Kansas
LTAP Fact Sheet
A Service of The University of Kansas Transportation Center for Road & Bridge Agencies

The Safety Edge is Gaining Ground

This paving technique helps vehicles recover if they run off the pavement.

The Safety Edge is a simple and effective solution to reduce the likelihood of run-off-the-road crashes. It can help save lives by allowing drivers who drift off highways to return to the road safely. When laying a new layer of asphalt, instead of a creating a vertical drop-off at the edge, an attachment added to the paving machine shapes the edge of the pavement to 30 degrees. Research has shown this is the optimal angle to allow drivers to re-enter the roadway safely. The Safety Edge provides a strong, durable transition for all vehicles. Even at higher speeds, vehicles can return to the paved road smoothly and easily.

The Federal Highway Administration (FHWA), as part of its "Every Day Counts" initiative, has set a national goal to increase the use of the Safety Edge on state and local roads, working with States to develop specifications and adopt this pavement edge treatment as a standard practice on all new paving and resurfacing projects.

LTAP Centers across the country are helping meet that goal through a variety of ways, including workshops, paving demonstrations, safety edge "shoe" (attachment) loan programs, and education. This article is part of that effort. Kansas LTAP has also obtained two Safety Edge shoes for loan. This article will describe in more detail why the Safety Edge is considered a more effective technology than other methods for creating an angled edge, and how to start using the technology on your paving projects.

FHWA

This shows the Safety Edge during an overlay project and the finished product with the shoulder material in place next to the Edge (inset).

Why are pavement drop-offs so dangerous?

Roadway departures account for 51 percent of all fatal crashes and severe-injury crashes in Kansas. Further, most of those roadway departure fatal crashes occur on rural roads (see Kansas data below). Unforgiving pavement edges have been found to significantly contribute to roadway departure crashes. For example, researchers studying crashes in Missouri during 2002-2004 reported that pavement edges may have been a contributing factor in as many as 24 percent of rural run-off-road crashes on paved roads with unpaved shoulders. This type of crash was twice as likely to include a fatality than other types of rural crashes overall on similar roads.

When a driver drifts off the roadway and tries to steer back onto the pavement, a vertical pavement edge can create a "tire scrubbing" condition that may result in over-steering. If a driver over-steers to return to the roadway without reducing speed, he or she is prone to lose control of the vehicle. The resulting crashes tend to be more severe than other crash types. The vehicle may veer into the adjacent lane, where it may collide with oncoming cars, overturn, or run off the opposite side of the roadway and strike a fixed object or overturn on a slope. Inexperienced drivers are not the only victims of tire scrubbing—it can happen to anyone.

Smaller, lighter vehicles, including bicycles and motorcycles, have an especially hard time climbing a steep pavement edge. At high speeds, the climb is particularly dangerous. According

to in-service evaluations, a vertical or near vertical drop-off of 2.5 inches or more has been shown to pose a significant risk, while pavements built with the Safety Edge showed reductions of more than 5 percent of total crashes.

Why does the safety edge work?

A drop-off is created during most paving projects. Even when the unpaved shoulder graded back to the pavement edge to eliminate the dropoff, the edge often becomes exposed within a few months. The edge may deteriorate.

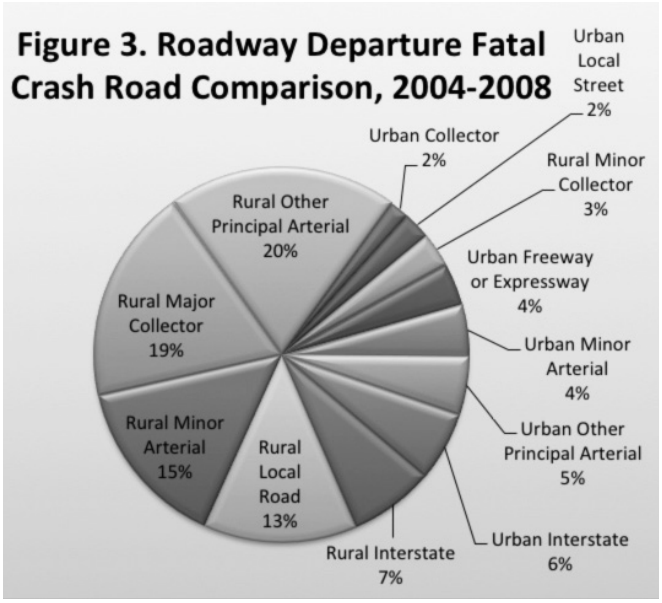
The Safety Edge shapes the edge of the pavement to 30 degrees using a commercially available device (called a shoe) that can be attached to the paver. The asphalt is extruded under the shoe and that provides an additional level of consolidation/compaction. This results in a durable edge that resists edge raveling more effectively than dragging a chain to smooth the edge, for example, which is a common paving practice in Kansas. Research has shown the Safety Edge's 30-degree shape allows drivers to re-enter the roadway safely.

After paving with the Safety Edge, the adjacent shoulder material should then be regraded flush with the top of the pavement, as this provides the safest pavement edge. The difference between the Safety Edge and other methods is that when the edge becomes exposed over time, this shape can be more safely traversed than a vertical or raveled edge.

Case study: Iowa's Safety Edge policy

FHWA's Iowa Division and the Iowa Department of Transportation (IDOT) recently began working with counties to install the Safety Edge on projects with a history of roadway departure crashes. The Safety Edge was included at the county level on project plans or incorporated as change orders on already-let projects. During one of these county projects, the contractor's safety officer said the Safety Edge potentially reduced the contractor's liability by providing immediate elimination of the vertical drop-off.

After seeing how easily even large vehicles could traverse the pavement edge without loss of control or damaging the edge, the county decided its typical practice of bringing in a gravel wedge before nightfall when a paving project was under way was not necessary when the Safety Edge was present. This saved the county time and money. The results



Source: Kansas Roadway Departure data. Figure 3 from the Roadway Departure chapter of the Kansas Strategic Highway Safety Plan (2011 draft). Kansas Department of Transportation.

Common Questions

Why should I change my current process to include the Safety Edge? The Safety Edge improves the short- and long-term safety of the roadway. Studies show that severe crashes may occur when a vehicle drops a tire over the edge of a nearly vertical pavement. The research shows that virtually all drivers can recover, even at high speeds, when the pavement edge is a 30-degree wedge. Using the Safety Edge also improves the durability of the pavement edge.

Do I need to modify my paving process to install the Safety Edge on asphalt? Very few changes are needed. The key item is to add a specially designed shoe, per manufacturer's instructions, to the paver to create the Safety Edge. While paving, the shoe should be monitored and adjusted to keep the bottom edge of the device in contact with the road shoulder surface. Using the Safety Edge should not affect the rate of production.

How much will the addition of the Safety Edge cost per mile? It will be almost negligible for Hot Mix Asphalt. It does depend somewhat on the specific design and construction parameters, but typically the process compacts asphalt that often otherwise would break off because it was loose. When measured, it has been calculated to be less than one percent additional asphaltic material.

How can I get started? If you are contracting-out a paving job, add the Safety Edge to your specs. FHWA has posted a sample one-page Guide Specification at http://safety.fhwa.dot.gov/roadway_dept/pavement/safedge/. If your agency uses its own equipment, borrow a Safety Edge shoe from Kansas LTAP to give it a try, or visit the FHWA website above (click on Frequently Asked Questions) for information on the types of Safety Edge shoes currently on the market and where they can be purchased.

Safety Edge in Kansas

by Lisa Harris

Mike Crow of the Kansas Asphalt Paving Association says the Safety Edge has been slow to catch on in Kansas. Asphalt contractors use other methods to create a graduated edge. Many road agency specs, including KDOT's, do not include the Safety Edge. But research shows that other methods are not as effective for safety or durability of the pavement edge.

However, the Safety Edge is starting to gain ground in our State. KDOT is planning to install a Safety Edge on a contracted paving project this October in District 3. Miami County will also use the Safety Edge for a six mile project planned in September. Both projects will use Safety Edge shoes borrowed from Kansas LTAP (see below).

Johnson County is planning to pave 15 miles of its roads with the Safety Edge, per Norm Bowers of the KAC. APAC is the contractor and they will be using their own shoe.

Riley County added the Safety Edge to a project a few years ago. Rod Meredith, assistant public works director, said that the edge is holding up well. "The edge is not raveling, even when the shoulders pull back from the edge over time. It's really easy to get back on the road if you happen to drive off the edge; we've tested it. There's no reason not to use it every time," he said.

Adding a Safety Edge to pavement is eligible for High Risk Rural Roads (HRRR) funding available from KDOT, and your HRRR application can include the purchase of a safety edge shoe to do the work.

Want to try before you buy? Kansas LTAP has acquired two Advant-Edge shoes for loan, along with a universal bracket for attaching the shoe to a paving machine. Contact Pat Weaver at weaver@ku.edu to arrange a loan. Want to see a live demo? Contact Pat to be added to a list for notification of pending projects.

FHWA

A pavement edge without the Safety Edge has an abrupt drop-off that makes it more difficult for errant vehicles to recover back to their lane without over-correcting.

were so positive that IDOT decided to use the Safety Edge on one of its own paving projects, and since then, IDOT has adopted the Safety Edge as standard practice statewide.

For more information

For more information on the Safety Edge or the Every Day Counts Initiative, contact Pat Weaver at Kansas LTAP, (785) 864-2595 or Norbert Muñoz at FHWA's Kansas Division at (785) 271-2448. To view footage of a Safety Edge under construction, watch the Safety Edge video available from our lending library. ■

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Sources:
- FHWA. Safety Edge Pavement Edge Treatment. 2010. http://safety.fhwa.dot.gov/roadway_dept/pavement/safedge/brochure/
- Kansas DOT. Kansas Strategic Highway Safety Plan. http://www.ksdot.org/burTrafficSaf/reports/kshs.asp