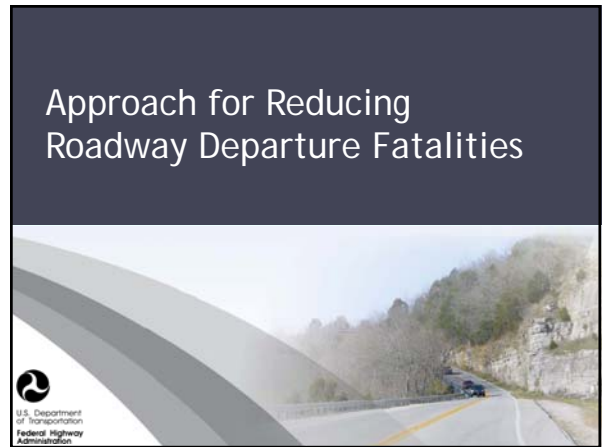
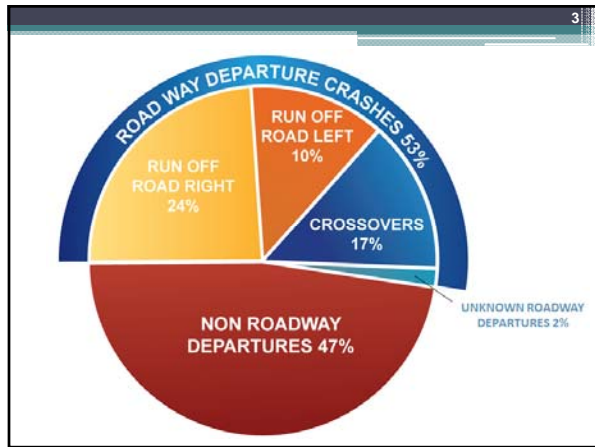




Roadway Departure Definition (FHWA)

A non-intersection crash in which a vehicle crosses an edge line, a centerline, or leaves the traveled way.



- 1
 - Keep Vehicle on Road
 - Signing and marking for sharp curves
 - Rumble strips
 - Alignment delineation
 - High friction surface
 - Traffic calming to reduce speeds
 - Enforcement and education

7

2

• Safe Recovery


- Wider shoulders
- Safety Edge
- Improved recovery areas
- Tree removal
- Utility pole relocation

8

3


• Reduce Severity

- Guard Rail Upgrades
- Median Barrier




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Reducing RD Fatalities


| Traditional | Systematic | Comprehensive |
|--|--|--|
| <ul style="list-style-type: none"> • Effective at locations • Minimal overall impact |  | <ul style="list-style-type: none"> • Incorporate Enforcement, Education |
| | <p>Policy</p> <ul style="list-style-type: none"> • Long-term gains • Standards-based | |

Roadway Departure Countermeasures



U.S. Department of Transportation
Federal Highway Administration

Curves



U.S. Department of Transportation
Federal Highway Administration

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Basic Curve Warning Sign



Chevron Installation



Advanced Curve Pavement Marking



FHWA Low-Cost Treatments for Horizontal Curve Safety

Advanced Curve Pavement Marking



Pennsylvania DOT

Advanced Signing with Beacons



Actuated Flashers at Curves



Speed-Actuated Sign - Argente, ME.

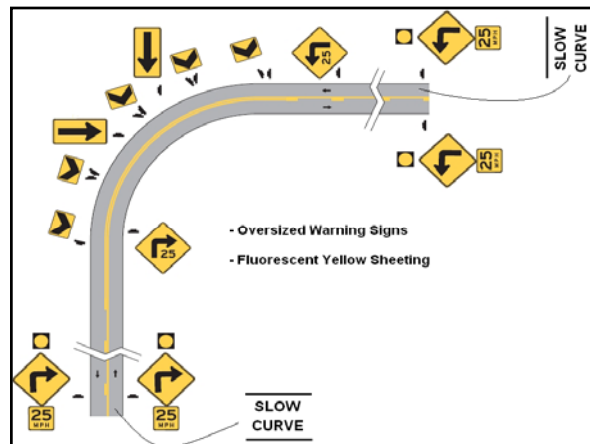


Flashing Beacon on Warning Sign.





(Courtesy of Caltrans)

Dynamic Warning System on I-88 in California.



Head-on Crashes

(and Opposite-direction Sideswipe)

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Centerline Rumble Strips

1. Centerline rumble strips extend into the travel lane—most common
2. Centerline rumble strips within pavement markings
3. Centerline rumble strips beyond pavement markings




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Route Continuity

What if a route has only a portion of its length show up in the data analysis as needing improvement?

Options

1. Address only that portion of the route
2. Address the entire route
 - Workers are out there already
 - Must consider cost increase



Single-Vehicle Run off Road: Shoulder Rumble Strips & Edge Line Rumble Strips




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Shoulder Rumble Strips



FHWA Low-Cost Treatments for Horizontal Curves Safety

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Edge Line Rumble Strips



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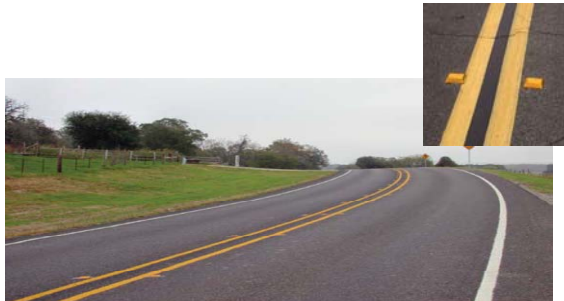
Urban Option: Raised Rumbles



Single-Vehicle Run off Road: Alignment Delineation



Raised Pavement Markers (RPMs)



Guardrail Delineation



Barrier Delineation



Wet RD Crashes: High Friction Treatments



High Friction Surface Treatment



FHWA Low-Cost Treatments for Horizontal Curve Safety

High Friction Surface Treatment



Application of Tyregrip® friction material on a curved ramp.

Florida DOT

Fixed Objects: Trees



U.S. Department of Transportation Federal Highway Administration

ASBHTO - Driving Down Lane, Oregon, 12/2011

Opportunity Trees vs. Forests



Missouri DOT

Brian Chandler

Reality is in between



Google

Tree Removal

- **Step 1: Keep Drivers on Road**
 - Apply sign and marking upgrades consistent with the MUTCD
 - Consider centerline and edgeline rumble strips
- **Step 2: Provide Safe Recovery**
 - Correction of any 2-inch+ shoulder drop-offs
- **Consider removal**
 - Evaluate clear zone to determine if other fixed objects also need treated.
- **Identify environmental issues**
- **Identify local issues (historical significance, etc.)**
- **Public R/W vs. Private Property**

Policy Approach: Guard Rail Safety Edge

U.S. Department of Transportation
Federal Highway Administration

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Guard Rail Crashes

Check for:

1. Deficient Height
2. Non-standard Guard Rail Types
3. Inadequate End Terminals

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Guard Rail

Google

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Safety Edge

Georgia DOT Safety Wedge Hardware.

Infrastructure Treatments for Speed-related Crashes (Traffic Calming)

U.S. Department of Transportation
Federal Highway Administration

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Infrastructure Strategies

FHWA-HRT-08-067

Traffic Calming on Main Roads Through Rural Communities
<http://www.tfrcr.gov/safety/pubs/08067/index.htm>

FHWA-HRT-08-067

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Infrastructure Treatments

FHWA-HRT-08-067

FHWA-HRT-08-067

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Peripheral Transverse Pavement Marking

Human Behavior

U.S. Department of Transportation
Federal Highway Administration

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Enforcement/Education RD Strategies

Enforcement
Targeted
Visible
Active

Education
Media

SUCCESS

Comprehensive RD Initiatives

U.S. Department of Transportation
Federal Highway Administration

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The E's of Safety (at least some of them)

Engineering

Enforcement

ARRIVE ALIVE Education

Photos: Brian Chandler; Lacey, Washington Police Dept.; Missouri Coalition for Roadway Safety

3-E Initiatives



Washington State DOT, Oregon DOT.

Questions?



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