

# **The FHWA, Office of Safety Nine Proven Safety Countermeasures**

***Rural Road Safety Webinar Series - Third in Series***  
**Thursday, June 24**

**NACo is pleased to present this webinar in cooperation with the Federal Highway Administration and the National Association of County Engineers.**



U.S. Department of Transportation  
Federal Highway Administration



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## **Tips for viewing this webinar:**

- **If you are having technical difficulties, please send us a message via the chat box on your right. Our organizer will reply to you privately and help resolve the issue.**
- **The chat box is on the right side of the webinar window. The box will collapse so that you can better view the presentation. To unhide the box, click the arrows on the top of the panel.**

**This webinar will be recorded and made available on line to NACo members to view later or review.**

**Within the next few days you will receive an email notice with the link to the recording with your webinar evaluation survey.**

**Thank you in advance for completing the webinar evaluation survey. Your feedback is important to us.**

## Question and Answer Session Instructions

**Type your question into the chat window, and the moderator will read the question on your behalf.**

# Rural Road Safety Webinar Series



There are nearly four million miles of public roads in the U.S. Approximately 75 percent of those roads are rural and experience the highest rates of accidental fatalities — over six times that of urban interstates.

The **Rural Road Safety Webinar Series** share approaches that can reduce costs to counties and save the lives of residents.

## ■ Webinar 1: Saving Lives in Your County — A systematic process for developing a road safety

January 28, 2010 • **AVAILABLE ONLINE**

Participants will be able to identify key programs and approaches to assist them in reducing the number of crashes and fatalities on rural and isolated roads. Participants will also learn about the various support services available to counties, specifically the Center for Excellence in Road Safety and NACO Rural Road Safety Peer Exchange Program, to assist them in this effort.

Access recorded webinars: [www.naco.org/webinars](http://www.naco.org/webinars)

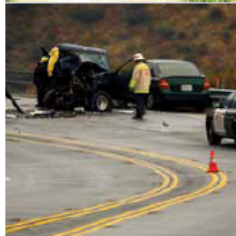


## ■ Webinar 2: Why Should a County Conduct a Road Safety Audit?

March 25, 2010 • 2:00–3:15 p.m. EST

This webinar will expand upon the basics of a County Action Plan and Strategic Highways Plans and examine road safety audits (RSA) and the legal issues surrounding the development of an RSA.

To register: [www2.gotomeeting.com/register/224239098](http://www2.gotomeeting.com/register/224239098)



## ■ Webinar 3: The Nine Road Safety Countermeasures — Cost-Effective Can Save Lives in Your County

June 24, 2010 • 2:00–3:15 p.m. EST

This webinar will focus on the implementation of proven safety countermeasures. Participants will be introduced to the countermeasure implementation process, the benefits of the nine countermeasures, and how they can save lives and county resources.

To register: [www2.gotomeeting.com/register/869987003](http://www2.gotomeeting.com/register/869987003)



Please contact Cindy Wasser at 202/942-4274 or [cwasser@naco.org](mailto:cwasser@naco.org) with questions.

## **Peer Exchange Program kicked off at:**

### **Developing County Solutions to Improve Rural Road Safety**

### **NACE 2009 Annual Meeting - Management & Technical Conference**

April 23

Peoria, IL

Workshop Objectives: Develop a system for sharing rural road safety best practices among counties

## **The FHWA, Office of Safety Nine Proven Safety Countermeasures Program**

- 2:00 Welcome/Review Objectives/Introduce Speakers
- 2:05 Discussion of Guidance Memorandum on Consideration and Implementation of Proven Safety Countermeasures –  
*David Nicol, Director*  
*FHWA Office of Safety Design*
- 2:20 Overview of Safety Features of Roundabouts  
*Tim Colling, P.E., PhD., Senior Research Engineer*  
*Michigan Technological University*
- 2:35 Safety Edge Program in Madison County, OH  
*David P. Brand, P.E., P.S.*  
*Madison County Engineer*
- 2:50 Q&A
- 3:15 Conclusion



**David Nicol, Director  
FHWA Office of Safety Design**

**202-366-9198  
david.nicol@dot.gov**

**Tim Colling, P.E., PhD.  
Senior Research Engineer  
Center for Technology and Training  
Michigan Tech Transportation Institute  
Michigan Technological University**

**906-487-2102  
Timothy Colling [tkcollin@mtu.edu]**

**David Brand,  
Madison County Engineer  
Madison County Engineer's Office**

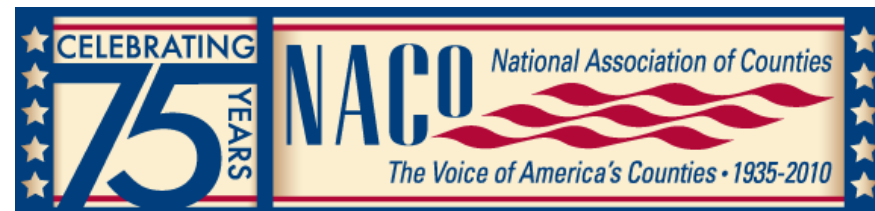
**740-852-9404  
[dbrand@co.madison.oh.us](mailto:dbrand@co.madison.oh.us)**

## Question and Answer Session Instructions

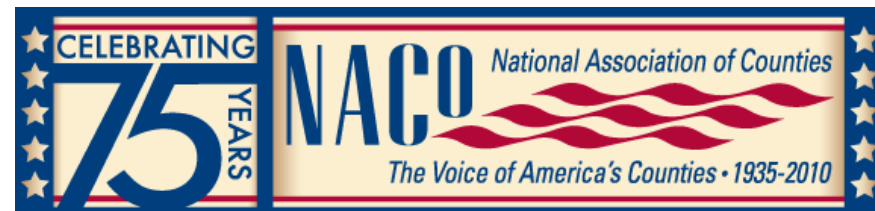
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**Thank you for participating in NACo's webinar.  
For more information about NACo membership,  
contact**

**Andrew Goldschmidt at [agoldschmidt@naco.org](mailto:agoldschmidt@naco.org) or  
Ilene Manster at [imanster@naco.org](mailto:imanster@naco.org)**



**Join NACo Members at  
NACo's Annual Conference  
in Reno/Washoe County, NV  
July 16 - 20, 2010  
Register now at [www.naco.org](http://www.naco.org)**

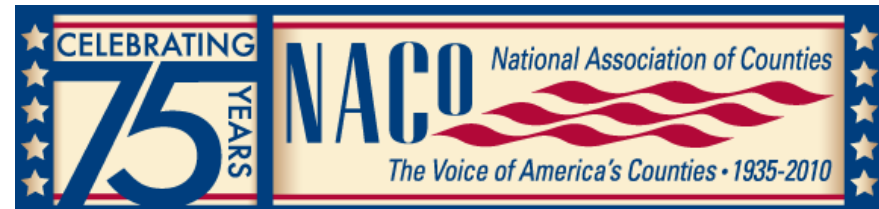


**Thank you for participating in NACo's webinar.**

**To learn about future webinars, please visit on  
[www.naco.org/webinars](http://www.naco.org/webinars)**

**For more information on NACo's Rural Road Safety Resource  
Center please visit**

[http://www.naco.org/Template.cfm?Section=New\\_Technical\\_Assistance&template=/rural\\_roads/resources.cfm](http://www.naco.org/Template.cfm?Section=New_Technical_Assistance&template=/rural_roads/resources.cfm)



An aerial photograph of a road, likely a rural road, showing a series of reflective markers or painted lines along the edge and in the center. The markers are in various colors, including white, yellow, and orange, and are arranged in a pattern that suggests a safety or construction project. The road itself is a dark, paved surface.

# **Proven Crash Countermeasures**

Rural Road Safety Webinar Series  
June 24, 2010

David Nicol

Director, Office of Safety Design  
Federal Highway Administration



# **Guidance Memorandum**

- § Issued to FHWA Field Offices July 10, 2008
- § Highlights nine proven countermeasures
  - Roadway departure
  - Intersections
  - Pedestrian safety

# Countermeasures

1. Road Safety Audits
2. Rumble Strips and Rumble Stripes
3. Median Barriers
4. Safety Edge
5. Roundabouts
6. Left- and Right-Turn Lanes
7. Yellow Change Interval
8. Pedestrian Refuge Areas
9. Walkways

# 1. Road Safety Audits

- § A formal safety performance evaluation of an existing or future road or intersection
- § Performed by an independent and multi-disciplinary team
- § Reports on potential safety issues and opportunities for improvement



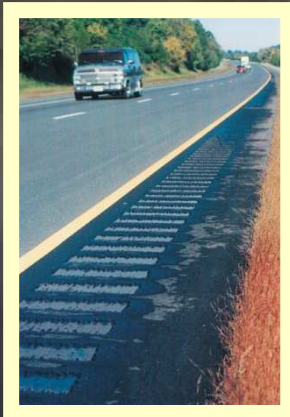
# Road Safety Audits

Agencies should adopt an RSA policy that identifies:

- Types of projects that will have RSAs
- What stage RSAs will be conducted
- Who will conduct RSAs
- How RSAs will be funded
- Procedures for review and implementation of recommendations

## 2. Rumble Strips and Rumble Stripes

- § Raised or grooved patterns on the pavement
- § Provide both audible warning and physical vibration to alert drivers that they are leaving their lane.
- § May be installed on shoulder or centerline
- § A countermeasure to drowsy or distracted drivers



# Rumble Strips and Stripes

- Shoulder Rumble Strips:
  - All rural freeways
  - Rural two-lane highways w/speed of 50+ MPH and ROR history
  - Provide adequate shoulder beyond strip (4 ft min)

# Rumble Strips and Stripes

- Centerline Rumble Strips
  - Rural two-lane highways where lane plus paved shoulder width at least 13 ft.
  - Particularly with:
    - High traffic volumes
    - Poor geometrics
    - History of head-on crashes



### 3. Median Barriers



- § Longitudinal barriers used to separate opposing traffic on divided highways
- § Significantly reduce cross-median crashes
- § Use in medians less than 50-ft wide
- § Cable barriers very cost-effective



## 4. Safety Edge



- § A paving technique which forms a sloped wedge at the edge of the pavement
- § Mitigates the effects of pavement dropoffs which can occur over time
- § Minimal cost

# **Safety Edge**

- Use wherever paved surface meets non-paved shoulder.
- Graded shoulders must be brought up after paving.

## 5. Roundabouts

- § Circular intersection
- § Entering traffic yields to exiting traffic
- § Entering traffic deflected by channelization at entry point
- § Reduces speeds
- § Eliminates head-on and right-angle collisions
- § Safer for pedestrians





## Roundabouts

- Preferred safety alternative for wide range of intersections
- Consider as alternative for all intersection improvement projects, including rural intersections.

## 6. Left- and Right-Turn Lanes at Stop-Controlled Intersections

- § Turn lanes on through (major) road
- § Provide storage for vehicles waiting to turn left
- § Provide room for slowing down for left- and right-turning vehicles



# Left- and Right-turn Lanes

- Consider for major road approaches with:
  - Significant turning volumes
  - History of turn-related crashes

## 7. Yellow Change Interval



- § The interval following a green signal when the yellow signal is displayed
- § Should provide enough time for motorists travelling at the prevailing speed to stop comfortably before the signal turns red



# Yellow Change Interval

- § First step in addressing red-light running problem
  - § Engineering formula should be used to set timing (ITE formula recommended)
  - § May be lengthened for significant truck traffic or older drivers



## 8. Pedestrian Refuge Areas



- § Raised islands placed in the street to separate crossing pedestrians from motor vehicles
- § Can be at intersections or mid-block
- § Should be at least 4 feet wide and of adequate length to accommodate anticipated number of pedestrians

## 9. Walkways

- § Separated walkways
- § Shared use paths
- § Sidewalks
- § Walkable shoulders



# Walkways

- Urban Areas:
  - Provide walkways or pathways on both sides
- Rural Areas:
  - Provide walkable shoulders (4-ft min) on both sides

An aerial photograph of a multi-lane highway with traffic. The image is dark and has a blue tint, with the text overlaid in the center.

## For more information

Memo: <http://safety.fhwa.dot.gov/policy/memo071008/>

FAQ: <http://safety.fhwa.dot.gov/policy/memo071008/faqs.cfm>

# Presenter

**Tim Colling, P.E., PhD.**

Senior Research Engineer / Assistant Director  
Center For Technology and Training

***MichiganTech***

Mr. Colling is a registered professional engineer in Michigan and Wisconsin. He worked as a Civil Engineering consultant for 10 years prior to assuming the position of Assistant Director of Michigan LTAP in 2003 at Michigan Tech University. Mr. Colling holds a bachelors degree in environmental engineering and a masters degree and Doctorate in civil engineering from Michigan Tech University.







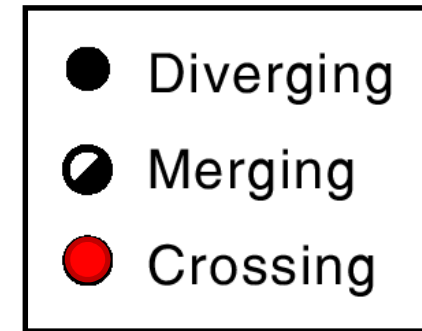
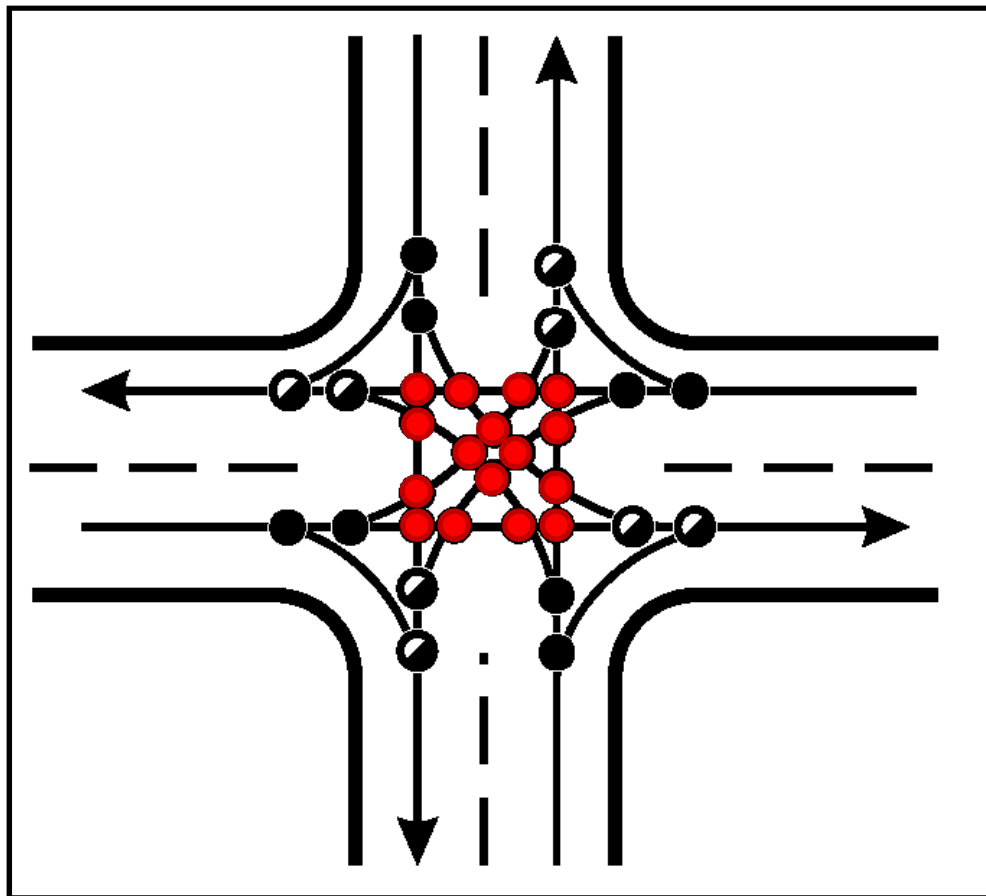








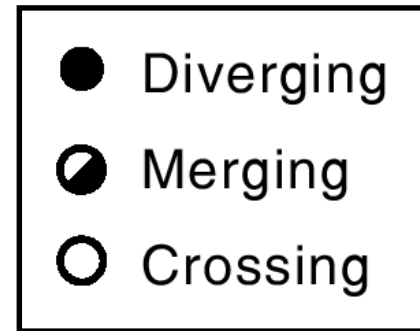
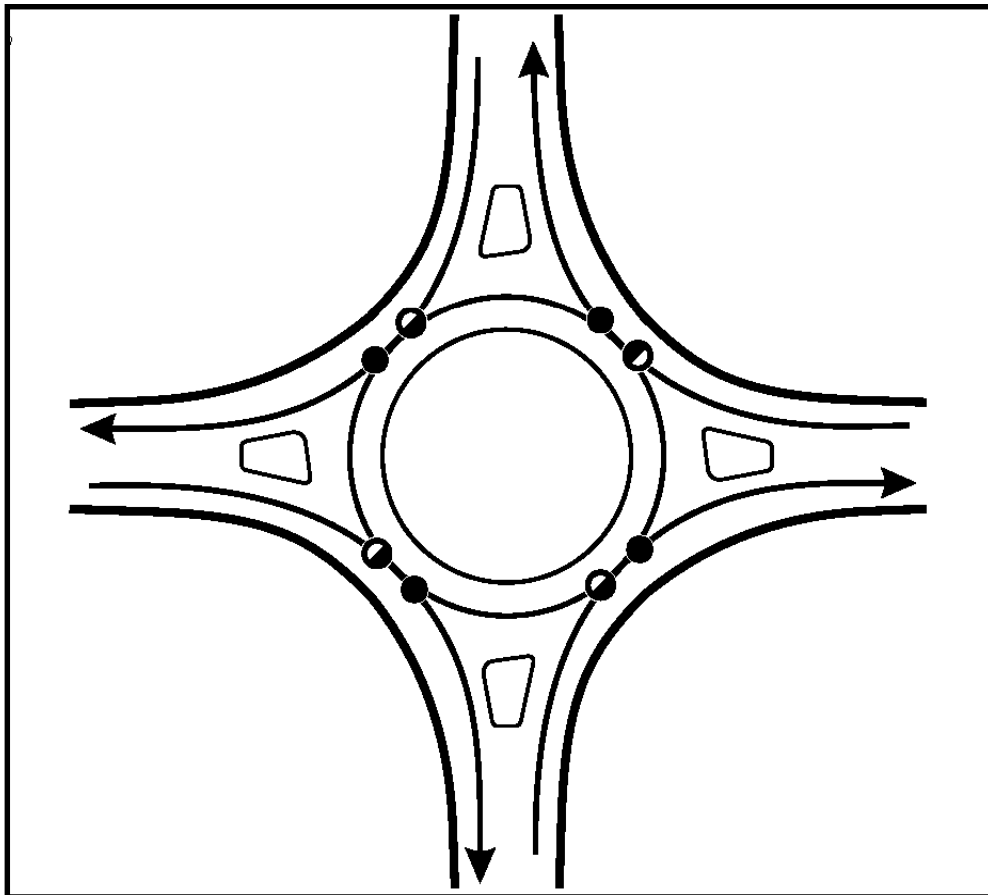
# Cross Intersection Conflict Points



32 Vehicle Conflict Points

12 Ped. Conflicts Points

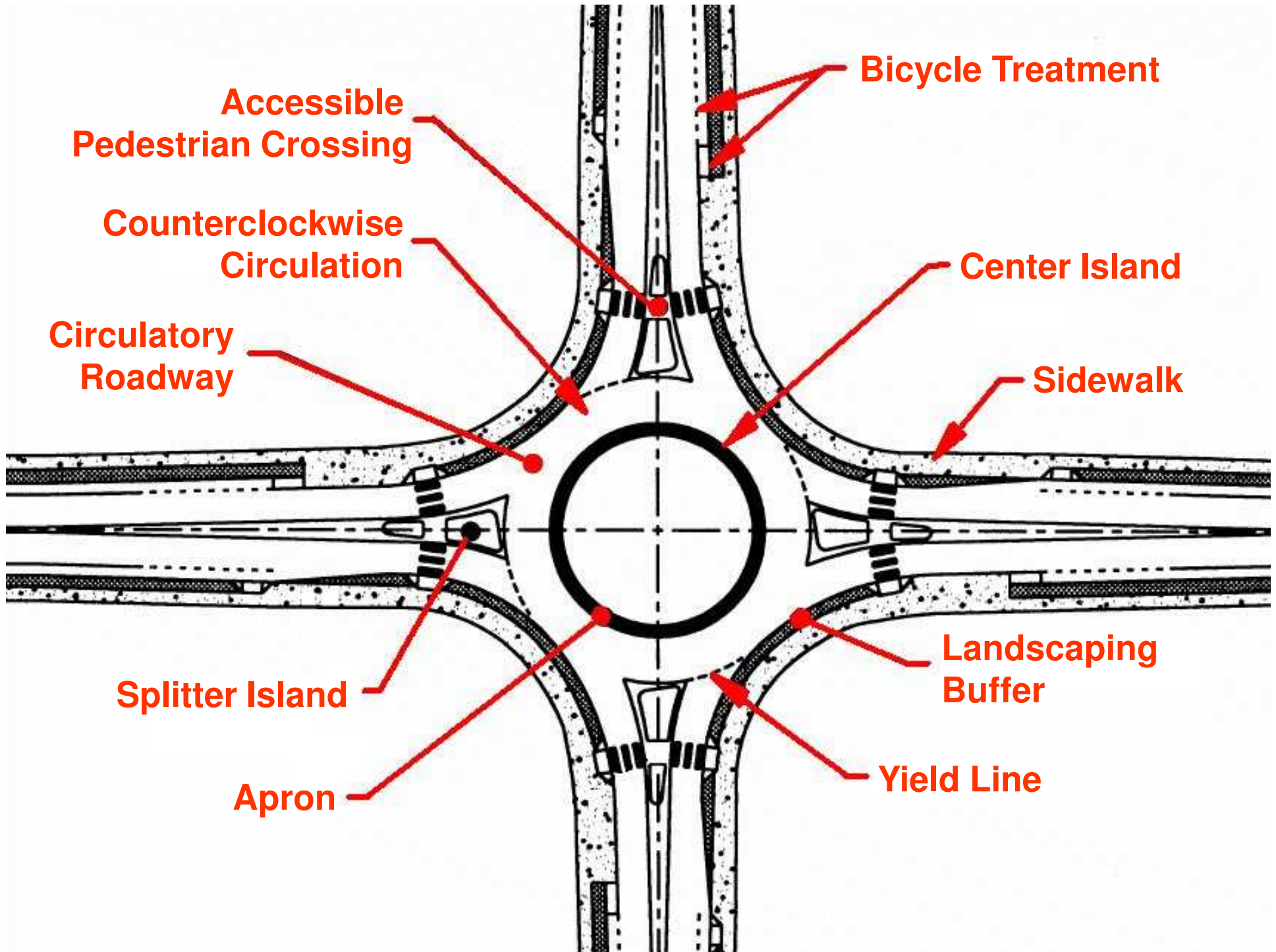
# Roundabout Conflict Points



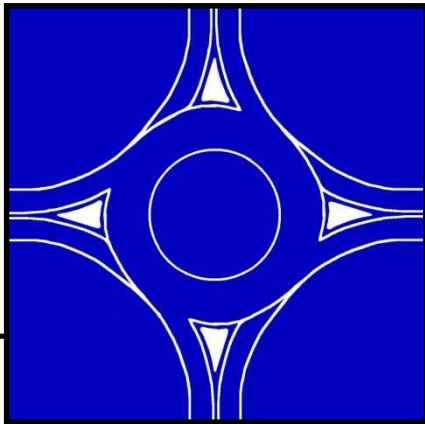
8 Vehicle Conflict Points

8 Ped. Conflicts Points





# Roundabout vs. Traffic Signal



## **Roundabout**

Cost: \$300 K to \$500K

Speed: 20 mph

Safety:

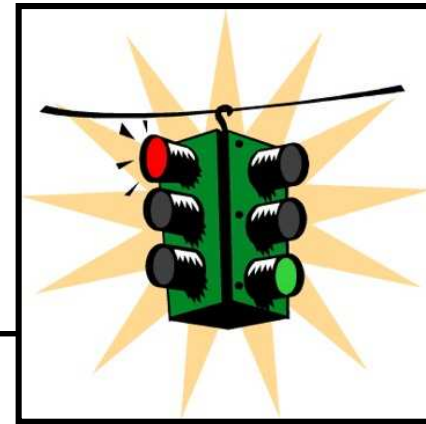
29% to 50% fewer crashes

30 to 73% fewer injury crashes

Delay: Shorter

Space Required: More

Initial opposition: Can be fierce



## **Traffic Signal**

Cost: \$125K to 250K + O&M

Speed: 35 mph +

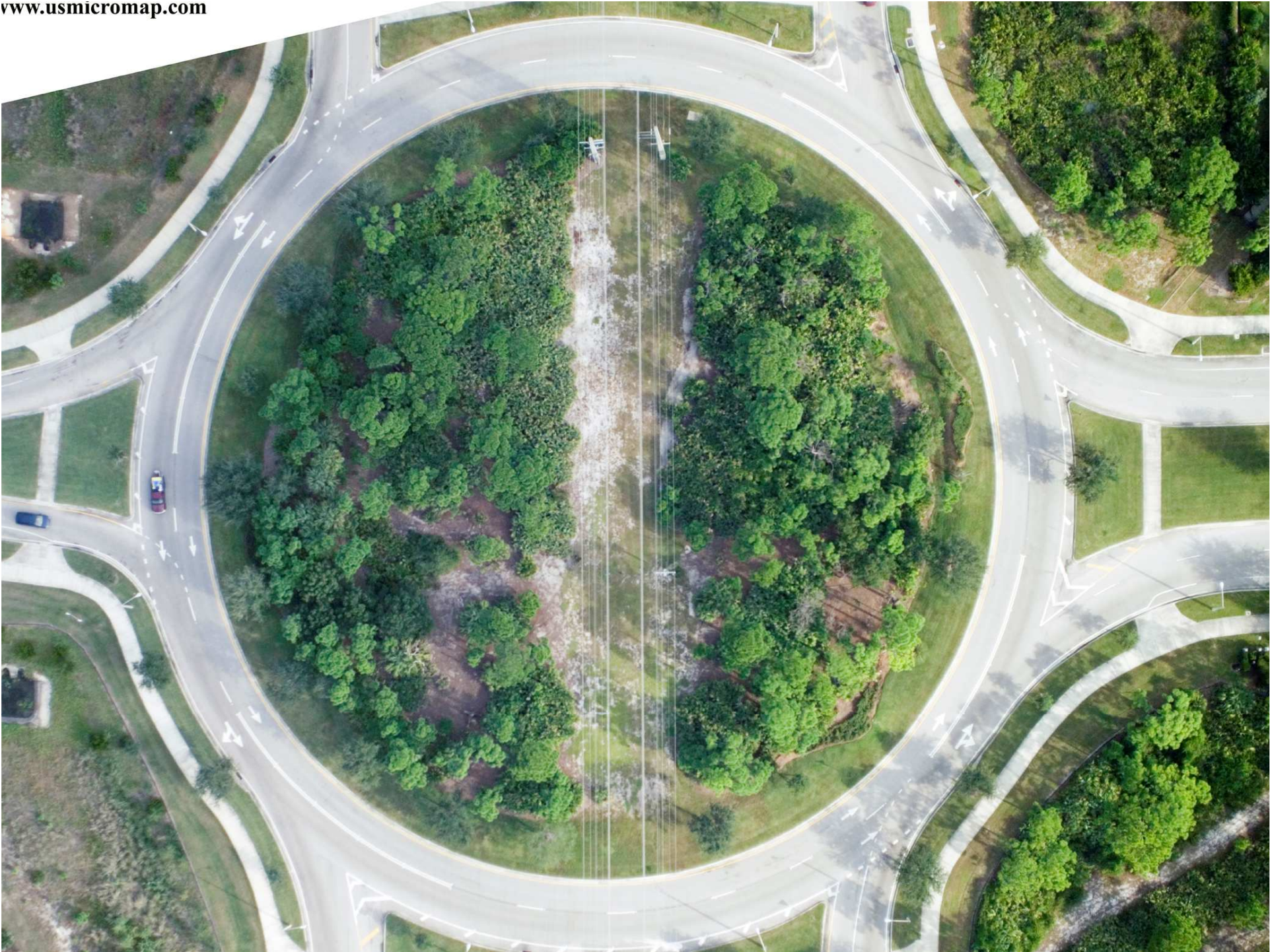
Safety: Less

Delay: Longer

Space Required: Less

Initial opposition: Acceptable

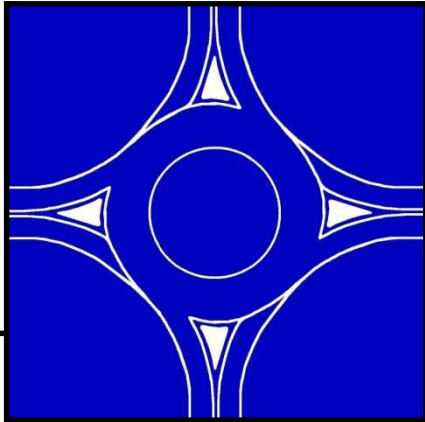








# Roundabout vs. Rotary



## **Roundabout**

Size: 100' to 200' dia.

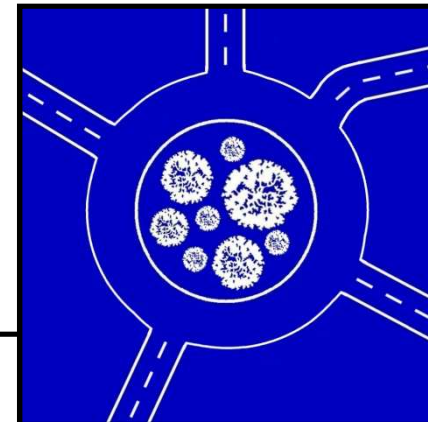
Speed: 20 mph

Crashes: Less frequent

Traffic Control: Yield to enter

Center Island: No pedestrians; low vegetation only

Parking: Not allowed in circle



## **Rotary / Traffic Circle**

Size: 400' dia and up

Speed: 35 mph +

Crashes: More frequent

Traffic Control: Circle yields

Center Island: Open to pedestrians and trees

Parking: Allowed in circle



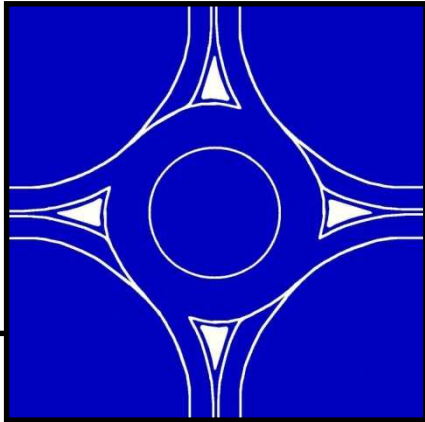








# Roundabout vs. Mini Traffic Circle



**Roundabout**

Size: 100' to 200' dia.

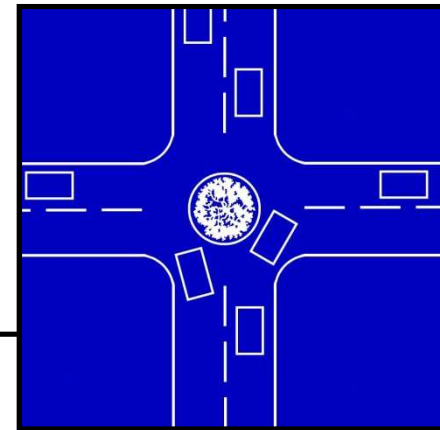
Speed: 20 mph

Application: Traffic control, safety

Application: Mid to high volume

Space Required: More

Large Vehicles: Yes



**Mini Traffic Circle**

Size: 10' to 50' dia.

Speed: 10% less than standard intersection

Application: Traffic calming

Application: Low volume only

Space Required: Standard

Large Vehicles: Can be limited

# Opposition Becomes Support

## National Cooperative Highway Research Program NCHRP

### Opinion Study



#### Prior to Construction

**68%** of the responses negative or very negative



#### After Construction

**73%** of the responses positive or very positive

# Case Study in Opposition



## **Excerpts from the Traverse City Record-Eagle**

“I was wondering what the city planners are thinking “

"These people can't drive, and now you want them to negotiate a circle"

“A recall effort against the city commission for its decision to build a traffic roundabout at the intersection of Eighth and Woodmere stalled on Friday - but not for very long. Supporters filed a new recall petition minutes after the other was rejected at a hearing ”

# Case Study in Opposition



## Brookfield WI

"We're not stupid people. Those of us who have never driven on a roundabout can learn how to do it; we just don't want to."

"This project is not Brookfield's roundabout - it is Brookfield's folly!"

"You have to be a fighter pilot to get on one and a kamikaze pilot to get off."

**Just for Fun**





**David P. Brand, P.E.,P.S.**

County Engineer

Madison County, Ohio

Chair

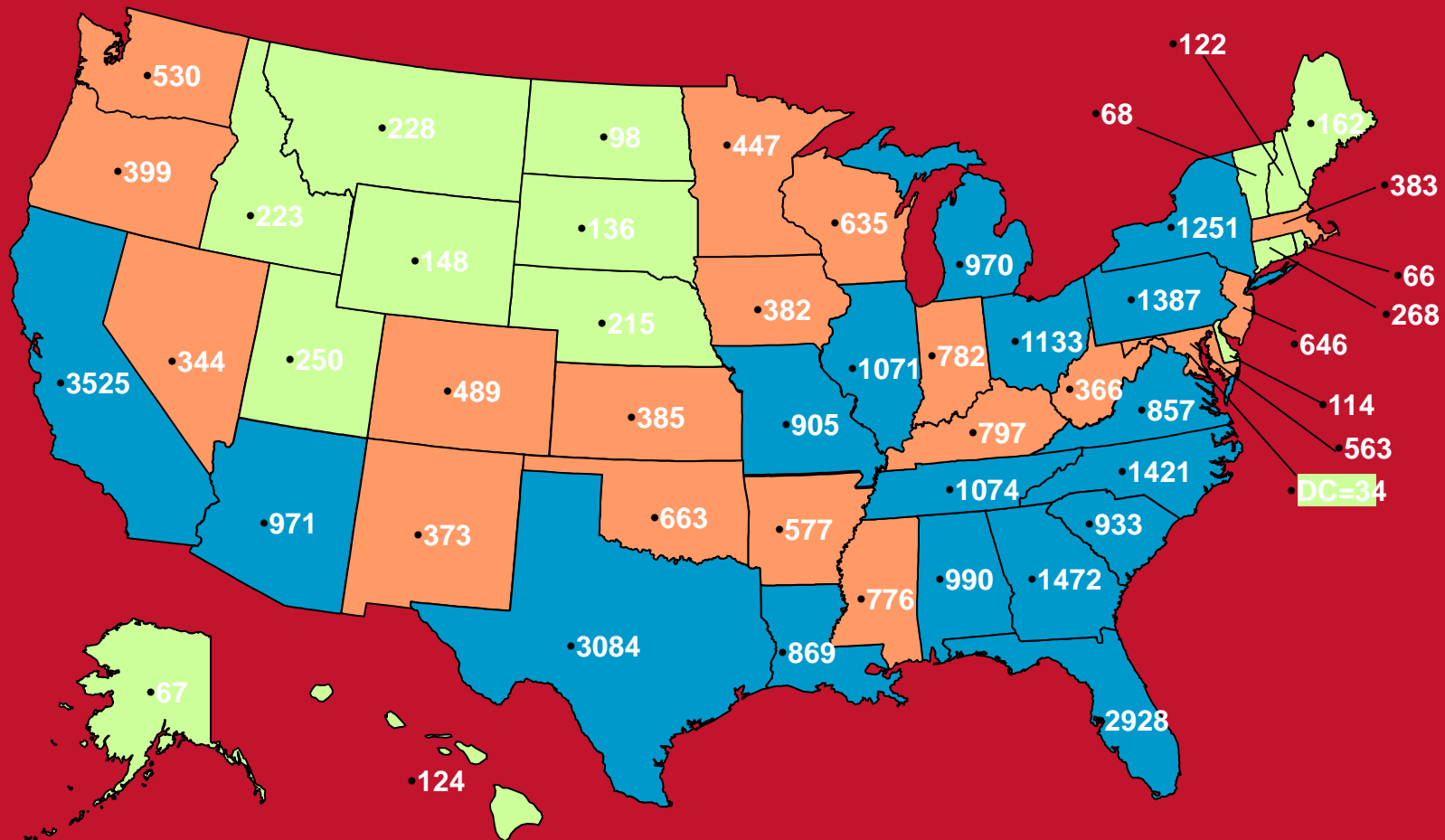
NACE Roadway Safety Working Group

NACE Representative on the  
Center for Excellence in Rural Safety  
(CERS) Advisory Committee



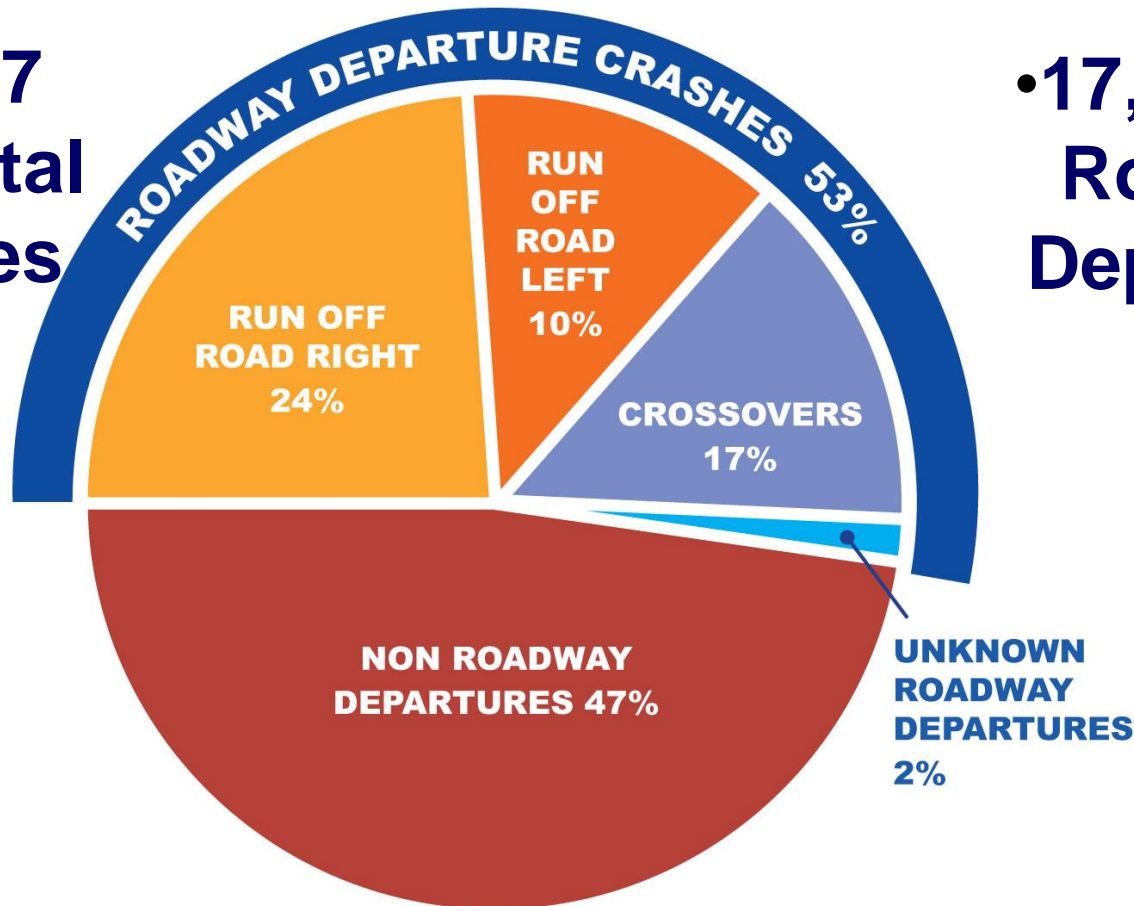
# 36,700 Fatal Crashes per Year

• 2006-2008 Average – Source: FARS



# 2008 Fatal Crashes (Based on FARS)

• **34,017**  
**U.S. Fatal**  
**Crashes**



• **17,818 U.S.**  
**Roadway**  
**Departures**

We can all agree...  
this is not a safe edge



Photo Source: FHWA

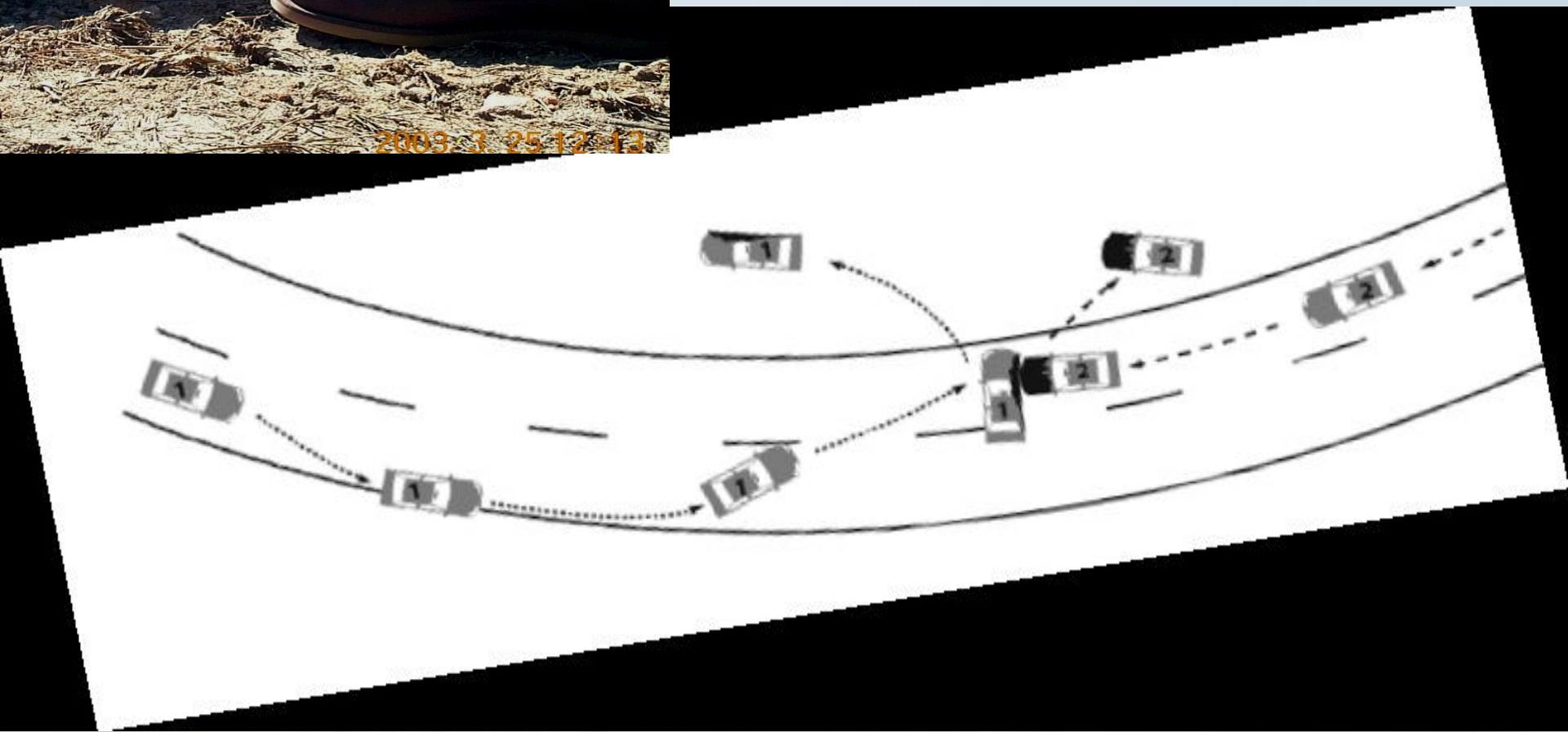


# Asphalt Overlay





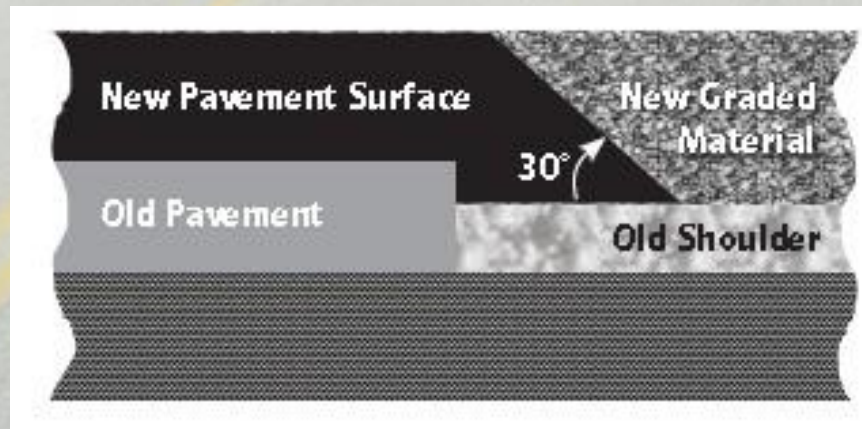
Typical drop-off crash  
involving tire scrubbing

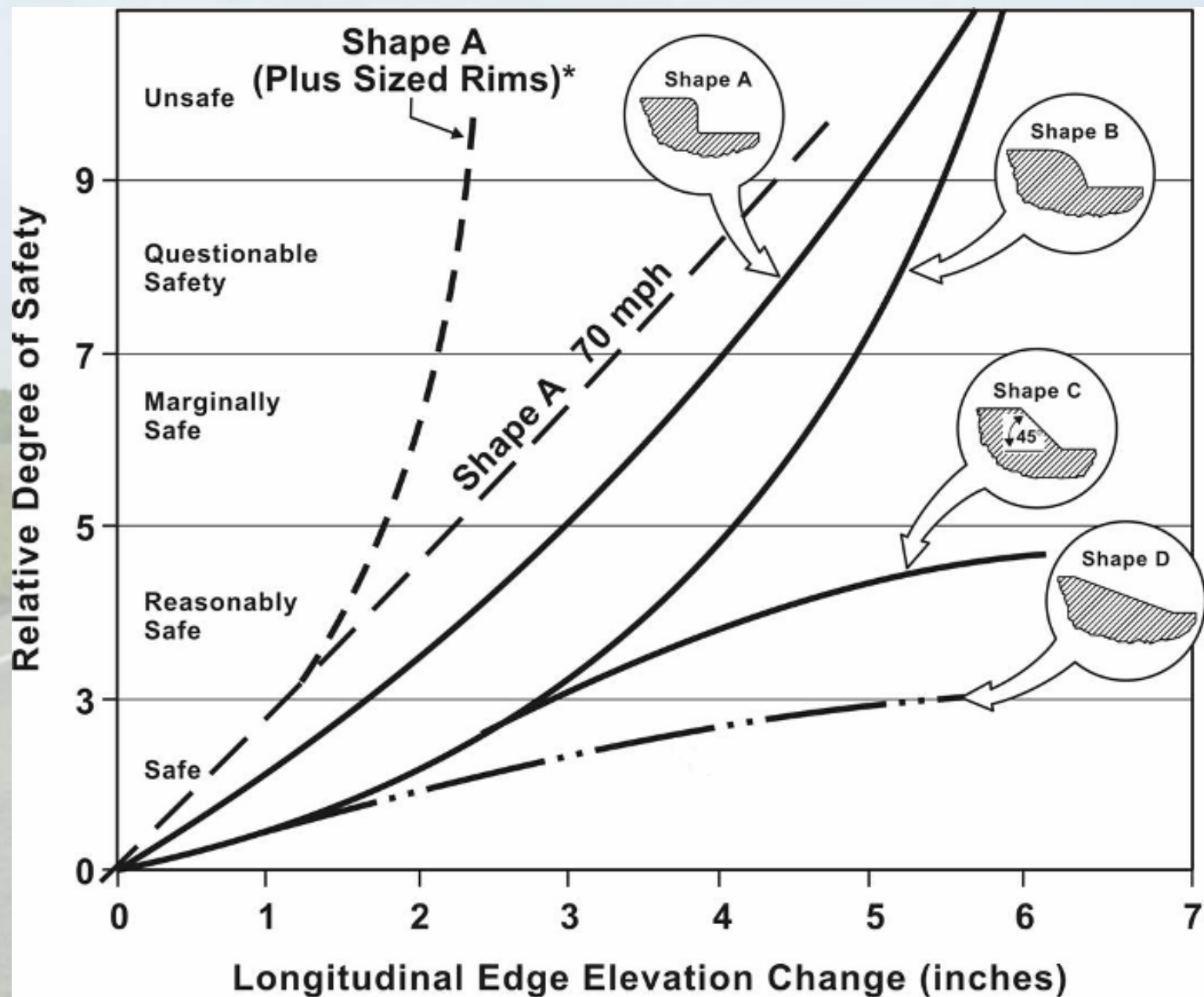




# What is Safety Edge?

- Simply – a 30° beveled pavement edge treatment
  - Achieved through the use of an attachment bolted to the paver screed
  - Typically done on asphalt pavements, but has been used on concrete as well











# Roadway Departure Focus: Rural Two Lane Roads

## Safety Edge Solution:

- Low Cost
- Safety Benefit
- Pavement Benefit



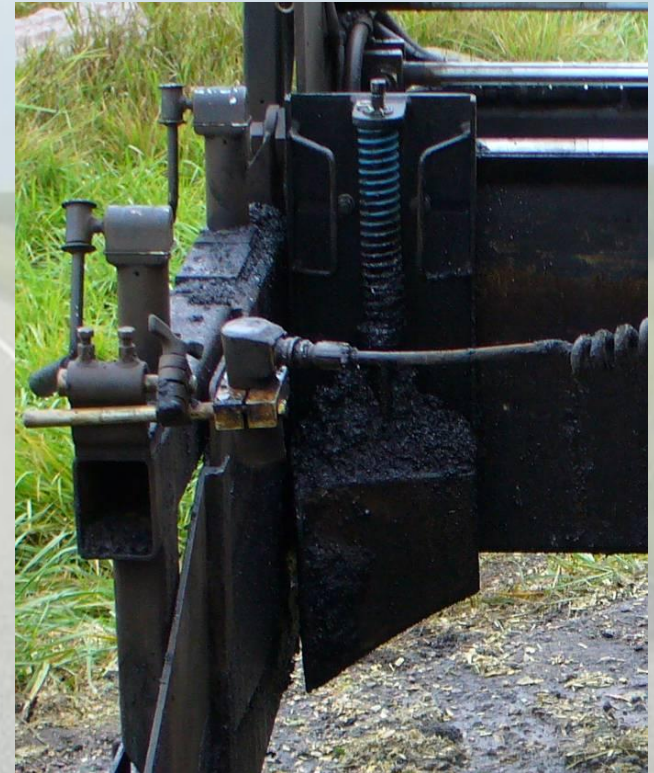
*The Safety Wedge Shoe is a special edging device that asphalt paving contractors can install on new or existing resurfacing equipment to shape the Safety Edge.*



# The Hardware



- Trans Tech Shoulder Wedge Maker <sup>TM</sup>
- [www.transtechsys.com](http://www.transtechsys.com)



- Advant-Edge <sup>TM</sup>
- [www.advantedgepaving.com](http://www.advantedgepaving.com)

# Construction

- Clip Shoulders
- Construct Overlay
- **Pull Shoulders Flush**
- Business as Usual
  - No Effect on Production
  - Minimal Monitoring





# What does it take to achieve a Safety Edge Success Story ?

- Prioritize your roads
- Specify “The right attachment”
  - either an Advent Edge, a Transtech Systems or industry accepted equal.
- Make sure the existing edge is exposed (clipped)
- Inspect to make sure the set-up is providing the desired results
- Install berm up to the top of the edge bevel
- “It’s not Rocket Science”

# Madison County Ohio Experience





# CR 7 – Plain City Georgesville Rd.

- 3800 ADT
- 9.1 miles long
- Numerous curves and hills
- 3 Fatalities and 45 injuries (3 years)
- 77 Total Crashes over 3 year period
  - 2.82 crashes/mile/year

# It starts with the Contract and / or Contractor

V. PLAIN CITY GEORGESVILLE (I-70 TO CONVERSE HUFF RD.)

6.94 miles, 22 ½ feet in width, First Lift ¾" 404 Scratch Coarse, Second Lift 1 ¼" 404, with .1 gal. tack per sq. yd. – Berm 18" wide tapered down on outside.

1. 5,253 CU.YDS. ITEM 404 – PRICE PER CU. YD. \$ 117.00  
SUB-TOTAL \$ 614,601.00

2. 2,720 TONS BERM AGGREGATE – ITEM 617  
PRICE PER TON \$ 19.50  
SUB-TOTAL \$ 53,040.00

3. ITEM 740.03 - PERMANENT YELLOW CENTER & WHITE EDGE LINES  
LUMP SUM \$ 16,000.00

4. ALTERNATE BID: (Only if Authorized)

SAFETY EDGE – ITEM SPECIAL (as per note) LUMP SUM INCLUDING ALL INCIDENTALS (Note: Bid item to cover the extra cost (above the asphalt concrete) of forming the safety edge and requiring the use of the "Shoulder Wedge Maker" (SWM) as produced by Transtech Systems, Inc. ([http://www.transtechsys.com/products/pro\\_products\\_main.htm](http://www.transtechsys.com/products/pro_products_main.htm)) or an equal as approved by engineer).

LUMP SUM \$ 1,600.00

5. ITEM 254 – PAVEMENT PLANING (10'X 22 1/2'X 1 ¼" Depth Tapered Out @ 8 Locations / 25'X 22 1/2'X 2" Depth Tapered Out @ 2 Locations)  
LUMP SUM \$ 6,000.00

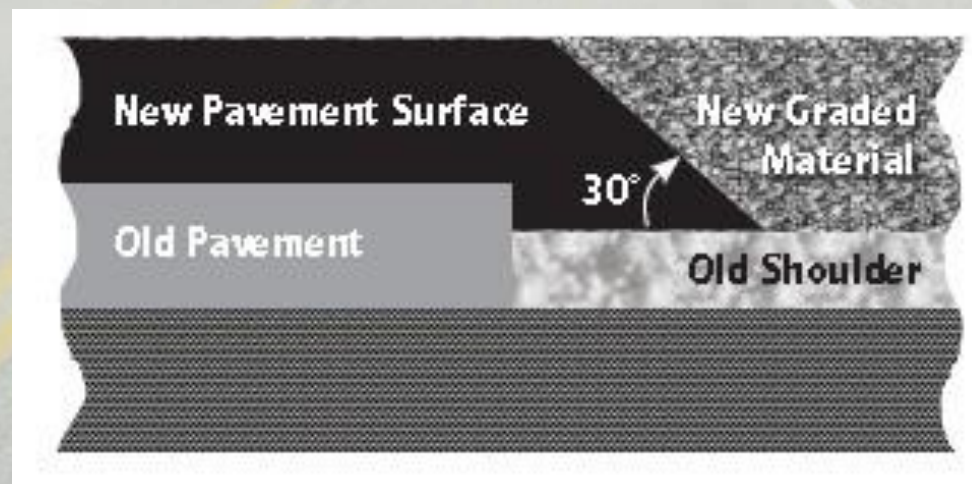
GRAND TOTAL PLAIN CITY GEORGESVILLE ....\$ 691,241.00

GRAND-TOTAL AMOUNT..... \$ 1,002,433.50

# Not a preferred attachment









24° Edge Bevel not 30°



# Slight snow plow scuffing (no damage)





# This is your insurance policy!



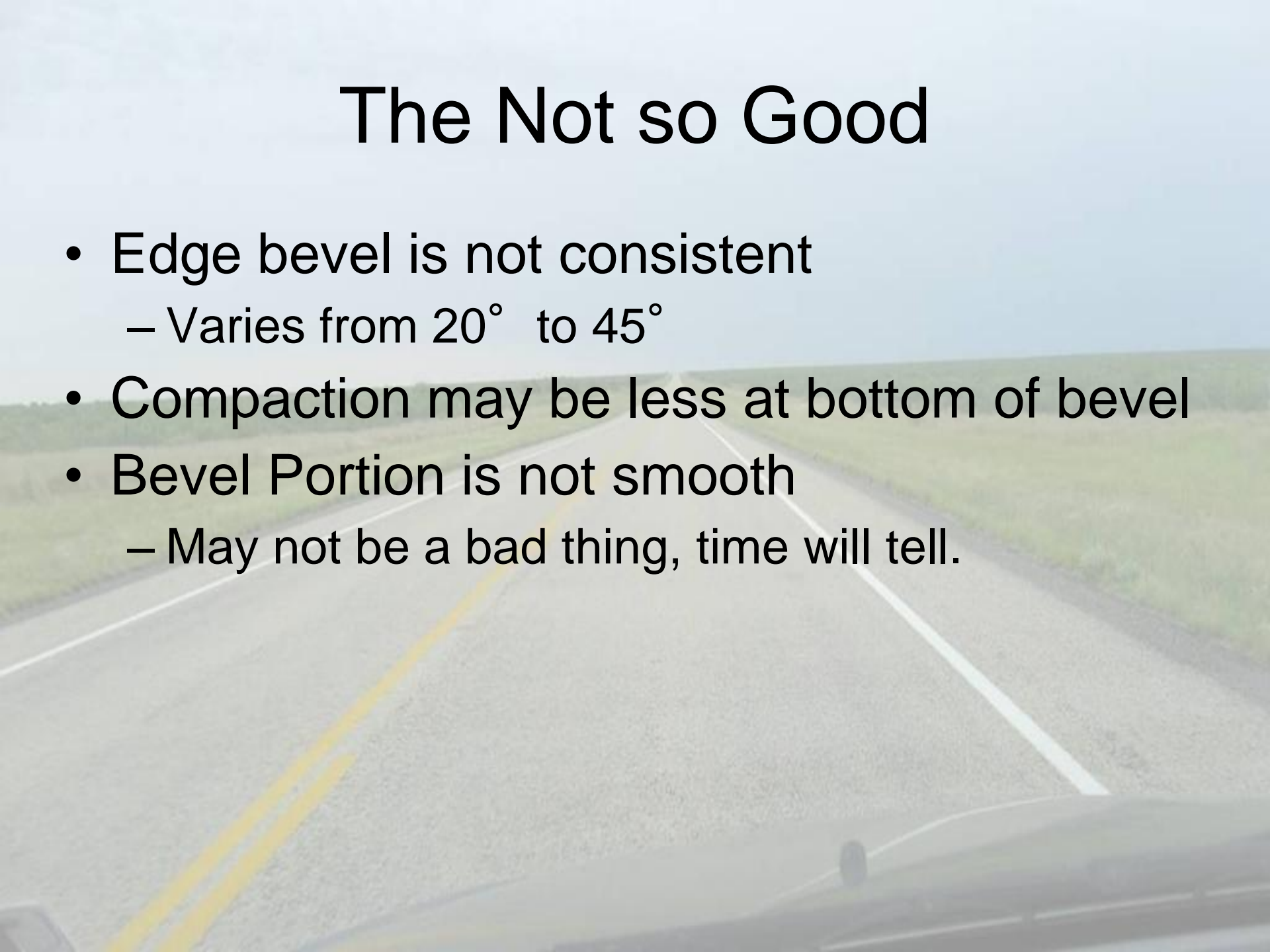
# The Good

- Achieved sufficient interlock with existing
  - We exposed the edge with grader (Clip)
- All Edge is now beveled
- Compaction is good at top of bevel (2")
- Roadway is much safer in terms of roadway departure



# The Not so Good

- Edge bevel is not consistent
  - Varies from  $20^{\circ}$  to  $45^{\circ}$
- Compaction may be less at bottom of bevel
- Bevel Portion is not smooth
  - May not be a bad thing, time will tell.



# Why we strive for Safety









Thank You



# Questions?

David Brand - Madison County Engineer

[dbrand@co.madison.oh.us](mailto:dbrand@co.madison.oh.us)

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Cell – (614) 623-6543