginia
September 10-11, 2013
Final Agenda

Day One

8:00 Welcome

- Welcome to Virginia – Raymond Khoury, Virginia State Traffic Engineer
- Peer Exchange Format, Ground Rules, and Goals – Dick Albin, FHWA
- Self-Introductions – All Participants

SWOT Scramble

- Presentation on SWOT Analysis – Cathy Satterfield, FHWA
- HFST Scramble
- Rumble Strip Scramble
- Safety Edge Scramble
- Delineation Scramble
- Discussion of results

Mini-Presentations on Implementation and Issues

- **Rumbles** – Joey Riddle, SCDOT
- **Delineation** – Brian Mayhew, NCDOT

11:30 LUNCH

12:30 RUMBLES Roundtable

- Balancing safety, pavements, bike access, and noise
- Center versus edge applications
- Options and effectiveness

DELINEATION Roundtable

- Countermeasure options and combinations
- Manual on Uniform Traffic Control Devices (MUTCD) compliance
- Performance goals

Mini-Presentations on Implementation and Issues

- **Safety Edge** – Shawn Troy, NCDOT
- **HFST** – Jarrod Stanley, KYTC

Every Day Counts Countermeasures Roundtable

- HFST
- Safety Edge

Action Planning Session – State by State

5:00 Wrap-up Day One



Day Two

8:00 **Project Development Roundtable**

- Implementation plans
- Planning, programming, and funding
 - SHSP/HSIP/other
 - MUTCD compliance
 - Performance requirements

Project Delivery Roundtable

- Contracting options and issues
- Troubleshooting

Action Plan Session – State by State

Report out and Wrap-up

12:00 **Closing Remarks**