FHWA’s 2017 Update of the Proven Safety Countermeasures

Make Your Mark
A Local Safety Peer Exchange
December 6, 2017
Life Cycle of a Safety Countermeasure

1. Experimental
2. Tried
3. Proven

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

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Roadway Departure</th>
<th>Pedestrian</th>
<th>Crosscutting Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left- and Right-Turn Lanes at Two-Stop Controlled Intersections</td>
<td>Longitudinal Rumble Strips and Stripes along Two-Lane Highways</td>
<td>Medians and Pedestrian Crossing Islands in Urban and Suburban Areas</td>
<td>Road Safety Audits</td>
</tr>
<tr>
<td>Backplates with Retroreflective Borders</td>
<td>Median Barrier</td>
<td>Pedestrian Hybrid Beacon</td>
<td>Local Road Safety Plans*</td>
</tr>
<tr>
<td>Corridor Access Management</td>
<td>SafetyEdge&lt;sup&gt;SM&lt;/sup&gt;</td>
<td>Road Diet</td>
<td>US Limits*</td>
</tr>
<tr>
<td>Yellow Change Interval</td>
<td>Enhanced Delineation and Friction for Horizontal Curves</td>
<td>Walkways</td>
<td></td>
</tr>
<tr>
<td>Roundabouts</td>
<td>Roadside Design Improvements at Curves*</td>
<td>Leading Pedestrian Intervals*</td>
<td></td>
</tr>
<tr>
<td>Systemic Application of Multiple Low Cost Countermeasures at Stop-Controlled Intersections*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced Left-Turn Conflict Intersections*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Indicates additional strategies for specific applications.
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
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

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 LCSI-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>CMF</th>
<th>Total</th>
<th>Fatal &amp; Injury</th>
<th>Rear End</th>
<th>Right Angle</th>
<th>Nighttime</th>
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<tbody>
<tr>
<td>CMF</td>
<td>0.917</td>
<td>0.899</td>
<td>0.933</td>
<td>0.941</td>
<td>0.853</td>
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</tbody>
</table>
Systemic Approach for Stop Intersections

Source: SCDOT
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
**SAFETY BENEFIT:**

11% Reduction in fatal and injury crashes

*Source: Safety Effects of the SafetyEdge<sup>SM</sup>, FHWA-SA-17-044*

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<tr>
<th>SafetyEdge&lt;sup&gt;SM&lt;/sup&gt; 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

Chevron signs installed along a curve.
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

Increasing the Clear Zone prevents crashes

Source: Leidos. Data Source: CMF Clearinghouse (CMF IDs 35 and 36)
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
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

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  USLIMITS2 – Guan Xu  guan.xu@dot.gov  (202) 366-5892
Additional Resources

• Crash Modification Factors Clearinghouse
  – [http://www.cmfclearinghouse.org](http://www.cmfclearinghouse.org)

• Systemic Safety Project Selection Tool

• US Roadway Assessment Program

• Pedestrian and Bicycle Crash Analysis Tool
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?