FHWA’s 2017 Update of the Proven Safety Countermeasures

Make Your Mark
A Local Safety Peer Exchange
June 13, 2018
Life Cycle of a Safety Countermeasure

- Experimental
- Tried
- Proven

- Pilot
  - High Crash Location
  - Systemic
  - Policy
## FHWA’s Proven Safety Countermeasures

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<th>Pedestrian</th>
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### Crosscutting Strategies

- Road Safety Audits
- Local Road Safety Plans*
- US Limits*
PSCi – Intersections

- Left- and Right-Turn Lanes at Two-Way Stop-Controlled Intersections
- Backplates with Retroreflective Borders
- Corridor Access Management
- Yellow Change Interval
- Roundabouts
- Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections
- Reduced Left-Turn Conflict Intersections
Left and Right Turn Lanes at Two-Way Stop-Controlled Intersections

SAFETY BENEFITS:

LEFT-TURN LANES
28-48% Reduction in total crashes

RIGHT-TURN LANES
14-26% Reduction in total crashes

Source: Highway Safety Manual
Backplates with Retroreflective Borders

Safety Benefit:

15% Reductions in total crashes

Source: CMF Clearinghouse, CMF ID 1410.
Corridor Access Management

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

Source: Highway Safety Manual
Yellow Change Interval

Safety Benefits of Well-Timed Yellow Change Intervals:

- 36-50% Reduction in red light running
- 8-14% Reduction in total crashes
- 12% Reduction in injury crashes

Source: NCHRP Report 731, Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections.
Roundabouts

Two-Way Stop-Controlled Intersection to a Roundabout

82% Reduction in severe crashes

Signalized Intersection to a Roundabout

78% Reduction in severe crashes

Source: Highway Safety Manual
Systemic Application of Multiple Low Cost Countermeasures at Stop-Controlled Intersections

• Mostly signing & pavement marking enhancements.
• Strategy relies on cost economy and treatment saturation.
• Best suited for intersections with under 20,000 AADT Total Entering.
Systemic Approach for Stop Intersections

Evaluation Results from LCSII-PFS Study:

- Sample consisted of 434 treated sites and 568 reference sites across South Carolina.
- Included 2X2 (3-leg, 4-leg) and 4X2 (3-leg, 4-leg) sites.
- Range of 3-5 years before and after data.

<table>
<thead>
<tr>
<th>Recommended CMFs from FHWA-HRT-17-086</th>
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</thead>
<tbody>
<tr>
<td>Total</td>
</tr>
<tr>
<td>CMF</td>
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</tbody>
</table>
Systemic Approach for Stop Intersections
Reduced Left-Turn Conflict Intersections (MUT and RCUT)

- Geometric designs that alter how left-turn movements occur.
- Simplify and reduce or modify conflicts related to turning.
- Proven safety and operational benefits.
# Reduced Left-Turn Conflict Intersections

<table>
<thead>
<tr>
<th>Vehicle-Vehicle Conflict Points</th>
<th>Conventional</th>
<th>MUT</th>
<th>RCUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossing</td>
<td>16</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Merging</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Diverging</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>16</td>
<td>14</td>
</tr>
</tbody>
</table>

## MUT Safety Performance
- 30% decrease F&I Crashes.
- 16% decrease All Crashes.

## RCUT Safety Performance
- 54% decrease F&I Crashes.
- 35% decrease All Crashes.

Sources: FHWA-SA-14-069, FHWA-SA-14-070
PSCI – Roadway Departure

- Longitudinal Rumble Strips and Stripes along Two-Lane Highways
- Median Barrier
- SafetyEdge™
- Enhanced Delineation and Friction for Horizontal Curves
- Roadside Design Improvements at Curves
Longitudinal Rumble Strips and Stripes

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
Median Barrier

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
SafetyEdge℠

SAFETY BENEFIT:

11% Reduction in fatal and injury crashes

Source: Safety Effects of the SafetyEdge℠, FHWA-SA-17-044

<table>
<thead>
<tr>
<th>SafetyEdge℠ CMFs</th>
<th></th>
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<tbody>
<tr>
<td>Drop-Off</td>
<td>0.655</td>
</tr>
<tr>
<td>ROR</td>
<td>0.790</td>
</tr>
<tr>
<td>Head-on</td>
<td>0.813</td>
</tr>
<tr>
<td>F+I</td>
<td>0.892</td>
</tr>
<tr>
<td>Total</td>
<td>0.989</td>
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</table>
Enhanced Delineation and Friction for Curves

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

SAFETY BENEFITS:
High Friction Surface Treatment
52%
Reduction in wet road crashes
24%
Reduction in curve crashes

Source: CMF Clearinghouse, CMF IDs 7900 and 7901
Roadside Design Improvements at Curves

- Increase clear zone at curves.
  - Recommended by AASHTO RDG.
  - Proven to reduce crashes.

- Improve traversability.
  - Adding or widening shoulders in curves.
  - Flatter slopes at curves than in tangent sections.

- Reconsider when to install barrier
  - Reduce severity.
Roadside Design Improvements at Curves

Increase Clear Zone on the Outside of Curves

- 27% of all fatal crashes occur at curves
- 80% of all fatal crashes at curves are roadway departure crashes
**PSCi – Pedestrians & Bicycles**

- Medians and Pedestrian Crossing Islands in Urban and Suburban Areas
- Pedestrian Hybrid Beacon
- Road Diet
- Walkways
- Leading Pedestrian Intervals
Medians and Pedestrian Crossing Islands

SAFETY BENEFITS:

Raised Median
46%
Reduction in pedestrian crashes

Pedestrian Crossing Island
56%
Reduction in pedestrian crashes

Source: Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11
Pedestrian Hybrid Beacons

Safety Benefits:

- **69%** Reduction in pedestrian crashes
- **29%** Reduction in total crashes
- **15%** Reduction in serious injury and fatal crashes

Source: CMF Clearinghouse, CMF IDs: 2911, 2917, 2922
Road Diets

SAFETY BENEFIT:

4-Lane → 3-Lane
Road Diet Conversions
19-47%
Reduction in total crashes

Source: Evaluation of Lane Reduction "Road Diet" Measures on Crashes, FHWA-HRT-10-053.
Walkways

SAFETY BENEFITS:

Sidewalks 65-89%
Reduction in crashes involving pedestrians walking along roadways

Paved Shoulders 71%
Reduction in crashes involving pedestrians walking along roadways

Source: Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, Table 11
Leading Pedestrian Interval

- Pedestrians get “WALK” signal before vehicles get green light.
- Provides pedestrians a 3-7 second head start before vehicles are given a green indication.
- Allows pedestrians to establish presence in crosswalk before vehicles have priority to turn left.
Leading Pedestrian Interval

Benefits:

• 60% reduction in pedestrian-vehicle crashes at intersections.
• Increased visibility of crossing pedestrians.
• Reduced conflicts between pedestrians and vehicles.
• Increased likelihood of motorists yielding.
PSCI – Crosscutting Strategies

- Road Safety Audits
- Local Road Safety Plans
- USLIMITS2
Road Safety Audits

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

Source: Road Safety Audits: An Evaluation of RSA Programs and Projects, FHWA-SA-12-037; and FHWA Road Safety Audit Guidelines, FHWA-SA-06-06.
Local Road Safety Plans

• Developing an LRSP is an effective strategy to improve local road safety.

• Local roads experience 3X the fatality rate of the Interstate Highway System.
USLIMITS2

- Free Web-based Tool
- Designed to help practitioners assess and establish safe, reasonable and consistent speed limits
- Supports customary engineering studies
- Produces unbiased and objective suggested speed limit value based on:
  - 50th and 85th percentile speeds
  - Traffic volumes
  - Roadway characteristics
  - Crash data
PSCI – Available Resources

http://safety.fhwa.dot.gov/provencountermeasures

• 1-pager marketing flyers.
• Slides from webinar and link to recorded session.
• Links to additional FHWA resources for each item.
Contacts for Further Information

Intersection Countermeasures:
  Jeffrey Shaw  jeffrey.shaw@dot.gov  (708) 283-3524

Roadway Departure Countermeasures:
  Menna Yassin  menna.yassin@dot.gov  (202) 366-2833
  Cathy Satterfield  cathy.satterfield@dot.gov  (708) 283-3552

Pedestrian/Bicycle Countermeasures:
  Tamara Redmon  tamara.redmon@dot.gov  (202) 366-4077

Crosscutting:
  LRSP – Rosemarie Anderson  rosemarie.anderson@dot.gov  (202) 366-5007
  RSA – Becky Crowe  rebecca.crowe@dot.gov  (804) 775-3381
  USLIMITS2 – Guan Xu  guan.xu@dot.gov  (202) 366-5892
Additional Resources

- Crash Modification Factors Clearinghouse
  - http://www.cmfclearinghouse.org
- Systemic Safety Project Selection Tool
  - http://safety.fhwa.dot.gov/systemic
- US Roadway Assessment Program
  - http://www.usrap.org/
- Pedestrian and Bicycle Crash Analysis Tool
  - http://www.pedbikeinfo.org/pbcat_us/
Time to Share!!!

• Which of these countermeasures have you tried in your jurisdiction?
  – Successes?
  – Challenges?

• Have adopted any of these countermeasures into agency policies or design standards?

• What other proven safety countermeasures have you tried in your jurisdiction?