


Roadway Departure Countermeasures

California Division Office


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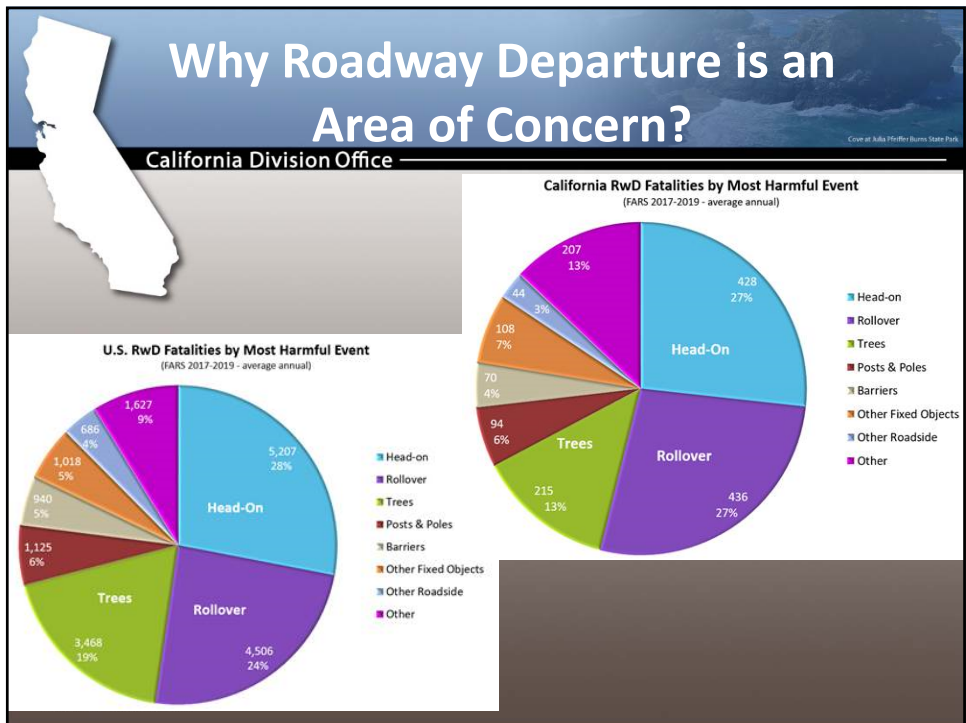
Learning Objectives

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- Why this is an Area of Concern
- Proven Safety Countermeasures (PSCs) that:
 - Keep vehicles in their lane
 - Reduce the potential for crashes
 - Minimize crash severity
- Case study for HFST
- Resources and technical assistance (WIIFU)
- Q&A throughout




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3 Ways to Prevent Roadway Departure Crashes

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- 1) Keep vehicles in their lane
- 2) Reduce the potential for crashes
- 3) Minimize crash severity



Keep vehicles in their lane

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- 1) Enhanced delineation
- 2) Friction treatments in curves and other spot locations
- 3) Edge line, shoulder and center line rumble strips

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Enhanced delineation

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Chevron signs installed along a curve.

SAFETY BENEFITS:
Chevron Signs
25%
Reduction in nighttime crashes
16%
Reduction in non-intersection fatal and injury crashes


Source: CMF Clearinghouse, CMF IDs 2438 and 2439

- Pavement markings
- Post-mounted delineation
- Larger signs and signs with enhanced retroreflectivity
- Dynamic advance curve warning signs and sequential curve signs


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Friction treatments in curves and other spot locations

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- Sharp curves
- Inadequate cross-slope design
- Wet conditions
- Polished roadway surfaces
- Driving speeds in excess of the curve advisory speed



High Friction Surface Treatment


52%
Reduction in wet road crashes

24%
Reduction in curve crashes

Source: CMF Clearinghouse, CMF IDs 7900 and 7901

California HFST Case Study


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Detour

■ **Not Necessary:** Treatment can be installed one lane at a time

■ **Necessary:** Roadway must be closed during construction.



<div style="display: flex; flex-direction: column; align-items: center;"> <div style="width: 15px; height: 15px; background-color: blue; margin-bottom: 5px;"></div> HFST</div> <div style="width: 15px; height: 15px; background-color: yellow; margin-bottom: 5px;"></div> Curve Realignment	Environmental Review & Design Timeframe	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%; background-color: blue; height: 15px;"></div> 4-6 Months </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%; background-color: yellow; height: 15px;"></div> 2-5 Years </div>
	Construction Duration	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%; background-color: blue; height: 15px;"></div> 10 working Days </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 70%; background-color: yellow; height: 15px;"></div> 6+ Months </div>
	Cost	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%; background-color: blue; height: 15px;"></div> ~\$250,000 </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%; background-color: yellow; height: 15px;"></div> \$14,000,000+ </div>

Edge line, shoulder and center line rumble strips

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- **Longitudinal rumble strips** are milled or raised elements on the pavement intended to alert drivers through vibration and sound that their vehicles have left the travel lane.
- **Rumble strips** are edge line or center line rumble strips where the pavement marking is placed over the rumble strip, which can result in an increased visibility of the pavement marking during wet, nighttime conditions.



SAFETY BENEFITS:
Center Line Rumble Strips
44-64%
Head-on, opposite-direction, and sideswipe fatal and injury crashes


Shoulder Rumble Strips
13-51%
Single vehicle, run-off-road fatal and injury crashes

Source: NCHRP Report 641, *Guidance for the Design and Application of Shoulder and Centerline Rumble Strips.*

Reduce the potential for crashes


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- 4) Safety EdgeSM
- 5) Maintain clear zones
- 6) Traversable roadside slopes

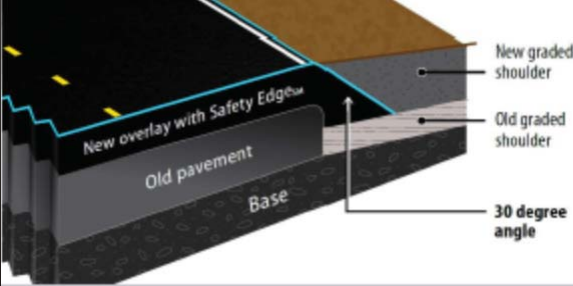


Safety EdgeSM

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- SafetyEdgeSM technology shapes the edge of the pavement at approximately **30 degrees** from the pavement cross slope during the paving process.
- This **systemic safety treatment** eliminates the vertical drop-off at the pavement edge, allowing drifting vehicles to return to the pavement safely.
- It has **minimal effect** on asphalt pavement project cost with the potential to **improve pavement life**.



Cross-section view of an overlay with SafetyEdgeSM.


SAFETY BENEFIT:
11%

Reduction in fatal and injury crashes

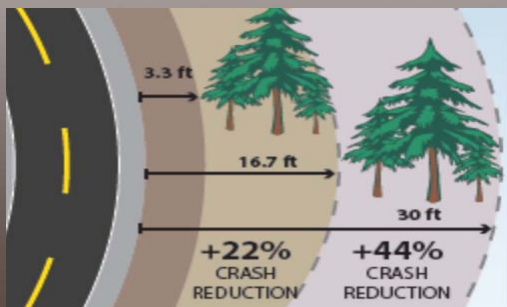
Source: Safety Effects of the SafetyEdgeSM, FHWA-SA-17-044.

Maintain clear zones

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- A **clear zone** is an unobstructed, traversable area beyond the edge of the through traveled way for the recovery of errant vehicles.
- Clear zones are free of rigid fixed objects such as trees and utility cabinets or poles.
- AASHTO's Roadside Design Guide details the clear zone width adjustment factors to be applied at horizontal curves.



SAFETY BENEFIT:
27%

of all fatal crashes occur at curves



80%

of all fatal crashes at curves are roadway departure crashes

Source: Fatality Analysis Reporting System (FARS)

Traversable roadside slopes

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- **Adding or widening shoulders** gives drivers more recovery area to regain control in the event of a roadway departure.
- **Slope flattening** reduces the steepness of the sideslope to increase drivers' ability to keep the vehicle stable, regain control of the vehicle, and avoid obstacles.

SAFETY BENEFITS:
Flatten sideslope from
1V:3H to 1V:4H: 8%
1V:4H to 1V:6H: 12%
 reduction for single-vehicle crashes

Source: NCHRP Report 617: Accident Modification Factors for Traffic Engineering and ITS Improvements (2008)

Minimize crash severity

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- 7) Breakaway features
 - Signs and Luminaire Supports
 - Utility Poles and Mailboxes
- 8) Barriers to shield obstacles
 - Trees and Shrubbery
 - Other fixed objects
 - Slopes

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Breakaway features





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- Slip bases can be omni-directional or uni-directional. Use the appropriate design for the location.
- Breakaway stub height of 4" for posts.
- Timber posts larger than 4x4 have drilled holes at 4" and 18" above the ground.
- Crashworthy sign supports are required by the CA MUTCD (Section 2A.19) if within clear zone.

Barriers to shield obstacles

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- **Cable barrier** is a flexible barrier made from wire rope supported between frangible posts.
- **Guardrail** is a semi-rigid barrier, usually either a steel box beam or W-beam. These deflect less than flexible barriers, so they can be located closer to objects where space is limited.
- **Concrete barrier** is a rigid barrier that does not deflect. These are typically reserved for use on divided roadways.

SAFETY BENEFITS

Median Barriers Installed on Rural Four-Lane Freeways

97%

reduction in cross-median crashes

Source: NCHRP Report 794: Median Cross-Section Design for Rural Divided Highways (2011)

Resources

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https://safety.fhwa.dot.gov/local_rural/tribal/Local_Rural_Local_Road_Virtual_Trade_Show.pdf

Resources

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Strategic Approach & Plan

- RdW Strategic Plan
- Crash Emphasis Areas Brochures
- RdW Focused Approach
- Additional Resources

COUNTERMEASURES

Keep Vehicles on Roadway

- Pavement Friction
- Rumble Strips
- Horizontal Curve Safety
- Nighttime Visibility

Provide for Safe Recovery

- SafetyEdge™
- Clear Zones

Reduce Crash Severity

- Hardware Eligibility Letters
- Guidance & Policies
- Resources

New! Focus on Reducing Rural Roadway Departures

Every year nearly 12,000 people die when their vehicle leaves its lane on a rural road. This [EDC initiative](#) is supported by four pillars:

- All Public Roads
- Proven Countermeasures
- Systemic Approach
- Safety Action Plans

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https://safety.fhwa.dot.gov/roadway_dept/

Thank You!

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The slide features a blue header with the text "Thank You!" in white. To the left of the header is a white silhouette of the state of California. Below the header, the text "California Division Office" is written in white. The main content area contains a white rectangular image showing several hands of various skin tones raised, each holding a question mark of a different color (cyan, pink, grey, green, blue, yellow). In the bottom left corner of the slide, there is a circular logo for the U.S. Department of Transportation Federal Highway Administration.