

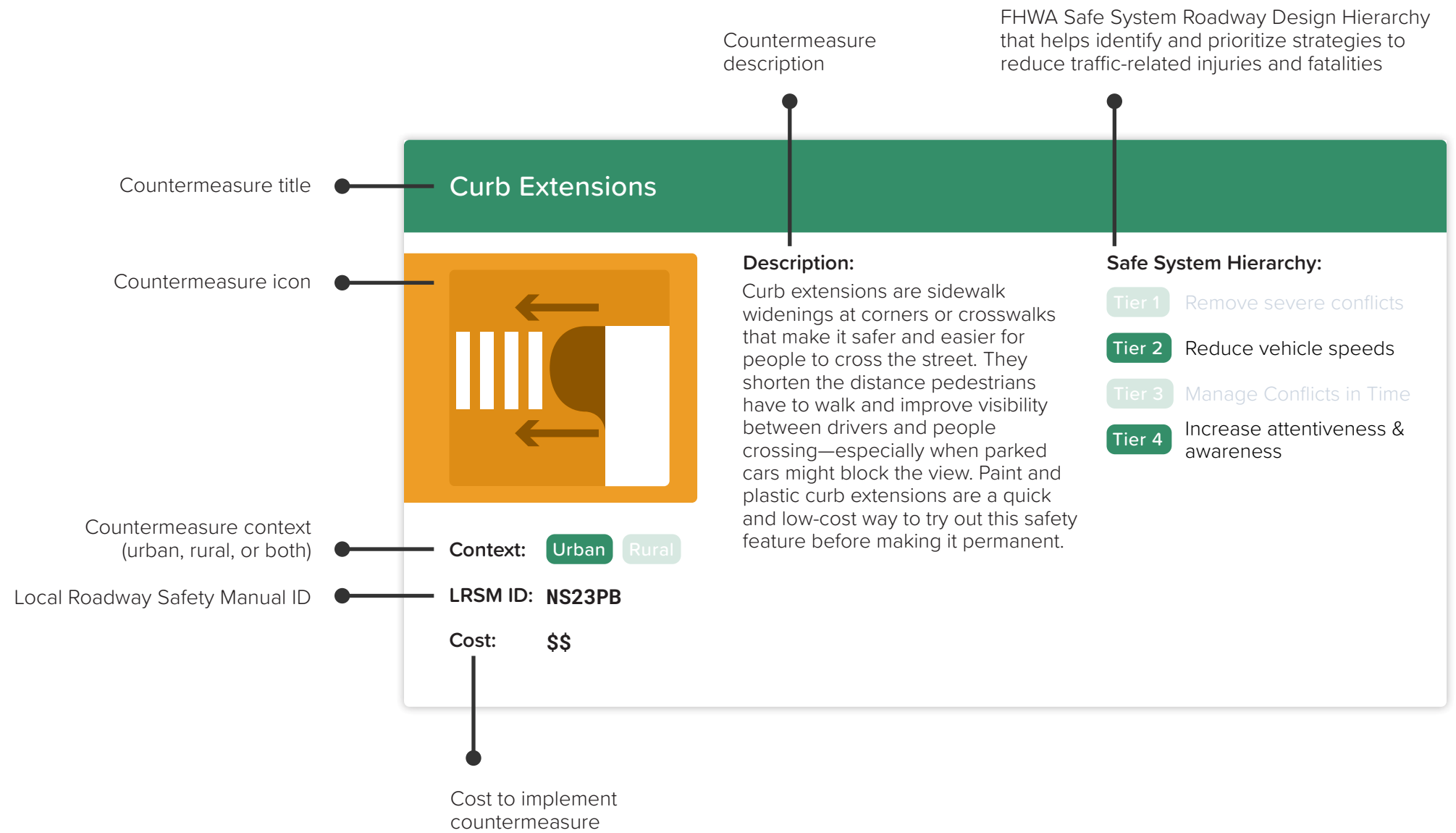


# APPENDIX C Countermeasure Toolbox

## What is the Countermeasure Toolbox?

The purpose of this Countermeasure Toolbox is to establish a shared understanding of key strategies available to address roadway safety issues that align with the **Safe System Approach**. The Toolbox describes a variety of countermeasures and how they can be applied to improve safety. It also includes general information about each tool's application, typical placement contexts, estimated costs, and tiers within the FHWA Safety System Hierarchy.

## Each countermeasure includes the following components:





## List of all Countermeasures in this Toolbox

### A. Bikeways Page C3

- Bicycle Box
- Bicycle Crossing (Dashed Green Paint)
- Bicycle Detection
- Bicycle Lane
- Buffered Bike Lane
- Bicycle Ramp
- Bicycle Signal/Exclusive Bike Phase
- Conflict Zone Striping
- Extend Green Time For Bikes
- Floating Transit Island or Bus Boarding Island
- Separated Bikeway
- Shared-Use Path

### B. Pedestrian Facilities Page C6

- Add or Improve Sidewalk
- Accessible Pedestrian Signals
- Co-Locate Bus Stops and Pedestrian Crossings
- Curb Extensions
- High-Visibility Crosswalk
- Leading Pedestrian Interval
- Pedestrian Barrier/Buffer
- Pedestrian Countdown Timer
- Pedestrian Detection
- Pedestrian Hybrid Beacon
- Pedestrian Refuge Island
- Pedestrian Scramble Phase
- Pedestrian Signal
- Prohibit Turns During Pedestrian Phase
- Rectangular Rapid Flashing Beacon
- Straighten Crosswalk

### C. Intersection Design Page C10

- Advance Stop Bar
- Advanced Yield Markings
- Acceleration/Deceleration Lanes
- All-Way Stop Control
- Close Slip Lane
- Directional Median Openings to Restrict Left Turns
- Install Stop or Yield Signs
- Intersection Lighting
- Intersection Reconstruction and Tightening
- Neighborhood Traffic Circle
- Protected Intersection
- Reduced Left-Turn Conflict Intersection
- Roundabout
- Striping Through Intersection
- Traffic Signal
- Turn Lanes

### D. Roadway Design Page C14

- Centerline Hardening
- Chevron Signs on Horizontal Curves
- Curve Advance Warning Sign
- Delineators, Reflectors, and/or Object Markers
- Edgelines and Centerlines
- Edgeline and Centerline Rumble Strips
- Guardrail
- Impact Attenuators
- Improved Pavement Friction
- Median Barrier
- No-Passing Line
- Raised Median
- Road Diet/Lane Reduction
- Roadway Lighting
- Two-Way Left-Turn Lane
- Widen/Pave Shoulder

### E. Signal Timing & Phasing Page C18

- Advanced Dilemma Zone Detection
- Emergency Vehicle Preemption
- Extend Yellow and All Red Time
- Flashing Yellow Turn Phase
- Prohibit Right-Turn-on-Red
- Protected Left Turns
- Protected Right Turns
- Red Light Camera
- Retroreflective Signal Backplates
- Signal Interconnectivity and Coordination
- Supplemental Signal Heads
- Upgrade Signal Head

### F. Signing & Striping Page C21

- Flashing Beacon as Advance Warning
- LED-Enhanced Sign
- Upgrade Intersection Pavement Markings
- Upgrade Signs with Fluorescent Sheeting
- Upgrade Striping
- Upgrade to Larger Warning Signs

### G. Speed Management Page C23

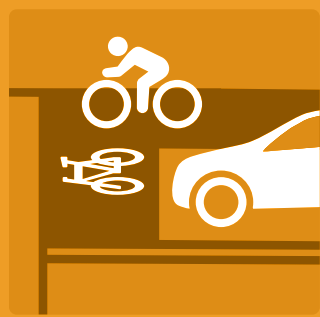
- Lane Narrowing
- Pavement Speed Legends
- Raised Crosswalk/Speed Table
- Raised Intersection
- Speed Feedback Sign
- Speed Cushion or Speed Hump
- Speed Limit Reduction
- Speed Reduction Markings
- Speed Sensitive Rest in Red Signal
- Traverse Rumble Strips

### H. Non-Engineering Strategies Page C26

- Automated Enforcement
- High-Visibility Enforcement
- Policies and Design Standards Updates
- Public Education and Outreach
- Safe Routes to School
- Sobriety Checkpoints



### Bicycle Box



**Description:**

A bike box is a designated area (often painted green) between the crosswalk and vehicle stop bar at a signalized intersection where bicyclists can wait during a red signal phase. The bike box places bicyclists in a location where they are more visible to motorists and is typically used to facilitate left turn movements.

**Safe System Hierarchy:**

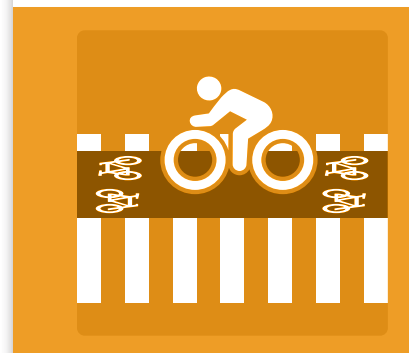
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI21PB**

Cost: \$

### Bicycle Crossing (Dashed Green Paint)



**Description:**

Dashed green paint across an intersection that signifies the bicycle crossing. Increases the visibility of bicyclists' anticipated path of travel.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **N/A**

Cost: \$

### Bicycle Detection



**Description:**

Bike detection is technology used at signalized intersections—in the form of push buttons, in-pavement loops, or video/infrared cameras—to initiate a green light for bicyclists and reduce delay for bicycle travel. Discourages bicyclists from running red lights and increases the convenience of bicycling.

**Safe System Hierarchy:**

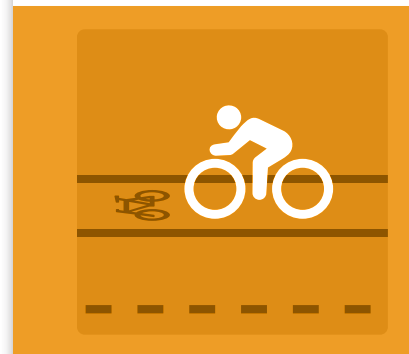
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **N/A**

Cost: \$\$

### Bicycle Lane



**Description:**

Bike lanes designate an exclusive space for bicyclists using pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or parking lane.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

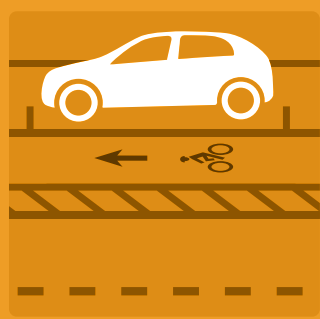
Context: **Urban** Rural

LRSM ID: **R33PB**

Cost: \$\$



### Buffered Bike Lane



**Description:**

Buffered bike lanes have a designated painted buffer space, creating additional horizontal distance from the adjacent motor vehicle travel lane and/or parking lane. Buffers provide greater space for bicycling without making the bike lane appear so wide that it might be mistaken for a travel lane.

**Safe System Hierarchy:**

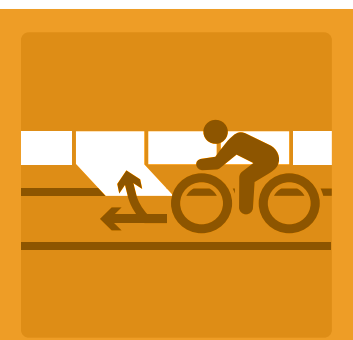
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: R33PB

Cost: \$\$

### Bicycle Ramp



**Description:**

A ramp, typically at intersections, that connects on-street bike lanes to a shared-use path or sidewalk-level separated bikeway.

**Safe System Hierarchy:**

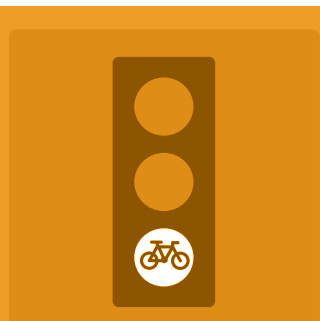
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: R34PB

Cost: \$

### Bicycle Signal/Exclusive Bike Phase



**Description:**

A traffic signal that directs bicycle traffic across an intersection. Separates bicycle movements in time from conflicting motor vehicle, transit, or pedestrian movements. Most applicable for separated bikeway facilities or shared-use paths.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$\$\$

### Conflict Zone Striping



**Description:**

Conflict striping is green pavement markings in a dashed pattern that extend across bike lanes, specifically when approaching an intersection and/or going through an intersection or major driveway. Improves awareness bicycle-car conflict points.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

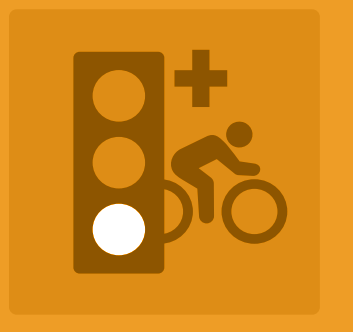
Context: **Urban** Rural

LRSM ID: N/A

Cost: \$



### Extend Green Time For Bikes



**Description:**

A longer green phase when bicyclists are present provides additional time for bicyclists to clear the intersection. It can occur automatically in the signal phasing, or be prompted with bicycle detection. Topography should be considered in clearance time.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI03**

Cost: **\$**

### Floating Transit Island or Bus Boarding Island



**Description:**

Transit/boarding islands allow bicycles to pass between the sidewalk and transit boarding area, thereby avoiding bus-bike conflicts at the transit stop. Can be used in combination with a bike lane, buffered bike lane, or separated bikeway. The treatment can also reduce vehicle speeds, as the island itself visually narrows the roadway and can have a traffic calming effect with in-lane bus stops.

**Safe System Hierarchy:**

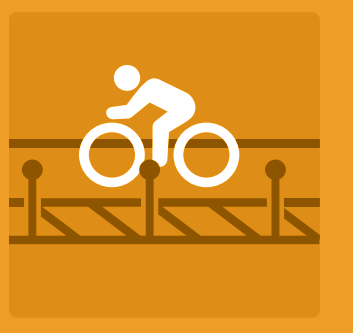
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **N/A**

Cost: **\$\$**

### Separated Bikeway



**Description:**

A separated bikeway, also called protected bike lanes or cycletrack, provides dedicated street space for bicyclists, typically adjacent to outer vehicle travel lanes, with physical separation from vehicle traffic, designated lane markings and signage. Physical separation may consist of plastic posts, parked vehicles, raised median, or a curb (if the separated bike lane is raised to sidewalk level). The separation reduces the risk of severe conflicts between bicycles and vehicles on the road, and also reduces conflicts between people biking and walking as compared to a shared-use path.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**

LRSM ID: **R34PB**

Cost: **\$\$\$**

### Shared-Use Path



**Description:**

Shared-use paths or trails are off-street facilities that provide exclusive use for nonmotorized travel, including bicyclists and pedestrians. They can be located alongside a roadway (referred to as a Side Path), or exist in a separate right-of-way.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**

LRSM ID: **R35PB**

Cost: **\$\$\$**



### Add or Improve Sidewalk



**Description:**

Sidewalks provide a separated facility for pedestrians, that follows along the roadway but is outside of the traveled way or shoulder.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R35PB

Cost: \$\$\$

### Accessible Pedestrian Signals



**Description:**

Pedestrian push buttons at crosswalks must follow accessibility standards set by the Americans with Disabilities Act (ADA) and the Public Rights of Way Accessibility Guidelines (PROWAG). These buttons should be easy to both see and reach for all pedestrians, including those using wheelchairs or with limited mobility. To support people who are blind or have low vision, accessible pedestrian signals (APS) include features like audible tones, speech messages, and vibrating arrows that indicate when it's safe to cross. These features help make crossing streets safer and more inclusive for everyone

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: N/A

Cost: \$

### Co-Locate Bus Stops and Pedestrian Crossings



**Description:**

Bus stops should be placed near safe pedestrian crossings so that people using transit can easily and safely cross the street. When crossings are well-designed and close to bus stops, it makes travel more convenient and reduces the risk of crashes involving pedestrians.

**Safe System Hierarchy:**

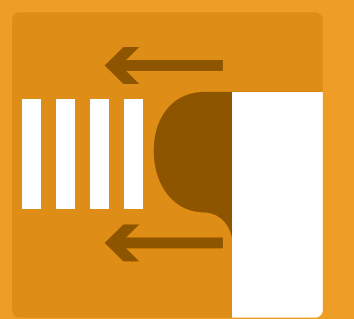
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: N/A

Cost: \$

### Curb Extensions



**Description:**

Curb extensions are sidewalk widenings at corners or crosswalks that make it safer and easier for people to cross the street. They shorten the distance pedestrians have to walk and improve visibility between drivers and people crossing—especially when parked cars might block the view. Paint and plastic curb extensions are a quick and low-cost way to try out this safety feature before making it permanent.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: NS23PB

Cost: \$\$



### High-Visibility Crosswalk



**Description:**

High-visibility crosswalks use bold, striped patterns—often called “ladder markings”—made from durable, reflective materials like thermoplastic instead of traffic paint. These markings make crosswalks easier for drivers to see, especially at night or in bad weather, and serve as a clear signal that pedestrians may be present crossing the street.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI19PB, NS22/23PB, and R36PB**

Cost: \$

### Leading Pedestrian Interval



**Description:**

At busy intersections with lots of turning vehicles and pedestrian activity, a leading pedestrian interval (LPI) gives people walking a 3–7 second head start to begin crossing before cars get a green light. This helps pedestrians become more visible in the crosswalk. Pedestrian recall automatically activates the walk signal during every light cycle so pedestrians don't have to press a button to get a walk signal.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI22PB**

Cost: \$

### Pedestrian Barrier/Buffer



**Description:**

Adding a landscaped buffer or vertical barrier between the road, sidewalks, and/or bikeways creates more space between drivers and people walking or biking. This added space enhances comfort and safety for those walking or biking while visually signaling drivers to slow down. The increased separation not only reduces the likelihood and severity of crashes but also contributes to a more pleasant and inviting streetscape.

**Safe System Hierarchy:**

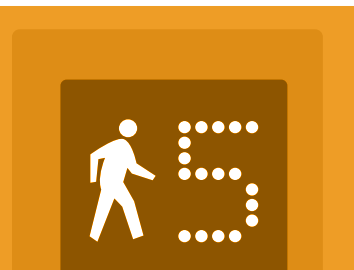
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI12PB**

Cost: \$\$

### Pedestrian Countdown Timer



**Description:**

Countdown pedestrian signals show how many seconds are left to finish crossing the street. These timers help people walking make safer decisions about when to cross. These timers are now required on all new traffic signals that include signalized pedestrian crossings.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI18PB**

Cost: \$



### Pedestrian Detection



**Description:**

These sensors can detect when a person is at an intersection waiting to cross, then automatically trigger the “WALK” signal without the person needing to press a button. This helps reduce unsafe crossings and ensures that pedestrians get enough time to cross the street safely.

**Safe System Hierarchy:**

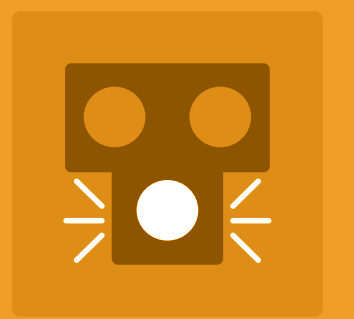
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$

### Pedestrian Hybrid Beacon



**Description:**

A Pedestrian Hybrid Beacon (PHB) is a special type of crossing signal used on roadways with higher volumes and speeds at mid-block crosswalks or unsignalized intersections. It stays off (dark) until a person presses a button or is detected waiting to cross. Then, it lights up with a sequence of yellow and red lights to alert drivers to stop and let the pedestrian cross safely.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: NS25PB

Cost: \$\$\$

### Pedestrian Refuge Island



**Description:**

A refuge island is a raised, curbed median in the center of the roadway that provides a place for pedestrians to wait until there is a gap in traffic to finish crossing the intersection. This reduces pedestrians' exposure to traffic by allowing them to cross the intersection in multiple stages. Pedestrian refuge areas constructed from paint and plastic may be implemented as part of a low-cost/quick build project.

**Safe System Hierarchy:**

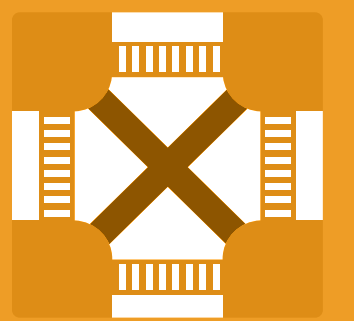
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**

LRSM ID: NS21PB

Cost: \$\$

### Pedestrian Scramble Phase



**Description:**

A pedestrian “WALK” phase, called a pedestrian scramble or all-way walk, stops all vehicle traffic at an intersection. This gives pedestrians the chance to cross in any direction, including diagonally, all at once. It removes conflicts by completely separating turning cars from crossing pedestrians in time. It can be especially effective in busy areas with lots of foot traffic.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: SI20PB

Cost: \$



### Pedestrian Signal



**Description:**

Pedestrian signals operate similarly to traffic signals with red, yellow, and green lights for pedestrians and walking signals for pedestrians. Pedestrian signals are used at mid-block crosswalks on roadways with higher volumes and speeds.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: NS25PB

Cost: \$\$\$

### Prohibit Turns During Pedestrian Phase



**Description:**

Prohibiting left and right turns while pedestrians are crossing helps prevent conflicts between turning vehicles and people in the crosswalk. These turn restrictions are often shown using special electronic signs, called blank-out signs, which light up only when the restriction is active.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$\$

### Rectangular Rapid Flashing Beacon



**Description:**

A Rectangular Rapid Flashing Beacon (RRFB) is a special flashing light that pedestrians can activate when they want to cross the street. It's paired with signs to alert drivers that someone is crossing. The bright, flashing lights make the crosswalk more visible and remind drivers to yield to people walking.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: NS24PB and R38PB

Cost: \$\$

### Straighten Crosswalk



**Description:**

Straightening crosswalks improves sight lines, making pedestrians more visible to oncoming drivers. It can also shorten the crossing distance, reducing the time pedestrians need to cross an intersection.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

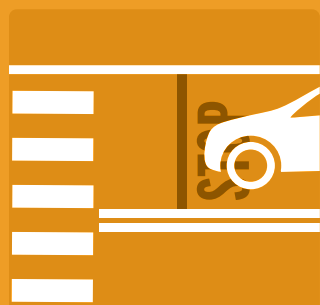
Context: **Urban** Rural

LRSM ID: N/A

Cost: \$\$



### Advance Stop Bar



**Description:**

An advanced stop bar is a transverse pavement marking placed upstream of a crosswalk to indicate the required vehicle stop location. It minimizes crosswalk encroachment and can be widened or set further back at locations with frequent violations.

**Safe System Hierarchy:**

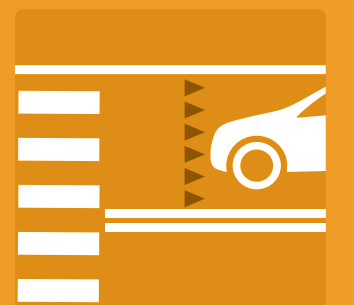
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: **SI21PB** and **NS09**

Cost: \$

### Advanced Yield Markings



**Description:**

Yield lines, also known as shark's teeth, are pavement markings placed 20 to 50 feet before multi-lane pedestrian crossings. They improve pedestrian visibility and help reduce the risk of multiple-threat crashes, where one vehicle stops for a pedestrian but another in an adjacent lane does not.

**Safe System Hierarchy:**

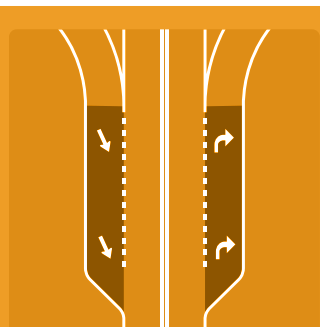
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: **NS09**

Cost: \$

### Acceleration/Deceleration Lanes



**Description:**

Providing adequate acceleration and deceleration lanes allows vehicles to speed up or slow down outside the main travel lanes, reducing conflicts with through traffic. These lanes improve traffic flow and safety by minimizing abrupt speed changes, preventing turn queues from spilling into through lanes, and lowering the risk of rear-end and sideswipe crashes.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: **R11**

Cost: \$\$\$

### All-Way Stop Control



**Description:**

An all-way stop-controlled intersection requires all vehicles to stop before crossing an intersection. This reduces the risk of severe conflicts by eliminating high speed movements through an intersection. The MUTCD (Manual on Uniform Traffic Control Devices) includes information on when and how to implement "All-Way" Or "Multi-Way" stop control intersections.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

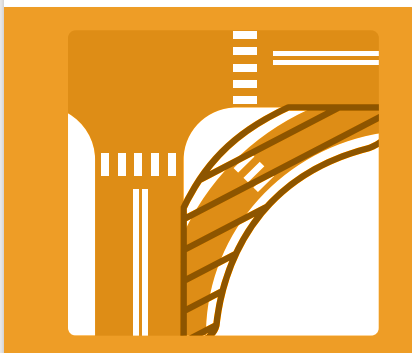
Context: Urban Rural

LRSM ID: **NS02**

Cost: \$



### Close Slip Lane



**Description:**

A close slip lane modifies the corner of an intersection to remove the sweeping right turn lane for vehicles. This results in shorter crossings for pedestrians, reduced speed for turning vehicles, and better sight lines.

**Safe System Hierarchy:**

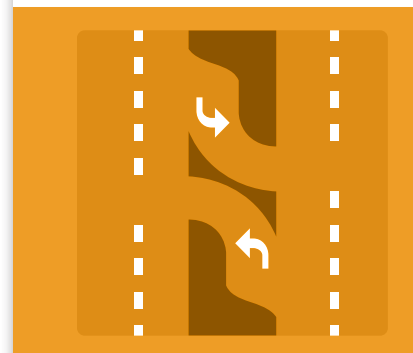
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**

LRSM ID: N/A

Cost: \$\$\$

### Directional Median Openings to Restrict Left Turns



**Description:**

A directional median opening restricts specific turning movements, such as allowing a left-turn from a major street but not from a minor street. This improves safety by reducing the number of conflict points.

**Safe System Hierarchy:**

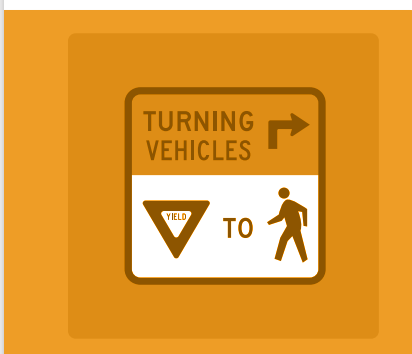
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**

LRSM ID: **SI13** and **NS17**

Cost: \$\$

### Install Stop or Yield Signs



**Description:**

Adding stop or yield signs at uncontrolled intersections helps clarify right-of-way, reducing confusion and potential conflicts between drivers, bicyclists, and pedestrians. By improving predictability and encouraging vehicles to slow or stop before entering the intersection, this measure decreases the likelihood and severity of crashes.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**

LRSM ID: **NS08**

Cost: \$

### Intersection Lighting



**Description:**

Extra lighting at intersections and crosswalks makes it easier for drivers to see people walking, biking, or driving—especially at night or in dim conditions. However, it's important to design the lighting carefully. If it creates glare or lights up pedestrians from behind, it can actually make them harder for drivers to see.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

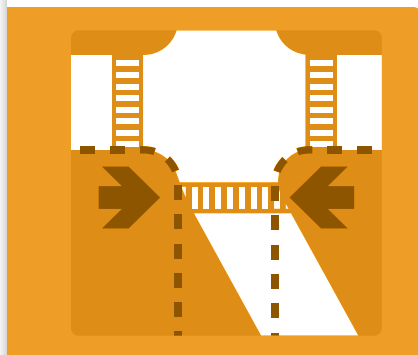
Context: **Urban** **Rural**

LRSM ID: **SI01** and **NS01**

Cost: \$\$



### Intersection Reconstruction and Tightening



**Description:**  
Skewed intersections have a greater likelihood of collisions due to restricted sight lines and high speed turn movements. "Squaring up" the intersection as close to 90 degrees as possible helps reduce the likelihood of collisions. The process requires intersection reconstruction and approach realignment to provide better visibility for all road users. It also reduces high speed turns, reduces length exposure for vehicles and/or bikes passing through the intersection, and reduces pedestrian crossing length.

Context: **Urban** Rural

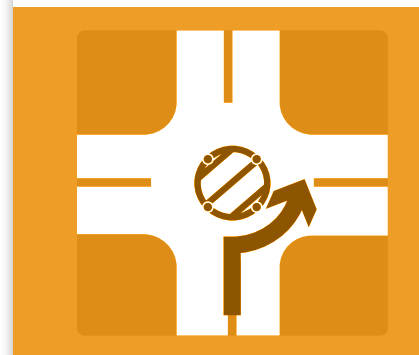
LRSM ID: N/A

Cost: \$\$\$

#### Safe System Hierarchy:

- Tier 1** Remove severe conflicts
- Tier 2** Reduce vehicle speeds
- Tier 3** Manage Conflicts in Time
- Tier 4** Increase attentiveness & awareness

### Neighborhood Traffic Circle



**Description:**  
Neighborhood traffic circles are similar to roundabouts, but are stop-controlled on some or all approaches. Typically, they supplement existing stop-controlled intersections with a circular island in the center that is designed to slow traffic and reduce conflict points (such as conflicting left-turn movements).

Context: **Urban** Rural

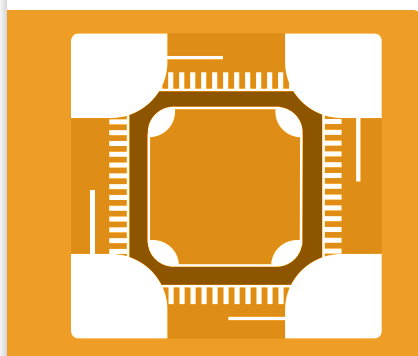
LRSM ID: N/A

Cost: \$\$

#### Safe System Hierarchy:

- Tier 1** Remove severe conflicts
- Tier 2** Reduce vehicle speeds
- Tier 3** Manage Conflicts in Time
- Tier 4** Increase attentiveness & awareness

### Protected Intersection



**Description:**  
Protected intersections use corner islands, curb extensions, and colored paint to delineate bicycle and pedestrian movements, and physically separate bicycles from pedestrians and moving vehicles. The delineations/separations reduce the likelihood of conflicts, reduce driving speeds and shorten crossing distances for pedestrians.

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$\$\$

#### Safe System Hierarchy:

- Tier 1** Remove severe conflicts
- Tier 2** Reduce vehicle speeds
- Tier 3** Manage Conflicts in Time
- Tier 4** Increase attentiveness & awareness

### Reduced Left-Turn Conflict Intersection



**Description:**  
These are geometric designs that alter how left-turn movements occur. They can simplify decisions and minimize the potential for left-turn related crashes. Two designs that rely on U-turns to complete certain left-turn movements are known as the restricted crossing U-turn (RCUT) and the median U-turn (MUT) intersections. Both designs require some out-of-direction travel for vehicles.

Context: **Urban** Rural

LRSM ID: SI15

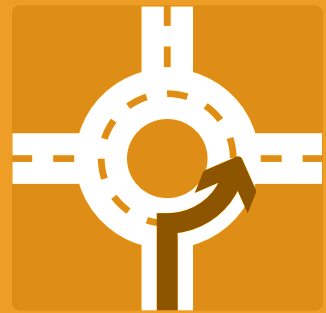
Cost: \$\$\$

#### Safe System Hierarchy:

- Tier 1** Remove severe conflicts
- Tier 2** Reduce vehicle speeds
- Tier 3** Manage Conflicts in Time
- Tier 4** Increase attentiveness & awareness



### Roundabout



**Description:**

A roundabout is a circular intersection where traffic flows in one direction around a central island, and vehicles must yield at entrance lanes. Unlike conventional intersections, roundabouts eliminate severe conflicts from crossing and left-turn movements. The design of a roundabout forces drivers to slow down, which narrows the range of vehicle speeds and reduces the severity of crashes. Additionally, pedestrians only need to cross one direction of traffic at a time, minimizing their exposure to vehicles.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI16/17 and NS04/05/06/07**

Cost: **\$\$\$**

### Striping Through Intersection



**Description:**

Clear pavement markings within complex intersections help guide motorists through lane assignments and turning movements. This treatment is especially effective at locations where lane designations are unclear due to horizontal offsets or multiple turning lanes.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI08**

Cost: **\$**

### Traffic Signal



**Description:**

Traffic signals at intersections manage traffic flow by assigning right-of-way to different movements at specific times. For instance, protected left-turn signal phasing is more effective at preventing severe left-turn collisions compared to permitted left-turn signal phasing. Additionally, traffic signals significantly enhance safety for pedestrians crossing large intersections.

**Safe System Hierarchy:**

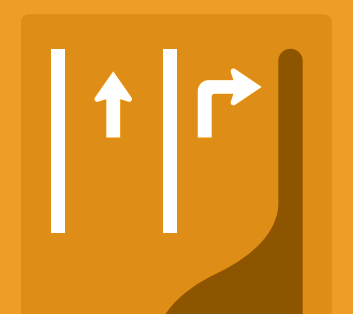
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **NS03**

Cost: **\$\$\$**

### Turn Lanes



**Description:**

Adding dedicated turn lanes separates turning vehicles from through traffic, improving safety and traffic flow. Right-turn lanes reduce rear-end and sideswipe crashes by removing slower, decelerating vehicles from the through-traffic stream and minimizing conflicts with following and cross-street vehicles. Left-turn lanes provide a sheltered space for drivers waiting to turn, reducing the risk of rear-end crashes and allowing for safer, more deliberate gap selection when crossing opposing traffic. Together, turn lanes help lower crash frequency and severity while enhancing intersection efficiency.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **NS19/20**

Cost: **\$\$\$**



### Centerline Hardening



**Description:**  
Centerline hardening involves placing plastic bollards and/or rubber curbs along a roadway's centerline. When used at intersections, they can be effective at requiring motorists to make left-turn movements at angles closer to 90-degrees, thereby slowing vehicle turning speeds and improving motorists' visibility of the crosswalks. When used along a roadway segment, they can be effective access control preventing undesirable left-turns and/or U-turns between intersections.

Context: Urban Rural

LRSM ID: N/A

Cost: \$

- Safe System Hierarchy:**
- Tier 1 Remove severe conflicts
  - Tier 2 Reduce vehicle speeds
  - Tier 3 Manage Conflicts in Time
  - Tier 4 Increase attentiveness & awareness

### Chevron Signs on Horizontal Curves



**Description:**  
Post-mounted chevrons are traffic signs placed along curves to provide continuous visual guidance. They enhance curve visibility, alert drivers to the change in alignment, and help maintain proper lane tracking through the curve.

Context: Urban Rural

LRSM ID: R23

Cost: \$

- Safe System Hierarchy:**
- Tier 1 Remove severe conflicts
  - Tier 2 Reduce vehicle speeds
  - Tier 3 Manage Conflicts in Time
  - Tier 4 Increase attentiveness & awareness

### Curve Advance Warning Sign



**Description:**  
A curve advance warning sign alerts drivers to an upcoming horizontal curve and may include an advisory speed plaque. It provides advance notice to reduce speed and improve curve navigation. For enhanced effectiveness, it is often paired with chevrons, delineators, or flashing beacons to increase driver awareness and guidance through the curve.

Context: Urban Rural

LRSM ID: R24/25

Cost: \$

- Safe System Hierarchy:**
- Tier 1 Remove severe conflicts
  - Tier 2 Reduce vehicle speeds
  - Tier 3 Manage Conflicts in Time
  - Tier 4 Increase attentiveness & awareness

### Delineators, Reflectors, and/or Object Markers



**Description:**  
Delineators, reflectors, and object markers are visual cues installed in a roadway, intended to warn drivers of an approaching curve or fixed object that cannot easily be removed. They are generally less costly than signage.

Context: Urban Rural

LRSM ID: R27

Cost: \$

- Safe System Hierarchy:**
- Tier 1 Remove severe conflicts
  - Tier 2 Reduce vehicle speeds
  - Tier 3 Manage Conflicts in Time
  - Tier 4 Increase attentiveness & awareness



### Edgelines and Centerlines



**Description:**

Adding or improving edgelines and centerlines enhances roadway visibility and guidance, helping drivers maintain proper lane position—especially at night or in poor weather. On wide roads, these markings visually narrow the travel way and create a greater sense of channelization, which can encourage drivers to reduce speeds. Together, these effects improve lane discipline, reduce roadway departure and head-on crashes, and enhance overall safety for all users.

**Safe System Hierarchy:**

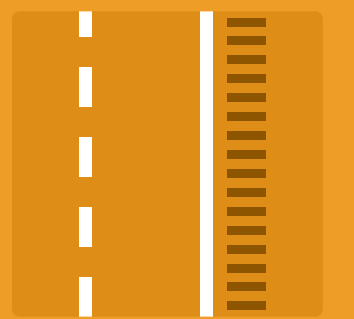
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R28

Cost: \$

### Edgeline and Centerline Rumble Strips



**Description:**

Edgeline and centerline rumble strips are grooves added to the roadway surface that produce noise and vibrations inside a vehicle, alerting drivers when they cross the edgeline or centerline. Helps drivers stay in their lane, especially if they are distracted or drowsy. Also warns drivers of lane boundaries in poor visibility conditions like rain, fog, snow, or dust.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R30/31

Cost: \$

### Guardrail



**Description:**

A guardrail redirects a vehicle away from embankment slopes or fixed objects and dissipates the energy of an errant vehicle. Guardrails are installed to reduce the severity of lane departure crashes when the crash severity of striking the guardrail is less severe than going down an embankment.

**Safe System Hierarchy:**

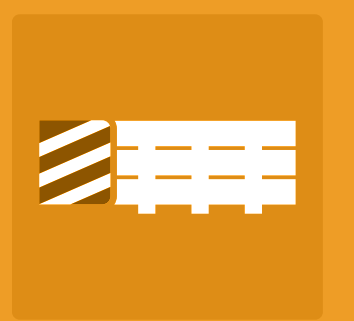
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R04

Cost: \$\$

### Impact Attenuators



**Description:**

Impact attenuators are safety devices placed on roads to help stop or slow down vehicles that accidentally leave their lane. Instead of crashing into something hard like a concrete wall or a bridge pillar, the vehicle hits the attenuator, which absorbs the impact and reduces the damage. These devices are often used in places where it's not possible to remove the dangerous object, so they act as a protective crash cushion.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R05

Cost: \$\$



### Improved Pavement Friction



**Description:**

High-friction surface treatments improve a vehicle's ability to stay on the roadway, as well as to stop over a shorter distance. These treatments can be used to help address roadway departure crashes and/or crashes on approaches to unsignalized intersections.

**Safe System Hierarchy:**

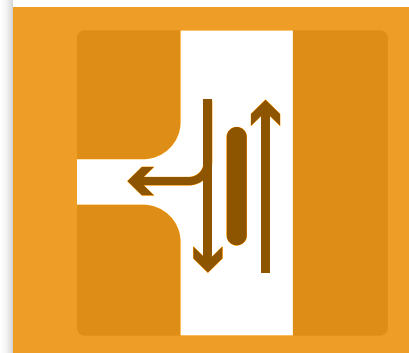
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R21

Cost: \$\$

### Median Barrier



**Description:**

A median barrier is a raised or fenced divider that separates traffic moving in opposite directions, helping prevent head-on crashes and keeping vehicles from crossing into oncoming lanes. For people walking, median barriers improve safety by discouraging unsafe midblock crossings and guiding pedestrians to designated crosswalks, where drivers are more likely to see and yield to them.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R03/10PB

Cost: \$\$

### No-Passing Line



**Description:**

Installing or upgrading no-passing lines helps prevent unsafe passing maneuvers on two-lane roads, particularly where sight distance is limited or opposing traffic volumes are high. These markings clearly communicate where passing is prohibited, improving driver compliance and reducing the likelihood of head-on and sideswipe collisions.

**Safe System Hierarchy:**

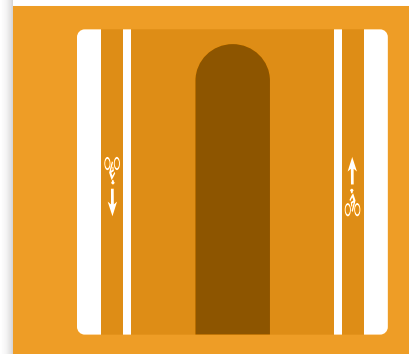
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: R29

Cost: \$

### Raised Median



**Description:**

Raised medians are curbed sections in the center of the roadway that create physical separation between opposing vehicular traffic. They can also help control access to and from side streets and driveways, reducing conflict points.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

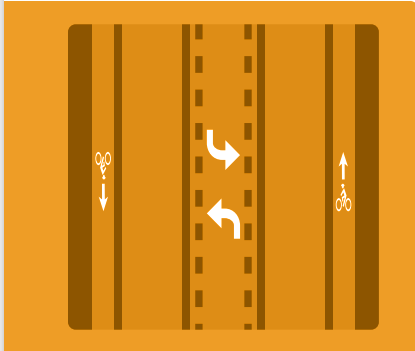
Context: Urban Rural

LRSM ID: R08

Cost: \$\$



### Road Diet/Lane Reduction



**Description:**

A road diet reconfigures roadway space originally dedicated to vehicle travel lanes and creates room for bicycle facilities, wider sidewalks, and/or center turn lanes. This reduces vehicle speeds and creates designated space for all road users.

**Safe System Hierarchy:**

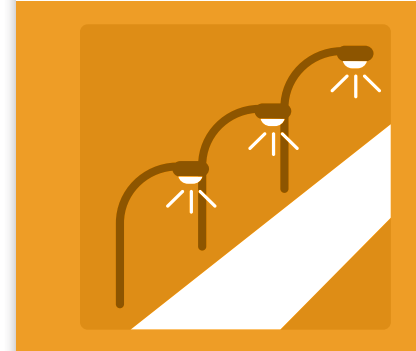
- Tier 1** Remove severe conflicts
- Tier 2** Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: R14

Cost: \$\$

### Roadway Lighting



**Description:**

Adding street lighting helps drivers see better at night or in low-light conditions, and makes it easier to spot other people, vehicles, or objects on the road.

**Safe System Hierarchy:**

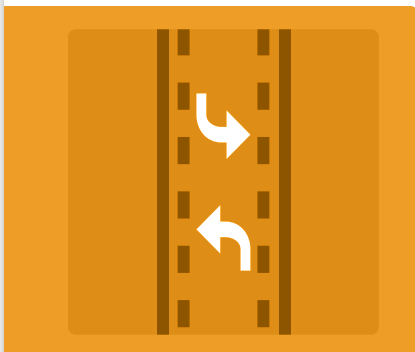
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4** Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: R01

Cost: \$\$

### Two-Way Left-Turn Lane



**Description:**

A two-way left-turn lane (TWLTL) provides a shared center lane for left-turning vehicles traveling in either direction. This treatment removes turning vehicles from the through-traffic stream, reducing rear-end and sideswipe crashes. It also provides a refuge area for vehicles waiting to turn, improving traffic flow and safety on multi-lane or high-volume corridors. When paired with good access management, TWLTLs can enhance overall corridor operations and reduce crash frequency.

**Safe System Hierarchy:**

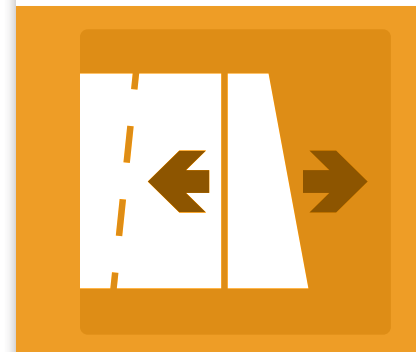
- Tier 1** Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**

LRSM ID: R13

Cost: \$\$

### Widen/Pave Shoulder



**Description:**

Widened and paved shoulders create space for pedestrians and bicyclists, allow drivers to safely recover from lane departures, and provide room for inoperable vehicles to pull out of the travel lane. Adding a paved shoulder to an existing road can help reduce run-off-road crashes. This improvement is beneficial for high-risk rural roads without paved shoulders.

**Safe System Hierarchy:**

- Tier 1** Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

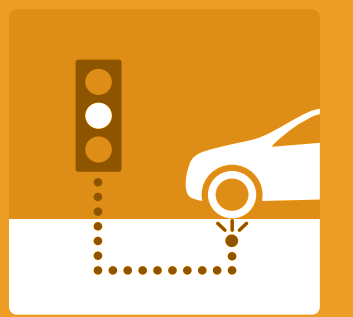
Context: **Urban** **Rural**

LRSM ID: N/A

Cost: \$\$\$



### Advanced Dilemma Zone Detection



**Description:**

The Advanced Dilemma-Zone Detection system helps make intersections safer by adjusting when the yellow light turns on. It detects where cars are and how fast they're going. Then, the signal controller decides whether to activate or delay the yellow light. This helps drivers avoid the tricky situation where they're not sure if they should stop or keep going when the light changes. The goal is to reduce broadside collisions at signalized intersections.

**Safe System Hierarchy:**

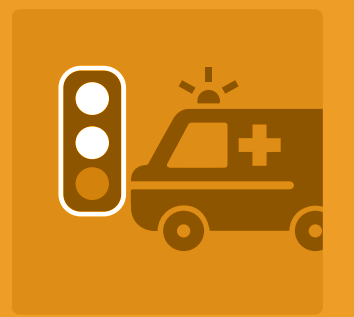
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time**
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$

### Emergency Vehicle Preemption



**Description:**

Providing emergency vehicle preemption at signals or along corridors enhances both safety and response efficiency. Preemption reduces the risk of crashes as emergency vehicles navigate intersections by temporarily halting conflicting traffic movements. It also shortens emergency response times, enabling faster delivery of medical care—an essential component of the Post-Crash Care element in the Safe System Approach.

**Safe System Hierarchy:**

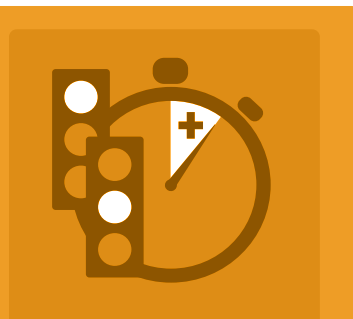
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time**
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: SI04

Cost: \$

### Extend Yellow and All Red Time



**Description:**

Lengthening the yellow and all-red intervals at signalized intersections gives drivers more time to react and clear the intersection safely. This reduces the likelihood of red-light running and angle crashes caused by late entries. Properly timed intervals also improve compliance and comfort for all users, particularly at high-speed or high-volume locations.

**Safe System Hierarchy:**

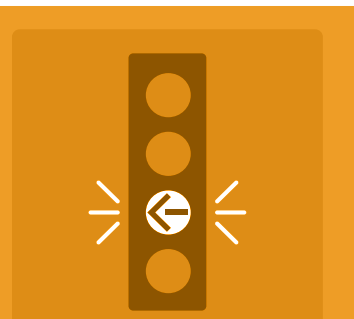
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time**
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: SI03

Cost: \$

### Flashing Yellow Turn Phase



**Description:**

A flashing yellow turn arrow tells drivers they can make a permissive turn. They must wait for a clear gap in oncoming traffic before turning. This signal is used only when no pedestrians are crossing. When pedestrians are present, the signal should use a protected-only turn phase, where turning vehicles must wait for a green arrow to ensure pedestrian safety.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness**

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$\$



### Prohibit Right-Turn-on-Red



**Description:**

Prohibiting right turns on red should be considered at locations with unusual layouts, such as skewed intersections, or where there are pedestrian scrambles or leading pedestrian intervals (LPIs). Preventing right turns on red in these situations can reduce the risk of crashes between turning vehicles and pedestrians, as well as crashes with vehicles traveling through the intersection from the cross street.

**Safe System Hierarchy:**

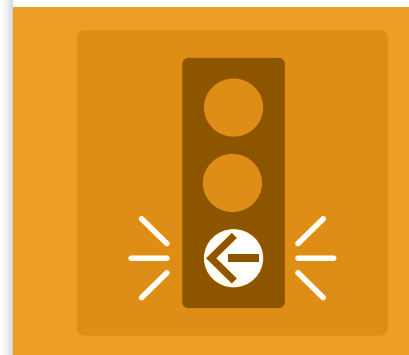
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$

### Protected Left Turns



**Description:**

Adding protected left-turn phases at intersections reduces broadside crashes and pedestrian crashes. These signals give drivers a dedicated green arrow so they don't have to wait for a gap in oncoming traffic, or worry about people crossing the street at the same time.

**Safe System Hierarchy:**

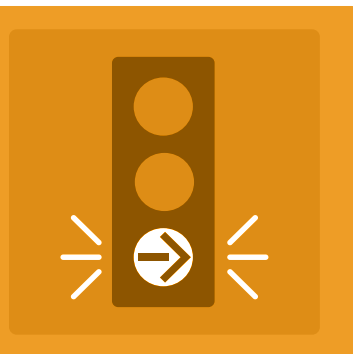
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: SI05/06

Cost: \$\$

### Protected Right Turns



**Description:**

A green arrow for right turns phase helps prevent conflicts with pedestrians and bicyclists who may be crossing the street on the right side of the intersection.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$\$

### Red Light Camera



**Description:**

Red light cameras help enforce traffic laws by taking a photo of any vehicle that drives through an intersection after the light has turned red. These cameras work automatically, and the photos they take are used by authorities to issue tickets to drivers who run red lights.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$\$



### Retroreflective Signal Backplates



**Description:**

Retroreflective borders are bright, reflective outlines added around traffic signals to make them easier to see—especially for older drivers or those with color vision difficulties. These borders help drivers quickly recognize which light is on. They're also useful during power outages, because they reflect headlights and make the signal visible even when it's not working.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: SI02

Cost: \$

### Signal Interconnectivity and Coordination



**Description:**

Improving how traffic signals are timed can make streets safer. One approach is called a “green wave,” where signals are coordinated to let people driving and people on bikes move smoothly through several intersections without stopping at a set desired speed, typically lower than the speed limit and in line with typical bicycle travel speeds. The slow green wave can be accompanied by signs that alert the drivers and help slow down cars, which can reduce the risk of severe collisions.

**Safe System Hierarchy:**

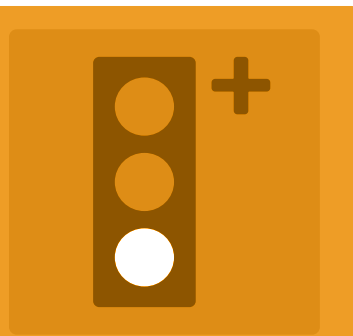
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: SI03

Cost: \$\$

### Supplemental Signal Heads



**Description:**

Supplemental signal heads are extra traffic lights placed in addition to the main signal. They help drivers see the signal more clearly, especially when the intersection is hard to see—like when it's hidden behind vertical curve or around a horizontal curve.

**Safe System Hierarchy:**

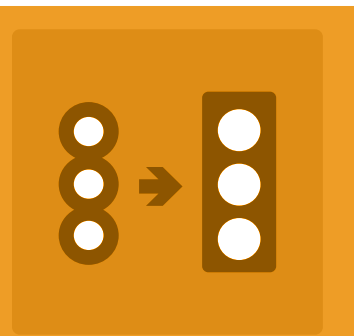
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: SI02

Cost: \$

### Upgrade Signal Head



**Description:**

Upgrading signal heads means replacing smaller 8-inch traffic lights with larger 12-inch ones, as recommended by California's MUTCD. The larger signal heads are easier for drivers to see, especially from a distance. This helps drivers notice intersections sooner and respond more safely to traffic signals.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

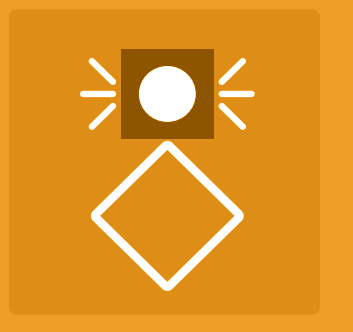
Context: Urban Rural

LRSM ID: SI02

Cost: \$



### Flashing Beacon as Advance Warning



**Description:**

A flashing beacon is a blinking light paired with signage used as advanced warning to alert drivers to an upcoming intersection or crosswalk. This tool increases driver awareness and provides additional time to slow down or yield to pedestrians, enhancing safety at conflict points.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**  
 LRSM ID: **SI09, NS10/11, and R25**  
 Cost: \$

### LED-Enhanced Sign



**Description:**

An LED-enhanced sign integrates flashing or steady LED lights into the sign's border or message to improve visibility. These signs are especially effective at locations with limited sight distance or a history of driver non-compliance, such as at STOP signs. The enhanced visibility helps draw driver attention and improve compliance with traffic control devices.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**  
 LRSM ID: **NS08**  
 Cost: \$

### Upgrade Intersection Pavement Markings



**Description:**

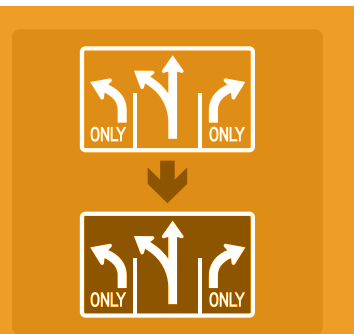
Upgrading intersection pavement markings, such as stop ahead markings, centerlines, and stop bars, improves visibility for drivers approaching and entering intersections.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**  
 LRSM ID: **SI08, NS09**  
 Cost: \$

### Upgrade Signs with Fluorescent Sheeting



**Description:**

Upgrading signs with fluorescent sheeting enhances nighttime visibility by reflecting headlight beams more effectively, making warnings clearer for drivers.

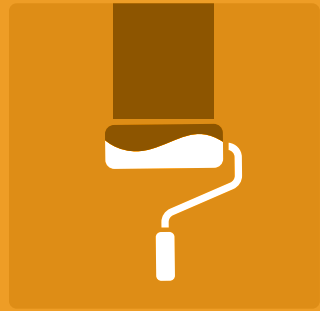
**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** **Rural**  
 LRSM ID: **NS08 and R22**  
 Cost: \$



### Upgrade Striping



**Description:**

Restriping lanes with reflective materials—such as thermoplastic, contrast striping, and raised pavement markers—enhances visibility and helps drivers clearly identify lane assignments, particularly in low-light or wet conditions. Contrast striping, which uses a darker outline or background around white or yellow markings, improves visibility on light-colored pavements and in bright sunlight. These treatments are especially effective where lane configurations change or where additional guidance is needed to reduce lane departure and sideswipe crashes.

**Safe System Hierarchy:**

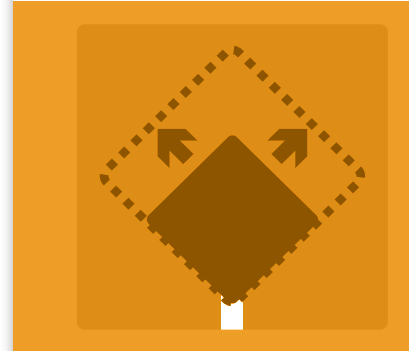
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness**

Context: **Urban** **Rural**

LRSM ID: **SI08** and **R28**

Cost: \$

### Upgrade to Larger Warning Signs



**Description:**

Upgrading to larger warning signs improves visibility and makes information easier to read—especially for older drivers.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness**

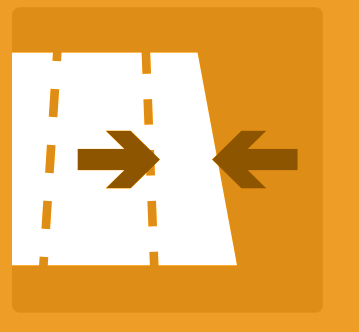
Context: **Urban** **Rural**

LRSM ID: **NS08**

Cost: \$



### Lane Narrowing



**Description:**

Lane narrowing reduces the width of the marked vehicle lanes to encourage motorists to travel at slower speeds. Lane narrowing can also help reallocate existing roadway space to other road users.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds**
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: N/A

Cost: \$

### Pavement Speed Legends



**Description:**

Speed legends are numerals painted directly on the roadway surface to indicate the posted speed limit. Typically placed near speed limit signs, they reinforce speed awareness and improve compliance, especially at transitions to slower streets.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds**
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: SI08, NS09

Cost: \$

### Raised Crosswalk/Speed Table



**Description:**

A raised pedestrian crosswalk is elevated above the road, either by a few inches, or at sidewalk level. This type of crosswalk, also commonly referred to as a speed table, increases pedestrian visibility and slows motorists.

**Safe System Hierarchy:**

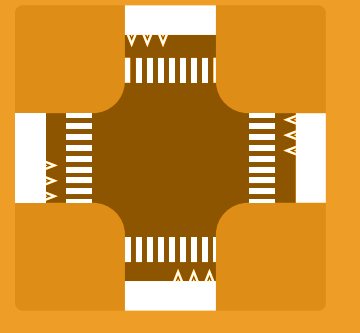
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds**
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: R37PB

Cost: \$\$

### Raised Intersection



**Description:**

A raised intersection elevates the entire crossing area to the level of the adjoining sidewalks, creating a continuous surface for pedestrians while signaling drivers to slow down. The vertical deflection reduces vehicle speeds, improves driver awareness, and enhances visibility of pedestrians and bicyclists. Raised intersections are especially effective in urban or downtown settings with high pedestrian activity, helping to calm traffic and reduce the likelihood and severity of crashes.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds**
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

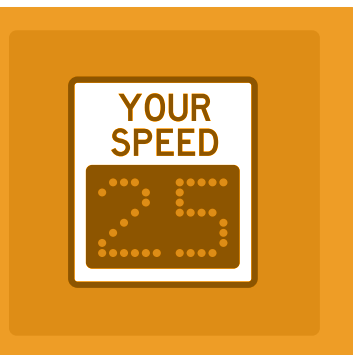
Context: **Urban** Rural

LRSM ID: R37PB

Cost: \$\$\$



### Speed Feedback Sign



**Description:**

A speed feedback sign displays a driver's current speed alongside the posted speed limit, encouraging voluntary speed reduction. It serves as a real-time visual cue to promote speed awareness and compliance, particularly in areas with speeding concerns.

**Safe System Hierarchy:**

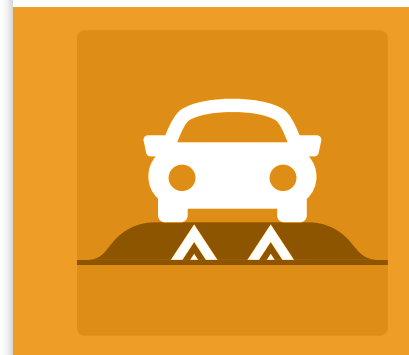
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: N/A

Cost: \$

### Speed Cushion or Speed Hump



**Description:**

Speed cushions and speed humps are raised pavement features designed to reduce vehicle speeds, especially on residential streets and near schools. Unlike speed bumps, which are short and abrupt and typically used in parking lots, speed humps are wider and provide a smoother, more gradual rise to encourage consistent lower speeds. Speed cushions serve a similar purpose but include wheel gaps that allow larger vehicles—such as fire trucks and buses—to pass with less impact. Together, these treatments help calm traffic, improve safety, and enhance comfort for people walking and biking.

**Safe System Hierarchy:**

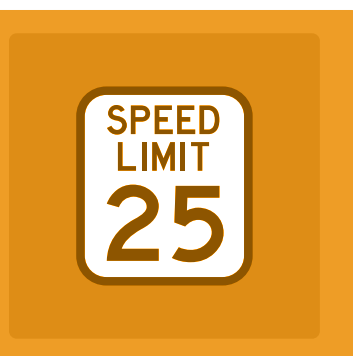
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: N/A

Cost: \$

### Speed Limit Reduction



**Description:**

Lower speeds help reduce the risk and severity of crashes. California Assembly Bill (AB) 43 allows for speed limits to consider factors like roadway characteristics, adjacent land use context, as well as the presence of people walking and biking.

**Safe System Hierarchy:**

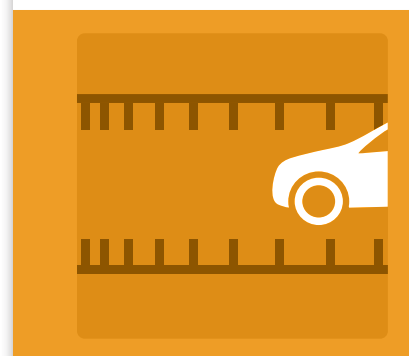
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban Rural

LRSM ID: N/A

Cost: \$

### Speed Reduction Markings



**Description:**

Speed reduction markings use visual cues—such as converging lines, transverse bars, or spaced pavement markings—to create the perception of higher speed, prompting drivers to slow down. When applied with reflective or contrast materials, these markings remain visible at night and in wet conditions. They are especially effective in transition zones, near intersections, schools, or curves, where lower operating speeds are desired.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

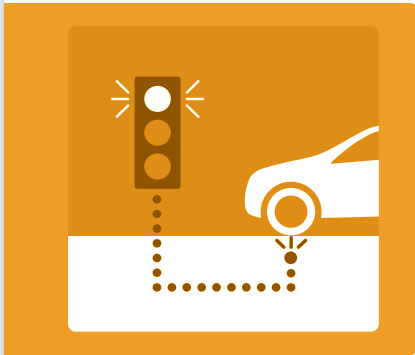
Context: Urban Rural

LRSM ID: N/A

Cost: \$



### Speed Sensitive Rest in Red Signal



**Description:**

At certain times—like late at night—some traffic signals stay red until a vehicle approaches. These signals are designed to reward drivers who follow the speed limit. If a car is going too fast, the light stays red until the driver comes to a stop. But if the car is going at or below the speed limit, the light turns green before the car arrives, allowing it to pass through smoothly. This encourages safe driving and can be combined with electronic speed signs that warn drivers if they're going too fast.

**Safe System Hierarchy:**

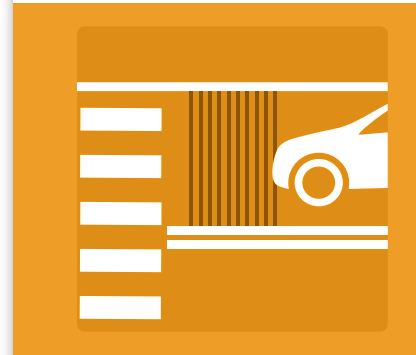
- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: **Urban** Rural

LRSM ID: **SI03**

Cost: **\$\$**

### Traverse Rumble Strips



**Description:**

Transverse rumble strips are raised or grooved patterns placed perpendicular to the travel lane to alert drivers through sound and vibration. They are typically installed in advance of intersections, curves, toll plazas, or other areas requiring reduced speeds or increased attention. By warning inattentive or drowsy drivers, these strips prompt timely deceleration and improve awareness of upcoming conditions. When used strategically, transverse rumble strips can reduce run-off-road and rear-end crashes, particularly on high-speed rural approaches.

**Safe System Hierarchy:**

- Tier 1 Remove severe conflicts
- Tier 2 Reduce vehicle speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase attentiveness & awareness

Context: Urban **Rural**

LRSM ID: **NS12**

Cost: **\$**



### Automated Enforcement



**Description:**

Automated enforcement uses cameras or sensors to detect and record traffic violations such as speeding or red-light running. This strategy increases compliance with traffic laws by providing consistent, unbiased enforcement. When combined with public awareness campaigns, automated enforcement can significantly reduce crash frequency and severity, particularly at high-risk locations.

In California, using automated speed enforcement (speed cameras) is currently limited. Assembly Bill (AB) 645, signed into law in 2023, authorizes a five-year pilot program for “speed safety systems” in select cities (Los Angeles, San Francisco, Oakland, San Jose, Long Beach, and Glendale) and only on local streets (not state highways or freeways).

### High-Visibility Enforcement



**Description:**

High-visibility enforcement (HVE) combines increased police presence with media and community outreach to deter unsafe driving behaviors such as speeding, impaired driving, and failure to yield. The visible enforcement activity raises driver awareness and promotes voluntary compliance with traffic laws, leading to measurable reductions in crashes and risky behaviors.

HVE campaigns are typically short-term, intensive, and well-publicized, focusing on a specific behavior or location (for example, “Click It or Ticket” seat belt enforcement or “Drive Sober or Get Pulled Over” impaired-driving campaigns). Effective programs coordinate enforcement waves with earned and paid media, community partnerships, and data-driven deployment to maximize visibility and credibility.

### Policies and Design Standards Updates



**Description:**

Updating policies, guidelines, and design standards ensures that planning, design, and engineering practices reflect the latest safety research and proven countermeasures. By institutionalizing safety principles—such as the Safe System Approach and Complete Streets policies—agencies can proactively design for human error, reduce crash severity, and support equitable mobility for all users.

These updates help embed safety into everyday decision-making, from project scoping to design exceptions and performance evaluation. Aligning local and regional standards with national guidance promotes consistency, innovation, and accountability in achieving zero traffic fatalities and serious injuries.

### Public Education and Outreach



**Description:**

Public education and outreach programs build awareness of safe behaviors for all road users, including drivers, pedestrians, bicyclists, and e-bike riders. Through coordinated campaigns, community events, school programs, and social media, these initiatives encourage responsible choices and reinforce traffic laws.

When integrated with enforcement and engineering strategies, education and outreach foster a culture of shared responsibility and help sustain long-term behavior change. Effective programs are data-driven, tailored to local crash patterns or priority populations, and may focus on issues such as speed management, impaired or distracted driving, pedestrian visibility, and safe micromobility use.



### Safe Routes to School



**Description:**

The Safe Routes to School (SRTS) program promotes safe, active travel for students by combining education, encouragement, enforcement, engineering, and evaluation strategies around schools. These coordinated efforts reduce traffic conflicts, improve driver yielding behavior, and enhance walking and biking conditions in school zones.

SRTS programs also foster long-term community benefits by encouraging healthy, sustainable travel habits among children and families. When paired with infrastructure improvements—such as sidewalks, crossings, and speed management measures—Safe Routes to School supports the Safe System Approach by reducing crash risk and improving comfort and confidence for all users near schools.

### Sobriety Checkpoints



**Description:**

Sobriety checkpoints are temporary, highly visible operations where law enforcement officers systematically stop vehicles to identify signs of alcohol or drug impairment. When well-publicized and conducted regularly, these checkpoints increase the perceived risk of arrest, deterring impaired driving and reinforcing community norms around sober driving.

Research shows that frequent, well-advertised sobriety checkpoints can lead to reductions in alcohol-related crashes. Integrating checkpoints with public education and media campaigns further amplifies their deterrent effect, improving roadway safety and saving lives.