Federal Highway Administration

Every Day Counts

Innovation Initiative

SafetyEDGE

Your Angle for Reducing Roadway Departure Crashes

2010 Iowa Safety Edge Installation

Chris Wagner, P.E.

FHWA – Resource Center – Atlanta, GA

What are the Innovations?

- **Warm Mix Asphalt (WMA)**

- Prefab. Bridge Elements & Systems

- Geosynthetic Reinforced Soil

- **Safety Edge**

- Adaptive Traffic Control Technology

Warm Mix Asphalt

- WMA encompasses a wide range of enabling technologies that enhance asphalt production and/or lay-down properties…

Warm Mix Asphalt (WMA)

General Technology Categories:

- Materials Processing
- Organic Additives
- Chemical Additives
- **Foaming Processes**
- Hybrid Systems (combination of technologies)

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KOLO VEIDEKKE

ASPHALT INNOVATIONS™
A MeadWestvaco Business

Thiopave
Technologies for Sulphur Enhanced Road Construction

AESCO SINCE 1980 MADSEN SINCE 1910

TEREX Roadbuilding

TARMAC INTERNATIONAL, INC.

EUROVIA

Mathy Tech. & Eng. Services and
Paragon Technical Services, Inc

MEEKER

lea-co

sasol

GENCOR INDUSTRIES INC.

ceca ARKEMA GROUP

PQ Corporation

AKZO NOBEL

Currently Twenty Two (22) Technologies Marketed and Available in the US.

MAXAM™ Maxam Equipment, Inc.

Stansteel® ON TARGET EVERY TIME!

sonneborn REFINED PRODUCTS

Reliable Asphalt Products

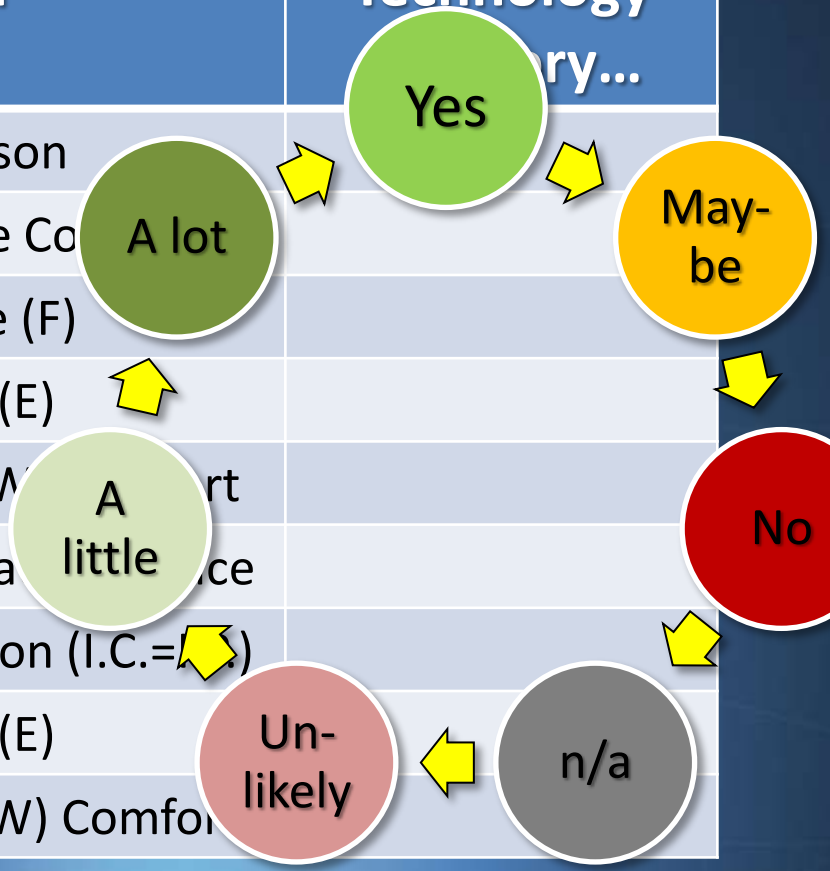
ASTEC

Lake Asphalt of
Trinidad and Tobago

iterchimica CHIMICA INNOVATIVA PER LE PAVIMENTAZIONI STRADALI

What is WMA?

Relative Production Temperature (°F)	Zone	Driver	WMA Technology ...ry...
HMA - 40° - 60° - 80° - 100°	Total Project	Extend Paving Season	
	Production	Improve Aggregate Co	
		Reduce Fuel Usage (F)	
		Reduce Emissions (E)	
		Enhance Worker (W...rt	
	Transport	Extend Effective Ha...ce	
	Lay-Down	Improve Compaction (I.C.=...)	
		Reduce Emissions (E)	
		Enhance Worker (W) Comfo...	



I.C. = I.P.

- The BAD mix with GOOD density out-performed the GOOD mix with POOR density

Nevada Automotive Test Center

Economics of WMA

- WMA Technology (Operating) Cost:
  - Foaming Systems… water is basically free. If a liquid antistrip is needed, this adds ~ $1 to $2 / ton
  - Additive Systems… $1.75 to 2.50 / ton of mix
  - This does NOT include fuel savings Net cost ~ Zero to $1.50 / ton

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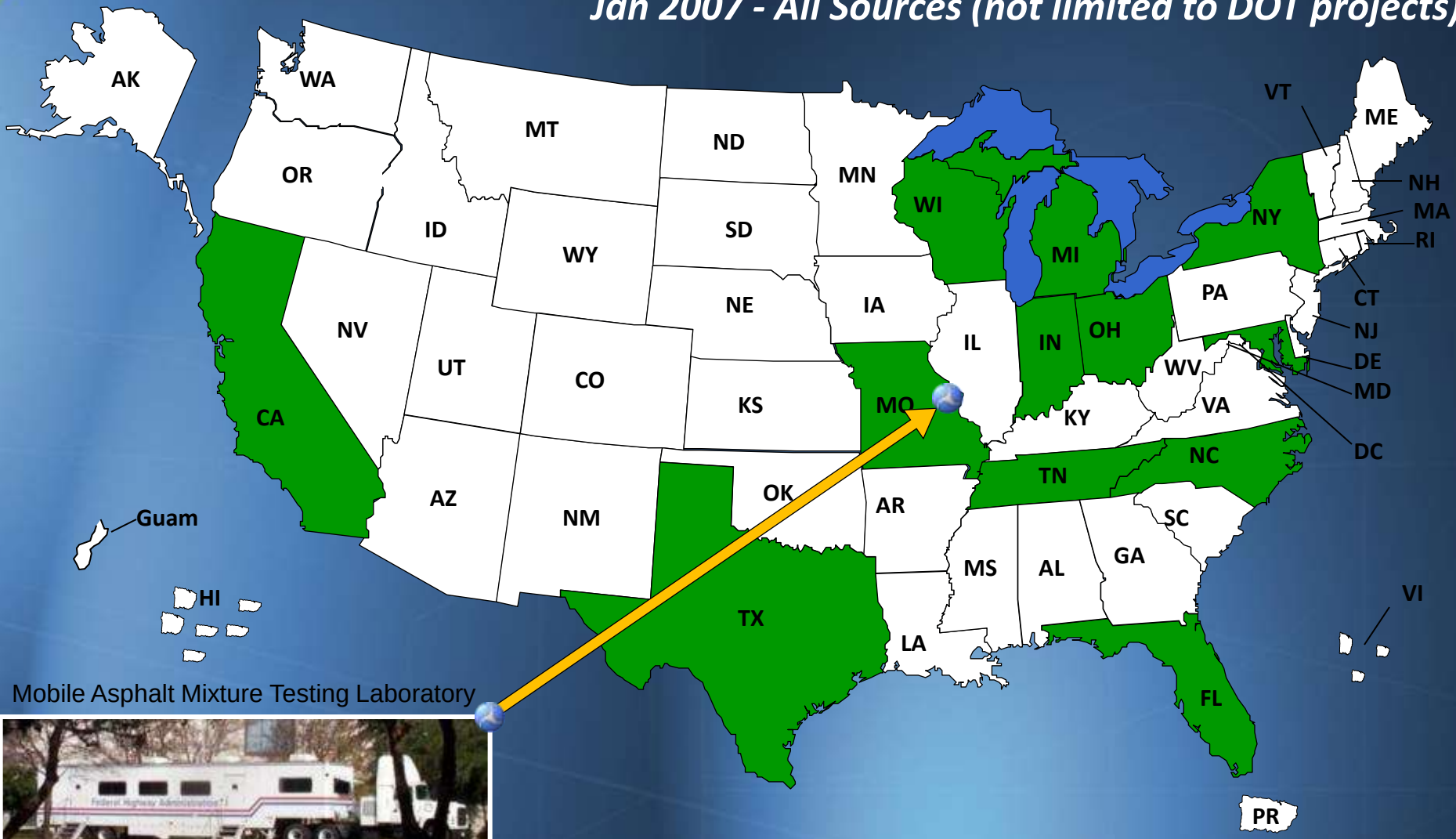
WMA Trials & Demonstration Projects

Jan 2007 - All Sources (not limited to DOT projects)



Mobile Asphalt Mixture Testing Laboratory

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WMA Trials & Demonstration Projects

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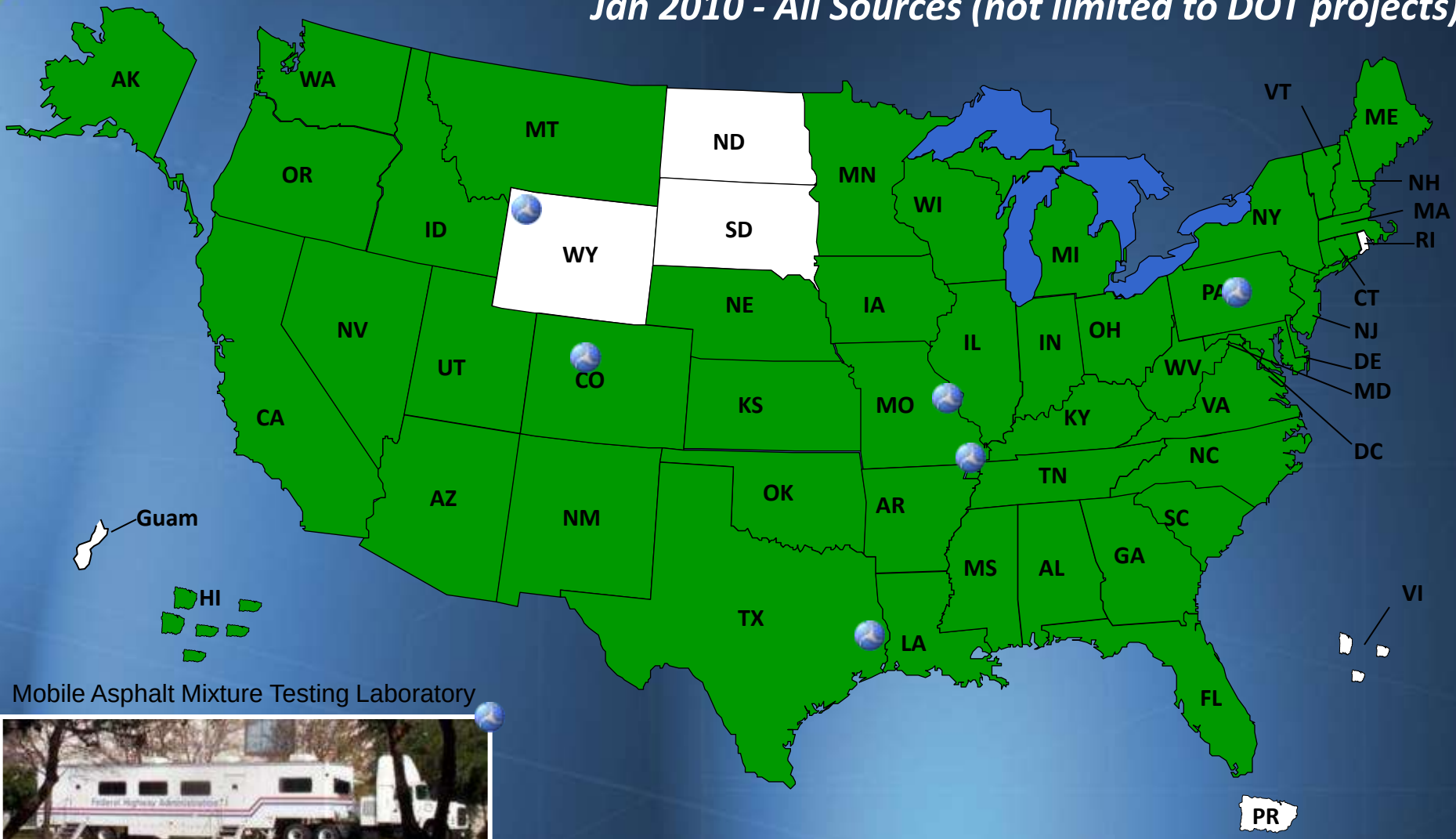

Mobile Asphalt Mixture Testing Laboratory

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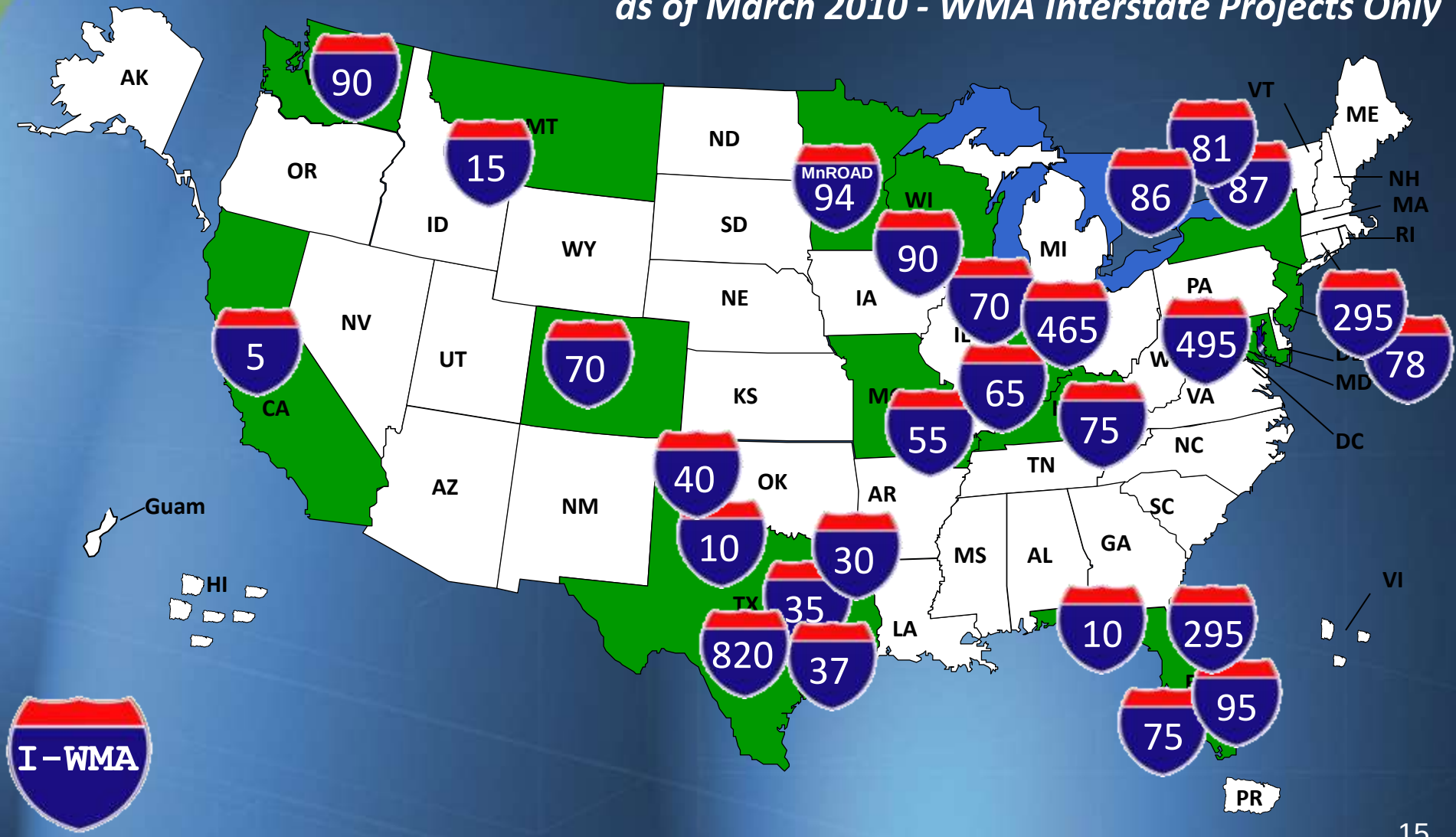
Interstate Highway WMA Usage

as of March 2010 - WMA Interstate Projects Only



Challenge: Reduced Production Temperatures

- Concerns:
  - Incomplete drying of aggregate
  - Reduced production aging of binder
  - Performance issues
    - Moisture susceptibility
    - Early rutting

National Research Initiatives

- NCHRP 9-43 *"Mix Design Practices for Warm Mix Asphalt"* $500,000
- NCHRP 9-47A *"Engineering Properties, Emissions, and Field Performance"* $900,000
- NCHRP 9-49 *"Long Term Field Performance of Warm Mix Asphalt Technologies"*
  - Phase I, Moisture Susceptibility - $450,000
  - Phase II, Long-Term Performance - $900,000

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WMA Publications

WMA Latest News

www.warmmixasphalt.com/

- **Technical Working Group Meeting(s)**
- **2nd International Conference on WMA**
  October 2011 - St. Louis, MO

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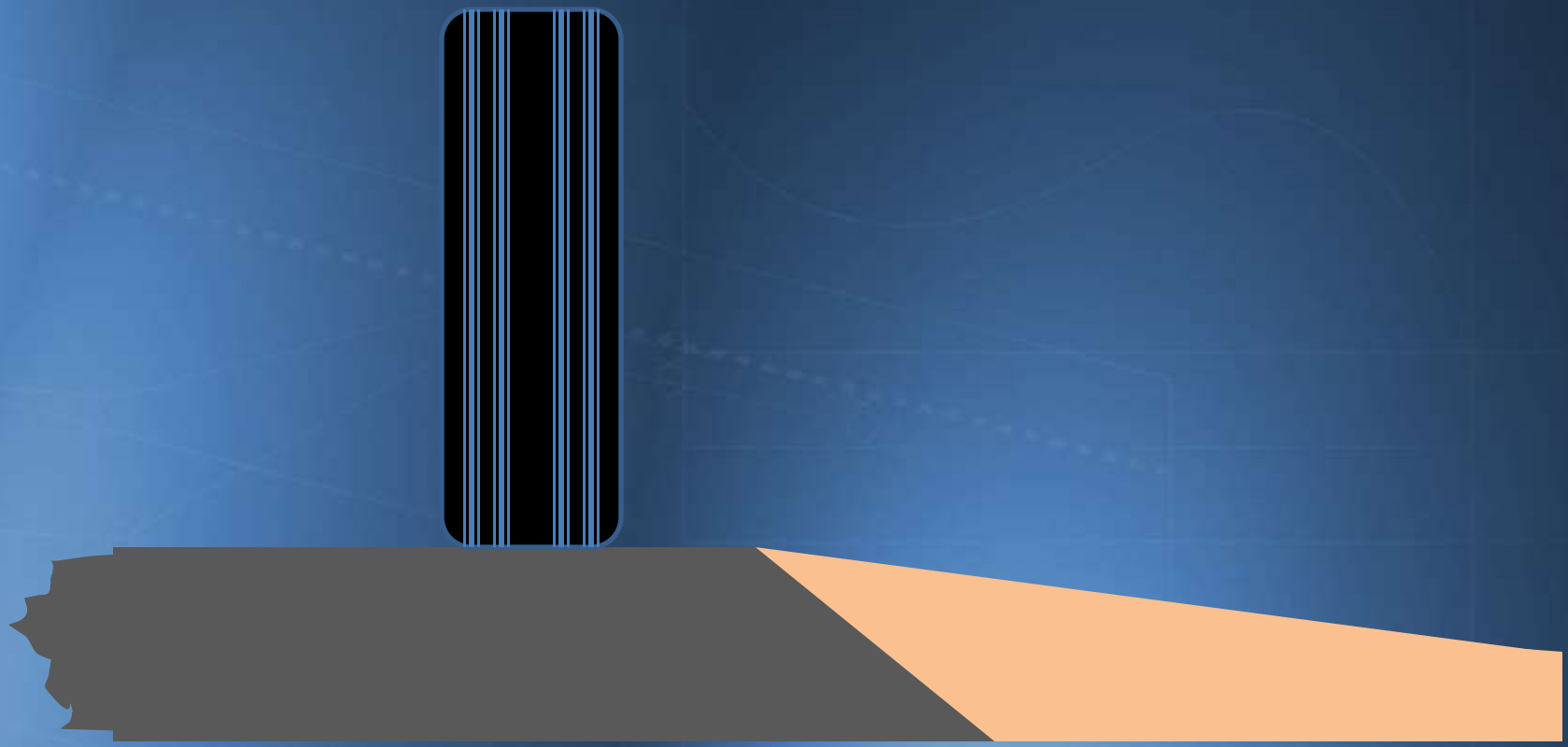
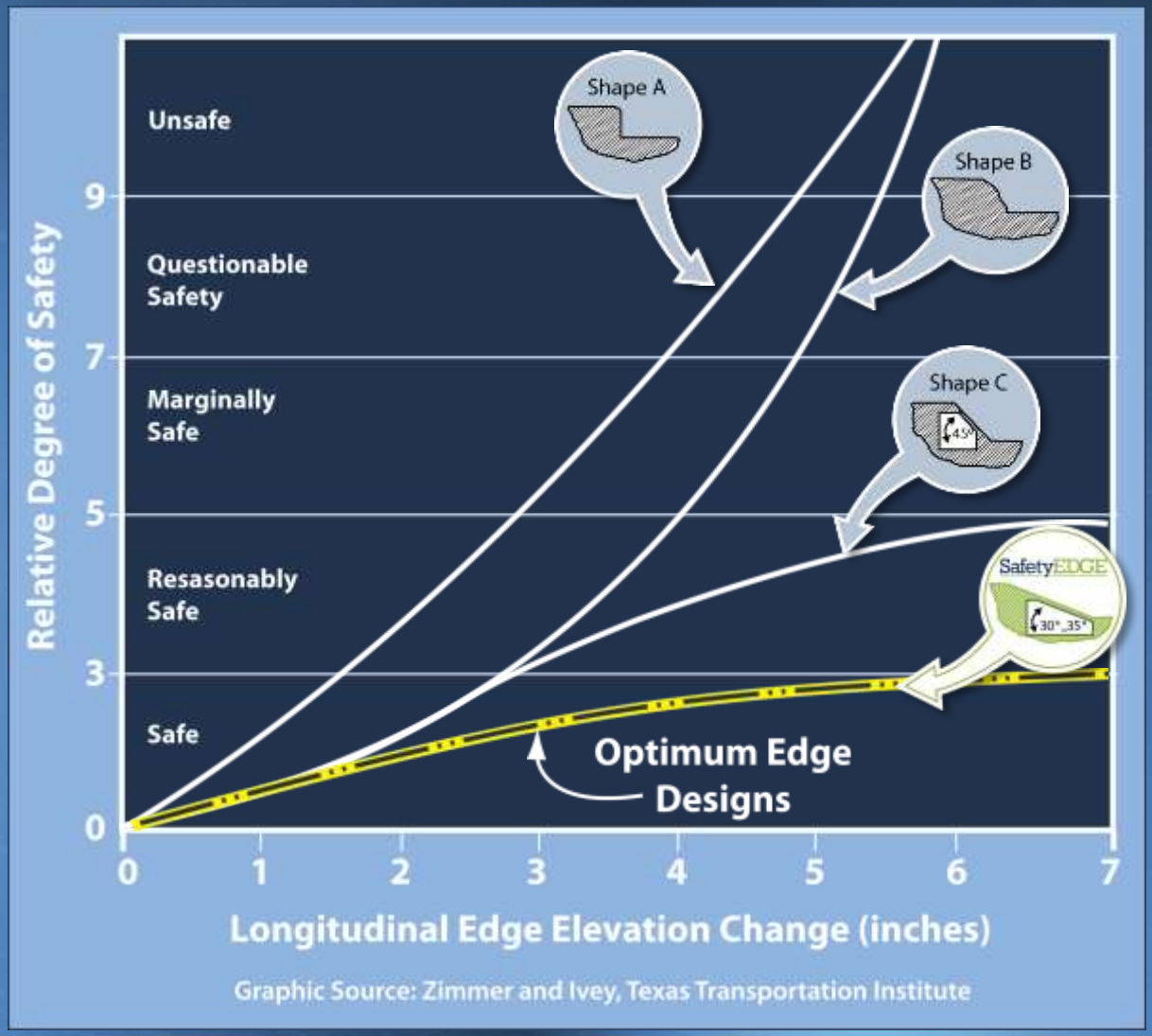


THE PROBLEM


Unsafe
Questionable Safety
Marginally Safe
Resasonably Safe
Safe
Shape A
Shape B
Shape C
SafetyEDGE
Optimum Edge Designs
Relative Degree of Safety
0
3
5
7
9
0
1
2
3
4
5
6
7
Longitudinal Edge Elevation Change (inches)
Graphic Source: Zimmer and Ivey, Texas Transportation Institute

1 Fatality Every 27 minutes

54 people will die in a roadway departure crash in the United States today.

2006 AAA Drop-Off Study

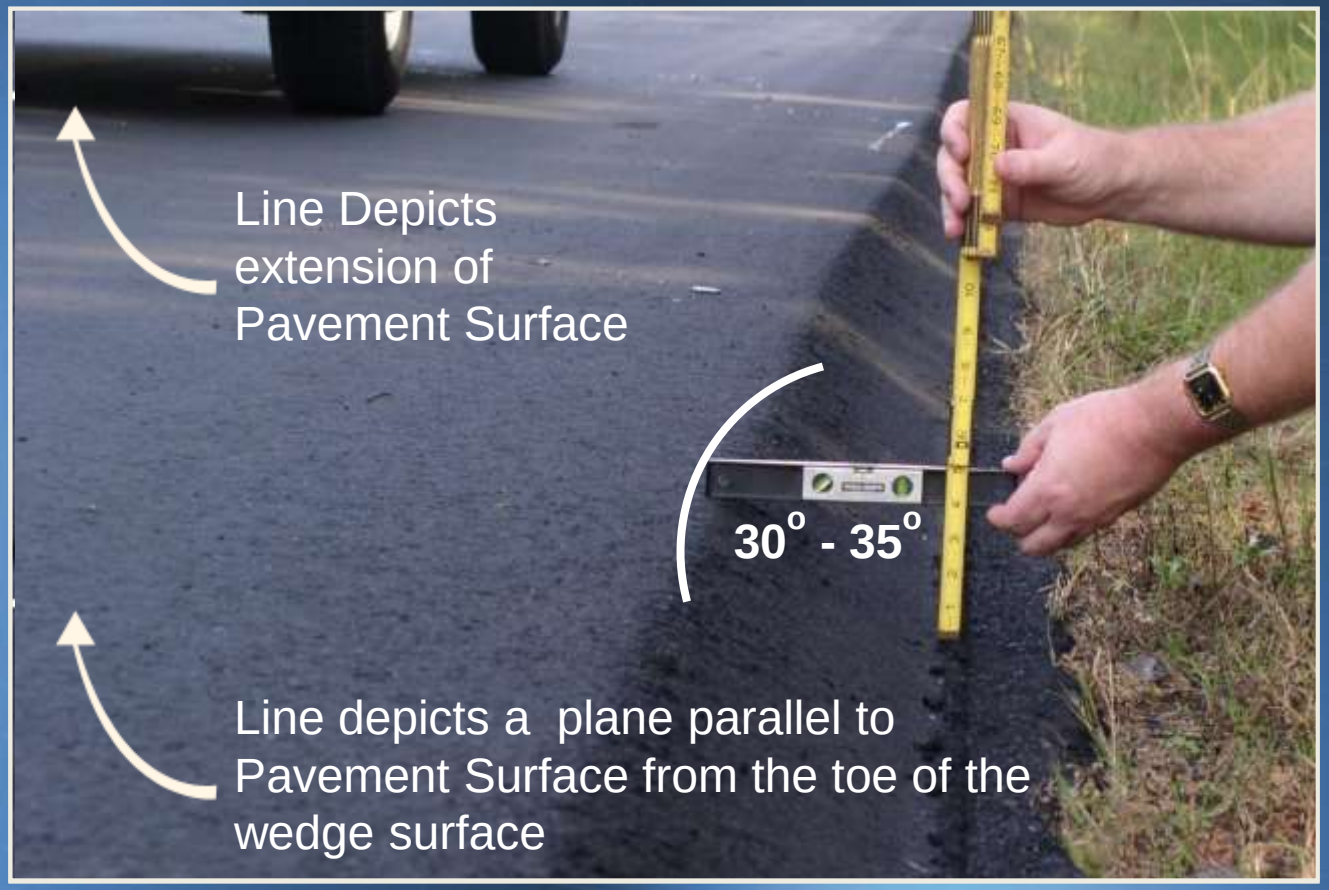
(On rural paved roads with unpaved shoulders)

- Drop-off crashes were 17.7% of ROR crashes in Iowa
- Drop-off crashes were 24.5% of ROR crashes in Missouri
- Drop-off crashes in Iowa were four times as likely to be fatal as all rural crashes and twice as likely to be fatal as other rural ROR crashes
- Drop-off crashes in Missouri were twice as likely to be fatal as all rural crashes on similar roads

Horizontal Curves

Eroded Areas

Asphalt Overlay



2004 Georgia Safety Edge Installation

Construction

Similar to Conventional Paving

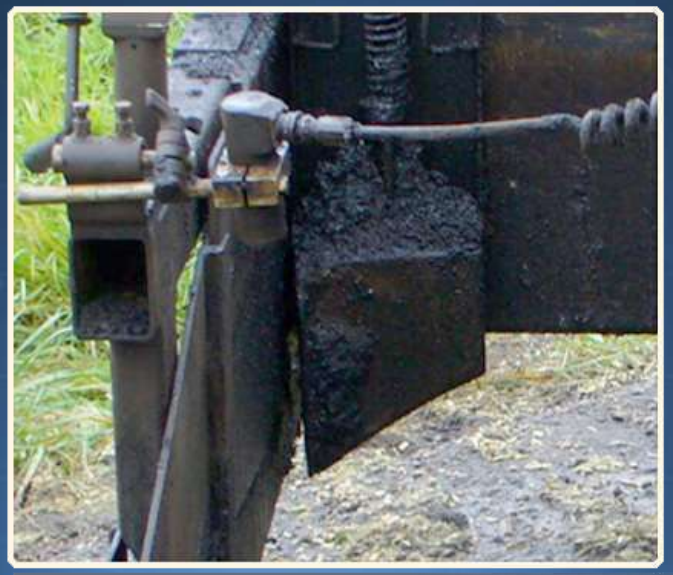
- Clip Shoulders
- Construct Overlay
- Pull Shoulders Flush

Finished Surface

The Hardware

Trans Tech Shoulder Wedge Maker™

www.transtechsys.com
www.troxlerlabs.com



Advant-Edge™

www.advantedgepaving.com

Carlson Paving Products Safety Edge Beveled End Gate

2010 Wisconsin Safety Edge Installation

- Superior Performance thru Heat and Compaction.
- From 90 degrees to 25 degrees in seconds. In order to match approaches and Bevel faster and safer.
- Sealed, Screeded, Compacted,edge for longer life.

Edge Compaction

Condition After One Year of Service

Without Safety Edge

With Safety Edge

Paving without shoe

Paving with shoe

2010 Maine Safety Edge Installation

Benefits of a Safety Edge

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

DesMoines Register December 10, 2010

Dangerous stretch of road costs state $1.14 million

- It was chilling when Anne Michael learned that in the three months before her husband was killed in a 2007 car accident, three other drivers had encountered the same road hazard on the same stretch of U.S. Highway 30 in Tama County.
- In each crash, all within 400 feet of each other, law enforcement officials noted a steep drop-off (4 ½") between the road and the gravel shoulder.
- The two vehicles collided head-on, killing all three adults and injuring the boy.
- The state argued that Dochterman responded inappropriately to the edge drop-off.
- Within hours of the fatalities, Mason said, a state work crew lined the shoulder there with gravel until it was flush with the highway.

Let’s tell a different story !!

Questions ?

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2010 Missouri Safety Edge Installation