

Safety Countermeasures, Best Practices and Safety Research

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Montana Department of Transportation
2022 Annual Transportation Safety Meeting
October 11 & 12, 2022

zero deaths
zero serious injuries

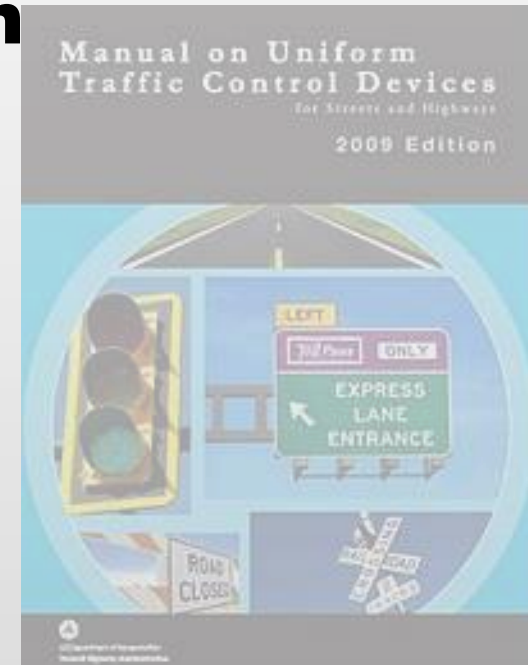


Safety Countermeasures, Best Practices and Safety Research

AKA

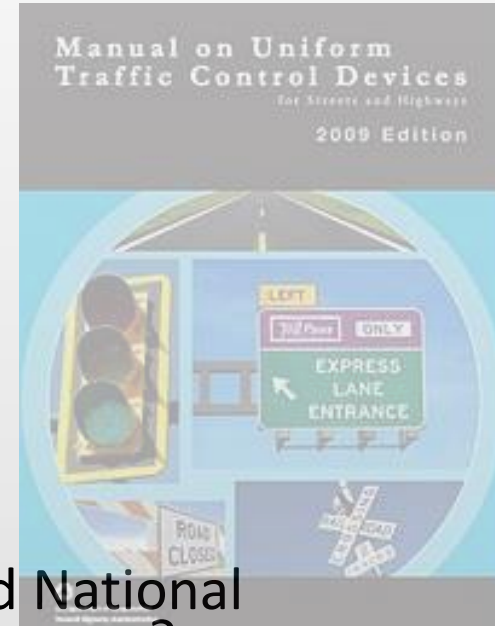
- Target Specific Crashes (Reactive)
- Develop Standards (Proactive)
- Analyze Results for Continuous Improvement

Safety Countermeasures, Best Practices and Safety Research



Trivia –

What do Lyndon B. Johnson, Vietnam and National Design Standards (MUTCD) have in common?



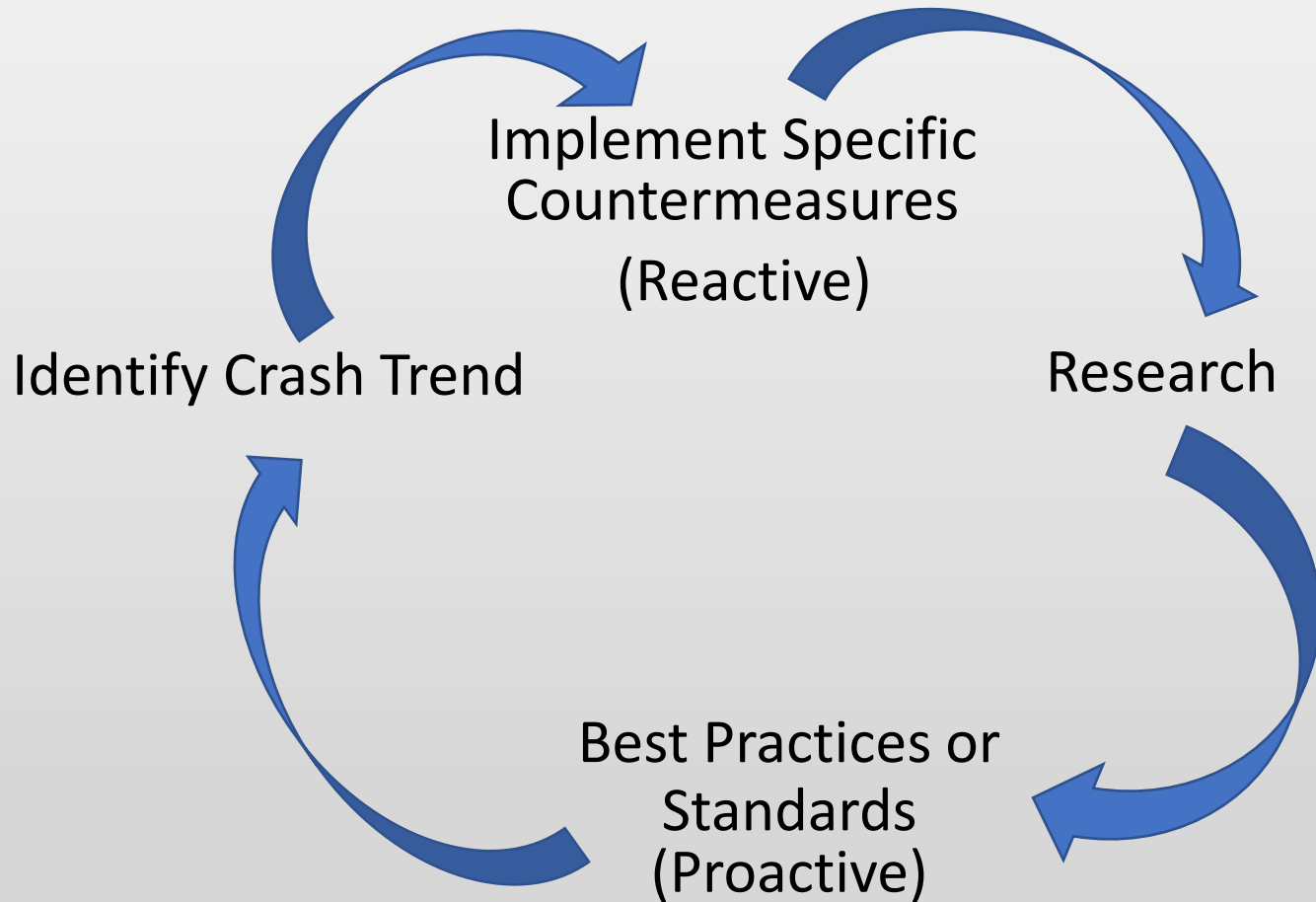
Trivia –

What do Lyndon B. Johnson, Vietnam and National Design Standards (MUTCD) have in common?

“Over the {1966} Labor Day weekend, 29 American servicemen died in Vietnam. During the same Labor Day weekend, 614 Americans died on our highways in automobile accidents.”

-LBJ while signing the Highway Safety Act
(Req'd Conformance w/ MUTCD)

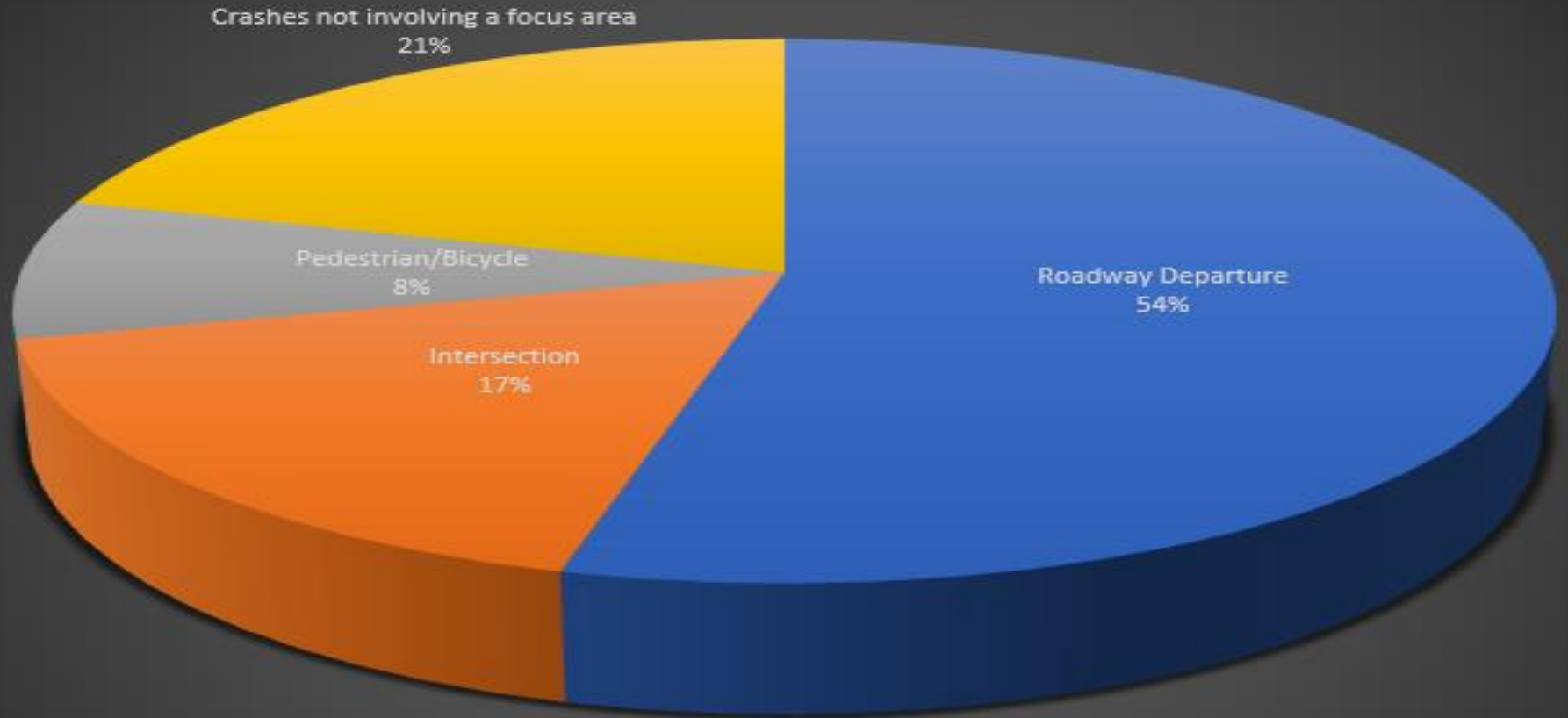
Safety Feedback Loop



Manual on Uniform
Traffic Control Devices

For Streets and Highways

Fatal and Serious Injury Crashes (5 Years)



■ Roadway Departure

■ Intersection

■ Pedestrian/Bicycle

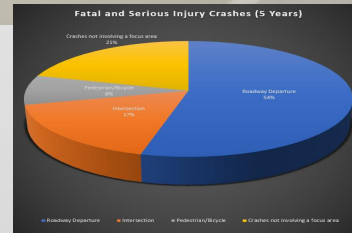
■ Crashes not involving a focus area

Implement Specific Countermeasures

Two Main Categories

Roadway Departure Crashes

Prevent or mitigate vehicles leaving the traveled way



Intersection Crashes

Prevent Crashes related to Intersecting Roadways



Proven Safety Countermeasures

FHWA's Proven Safety Countermeasures initiative (PSCI) is a collection of countermeasures and strategies effective in reducing roadway fatalities and serious injuries on our Nation's highways. Transportation agencies are strongly encouraged to consider widespread implementation of PSCs to accelerate the achievement of local, State, and National safety goals.

ROADWAY DEPARTURE -----

INTERSECTIONS -----

For Each:

- Implementation status in MT
- What Research shows for Crash Reduction

<https://safety.fhwa.dot.gov/provencountermeasures/>

Roadway Departure Crashes

Prevent or mitigate vehicles
leaving the traveled way

ROADWAY DEPARTURE



Wider Edge Lines



Enhanced Delineation
for Horizontal Curves



Longitudinal Rumble
Strips and Stripes



SafetyEdgeSM



Roadside Design
Improvements at
Curves



Median Barriers

Roadway Departure Crashes

Wider Edge Lines

ROADWAY DEPARTURE



Wider Edge Lines



SafetyEdgeSM



Enhanced Delineation for Horizontal Curves



Roadside Design Improvements at Curves

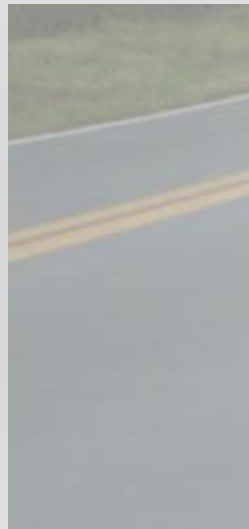


Longitudinal Rumble Strips and Stripes



Median Barriers

Consideration for Future



Wider edge lines can reduce crashes up to:

37%

for non-intersection, fatal and injury crashes on rural, two-lane roads.²

22%

for fatal and injury crashes on rural freeways.³



Roadway Departure Crashes

Enhanced Delineation for Horizontal Curves

ROADWAY DEPARTURE



Wider Edge Lines



Enhanced Delineation for Horizontal Curves



Longitudinal Rumble Strips and Stripes



SafetyEdgeSM



Roadside Design Improvements at Curves



Median Barriers

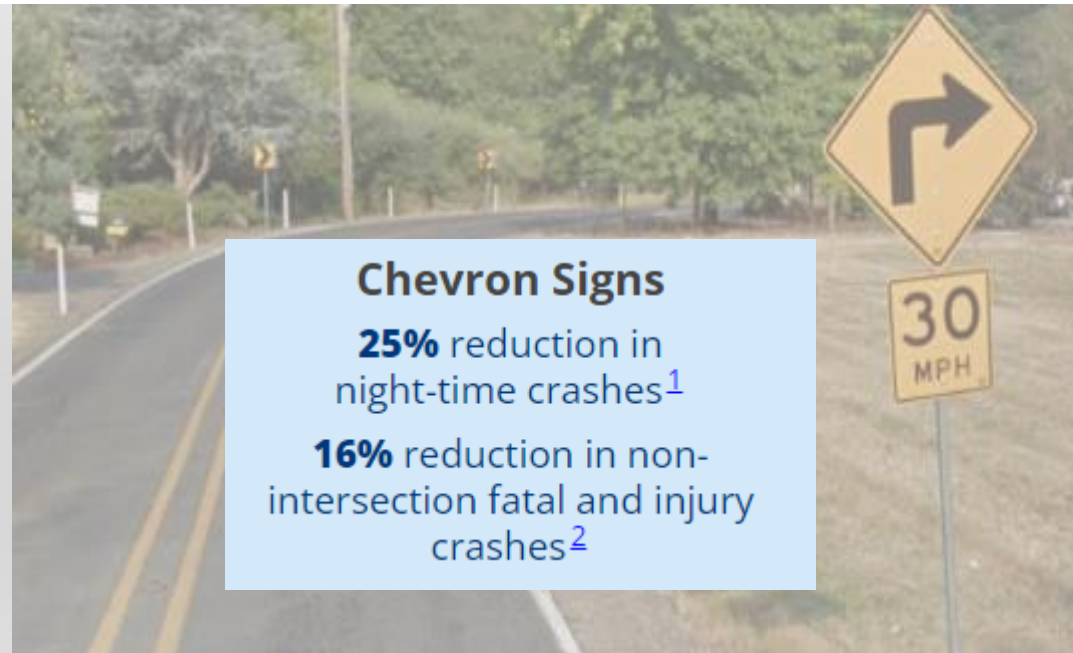
Standard

Advisory Signs, Chevrons, Delineators

Location Specific

Enhanced Delineation, Dynamic Warning Signs,

Retroreflective Strips on Sign and Delineator Posts



Chevron Signs
25% reduction in night-time crashes¹
16% reduction in non-intersection fatal and injury crashes²

Roadway Departure Crashes

Longitudinal Rumble Strips

ROADWAY DEPARTURE



Wider Edge Lines



Enhanced Delineation for Horizontal Curves



Longitudinal Rumble Strips and Stripes



SafetyEdgeSM



Roadside Design Improvements at Curves



Median Barriers

Standard

Conventional shoulder & CLRS

Location Specific

Sinusoidal (Low Noise) Rumble Strips

(Ongoing Research Project)

Center Line Rumble Strips

44-64%

reduction in head-on fatal and injury crashes on two-lane rural roads.⁴

Shoulder Rumble Strips

13-51%

reduction in single vehicle, run-off-road fatal and injury crashes on two-lane rural roads.⁴

Butte Area
Before & After:
~50% reduction
Fatal and SI

Roadway Departure Crashes

Improved Pavement Edge

ROADWAY DEPARTURE



Wider Edge Lines



Enhanced Delineation for Horizontal Curves



Longitudinal Rumble Strips and Stripes



SafetyEdgeSM



Roadside Design Improvements at Curves



Median Barriers

Standard

11%

reduction in fatal and injury crashes.²

21%

reduction in run-off-road crashes.²

19%

reduction in head-on crashes.²



Roadway Departure Crashes

Roadside Design Improvements at Curves

ROADWAY DEPARTURE



Wider Edge Lines



Enhanced Delineation for Horizontal Curves



Longitudinal Rumble Strips and Stripes



SafetyEdgeSM



Roadside Design Improvements at Curves



Median Barriers

Location Specific

Spot Crash Locations

- Improved Clear Zone
- Slope Flattening
- Wider Shoulders



Flatten sideslope from 1V:3H to 1V:4H:

8%

reduction for single-vehicle crashes.²

Flatten sideslope from 1V:4H to 1V:6H:

12%

reduction for single-vehicle crashes.²

Standard Reconstruction Projects

Roadway Departure Crashes

Median Barriers

ROADWAY DEPARTURE



Wider Edge Lines



Enhanced Delineation for Horizontal Curves



Longitudinal Rumble Strips and Stripes



SafetyEdgeSM



Roadside Design Improvements at Curves



Median Barriers

Location Specific

High Tension Cable
Rail

Select Locations
based on Crash
History and
Median Width

8%

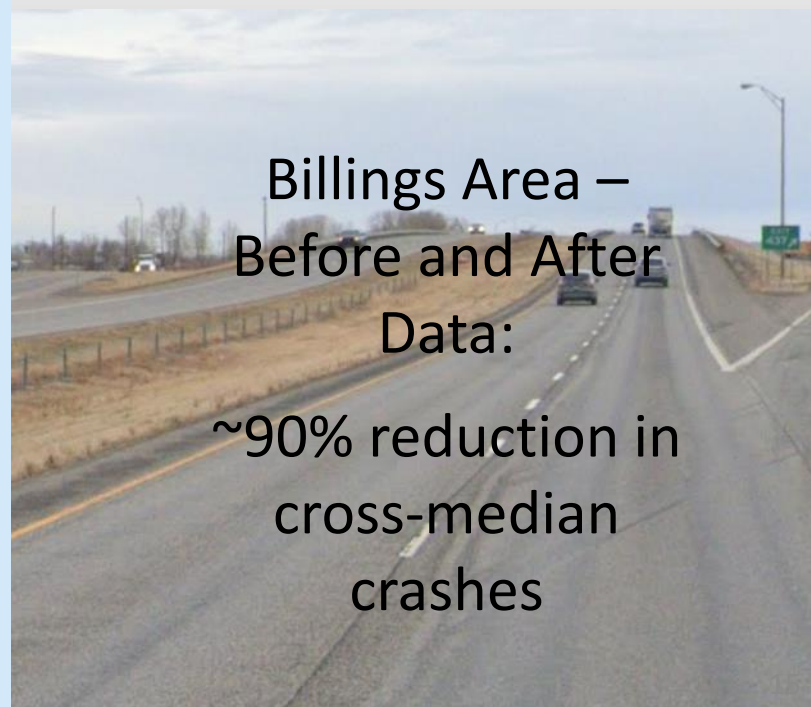
of all fatalities on divided
highways are due to head-on
crashes.¹

Safety Benefits:

**Median Barriers Installed
on Rural Four-Lane
Freeways**

97%

reduction in
cross-median crashes.²



Billings Area –
Before and After
Data:

~90% reduction in
cross-median
crashes

Intersection Crashes

Prevent Crashes related to Intersecting Roadways

INTERSECTIONS



Backplates with Reflective Borders



Corridor Access Management



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



Reduced Left-Turn Conflict Intersections



Roundabouts



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

Intersection Crashes

Reflective Backplates

INTERSECTIONS



Backplates with Reflective Borders



Corridor Access Management



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



Reduced Left-Turn Conflict Intersections



Roundabouts



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

Now Standard



Intersection Crashes

Corridor Access Management

INTERSECTIONS



Backplates with Reflective Borders



Corridor Access Management



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



Reduced Left-Turn Conflict Intersections

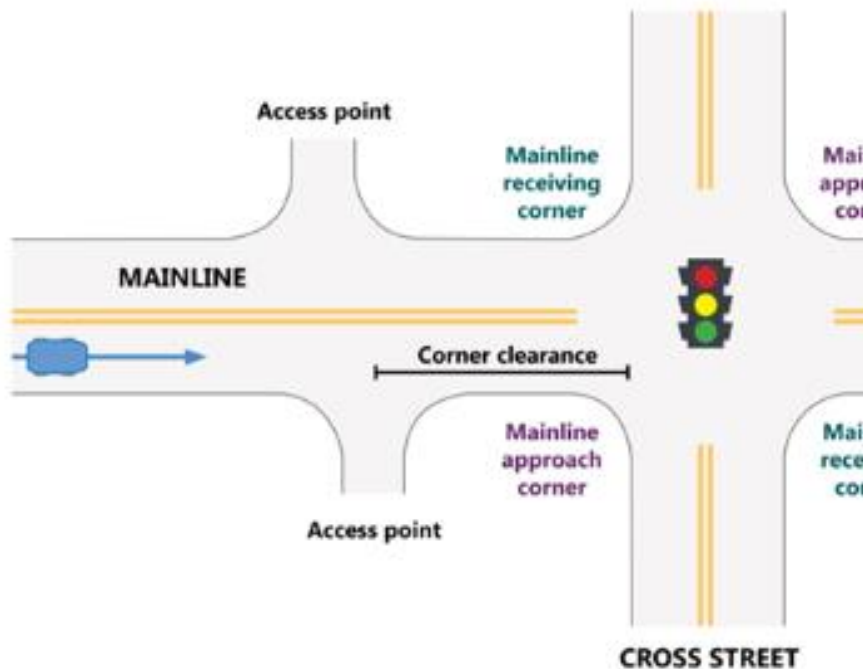


Roundabouts



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

Select Corridors Throughout the State



Reducing driveway density

5-23%
reduction in total crashes along 2-lane rural roads.³

25-31%
reduction in fatal and injury crashes along urban/suburban arterials.⁴

Schematic of an intersection and adjacent access points. Source: FHWA

Intersection Crashes

Dedicated Left and Right Turn Lanes

INTERSECTIONS



Backplates with Reflective Borders



Corridor Access Management



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



Reduced Left-Turn Conflict Intersections

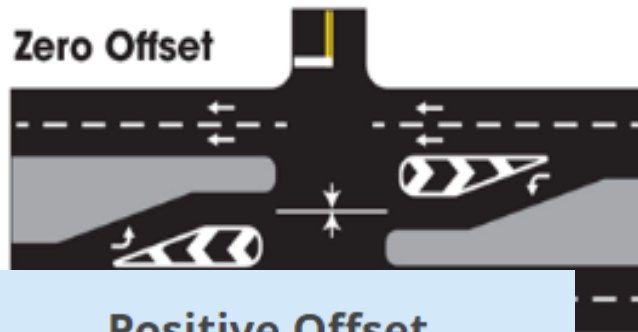


Roundabouts

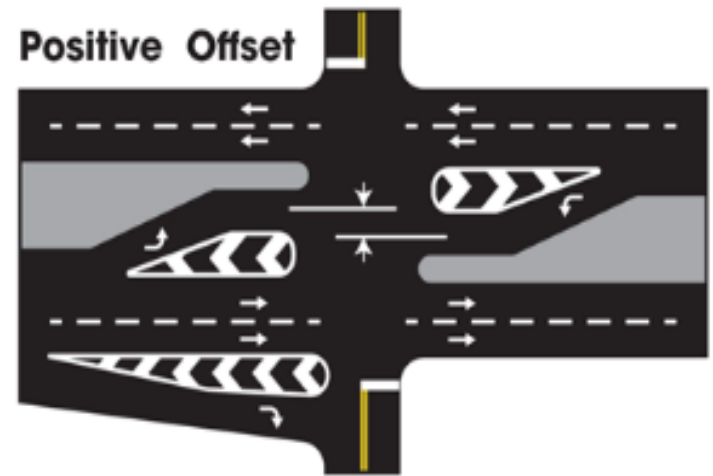


Systemic Application of Multiple Low Cost Countermeasures at Stop-Controlled Intersections

Select
Intersections
Throughout
the State



Positive Offset Left-Turn Lanes
36%
reduction in fatal and injury crashes.²



to positive offset of left- and right-turn lanes.

Intersection Crashes

Reduced Left-Turn Conflict Intersections

INTERSECTIONS



Backplates with Reflective Borders



Corridor Access Management



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



Reduced Left-Turn Conflict Intersections



Roundabouts



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

Early Implementation

Median U-turn:

Restricted Crossing U-turn:

Minor road traffic turns right followed by a U-turn at a designated location

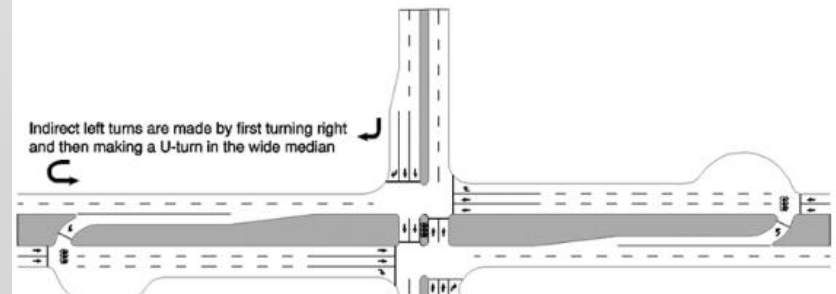
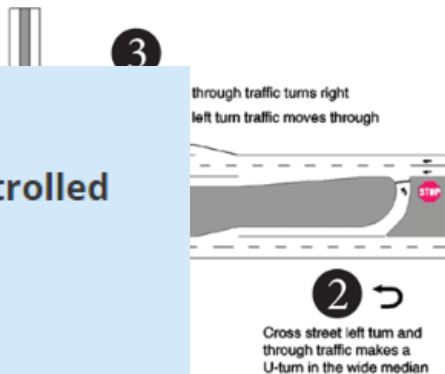
Minor road traffic turns right followed by a U-turn at a designated location

RCUT

Two-Way Stop-Controlled to RCUT:

54%

reduction in fatal and injury crashes.²



30%

reduction in intersection-related injury crash rate.⁵

Intersection Crashes

Roundabouts

INTERSECTIONS



Backplates with Reflective Borders



Corridor Access Management



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



Reduced Left-Turn Conflict Intersections



Roundabouts

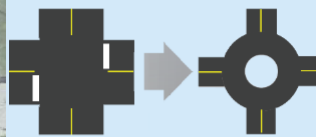


Systemic Application of Multiple Low Cost Countermeasures at Stop-Controlled Intersections

Select Locations Throughout State



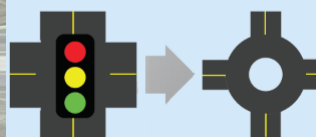
Two-Way Stop-Controlled Intersection to a Roundabout



82%

Reduction in fatal and injury crashes¹

Signalized Intersection to a Roundabout



78%

Reduction in fatal and injury crashes¹

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.

Intersection Crashes

Low-Cost Countermeasures at Stop-Control Intersections

INTERSECTIONS



Backplates with Reflective Borders



Corridor Access Management



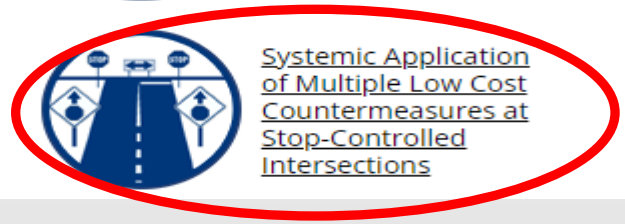
Left- and Right-Turn Lanes at Two-Way Stop-Controlled Intersections



Reduced Left-Turn Conflict Intersections



Roundabouts



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

Individual Locations and Future Systemic Application

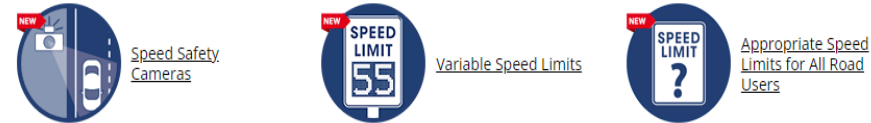
- 10%**
reduction of fatal and injury crashes at all locations/types/areas.
- 15%**
reduction of nighttime crashes at all locations/types/areas.
- 27%**
reduction of fatal and injury crashes at rural intersections.
- 19%**
reduction of fatal and injury crashes at 2-lane by 2-lane intersections.

FHWA Basic Package for Intersections (Left) and MDT Double Arrow Sign (Right)



FHWA's Proven Safety Countermeasures Initiative

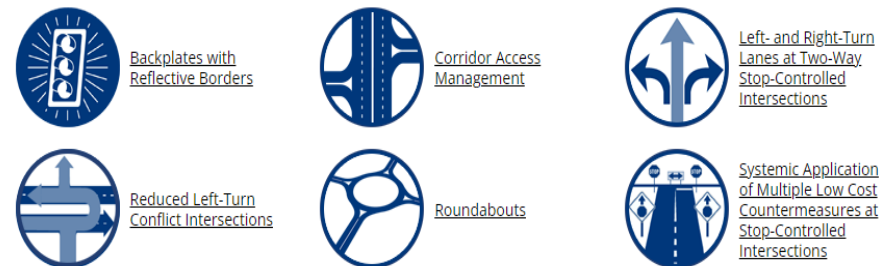
SPEED MANAGEMENT



ROADWAY DEPARTURE



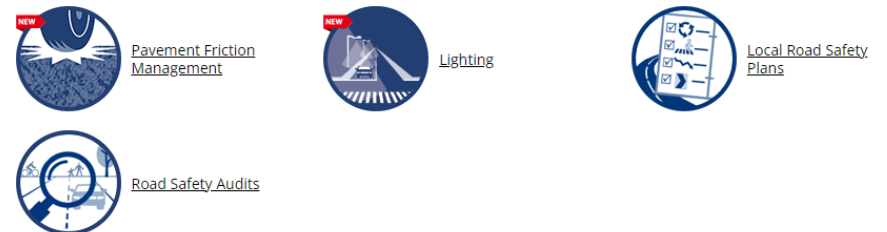
INTERSECTIONS



PEDESTRIAN/BICYCLIST



CROSSCUTTING



28 PSC in All

<https://safety.fhwa.dot.gov/provencountermeasures/>

Safety Countermeasures, Best Practices and Safety Research Recap

- Target Specific Crashes (Reactive)
- Develop Standards (Proactive)
- Analyze Results for Continuous Improvement

MT-Specific Before and After Data
Agree w/ National Stats

Safety Countermeasures, Best Practices and Safety Research

Questions?

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