Chris Wagner, P.E.
Pavement and Materials Eng.
FHWA Resource Center
Christopher.wagner@dot.gov

2011 Michigan Safety Edge SM Installation
Key Message

• **Saves Lives**
  – Allows vehicles to safely return to the travel lane

• **Improves Durability**
  – Reduces edge raveling

• **Low Cost**
  – Minor change to paving operations
1 Roadway Departure Fatality
Every 29 minutes

50 people die in roadway departure crashes in every day
33,561 fatalities in 2012
18,887 RwD fatalities in 2012

**Fatals by FHWA Focus Area**

- **Intersections and Pedestrians/Bicycles**: 4.8%
- **Intersections and Roadway Departures**: 4.5%
- **Roadway Departures and Pedestrian/Bicycles**: 1.2%
- **All Focus Areas**: 0.2%

NOTE: Totals in the main and secondary pie charts do not add up to 100% and 11%, respectively, due to rounding.
2006 AAA Drop-Off Study
(On rural paved roads with unpaved shoulders)

• Drop-off crashes were **17.7%** of ROR crashes in Iowa and **24.5%** of ROR crashes in Missouri

• Drop-off crashes in Iowa were **four times more fatal**

• Drop-off crashes in Missouri were **twice as likely to be fatal** as all rural crashes on similar roads
Without a Safety Edge
Relative Degree of Safety

Unsafe
Questionable Safety
Marginally Safe
Reasonably Safe
Safe

Longitudinal Edge Elevation Change (inches)

Optimum Edge Designs

Graphic Source: Zimmer and Ivey, Texas Transportation Institute
Finished Surface
“...5.7 percent effectiveness estimate for reduction in total crashes appears to be the most reliable effectiveness estimate for the safety edge treatment...”

“These results suggest that the safety edge treatment is highly cost-effective under a broad range of conditions.”
Research to Reality
• Roll Over
• Head-on
• Opposing Sideswipe
• Roadside Object
“Dangerous stretch of road costs state $1.14 million”

- 4 Drop-Off Crashes:
  - April 25, 2007
    - PDO ($3000)
  - July 24, 2007
    - PDO ($4000)
  - July 30, 2007
    - PDO ($6000)
  - August 1, 2007
    - 3 Killed, 1 Injured
Chris’s Top 10 Safety Edge Construction Questions

Original SE built in 2003
10: What Is the Safety Edge and why should I build it?

30 degree beveled pavement edge shaped during the paving process. Placed where pavement interfaces with a graded material.

Safety Benefit: Allows the vehicle to enter with greater stability.

Pavement Benefit: Creates a more durable pavement edge.

Iowa installation 2009
9: What hardware is needed?
Hardware

• Carlson Safety Edge End Gate
TransTech: Shoulder Wedge Maker™

New York Transtech installation
North Carolina Hardware Modifications
North Carolina Modifications

Reasonably quick transition at driveway
Advantedge “Ramp Champ”

Advantedger

Iowa Advantedge installation
8: What shoulder prep do I need?

Pennsylvania State Road 2009

July 2010

(1.5-inch HMA overlay, 9.5-mm mix, Advant-Edger)
Shoulder Clipping

Minor Amount of Soil Disturbance

Soil/Vegetation high next to road
7: Will roller pattern affect the finished angle?
Slope Results
6: How much does it cost?

- Limited Quantitative Data
- Missouri SR 19
  Percentage Difference: 0.82%*
- NCAT
  0.1 % Extra Material
  Asphalt Pavement Magazine January 2014

Hard Ware Cost $700 - $3000

Missouri installation 2011
Please click on You Tube videos:

Paving Without shoe:
http://www.youtube.com/watch?v=_fDW9_ukloc&NR=1

Paving with shoe
http://www.youtube.com/watch?v=NG-mK4aa0-k&feature=related
5: Are there acceptable Alternate designs?
Construction

Idaho Installation 2012
4: Where not to use the SE?

- Open Graded top mixes
- Mill and Fill operations (shoulder not milled)
- Curb and Gutter
- Drop off angle greater than 30°
3: Can I pave under guard rail?
2: Can we construct thin lifts?

Lift thickness does not correlate with edge depth.

The lift of asphalt is 1.5 inches as can be seen at the centerline.

Across the road it shows about a 4 inch depth because the shoulder was lower after clipping the shoulder.
1: Is it going to hold up?
Burke County, NC – SR 1611

- Safety Edge Section

After 24 months – 3.0” Drop off
Burke County, NC – SR 1611

- No Safety Edge

After 24 months – 3.5”
Please click on You Tube Video

Loaded trucks test durability

http://www.youtube.com/watch?v=xLvptCW_25g
Where We Are: Safety Edge℠

Considered Universally
Site Analysis/Systematic
Not at all/case by case
No Baseline Score

Alternative design
Office of Safety
Proven Safety Countermeasures

These nine countermeasures address crashes that occur in the focus areas of intersections, pedestrians, and roadway departure.

Improving safety is a top priority for the U.S. Department of Transportation, and FHWA remains committed to reducing highway fatalities and serious injuries on our Nation's highways. We are highly confident that certain processes, infrastructure design techniques, and highway features are effective and their use should be encouraged.

Memo
2012 "Guidance Memorandum on Promoting the Implementation of Proven Safety Countermeasures" (HTML, PDF 20 KB)

In 2008, FHWA issued a "Guidance Memorandum on the Consideration and Implementation of Proven Safety Countermeasures" which highlights when and where we believe certain processes, design techniques, or safety countermeasures should be used. Many of the countermeasures promoted in 2008 have been widely applied and FHWA is updating its previous guidance. While agencies should still consider the application of all the countermeasures listed in the 2008 memo, the 2012 "Guidance Memorandum on Promoting the Implementation of Proven Safety Countermeasures" supersedes that from four years ago and takes into consideration the latest safety research. Safety practitioners are encouraged to consider this new set of countermeasures that are research-proven, but not widely applied on a national basis.

Click on one of the nine countermeasures below for more information and a downloadable fact sheet.

- Roundabouts
- Corridor Access Management
- Backplates with Retroreflective Borders
- Longitudinal Rumble Strips and Striping on Two-Lane Roads
- Enhanced Delineation and Friction for Horizontal Curves
- Safety Edge®
- Medians and Pedestrian Crossing Islands in Urban and Suburban Areas
- Pedestrian Hybrid Beacon
- Road Diet

You may need the Adobe Reader to view the PDFs on this page.
Which side of the road will you be on in 8 years?

Original Project Constructed  7/2003
Photo taken 6/2011

With Safety Edge

Without Safety Edge
Questions?