



U.S. Department
of Transportation
Federal Highway
Administration



Safety **EDGE**

Your Angle for Reducing Roadway Departure Crashes

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What Is the Safety Edge?

When used on asphalt pavement the



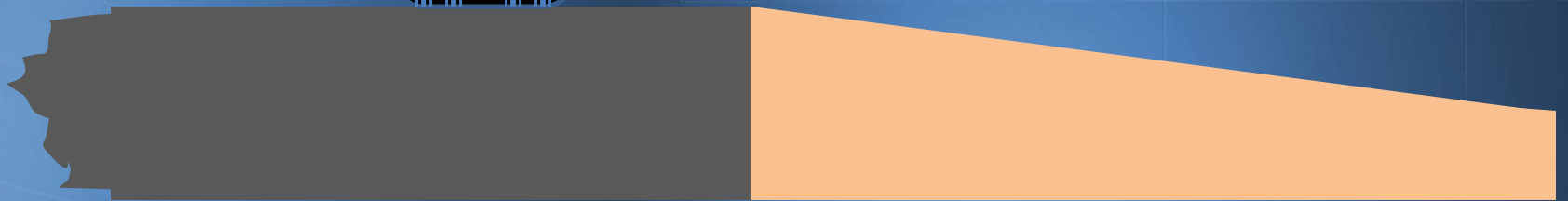


Key Message

- **Saves Lives**
 - Allows vehicles to safely return to the travel lane
- **Improves Durability**
 - Reduces edge raveling
- **Low Cost**
 - Minor change to paving operations



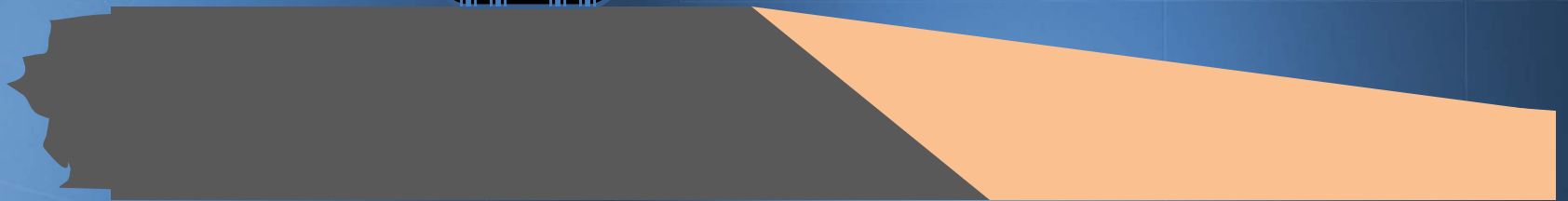
Basic Principle



Without a Safety Edge



Basic Principle



With Safety Edge

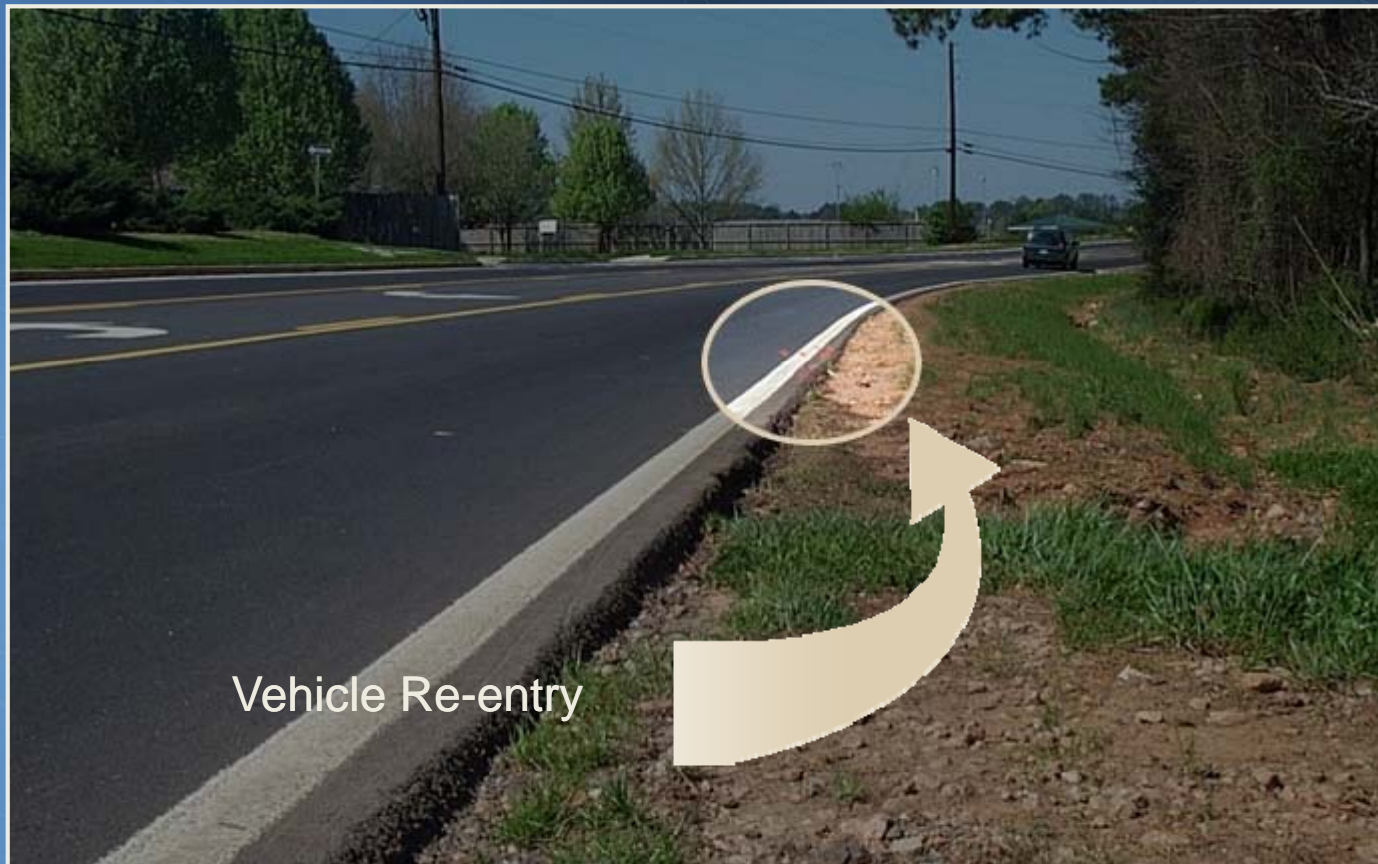


Locations at High-Risk for Drop-Offs

- Horizontal Curves
- Near Roadside Mailboxes
- Turnarounds/Unpaved Pull-Outs
- Shaded Areas
- Eroded Areas
- Edge ruts
- Asphalt Pavement Overlays



Are Drop-Offs a Problem?



Vehicle Re-entry



Edge Drop-Off Crash Types

- Roll Over
- Head-on
- Opposing Sideswipe
- Roadside Object



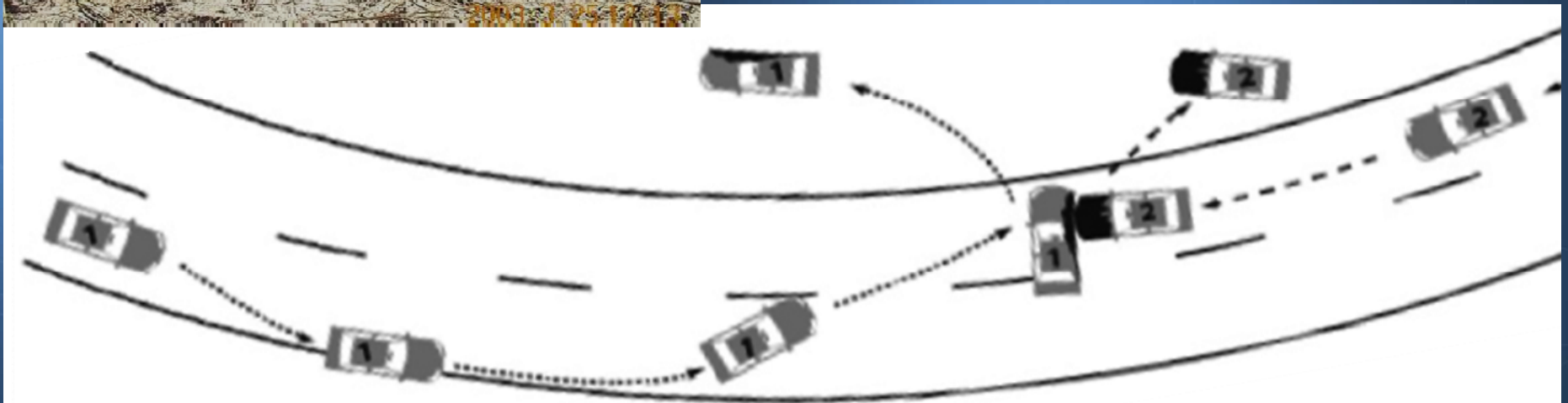
From The Atlanta Journal Constitution, 3-25-03



Typical Drop-Off Crash with Tire Scrubbing



Video





Horizontal Curves





Drop-Off with the Safety Edge

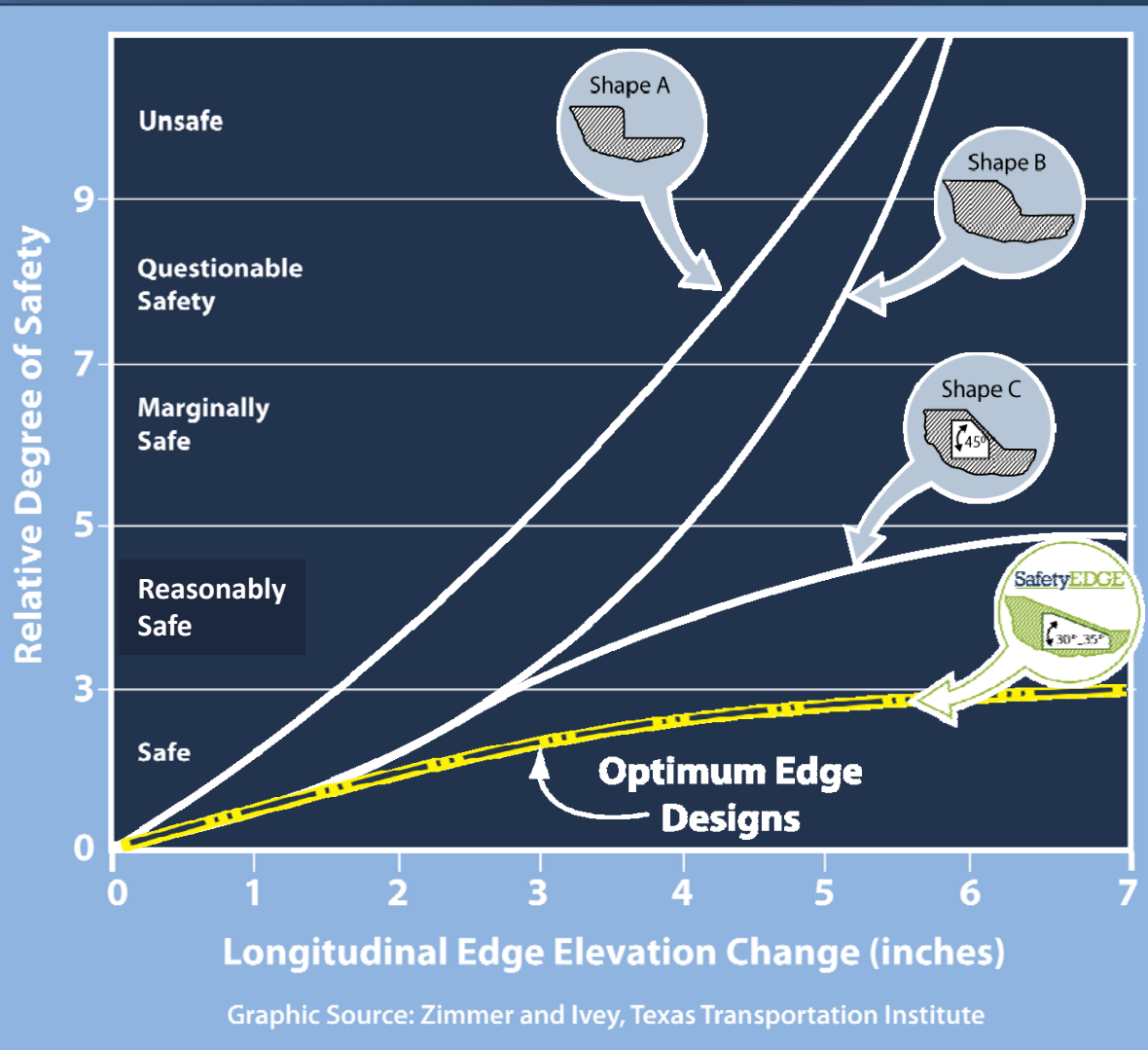




Risk Factors

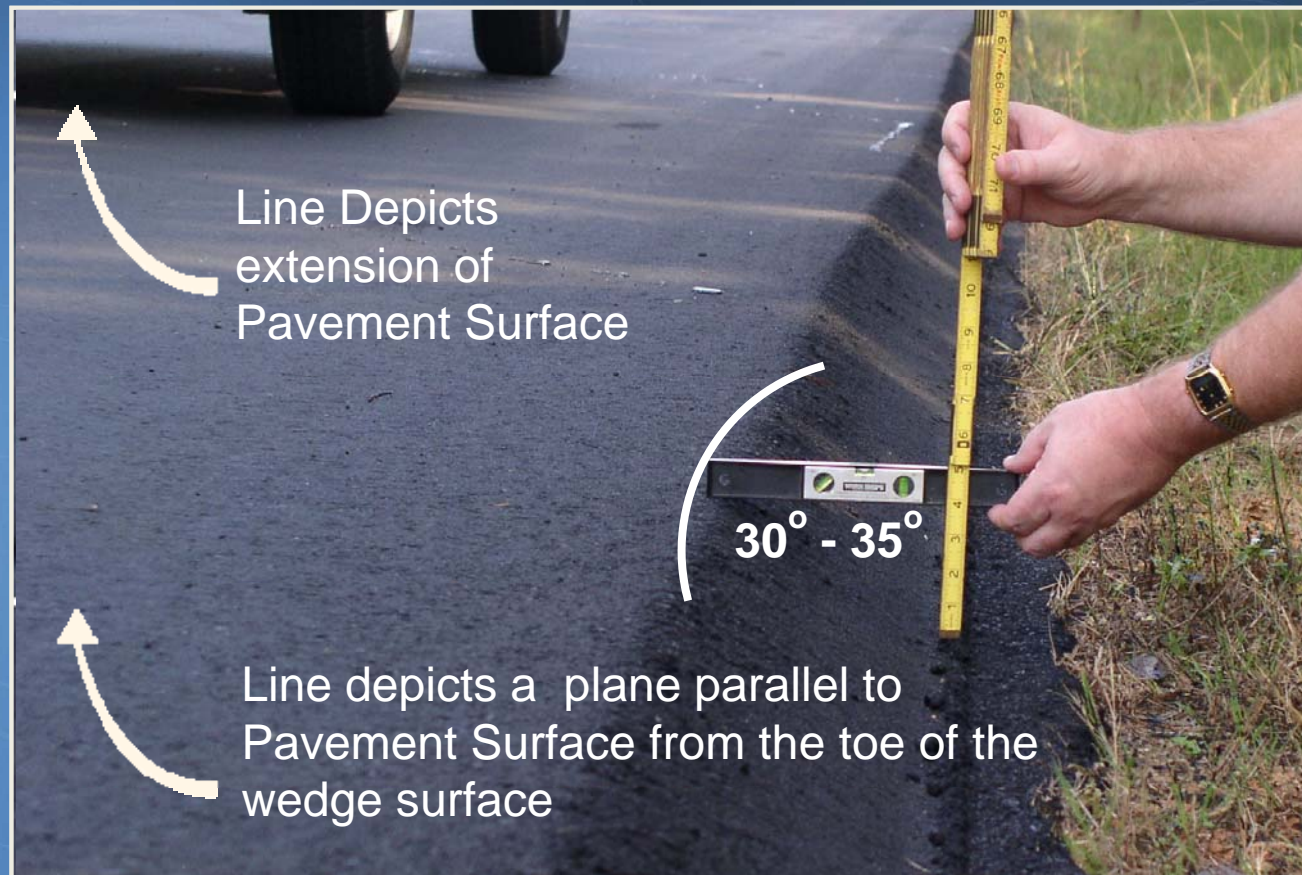
What are the factors associated with pavement edge drop-off crashes?

- Speed
- Driver Experience
- Vehicle/Tires
- Drop-off Height
- Shape Of Pavement Edge**





Angle Definition





Approach to Reducing Roadway Departure Crashes

- Low-Cost Solutions
- Highly-Effective Countermeasures
- Systematic Application



Safety Edge Installation: Georgia



Construction

Similar to Conventional Paving
(No Effect on Production)

- Clip Shoulders
- Construct Overlay
- Pull Shoulders Flush





The Hardware





BOMAG

AMERICAS



Colorado installation 2011

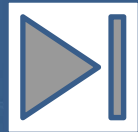




Conventional Edge



Video



Safety Edge



Video





Increased Edge Durability?



Without Safety Edge



With Safety Edge



Edge Durability

Condition After **6** Years of Service



Without Safety Edge



With Safety Edge

Safety Edge Installation: Georgia



Which side of the road will you be on in 8 years ?

Original Georgia Project
Constructed 7/2003

Photos taken 6 /2011

Without Safety Edge



With Safety Edge





Durability



Video





Is the SE going to hold up?

Burke County, NC – SR 1611

- Safety Edge Section



After 24 months – 3.0” Drop off



Burke County, NC – SR 1611

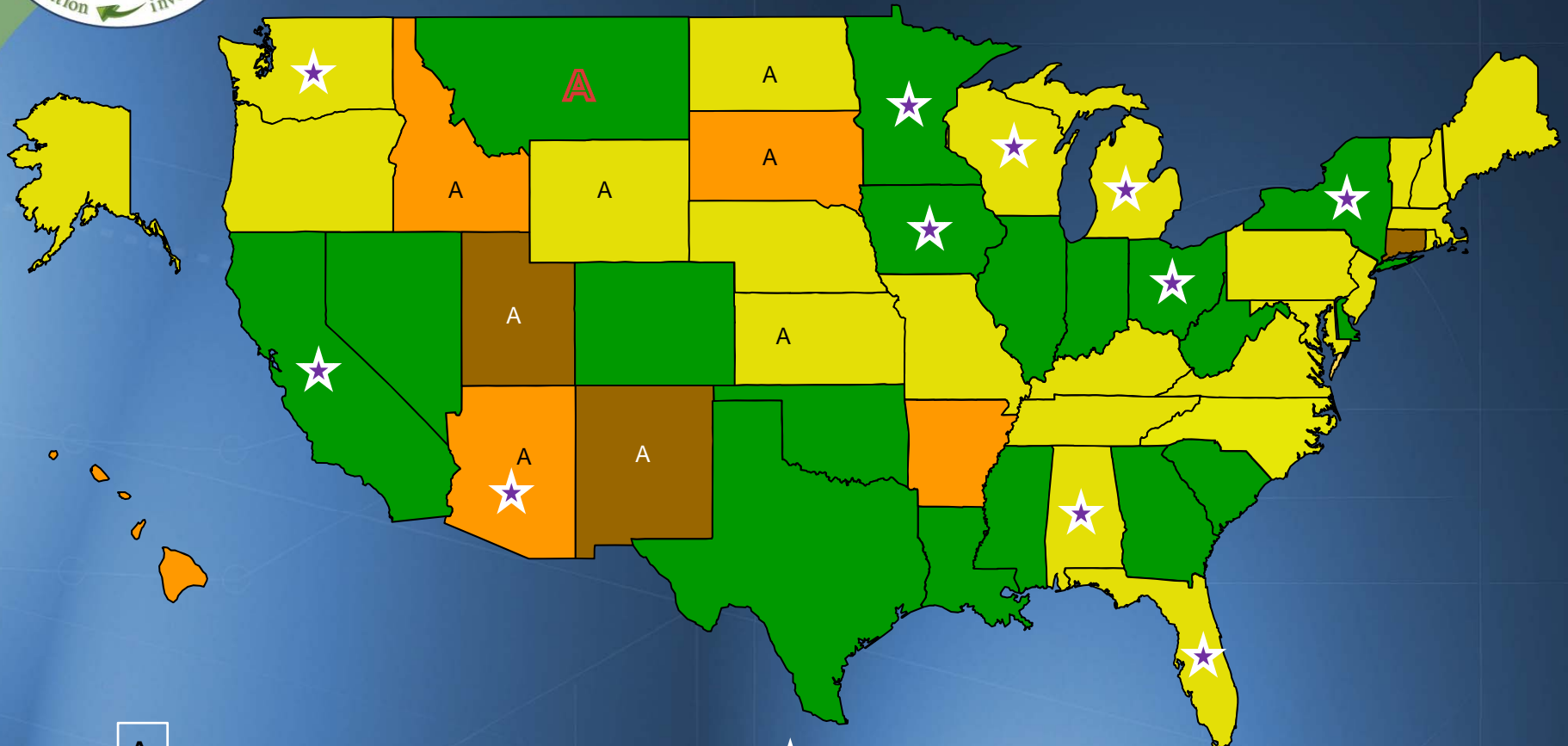
- No Safety Edge



After 24 months – 3.5”



Safety Edge Implementation



A

Alternate Detail



Policy/Standard



State DOT Projects Built



Notable Local Efforts



Project Pending/State Evaluating



No State DOT Projects Expected

Jan 2012



Nebraska State Route 10

July 2010

(2.0-inch HMA overlay, 12.5 mm mix, TransTech Shoulder Wedge Maker)





Nebraska State Route 10



- Rolling did not steepen the slope.
- Safety edge and control (no safety edge) section densities were similar.
- Average slope was 34° .



Nebraska State Route 10

February 2011



➤ Seven months after construction 2" plus drop off throughout (tire tracks)

➤ Safety edge intact



Nebraska State Route 10

February 2011



- Driveway – no Safety Edge
- Large drop off



Nebraska State Route 10

February 2011



- Arrow is location Safety Edge is employed
- Pavement edge deterioration without Safety Edge
- Pavement edge intact with Safety Edge
- Drop off depth reduces with Safety Edge



North Carolina Brogden Road

April 2011

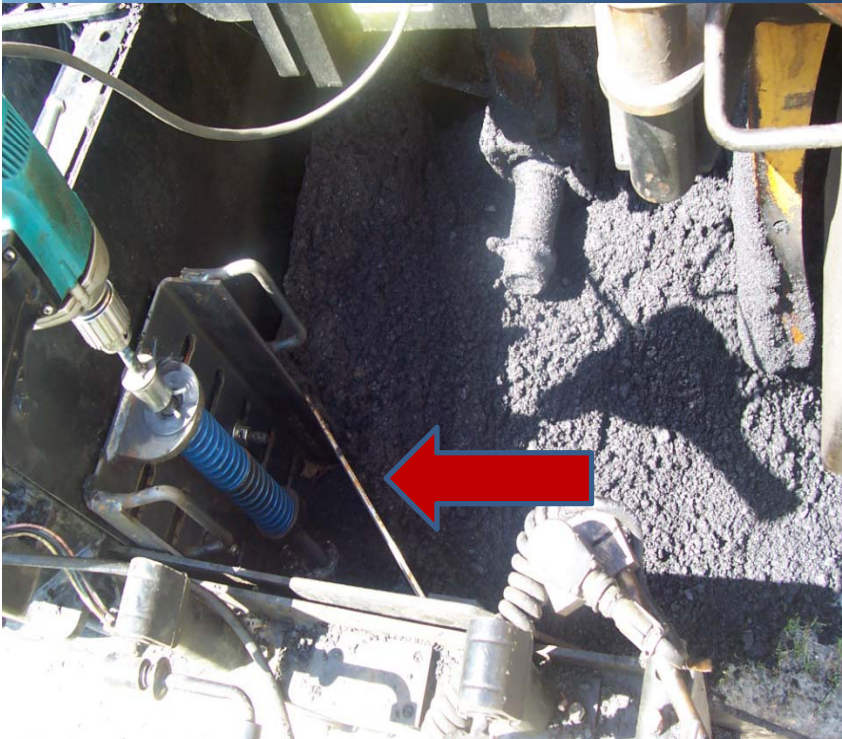
(1.5-inch WMA overlay, 9.5 mm mix, Troxler SafeTSlope Edge Smoother, NC DOT Safety Edge device)





North Carolina Brogden Road

- Troxler SE average slope 28°
- NC DOT SE average slope 26°
- Safety edge density was 1.7% higher than the control (no safety edge) section.



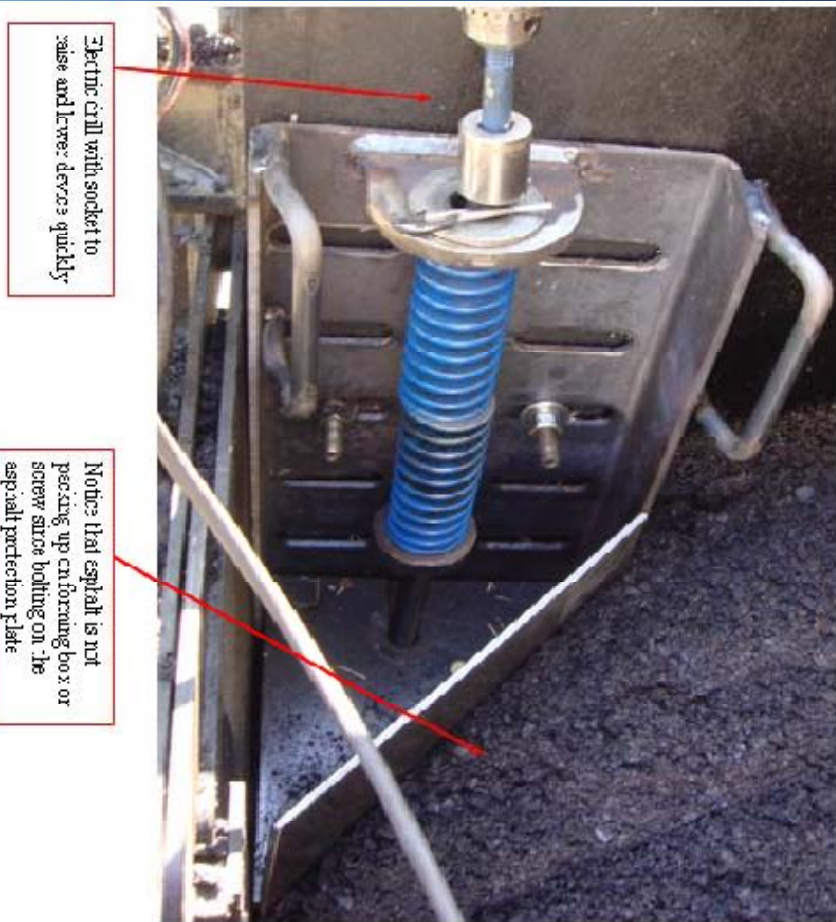
- Photo of NC DOT design – note plate to keep asphalt from entering spring area





North Carolina Brogden Road NC SE Device

Leading edge shaped to ride smoothly on surface





North Carolina Brogden Road



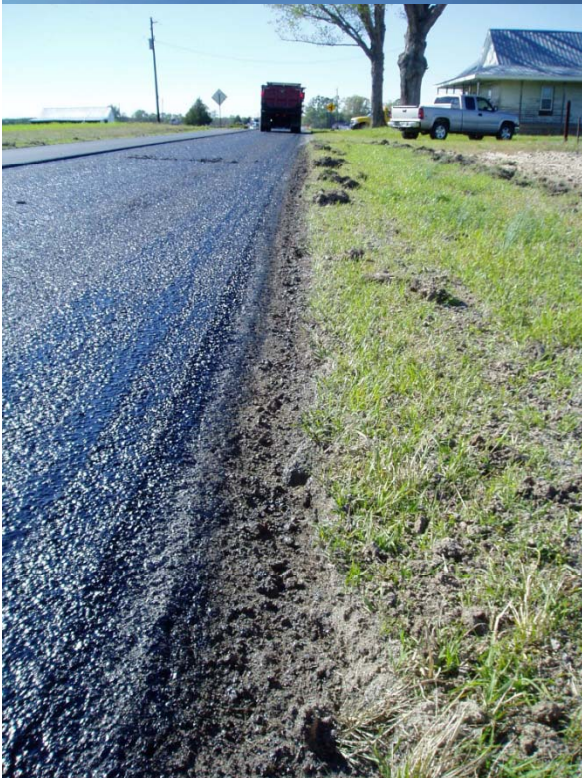
- Troxler device plowing soil into asphalt (soil was soft/uncompacted in this location)



North Carolina Brogden Road Shoulder Clipping

Minor Amount of Soil
Disturbance

Soil/Vegetation high next to road





North Carolina Brogden Road



- Isolated longitudinal cracking after breakdown rolling
- Is this Safety Edge related?



North Carolina Brogden Road





North Carolina Brogden Road



- Lane edge was paved on soil/vegetation
- Holding vegetation root



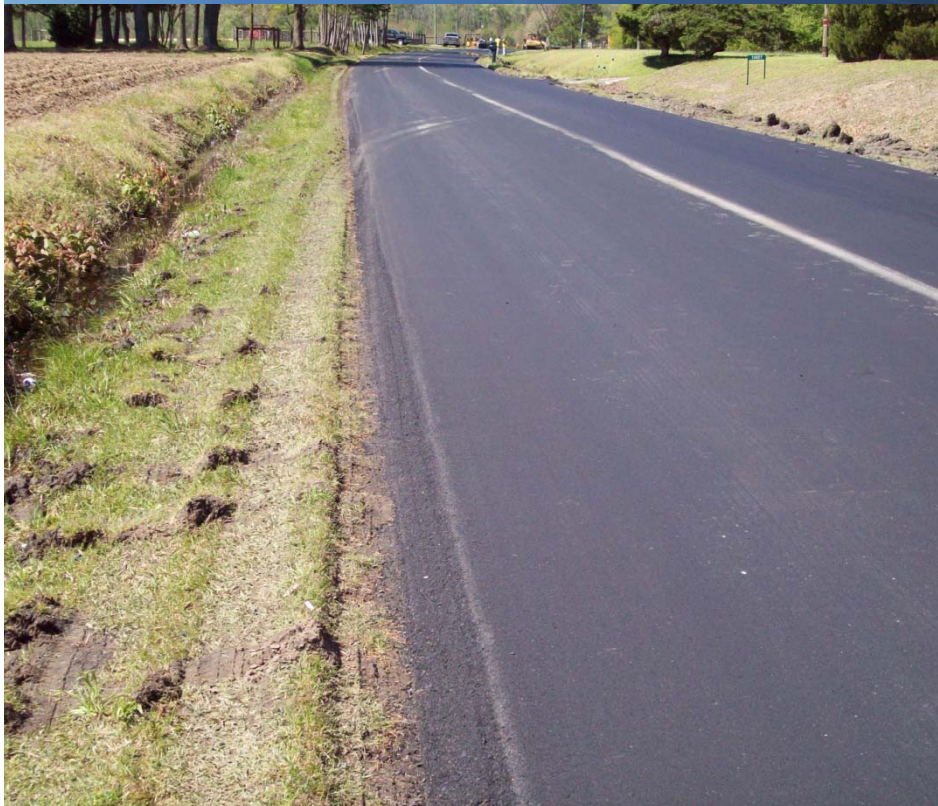
North Carolina Brogden Road



- Keep lane edge on sound material as rest of lane



North Carolina Brogden Road



- Loaded asphalt trucks running on SE – no damage
- Contractor stated will use SE wherever allowed since no damage



Where not to use the SE?

- Mill and Fill operations (shoulder not milled)
- Curb and Gutter
- Drop off angle greater than 30°





Density Measurement





Test Result Summary

State	Device / Section	Slope	Density, pcf (Near Edge)	Density, pcf (3 ft from Edge)	% Air Voids (Near Edge)	% Air Voids (3 ft from Edge)
DE	Advant-Edger	48°	145.1	147.5	9.0	7.4
DE	TransTech	37°	140.2	145.6	11.8	8.4
DE	Control Section	NA	137.9	141.2	13.5	8.9
IA	TransTech	38°	133.2	145.8	13.6	5.4
IA	Control Section	NA	140.2	147.2	9.1	4.6
MS	TransTech	37°	131.4	137.3	10.6	6.6
MS	Control Section	NA	129.0	137.5	12.3	6.5
NC-B	Troxler	28°	134.9	139.9	10.5	7.2
NC-B	NCDOT	26°	134.8	140.5	10.6	6.8
NC-B	Control Section	NA	132.2	138.8	12.3	7.9



Test Result Summary

State	Device / Section	Slope	Density, pcf (Near Edge)	Density, pcf (3 ft from Edge)	% Air Voids (Near Edge)	% Air Voids (3 ft from Edge)
NC-D	Carlson	29°	135.6	135.4	11.3	11.5
NC-D	Control Section	NA	135.9	139.7	11.2	8.7
NE	TransTech	34°	133.5	140.3	11.8	7.3
NE	Control Section	NA	135.4	138.6	10.5	8.5
PA	Advant-Edger	48°	137.1	140.2	13.6	11.7
PA	Control Section	NA	131.9	140.6	16.9	11.4
WI	TransTech	35°	136.7	145.4	11.2	5.5
WI	Carlson #2	33°	135.4	144.9	12.0	5.8
WI	Carlson #3	36°	132.9	143.6	13.6	6.7
WI	Control Section	NA	137.1	145.2	10.9	5.6



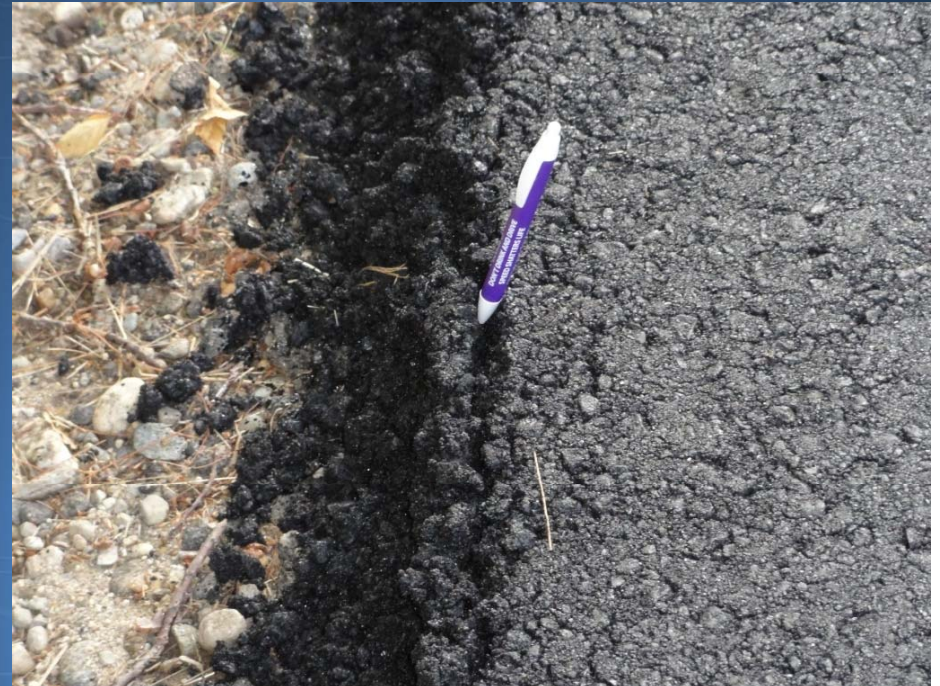
Summary

- ☑ The HMA densities measured adjacent to the unconfined edge were similar with or without using the Safety Edge.
- ☑ The average slope of the Safety Edge can be constructed between values of 30 to 40 degrees using standard rolling patterns.



Summary

- Safety Edge equipment/processes – enhancements will come with more experiences
- Picture vs data





Benefits of the Safety Edge

- Temporary safety benefit during construction
- Increase production—shoulder work after overlay complete
- Aid vehicle re-entry
- **Increased Pavement Edge Durability**
- **Reduced Crashes Over Life of the Pavement**



What can the FHWA offer?

Training

Toolkit:

- Promotional Material
- Specifications
- Design/Const Guide
- Tech Drawings

Demo projects:

- Free loaner equipment
- Technical assistance
- Project documentation

Evaluation





Every Day Counts

Innovation Initiative

Contact Information

To learn more about the Safety Edge, visit:

<http://www.fhwa.dot.gov/everydaycounts>