

Reducing Crashes Through Proven Safety Countermeasures

ROADWAY DEPARTURE



1. Roadway Departure Countermeasures
2. Longitudinal Rumble Strips and Stripes
3. Safety
4. Roadside Design Improvements at Curves
5. Median Barriers

PEDESTRIANS/BICYCLES



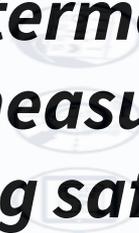
13. Pedestrian and Bicycle Crossing
14. Medians and Pedestrian Crossing Islands in Urban and Suburban Areas
15. Pedestrian and Bicycle Crossing Beacons
16. Road Diets/Reconfigurations
17. Walkways

INTERSECTIONS



6. Backsight Triangles at Road Borders
7. Roadway Departure Countermeasures
8. Left and Right-Turn Lanes at Two-Way Stop-Controlled Intersections
9. Reduced Left-Turn Conflict Intersections
10. Roundabouts
11. Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections
12. Yellow Change Intervals

CROSSCUTTING



18. Roadway Departure Countermeasures
19. Roadway Departure Countermeasures
20. Roadway Departure Countermeasures

Proven Safety Countermeasures that offer significant and measurable impacts to improving safety

<http://safety.fhwa.dot.gov>

Reducing Crashes Through Proven Safety Countermeasures

ROADWAY DEPARTURE	PEDESTRIANS/BICYCLES
 1. Enhanced Delineation and Friction for Horizontal Curves	 13. Leading Pedestrian Intervals
 2. Longitudinal Rumble Strips and Stripes	 14. Medians and Pedestrian Crossing Islands in Urban and Suburban Areas
 3. SafetyEdge _{sm}	 15. Pedestrian Hybrid Beacons
 4. Roadside Design Improvements at Curves	 16. Road Diets/Reconfigurations
 5. Median Barriers	 17. Walkways
INTERSECTIONS	CROSSCUTTING
 6. Backplates with Retroreflective Borders	 18. Local Road Safety Plans
 7. Corridor Access Management	 19. Road Safety Audits
 8. Left- and Right-Turn Lanes at Two-Way Stop-Controlled Intersections	 20. USLIMITS2
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ROADWAY DEPARTURE



1. Roadway Departure Countermeasures
2. Longitudinal Rumble Strips and Stripes
3. Safety Restraints
4. Roadside Design Improvements at Curves
5. Median Barriers

INTERSECTIONS



6. Backplates with Retro-reflective Borders
7. Corridor Access Management
8. Left and Right-Turn Way Stop-Controlled Intersections
9. Reduced Left-Turn Conflict Intersections
10. Roundabouts
11. Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections
12. Yellow Change Intervals

PEDESTRIANS/BICYCLES



13. Pedestrian and Bicyclist Safety
14. Medians and Pedestrian Crossing Islands in Urban and Suburban Areas
15. Pedestrian and Bicyclist Safety Beacons
16. Road Diets/Reconfigurations
17. Walkways

CROSSCUTTING



18. Local Road Safety Plans
19. Road Safety Audits

- Roadway Departure
- Intersections
- Pedestrians/Bicycles
- Crosscutting

Reducing Crashes Through Proven Safety Countermeasures

Roadway Departure



1. Enhanced Delineation and Friction for Horizontal Curves

Enhanced Delineation

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

Canyon Ferry Rd



SAFETY BENEFITS:



CHEVRON SIGNS

25%

Reduction in nighttime crashes

16%

Reduction in non-intersection fatal and injury crashes

Montana Comprehensive Highway Safety Plan
2015-2020

#VisionZeroMT
zero deaths | zero serious injuries

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Roadway Departure



2. Longitudinal Rumble Strips and Stripes

District-wide Centerline Rumble Strip Projects – 2015 thru 2020



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.*

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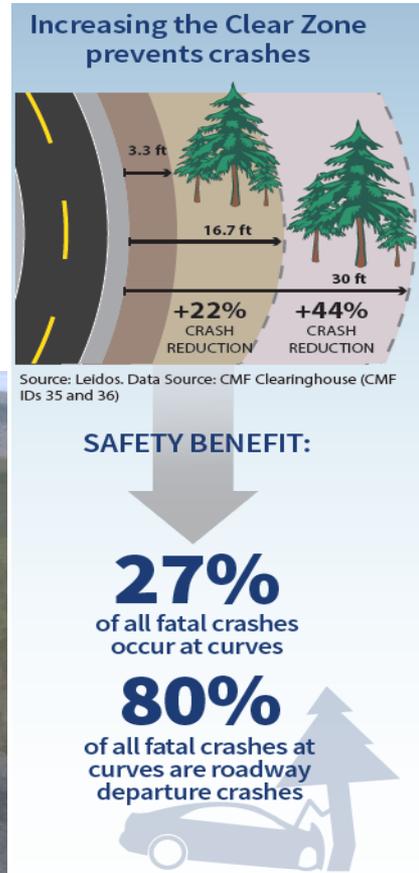
Roadway Departure



4. Roadside Design Improvements at Curves

- Improved Clear Zone
- Slope Flattening
- Wider Shoulders

MT-359 near Harrison



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Roadway Departure



5. Median Barriers

I-90 near Billings



Reducing Crashes Through Proven Safety Countermeasures

Intersections



6. Backplates with Retroreflective Borders



7. Corridor Access Management



8. Left-and Right-Turn Lanes at Two-Way Stop-Controlled Intersections



9. Reduced Left-Turn Conflict Intersections



10. Roundabouts



11. Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections



12. Yellow Change Intervals

Reducing Crashes Through Proven Safety Countermeasures

Intersections



6. Backplates with Retroreflective Borders

Statewide



SAFETY BENEFIT:



15%
Reduction in total
crashes

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Intersections

Select Corridors Statewide



7. Corridor Access Management

The following access management strategies can be used individually or in combination with one another:

- Driveway closure, consolidation, or relocation.
- Limited-movement designs for driveways (such as right-in/right-out only).
- Raised medians that preclude across-roadway movements.
- Intersection designs such as roundabouts or those with reduced left-turn-conflicts (such as J-turns, median U-turns, etc.).
- Turn lanes (i.e., left-only, right-only, or interior two-way left).
- Lower speed one-way or two-way off-arterial circulation roads.

Successful corridor access management involves balancing overall safety and corridor mobility for all users along with the access needs of adjacent land uses.



This intersection design restricts left-turn movements to improve safety.

Source: FHWA

SAFETY BENEFITS:

5-23%

Reduction in total crashes along 2-lane rural roads

25-31%

Reduction in injury and fatal crashes along urban/suburban arterials

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Intersections

Select Locations Statewide



8. Left-and Right-Turn Lanes at Two-Way Stop-Controlled Intersections



Example of a right-turn lane.



Example of left-turn lanes.

SAFETY BENEFITS:



LEFT-TURN LANES

28-48%

Reduction in total crashes

RIGHT-TURN LANES

14-26%

Reduction in total crashes



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Reducing Crashes Through Proven Safety Countermeasures

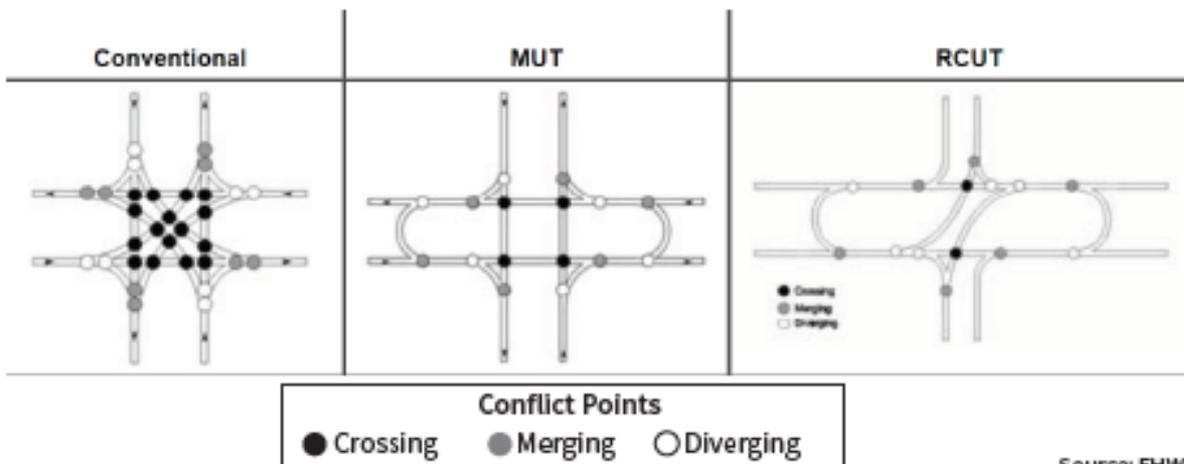
Intersections



9. Reduced Left-Turn Conflict Intersections

Option - US-93 near Pablo

MUT and RCUT Can Reduce Conflict Points by 50%



Source: FHWA



Example of MUT Intersection.

Source: FHWA

SAFETY BENEFITS:



RCUT

54%

Reduction in injury and fatal crashes¹

MUT

30%

Reduction in intersection-related injury crash rate²

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Intersections



10. Roundabouts

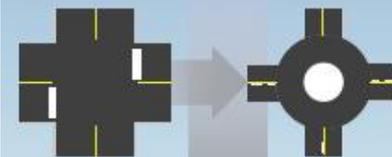
Roundabouts provide substantial safety and operational benefits compared to other intersection types, most notably a reduction in severe crashes.



Canyon Ferry & Lake Helena

- **10 years Before** – 2 Fatal Crashes, 15 injury crashes, 31 total crashes.
- **10 years After** – No fatal crashes, 2 injury crashes, 23 total crashes.

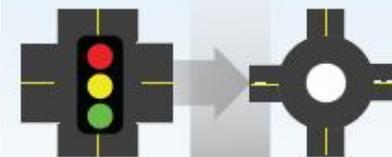
TWO-WAY STOP-CONTROLLED INTERSECTION TO A ROUNDABOUT



82%

Reduction in severe crashes

SIGNALIZED INTERSECTION TO A ROUNDABOUT



78%

Reduction in severe crashes

Reducing Crashes Through Proven Safety Countermeasures

Intersections

Select Locations Statewide



11. Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections



Example of countermeasures on the stop approach.

Source: South Carolina DOT



SAFETY BENEFITS:

10%

Reduction in injury and fatal crashes

15%

Reduction in nighttime crashes

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Reducing Crashes Through Proven Safety Countermeasures

Intersections



12. Yellow Change Intervals

Continually Considered Statewide

Since red-light running is a leading cause of severe crashes at signalized intersections, it is imperative that the yellow change interval be appropriately timed.

Transportation agencies can improve signalized intersection safety and reduce red-light running by reviewing and updating their traffic signal timing policies and procedures concerning the yellow change interval. Agencies should institute regular evaluation and adjustment protocols for existing traffic signal timing. Refer to the *Manual on Uniform Traffic Control Devices* for basic requirements and further recommendations about yellow change interval timing.

SAFETY BENEFITS:



36-50%

Reduction in red light running

8-14%

Reduction in total crashes

12%

Reduction in injury crashes



Reducing Crashes Through Proven Safety Countermeasures

Pedestrians/Bicycles



13. Leading Pedestrian Intervals



14. Medians and Pedestrian Crossing Islands in Urban and Suburban Areas



15. Pedestrian Hybrid Beacons



16. Road Diets/Reconfigurations



17. Walkways

Reducing Crashes Through Proven Safety Countermeasures

Pedestrians/Bicycles



13. Leading Pedestrian Intervals

A leading pedestrian interval (LPI) gives pedestrians the opportunity to enter an intersection 3-7 seconds before vehicles are given a green indication. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left.

Broadway & Van Buren

SAFETY BENEFIT:

60%

Reduction in pedestrian-vehicle crashes at intersections



LPIs are beneficial at intersections with high left-turning volumes.

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Pedestrians/Bicycles



14. Medians and Pedestrian Crossing Islands in Urban and Suburban Areas

Bitterroot Trail Safety – Missoula TA 8199(135)



Improved street crossings along the Bitterroot Trail in Missoula between 3rd Street and 14th



Median and pedestrian crossing islands near a roundabout.

Source: www.pedbikelimages.org / Dan Burden

SAFETY BENEFITS:



RAISED MEDIAN

46%

Reduction in pedestrian crashes

PEDESTRIAN CROSSING ISLAND

56%

Reduction in pedestrian crashes

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Pedestrians/Bicycles



15. Pedestrian Hybrid Beacons

Belgrade Interchange



Reducing Crashes Through Proven Safety Countermeasures

Pedestrians/Bicycles



16. Road Diets/Reconfigurations

W Broadway - Missoula



A “Road Diet,” or roadway reconfiguration, can improve safety, calm traffic, provide better mobility and access for all road users, and enhance overall quality of life.

SAFETY BENEFIT:



**4-LANE → 3-LANE
ROAD DIET
CONVERSIONS**

19-47%
Reduction in total crashes

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Reducing Crashes Through Proven Safety Countermeasures

Pedestrians/Bicycles



17. Walkways

4th Ave East Walks – Polson TA 24(48)



3 blocks (1,060 ft) of new sidewalk along 4th Avenue East in Polson between 4th Street and 7th

SAFETY BENEFITS:



SIDEWALKS

65-89%

Reduction in crashes involving pedestrians walking along roadways

PAVED SHOULDERS

71%

Reduction in crashes involving pedestrians walking along roadways



Example of a shared use path.

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Reducing Crashes Through Proven Safety Countermeasures

Crosscutting



18. Local Road Safety Plans



19. Road Safety Audits



20. USLIMITS2

Reducing Crashes Through Proven Safety Countermeasures

Crosscutting



18. Local Road Safety Plans

Consideration Going Forward

A local road safety plan (LRSP) provides a framework for identifying, analyzing, and prioritizing roadway safety improvements on local roads.

- Stakeholder engagement representing the 4E's – engineering, enforcement, education, and emergency medical services, as appropriate.
- Collaboration among municipal, county, Tribal, State and/or Federal entities to leverage expertise and resources.
- Identification of target crash types and crash risk with corresponding recommended proven safety countermeasures.
- Timeline and goals for implementation and evaluation.

Local roads experience
3x the fatality rate
of the
Interstate Highway System.

Source: FARS and FHWA Highway Statistics Series (2014)



Safety improvements on local roads can be determined through the LRSP process.

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Reducing Crashes Through Proven Safety Countermeasures

Crosscutting



19. Road Safety Audits

Continually
Considered
Statewide

A road safety audit is a proactive, formal safety performance examination of an existing or future road or intersection by an independent and multi-disciplinary team.

SAFETY BENEFIT:



10-60%

Reduction in total crashes

CONDUCTING AN RSA



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QUESTIONS???

INTERSECTIONS



6. Backplate Borders
7. Corridor A
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CROSSCUTTING



18. Local Road Safety Plans

19. Road Safety Audits

20. LIMITS2



VISION ZERO
zero deaths
zero serious injuries

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