

Why is the Safety EdgeSM needed?

Roadway departures account for 53 percent of fatal crashes. 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 drivers over-steer to return to the roadway without reducing speed, they are 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.

Though paved shoulders allow many vehicles to recover, driver inexperience, vehicle size, steering angle, and roadside obstacles can affect a driver's ability to return safely to the roadway. Even with paved shoulders, many vehicles will leave the pavement. If they encounter a drop-off, their chance of safely returning to the roadway is reduced unless a Safety EdgeSM is used.

What benefits have been achieved?

The Safety EdgeSM is particularly useful on rural two-lane highways, but its utility goes well beyond that. On well-maintained highways, vigilant maintenance may prevent drop-offs from becoming a problem. In the real world, however, dropoffs can occur even on reasonably maintained roads as a result of settlement, erosion, and wear. The Safety EdgeSM should be considered for use whenever roads are built or resurfaced. A 3-year crash analysis of the Safety EdgeSM in a number of States that used the technology indicates a 5.7 percent reduction in total crashes.

Contact Information

For training or more information on this Every Day Counts Initiative, please contact your local FHWA Divisions Office.

To learn more about EDC, visit:
<http://www.fhwa.dot.gov/everydaycounts>

About Every Day Counts

Every Day Counts is designed to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadway, and protecting the environment.



Safety Edge



U.S. Department
of Transportation

**Federal Highway
Administration**

EDC Overview

It is a commonly held perception that it takes an average of 13 years to deliver a major highway project (from planning through completion). However, several opportunities exist in the current project delivery process where innovative approaches will improve project delivery times. Consequently, in the summer of 2010, Federal Highway Administrator Victor Mendez launched the *Every Day Counts* (EDC) Initiative. Specifically, this initiative is designed to identify and deploy innovation aimed at enhancing the safety of roadways and protecting the environment, while ultimately shortening the transportation project development process.

What is the Safety EdgeSM?

The Safety EdgeSM is a simple but highly effective way to reduce highway crashes, by shaping the edge of the roadway pavement to 30 degrees, minimizing the problem of drop-off. This angle provides a safer roadway edge, reducing the potential for rollovers and other severe crashes. For asphalt pavement, the Safety EdgeSM also improves pavement edge durability.

When drop-offs recur at various locations along the road, instead of a vertical drop-off between the paved and unpaved surface which can result in loss of control on re-entry to the lane after a Roadway Departure, the Safety EdgeSM provides a smooth, controlled re-entry. *As with conventional paving, the paved edge should be covered with shoulder backing material.*

How does the Safety EdgeSM work?

Its design is uncomplicated. The surface width of the pavement is typically designed the same as for conventional paving. However, based on existing field conditions, the designer has some flexibility in where to place the breakpoint of the Safety EdgeSM. For multiple lifts, it is best to construct the Safety EdgeSM during each lift that comprises the top 5 inches of pavement, adjusting the width of each lift to account for the toe of the upper lift to be at the break point of the lower lift.

Before construction begins, plan for any areas where the Safety EdgeSM may need to be discontinued, such as bridges, curbed sections, guardrails, intersections or driveways. If the project scope includes widening the pavement, it is preferred that the wedge of the Safety EdgeSM be supported by the widened base. If the project requires clipping the existing shoulders, then the clipping should be extended a few inches more than with a conventional pavement edge to accommodate the Safety EdgeSM.

Monitor while paving. In asphalt demonstration projects completed to date, the Safety EdgeSM had no impact on the operation of the paver. However, the screed operator may need to adjust the device according to variations in the existing shoulder depth.

Rolling patterns rarely need to change. Typically the Safety EdgeSM should not change the rolling pattern on asphalt pavements. The desired finished angle is approximately 30 degrees, if the angle after rolling is too steep, the first recommendation is to adjust the device. To avoid steep angles, the rolling pattern may be adjusted. Currently, two devices are available that have adjustable angles.



Inspecting the Safety EdgeSM slope on a Michigan project

Quality control practices are similar to conventional paving. Measuring the slope of the edge is typically the only difference. A straight edge and ruler are recommended tools.

Placing the shoulder-backing material may be more efficient. On Safety EdgeSM projects, some agencies allow the contractor to place shoulder-backing in a more cost-effective manner (e.g. not requiring daily pulling of the shoulders), due to the immediate reduced risk of pavement drop-offs with the paving operation.



This Indiana demonstration project provided the opportunity for on-site explanation for improving quality of the edge

What are common barriers to using the Safety EdgeSM, and how can they be addressed?

The major barrier has been **resistance to change**. Getting buy-in from forward thinking people in each of the many stakeholder groups is a key to success. Safety and pavement professionals are two of the key stakeholder groups, but construction and maintenance personnel must also buy-in and understand the concept and any adjustments from the standard practice needed for successful, quality construction.

Partnerships have also proven to be an excellent method of overcoming resistance to change. The benefits of the Safety EdgeSM include reduced crashes, improved pavement edge durability and possibly construction efficiency. Therefore, the champion may not be your conventional stakeholder in the paving process. The champion overcomes barriers, gets the necessary answers, demonstration projects, and may even push internally or externally to get the Safety EdgeSM implemented as a standard practice.

Management and design decisions are integral to making the use of Safety EdgeSM a standard practice. The belief that the existing process is good enough or better may be a barrier. The best way to address this is to educate decisionmakers through presentations or technical assistance on the benefits of the Safety EdgeSM, and design and construction procedures. The next step is constructing a demonstration project, preferably bringing in technical expertise during the installation, to provide the opportunity for decisionmakers to pose questions to those with field experience in working through on-site issues and to overcome misunderstandings about the design, construction, and quality aspects of the application. Including an Open House with the demonstration project offers a wide variety of potential agencies and industry partners the opportunity to gain hands-on knowledge and encourages wider implementation of the innovative technology. Most of the successful implementation efforts are the result of a local champion emerging from the stakeholders.

In terms of cost and time savings, what can the Safety EdgeSM accomplish?

Efficiency increases. No additional time is required to install the Safety EdgeSM, and in some cases there are time savings to the contractor. Some contractors have seen an increase in efficiency of their operation; since using the Safety EdgeSM meant that temporary shoulder material did not need to be placed at the end of each day's construction. Another contractor saved repair time and cost because the Safety EdgeSM was not damaged when his construction equipment crossed the edge, a fairly common occurrence with conventional paving in narrow work zones.

No additional labor or training is needed. Existing personnel may need additional monitoring or to make some minor adjustments, but no additional personnel are needed to install the Safety EdgeSM.

Minimal additional material is needed for asphalt overlays. Typical Safety EdgeSM installations on asphalt overlay projects require less than 1 percent additional asphalt when using the Safety EdgeSM design. When constructing thicker concrete or asphalt pavement sections, a measurable amount of additional paving material may be required.

Long-Term savings can be considerable. A 3-year crash analysis showed that benefits outweighed the costs by as much as 63 to 1 in some cases. The lowest benefit-cost ratio found was 4 to 1, where traffic volumes were very low. Improved pavement edge durability reduces maintenance costs and extends pavement edge serviceability. The savings amount varies by project and depends on such issues as pavement width, traffic volumes and pavement structure.

What are FHWA's next steps in implementing this technology?

The FHWA's goal is to accelerate the use of the Safety EdgeSM technology. The agency is currently working with States to develop specifications and adopt this pavement edge treatment as a standard practice on all applicable new paving and resurfacing projects.

The EDC Safety EdgeSM Team has formed a partnership with the National Center for Asphalt Technology to install the Safety EdgeSM in a number of pavement sections on their test track in 2012. The main goal will be to quantify pavement performance benefits. Other goals include documenting construction and providing insights into mix design issues that could predict changes to construction that would improve the final product.

An additional safety analysis evaluation has been initiated. With the significantly greater sample size that is now available, the research will develop robust crash modification factors for the Safety EdgeSM.



Including the Safety EdgeSM in concrete slip-form paving requires a modified profile pan shape – no location specified for this one either