Safety Benefits of the Safety Edge

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Moving Research into Practice

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Pavement Edge Drop-off

- Vertical elevation difference between adjacent roadway surfaces
Pavement Edge Drop-off

- Vehicle leaves roadway and encounters drop-off
- Affects driver handling and stability
- Overcompensation (loss of control)
- Scrubbing as driver attempt to return to roadway (as driver steers to overcome friction between tire sidewall and pavement edge, loss of resistance on return to roadway can cause yawing)
Causes

- Resurfacing without maintenance
- Wear
- Erosion
- Construction

Images: Graham, MRI
Pavement Edge Drop-off

- Around 160 fatalities and 11,000 injuries annually
- Drop-off crashes 2 times more likely to result in fatal crash than other crashes on similar roadways
- Rural 2-lane roadways
  - more than ½ of all fatalities
  - 2/3 of roadway departure fatalities
- Liability for agencies
What is the Safety Edge?

- Creates a fillet along the outside edge of the paved section of a roadway
- Placed during Hot Mix Asphalt (HMA) paving
- Provides a sloped surface for errant vehicles to transition from an unpaved shoulder to paved surface

(image source: FHWA, 2009)
What is the Safety Edge?

- Device (shoe) shapes and consolidates asphalt material at the pavement edge into an approximate 30° slope
Q1: To what extent is the Safety Edge used in your organization (HMA projects)

A. Not used at all
B. Has been tested but not widely used
C. Limited use
D. Widely used on primary roads
E. Widely used on primary and secondary roads
F. Not sure
Safety Edge Construction Benefits

- Less likely to form extreme drop-off
- Some states do not require contractors to pull shoulders up immediately after construction
- Can reduce tort liability by showing “Due Care”
Q2: Are any incentives offered to contractors with your agency

A. None that I know of
B. Contractors do not have to “pull” shoulders up each night
C. Other incentives offered (please note what these benefits are in the chat box)
D. Our experience is very limited
Safety Benefits

- CTRE study evaluated sites in Iowa where Safety Edge was applied in 2010 & 2011
- Included control sections
- Before and after crash analysis

- CMF = 0.87 (all non-intersection crashes)
  - 13% reduction
- CMF = 0.89 (ROR, non-intersection crashes)
  - 11% reduction
- Crash reduction of 5.7% (MRI study)
Other Benefits

- Potential increased pavement edge durability due to increased compaction
- Provides temporary safety during construction while pavement edge face is exposed

(resurfacing without Safety Edge (images: Roche))

(resurfacing with Safety Edge (images: Roche))
Additional Benefits

- Minimal hardware, labor or material costs are required
- Estimated additional material ~ 1 to 2% HMA

### Additional Material Needed for HMA Safety Edge

<table>
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<tr>
<th>Total Depth All Lifts (in)</th>
<th>Additional Area for 30 vs. 80° (in²)</th>
<th>Material in slope (ton/mile)</th>
<th>% of Additional material per mile For 22’ wide pvmt</th>
<th>% of Additional material per mile for 24 foot pvmt</th>
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</table>
Safety Edge in Iowa

- First use in 2008: HMA resurfacing project on County Road Z-36 in Clinton County
- 2010: Iowa DOT adopted Safety Edge as Standard Practice for construction and rehabilitation projects
- Iowa DOT Design Manual requires use of the Safety Edge on all *primary* highways unless one of the following is met:
  - Roadway is an interchange ramp or loop
  - Roadway or shoulder has curbs
  - Paved shoulder width ≥ 4 ft
Implementation of Safety Edge in Iowa

- Emphasis by FHWA (Every Day Counts)
- Iowa DOT adopted Safety Edge as a standard practice for construction and rehabilitation projects in 2010 based on recommendations from MTC and other researchers
- Slow to be adopted in Iowa
- Iowa DOT funded marketing and outreach of Safety Edge to local agencies
Q3: What is the biggest barriers in implementing the Safety Edge in your organization

A. Adds additional cost in materials and equipment
B. Concerns that 30° slope cannot be uniformly applied
C. Do not see value
D. My organization has “bought” in, no barriers
Marketing/Outreach of Safety Edge in Iowa

- Team conducted marketing/outreach activities to encourage use:
  - Attended pre-con to answer questions about equipment
  - Loaned Safety Edge “shoes:
  - Conducted open houses to provide information and demonstrate application
  - Sites visits
  - Provided technical assistance
  - Measured slope
  - Developed recommendations on application of Safety Edge
PCC Application of Safety Edge

- Jones/Linn county
- E-34
- First PCC application in US in 2010
- Paved width: 26 feet
- Unbonded 6-inch PCC overlay over an existing 6-inch PCC pavement with a 1-inch HMA bond breaker
- 2.5 miles
PCC Application of Safety Edge

- No commercially available equipment
- Contractors fabricated Safety Slope Pan

PCC Paver modification for Linn/Jones by Horsfield Construction

PCC Paver modification for Wicks Construction
Q4: To what extent is the Safety Edge used PCC projects in your organization?

A. Not used at all
B. Has been tested but not widely used
C. Used on primary roads
D. Used on primary and secondary roads
E. Not sure
Implementation

• Benefits easily described
• Most agencies using Safety Edge in the 2010 construction season “bought in” once advantages were explained
  ➢ Maintenance benefits easily understood
• Early outreach critical
  ➢ Pre-letting assistance
  ➢ Pre-construction assistance
  ➢ Open houses
Q5: What primary sources have you used to determine whether the Safety Edge should be implemented in your organization?

A. I was already familiar with the Safety Edge
B. Information from FHWA such as “Every Day Counts”
C. Reports, tech briefs from groups other than FHWA
D. Networking (word of mouth)
E. Not sure
Q6: Prior to today’s presentation, how aware were you of the benefits of using the Safety Edge?

A. I was not really aware of the benefits
B. I was aware of the safety benefits but not maintenance/construction benefits
C. I was aware of safety and maintenance/construction benefits
QUESTIONS?
Iowa Safety Edge Experiences

Bill Rosener
Executive Vice President
Asphalt Paving Association of Iowa
Asphalt Paving Association of Iowa

An association of Hot-Mix Asphalt producers, asphalt cement suppliers, aggregate producers, consulting engineers and industry retailers formed to insure the highest quality of asphalt is produced and placed in the State of Iowa. Established in 1955.
QUESTIONS?
Thank you!

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is at your service
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