



Appendix D

Safety Countermeasure Toolbox



This appendix presents a toolbox of safety countermeasures that can be deployed to address crash trends and the systemic factors behind them. Systemic improvements, both engineering and programmatic/non-engineering related, were identified for implementation.

What Are Engineering Countermeasures?

Engineering countermeasures are physical, infrastructure-based improvements that can be made to roadways to reduce likelihood of crashes.

Example: Rectangular Rapid Flashing Beacon



What Are Programmatic/Non-engineering Countermeasures?

Programmatic/Non-engineering countermeasures introduce education, enforcement, and other policy instruments as means of encouraging safer roadways through user behavior, and they can be used to tackle traffic safety problems such as alcohol and drug impaired driving, distracted driving, speeding, and pedestrian and bicyclist safety.

Example: OTS Go Safely California campaign resources



Engineering Countermeasures

The purpose of this Engineering Countermeasure Toolbox is to establish a shared understanding of key strategies available to address roadway safety issues in the Yuba-Sutter Region 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.

The countermeasure toolbox includes:

Countermeasure title

Countermeasure icon

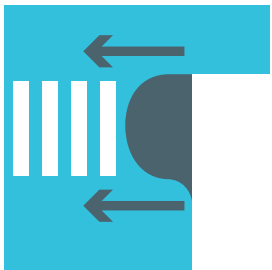
Federal Highway Administration (FHWA) proven countermeasure

Context to implement countermeasure

Local Roadway Safety Manual ID

Cost to implement countermeasure

Curb Extensions



FHWA PROVEN COUNTERMEASURE

Context

Urban

LRSM ID

NS21PB

Cost

\$\$

Low-Cost / Quick-Build Alternative Available

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 and Awareness

Countermeasure description

Countermeasure type

FHWA Safe System Roadway Design Hierarchy that that helps identify and prioritize strategies to reduce traffic-related injuries and fatalities

4 Yuba-Sutter

Engineering Countermeasure Toolbox List

A. Bikeways

- Bicycle Crossing (Solid Green Paint)
- Bicycle Ramp
- Bicycle Signal/Exclusive Bike Phase
- Bicycles May Use Full Lane Sign
- Bike Box
- Bike Detection
- Bike Lane
- Bike-Friendly Grate
- Buffered Bike Lane
- Door Zone Markings
- Extend Green Time For Bikes
- Floating Transit Island or Bus Boarding Island
- Green Conflict Striping
- Mixing Zone
- Separated Bikeway
- Shared-Use Path
- Through Bike Lane at Intersection
- Two-Stage Turn Queue Bike Box

B. Pedestrian Facilities

- Add Sidewalk
- Audible Push Button Upgrade
- Co-Locate Bus Stops and Pedestrian Crossings
- Curb Extensions
- Extend Time Push Button
- High-Visibility Crosswalk
- Install/Upgrade Pedestrian Crossing at Uncontrolled Locations (Signs and Markings Only)
- Landscape Buffer
- Leading Pedestrian Interval and Pedestrian Recall
- Pedestrian Countdown Timer
- Pedestrian Detection
- Pedestrian Hybrid Beacon
- Rectangular Rapid Flashing Beacon
- Remove Crossing Prohibition
- Restripe Crosswalk
- Upgrade Curb Ramp
- Widen Sidewalk

C. Intersections & Roadways

- All-Way Stop Control
- Centerline Hardening
- Close Slip Lane
- Directional Median Openings to Restrict Left Turns
- Guardrail
- Improved Pavement Friction
- Intersection Lighting
- Intersection Reconstruction and Tightening
- Lane Narrowing
- Median Barrier
- Median Guardrail
- Neighborhood Traffic Circle
- Partial Closure/Diverter
- Protected Intersection
- Raised Crosswalk
- Raised Intersection
- Raised Median
- Reduced Left-Turn Conflict Intersection
- Refuge Island
- Road Diet
- Roundabout
- Rumble Strips
- Safety Edge
- Slow Turn Wedge
- Speed Hump or Speed Table
- Splitter Island
- Straighten Crosswalk
- Superelevation at Horizontal Curve Locations
- Traffic Signal
- Widen/Pave Shoulder

D. Signals

- Advanced Dilemma Zone Detection
- All-Red Signal Time
- Extend Pedestrian Crossing Time
- Flashing Yellow Turn Phase
- Pedestrian Scramble
- Prohibit Left Turn
- Prohibit Right-Turn-on-Red
- Prohibit Turns During Pedestrian Phase (Blank-out Signs)
- Protected Left Turns
- Retroreflective Tape on Signals
- Separate Right-Turn Phasing
- Shorten Cycle Length
- Signal Interconnectivity and Coordination / Green Wave
- Speed Sensitive Rest in Red Signal
- Supplemental Signal Heads
- Upgrade Signal Head

E. Signing & Striping

- Advance Stop Bar
- Chevron Signs on Horizontal Curves
- Curve Advance Warning Sign
- Flashing Beacon as Advance Warning
- LED-Enhanced Sign
- Painted Centerline and Raised Pavement Markers at Curves on Residential Streets
- Speed Feedback Sign
- Speed Legends on Pavement at Neighborhood Entries
- Striping Through Intersection
- Time-Based Turn Restriction
- Upgrade Intersection Pavement Markings
- Upgrade Signs with Fluorescent Sheeting
- Upgrade Striping
- Upgrade to Larger Warning Signs
- Wayfinding
- Yield Markings
- Yield To Pedestrians Sign

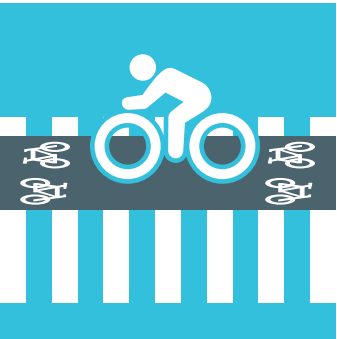
F. Others

- Back-In Angled Parking
- Driveway Consolidation
- Street Lighting
- Clear Zone
- Curbside Management
- Far-Side Bus Stop
- Delineators, Reflectors, and/or Object Markers
- Impact Attenuators
- Speed Limit Reduction
- Relocate Hazardous Utility Poles
- Remove Obstructions For Sightlines
- Upgrade Lighting to LED
- Red Light Camera
- Traffic Camera/Closed Circuit TV Camera



Bicycle Crossing (Dashed Green Paint)

BIKEWAYS



Description

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



Context Urban
LRSM ID N/A
Cost \$

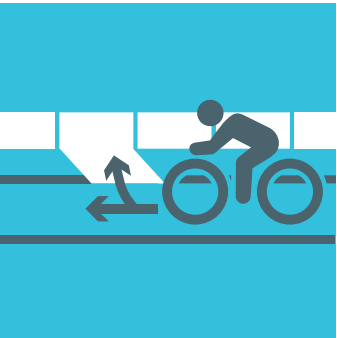
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Bicycle Ramp

BIKEWAYS



Description

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

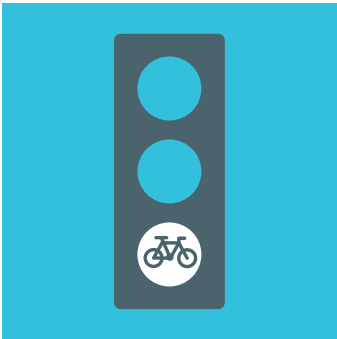
Context Urban/Rural
LRSM ID N/A
Cost \$

Safe System Hierarchy

- ☒ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Bicycle Signal/Exclusive Bike Phase

BIKEWAYS



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.



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 and Awareness

Bicycles May Use Full Lane Sign

BIKEWAYS



Description

A sign placed on roadways categorized as bike routes to indicate that bicyclists may occupy the full travel lane. Intended to encourage motorists to slow and yield to bicyclists until it is safe to pass. Also encourages bicyclists not to ride within the door zone if on-street parking is present.



Context Urban/Rural
LRSM ID N/A
Cost \$

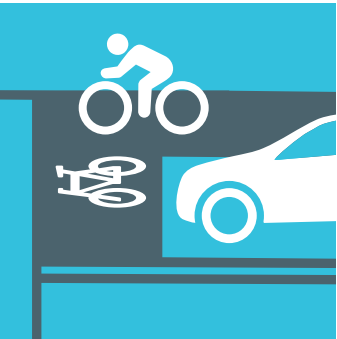
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Bike Box

BIKEWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context Urban

LRSM ID S20PB

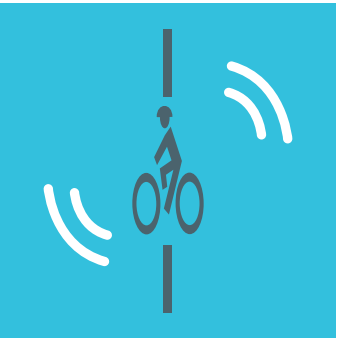
Cost \$

Low-Cost / Quick-Build
Alternative Available

- Safe System Hierarchy**
- ☐ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☐ Tier 3 Manage Conflicts in Time
 - ☒ Tier 4 Increase Attentiveness and Awareness

Bike Detection

BIKEWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context Urban/Rural

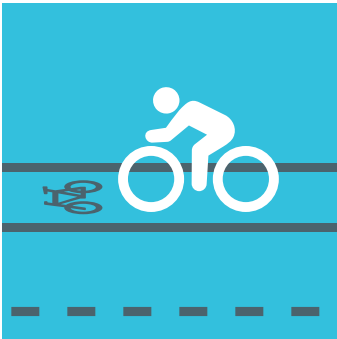
LRSM ID N/A

Cost \$\$

- Safe System Hierarchy**
- ☐ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☒ Tier 3 Manage Conflicts in Time
 - ☐ Tier 4 Increase Attentiveness and Awareness

Bike Lane

BIKEWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context Urban/Rural

LRSM ID R32PB

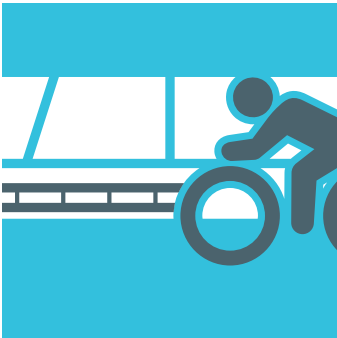
Cost \$\$

Low-Cost / Quick-Build
Alternative Available

- Safe System Hierarchy**
- ☒ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☐ Tier 3 Manage Conflicts in Time
 - ☐ Tier 4 Increase Attentiveness and Awareness

Bike-Friendly Grate

BIKEWAYS



Description

Bike-friendly grates are drainage inlets that have transverse or gridded grates to prevent bike tires from falling through the grate and causing a crash.

FHWA PROVEN COUNTERMEASURE

Context Urban/Rural

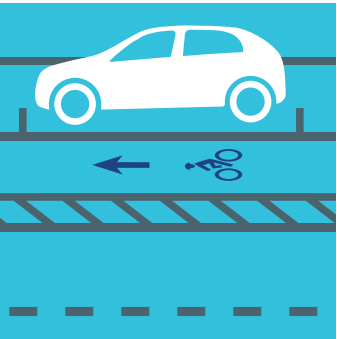
LRSM ID N/A

Cost \$\$

- Safe System Hierarchy**
- ☒ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☐ Tier 3 Manage Conflicts in Time
 - ☐ Tier 4 Increase Attentiveness and Awareness

Buffered Bike Lane

BIKEWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context

Urban/Rural

LRSM ID

R32PB

Cost

\$\$

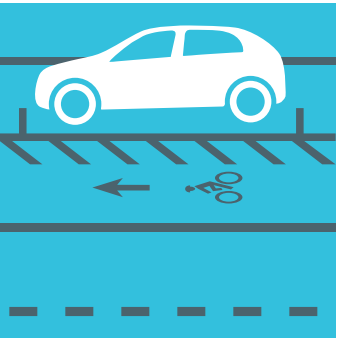
Low-Cost / Quick-Build

Alternative Available

- Safe System Hierarchy**
- ☒ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☐ Tier 3 Manage Conflicts in Time
 - ☐ Tier 4 Increase Attentiveness and Awareness

Door Zone Markings

BIKEWAYS



Description

These pavement markings denote the door zone of parked vehicles, to raise awareness for both bicyclists and motorists of the conflict area—in which an open car door could obstruct the path of a passing bicyclist.

Context

Urban

LRSM ID

N/A

Cost

\$

Low-Cost / Quick-Build

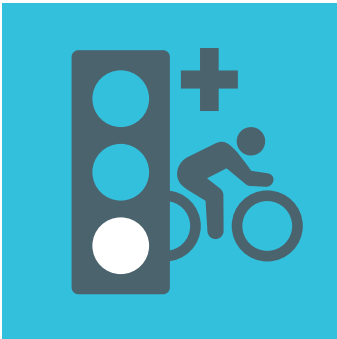
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Extend Green Time For Bikes

BIKEWAYS



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.

Context

Urban/Rural

LRSM ID

S03

Cost

\$

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Floating Transit Island or Bus Boarding Island

BIKEWAYS



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.

Context

Urban

LRSM ID

N/A

Cost

\$\$

Low-Cost / Quick-Build

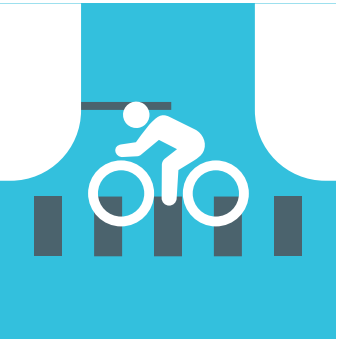
Alternative Available

Safe System Hierarchy

- ☒ Tier 1 Remove Severe Conflicts
- ☒ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Green Conflict Striping

BIKEWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context

Urban/Rural

LRSID ID

N/A

Cost

\$

Low-Cost / Quick-Build

Alternative Available

- Safe System Hierarchy
- ☐

 Tier 1 Remove Severe Conflicts
- ☐

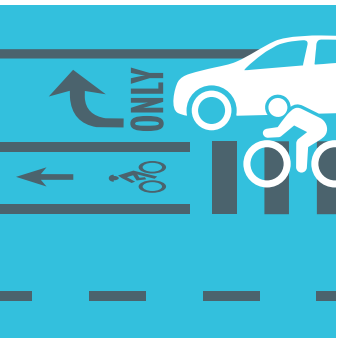
 Tier 2 Reduce Vehicle Speeds
- ☐

 Tier 3 Manage Conflicts in Time
- ☒

 Tier 4 Increase Attentiveness and Awareness

Mixing Zone

BIKEWAYS



Description

A mixing zone is a designated area in an intersection where bicyclists and motorists share the same space, often due to a bike lane transitioning into a shared lane. Lane markings increase awareness for bicyclists and motorists, indicating the intended shared lane.

Context

Urban

LRSID ID

N/A

Cost

\$

Low-Cost / Quick-Build

Alternative Available

- Safe System Hierarchy
- ☐

 Tier 1 Remove Severe Conflicts
- ☐

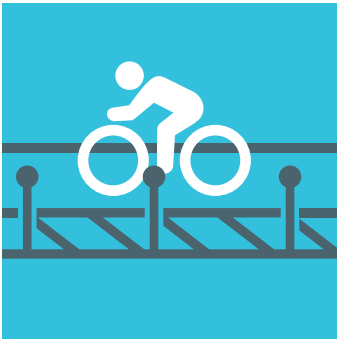
 Tier 2 Reduce Vehicle Speeds
- ☐

 Tier 3 Manage Conflicts in Time
- ☒

 Tier 4 Increase Attentiveness and Awareness

Separated Bikeway

BIKEWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context

Urban/Rural

LRSID ID

R33PB

Cost

\$\$\$

Low-Cost / Quick-Build

Alternative Available

- Safe System Hierarchy
- ☒

 Tier 1 Remove Severe Conflicts
- ☐

 Tier 2 Reduce Vehicle Speeds
- ☐

 Tier 3 Manage Conflicts in Time
- ☐

 Tier 4 Increase Attentiveness and Awareness

Shared-Use Path

BIKEWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context

Urban/Rural

LRSID ID

N/A

Cost

\$\$\$

Low-Cost / Quick-Build

Alternative Available

- Safe System Hierarchy
- ☒

 Tier 1 Remove Severe Conflicts
- ☐

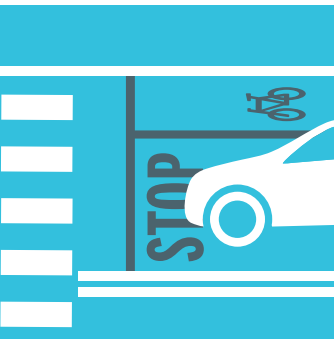
 Tier 2 Reduce Vehicle Speeds
- ☐

 Tier 3 Manage Conflicts in Time
- ☐

 Tier 4 Increase Attentiveness and Awareness

Through Bike Lane at Intersection

BIKEWAYS



Description

A through bike lane is a striping layout for intersections with a dedicated right-turn pocket, designed to allow for space for bicyclists to travel to the left side of right-turning vehicles.



Context Urban/Rural
LRSM ID N/A
Cost \$

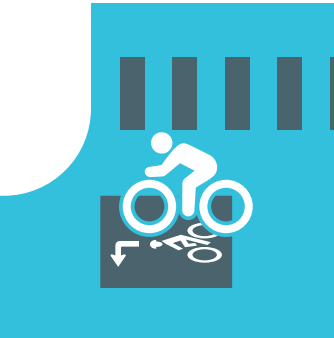
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Two-Stage Turn Queue Bike Box

BIKEWAYS



Description

This type of bike box is a designated area painted on the ground on the far side of an intersection. It provides bicyclists with a way to make a left turn at a multi-lane signalized intersection from a bike lane or separated bikeway on the far right side of the roadway. In this way, bicyclists are given the option of not having to mix with left-turning vehicles.



Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Add Sidewalk

PEDESTRIAN FACILITIES



Description

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



Context Urban/Rural
LRSM ID R34PB
Cost \$\$\$

Safe System Hierarchy

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Audible Push Button Upgrade

PEDESTRIAN FACILITIES



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



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 and Awareness

Co-Locate Bus Stops and Pedestrian Crossings

PEDESTRIAN FACILITIES



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

Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Curb Extensions

PEDESTRIAN FACILITIES



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

Context Urban
LRSM ID NS21PB
Cost \$\$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☒ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Extend Time Push Button

PEDESTRIAN FACILITIES



Description

Some crosswalks have a special push button that lets people request extra time to cross the street. This is especially helpful for older adults or anyone who may need a bit more time. These buttons are often placed near places like senior centers, medical offices, or assisted living communities.

Safe System Hierarchy

Context Urban
LRSM ID N/A
Cost \$

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

High-Visibility Crosswalk

PEDESTRIAN FACILITIES



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

Context Urban/Rural
LRSM ID S18/NS20
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Install/Upgrade Pedestrian Crossing at Uncontrolled Locations (Signs and Markings Only)

PEDESTRIAN FACILITIES



Description

Marked pedestrian crossings at intersections or along streets give people a clear, designated place to cross. This helps reduce the risk of crashes by making it more likely that drivers will expect and see pedestrians. Features like crosswalk striping and signs alert drivers to slow down and watch for people crossing.

FHWA PROVEN COUNTERMEASURE

Context Urban/Rural
LRSM ID R35PB
Cost \$

*Low-Cost / Quick-Build
Alternative Available*

- Safe System Hierarchy**
- ☐ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☐ Tier 3 Manage Conflicts in Time
 - ☒ Tier 4 Increase Attentiveness and Awareness

Landscape Buffer

PEDESTRIAN FACILITIES



Description

Adding a landscaped buffer between the road, sidewalks, and/or bikeways creates more space between drivers and people walking or biking. This separation not only makes everyone feel safer, but it also encourages drivers to slow down, which helps reduce the severity of crashes.

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 and Awareness

Leading Pedestrian Interval and Pedestrian Recall

PEDESTRIAN FACILITIES



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.

FHWA PROVEN COUNTERMEASURE

Context Urban
LRSM ID S21PB
Cost \$

- Safe System Hierarchy**
- ☐ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☒ Tier 3 Manage Conflicts in Time
 - ☐ Tier 4 Increase Attentiveness and Awareness

Pedestrian Countdown Timer

PEDESTRIAN FACILITIES



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.

Context Urban
LRSM ID S17PB
Cost \$\$

- Safe System Hierarchy**
- ☐ Tier 1 Remove Severe Conflicts
 - ☐ Tier 2 Reduce Vehicle Speeds
 - ☒ Tier 3 Manage Conflicts in Time
 - ☐ Tier 4 Increase Attentiveness and Awareness

Pedestrian Detection

PEDESTRIAN FACILITIES



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.

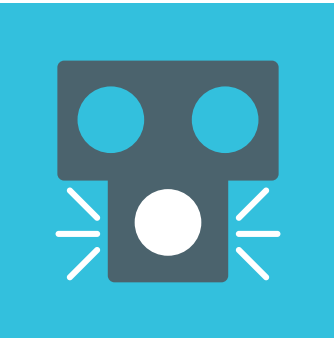
Context Urban
LRSM ID N/A
Cost \$\$

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Pedestrian Hybrid Beacon

PEDESTRIAN FACILITIES



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.



Context Urban/Rural
LRSM ID NS23PB
Cost \$\$\$

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Rectangular Rapid Flashing Beacon

PEDESTRIAN FACILITIES



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.



Context Urban/Rural
LRSM ID NS22PB
Cost \$\$

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Remove Crossing Prohibition

PEDESTRIAN FACILITIES



Description

Removing crossing restrictions and adding marked crosswalks makes it easier and safer for people to cross the street. Instead of forcing pedestrians to take longer, less direct routes—or cross during unsafe traffic movements—this approach provides clear, designated places to cross.

Context Urban
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Restripe Crosswalk

PEDESTRIAN FACILITIES



Description

Crosswalks need to be repainted regularly to stay visible to drivers and pedestrians. Over time, markings can fade due to weather and traffic. When repainting, using high-visibility designs—like ladder markings—can make crosswalks easier to see and help improve safety for everyone.



Context Urban/Rural
LRSM ID N/A
Cost \$

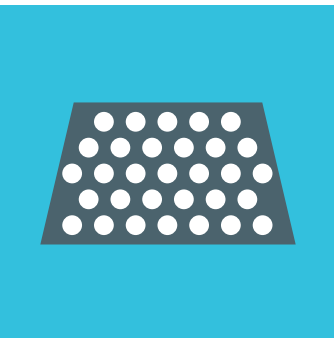
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Upgrade Curb Ramp

PEDESTRIAN FACILITIES



Description

Tactile warning surfaces and properly designed curb ramps are essential for helping people who are blind, have low vision, or are using a mobility device safely navigate street crossings. Curb ramps must meet national standards like the Public Rights-of-Way Accessibility Guidelines (PROWAG) and follow local design rules to ensure they are safe and accessible for everyone.

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 and Awareness

Widen Sidewalk

PEDESTRIAN FACILITIES



Description

Widening sidewalks creates more comfortable and safer spaces for people walking, especially in busy areas. It also provides enough room for people using wheelchairs or other mobility devices. By giving pedestrians more space, it reduces the chance that they'll need to walk in the street, which helps prevent crashes with vehicles.



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 and Awareness

All-Way Stop Control

INTERSECTIONS & ROADWAYS



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.

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 and Awareness

Centerline Hardening

INTERSECTIONS & ROADWAYS



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.

Safe System Hierarchy

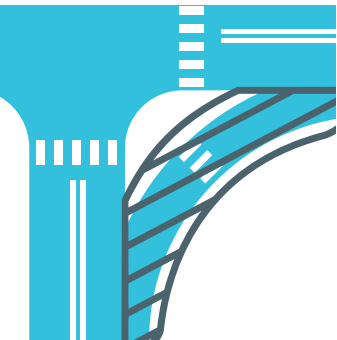
Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Close Slip Lane

INTERSECTIONS & ROADWAYS



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.

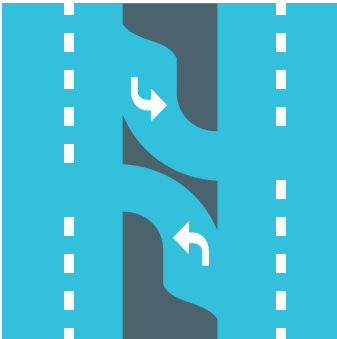
Safe System Hierarchy

Context Urban/Rural
LRSM ID N/A
Cost \$\$\$

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Directional Median Openings to Restrict Left Turns

INTERSECTIONS & ROADWAYS



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

Context Urban/Rural
LRSM ID N/A
Cost \$\$

Low-Cost / Quick-Build
Alternative Available

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Guardrail

INTERSECTIONS & ROADWAYS



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

Context Rural
LRSM ID N/A
Cost \$\$

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Improved Pavement Friction

INTERSECTIONS & ROADWAYS



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.

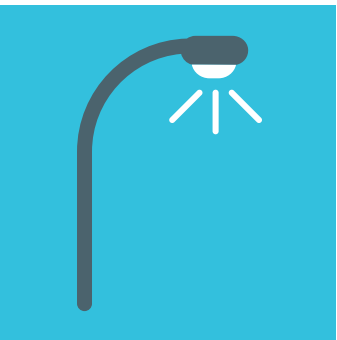
Safe System Hierarchy

Context Rural
LRSM ID N/A
Cost \$\$

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Intersection Lighting

INTERSECTIONS & ROADWAYS



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.

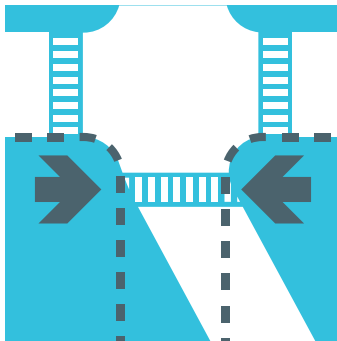
Safe System Hierarchy

Context Urban/Rural
LRSM ID N/A
Cost \$\$

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Intersection Reconstruction and Tightening

INTERSECTIONS & ROADWAYS



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.

Safe System Hierarchy

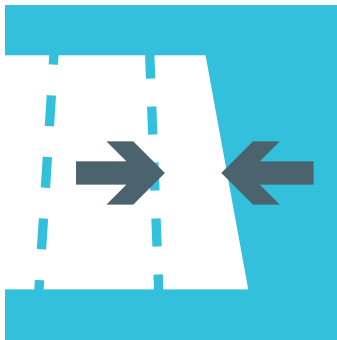
Context Urban/Rural
LRSM ID N/A
Cost \$\$\$

Low-Cost / Quick-Build
Alternative Available

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Lane Narrowing

INTERSECTIONS & ROADWAYS



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.

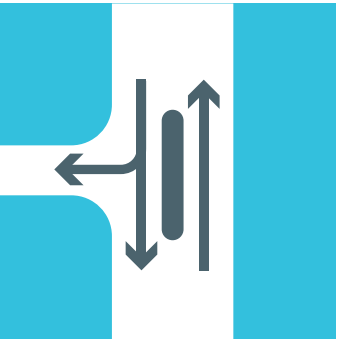
Safe System Hierarchy

Context Urban
LRSM ID N/A
Cost \$

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Median Barrier

INTERSECTIONS & ROADWAYS



Description

A median barrier in the center of the roadway physically separates opposing vehicular traffic. Median barriers can also help control access to and from side streets and driveways, reducing the number of conflict points.

Safe System Hierarchy

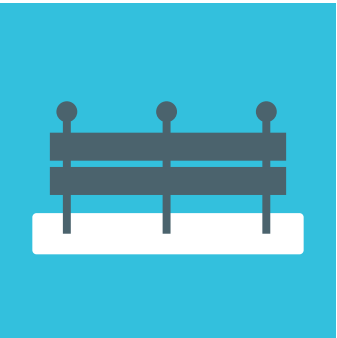
Context Rural
LRSM ID N/A
Cost \$\$\$

Low-Cost / Quick-Build
Alternative Available

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Median Guardrail

INTERSECTIONS & ROADWAYS



Description

Median guardrails are safety concrete barriers placed in the middle of roadways. While they might not stop all crashes caused by vehicles leaving the roadway, they can help prevent those crashes from turning into dangerous head-on collisions by keeping vehicles from crossing into oncoming traffic.

Safe System Hierarchy

Context Rural
LRSM ID N/A
Cost \$\$

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Neighborhood Traffic Circle

INTERSECTIONS & ROADWAYS



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).

Safe System Hierarchy

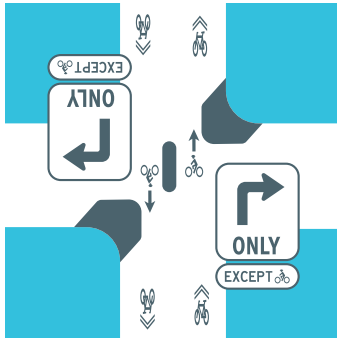
Context Urban
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Partial Closure/Diverter

INTERSECTIONS & ROADWAYS



Description

A partial closure or diverter restricts vehicle through movements, while still allowing bicyclists and pedestrians to proceed through an intersection in all directions.

Safe System Hierarchy

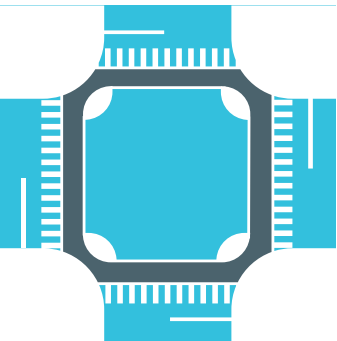
Context Urban
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Protected Intersection

INTERSECTIONS & ROADWAYS



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 \$\$\$

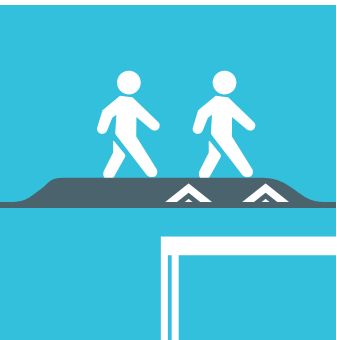
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Raised Crosswalk

INTERSECTIONS & ROADWAYS



Description

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

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 and Awareness

Raised Intersection

INTERSECTIONS & ROADWAYS



Description

A raised intersection brings vehicles up to the sidewalk level. This serves as a traffic calming measure by slowing drivers and increasing awareness of the pedestrian activity.

Context Urban
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 and Awareness

Raised Median

INTERSECTIONS & ROADWAYS



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.



Context Urban/Rural
LRSM ID N/A
Cost \$\$

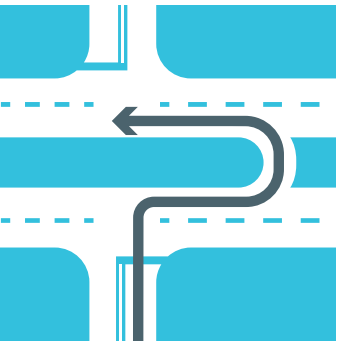
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- Tier 1 Remove Severe Conflicts
- Tier 2 Reduce Vehicle Speeds
- Tier 3 Manage Conflicts in Time
- Tier 4 Increase Attentiveness and Awareness

Reduced Left-Turn Conflict Intersection

INTERSECTIONS & ROADWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context	Urban/Rural
LRSM ID	N/A
Cost	\$\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Refuge Island

INTERSECTIONS & ROADWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context	Urban/Rural
LRSM ID	NS19PB
Cost	\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

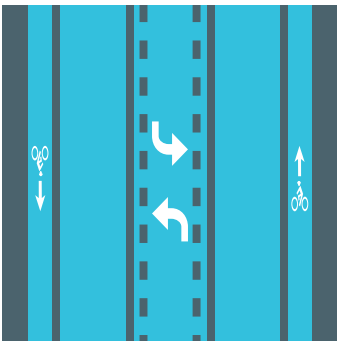
Increase Attentiveness and Awareness

Low-Cost / Quick-Build

Alternative Available

Road Diet

INTERSECTIONS & ROADWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context	Urban
LRSM ID	R14
Cost	\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

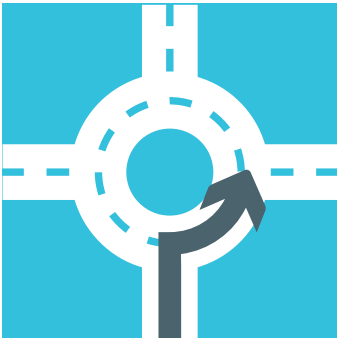
Increase Attentiveness and Awareness

Low-Cost / Quick-Build

Alternative Available

Roundabout

INTERSECTIONS & ROADWAYS



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.

FHWA PROVEN COUNTERMEASURE

Context	Urban/Rural
LRSM ID	S16/NS04
Cost	\$\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

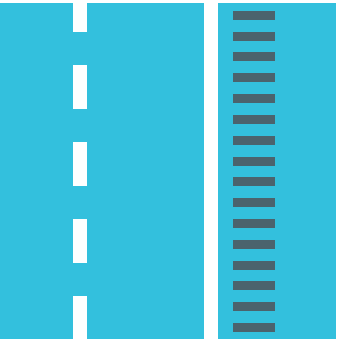
Increase Attentiveness and Awareness

Low-Cost / Quick-Build

Alternative Available

Rumble Strips

INTERSECTIONS & ROADWAYS



Description

Rumble strips are grooves added to the roadway surface that produce noise and vibrations inside a vehicle, alerting drivers when they cross the centerline or edge line. 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

Context Rural
LRSM ID R30/R31
Cost \$

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Safety Edge

INTERSECTIONS & ROADWAYS



Description

A safety edge slopes the shoulder pavement edge at a 30-35 degree angle, making it easier for drivers to reenter the roadway after leaving the paved roadway. It's designed to reduce the severity of crashes when a vehicle veers off the road and encounters a pavement-shoulder drop-off. This treatment can be incorporated as a standard practice in overlay or resurfacing projects.

Safe System Hierarchy

Context Rural
LRSM ID N/A
Cost \$

- ☒ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Slow Turn Wedge

INTERSECTIONS & ROADWAYS



Description

A slow turn wedge uses paint and delineators to extend the curb at intersections. This helps slow turns by restricting the turning radii of turning vehicles, expanding the field of vision for drivers, and increasing the visibility of pedestrians.

Safe System Hierarchy

Context Urban
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☒ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Speed Hump or Speed Table

INTERSECTIONS & ROADWAYS



Description

A speed hump or speed table is a raised area of pavement designed to slow down vehicles. Typically, speed humps and speed tables are wider and less abrupt than speed bumps, providing a gentler way to reduce vehicle speeds in residential areas or near schools. They help improve safety by encouraging drivers to maintain lower speeds.

Safe System Hierarchy

Context Urban
LRSM ID N/A
Cost \$

- ☐ Tier 1 Remove Severe Conflicts
- ☒ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Splitter Island

INTERSECTIONS & ROADWAYS



Description

A splitter island is a raised area that separates the two directions of travel on the minor street approach at an unsignalized intersection or roundabout. It helps channelize traffic in opposing directions and improves the visibility of the intersection for approaching drivers. Additionally, it provides a refuge for pedestrians crossing the street.

Safe System Hierarchy

Context Urban/Rural
LRSM ID N/A
Cost \$\$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Straighten Crosswalk

INTERSECTIONS & ROADWAYS



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

Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Superelevation at Horizontal Curve Locations

INTERSECTIONS & ROADWAYS



Description

Superelevation is the banking, or angling, of pavement on the approach to and through a horizontal curve, designed to help drivers negotiate the curve by counteracting lateral forces. However, this design can also inadvertently encourage higher speeds. When selecting appropriate superelevation, consider the target or desired speed for the roadway and relevant design guidance.

Safe System Hierarchy

Context Rural
LRSM ID N/A
Cost \$\$

- ☒ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Traffic Signal

INTERSECTIONS & ROADWAYS



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.

FHWA PROVEN COUNTERMEASURE

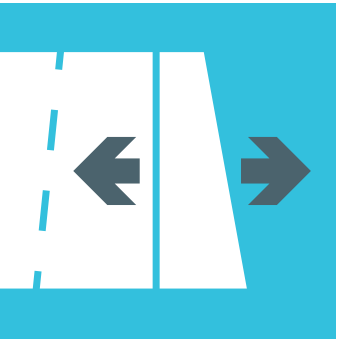
Safe System Hierarchy

Context Urban/Rural
LRSM ID N/A
Cost \$\$\$

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Widen/Pave Shoulder

INTERSECTIONS & ROADWAYS



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.

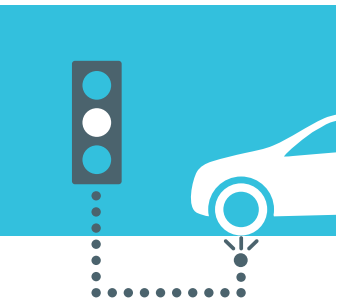
Safe System Hierarchy

Context Rural
LRSM ID N/A
Cost \$\$

- ☒ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Advanced Dilemma Zone Detection

SIGNALS



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.

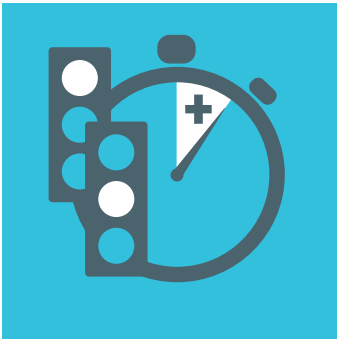
Safe System Hierarchy

Context Urban/Rural
LRSM ID N/A
Cost \$\$

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

All-Red Signal Time

SIGNALS



Description

Including a phase of all-red signals gives drivers and bicyclists a few extra seconds to safely get through an intersection before other traffic is allowed to move. This added time at the end of a signal phase helps reduce the risk of collisions, especially for people who are already in the intersection when the light changes.

Safe System Hierarchy

Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Extend Pedestrian Crossing Time

SIGNALS



Description

Extending the pedestrian walk signal time beyond the minimum required by national guidelines gives people more time to cross the street. This is especially helpful for vulnerable groups, like children, older adults, and people with disabilities, who may need extra time to cross safely.

Safe System Hierarchy

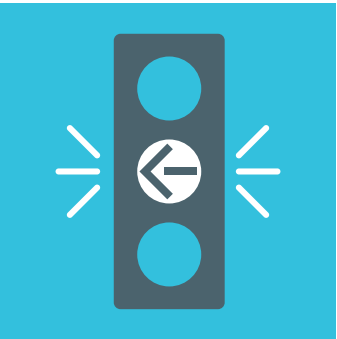
Context Urban
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Flashing Yellow Turn Phase

SIGNALS



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.

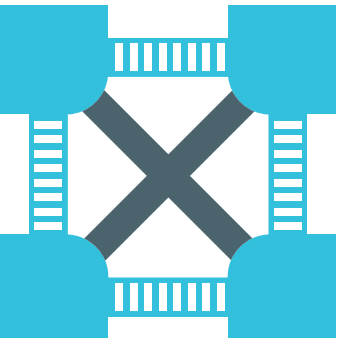
Context Urban
LRSM ID N/A
Cost \$\$

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Pedestrian Scramble

SIGNALS



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.

Context Urban
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 and Awareness

Prohibit Left Turn

SIGNALS



Description

Left turns may be restricted at certain intersections to improve safety. This is especially important where turning vehicles might conflict with pedestrians in the crosswalk or where there's heavy oncoming traffic. These restrictions can be enforced using signs or raised center medians that physically prevent the turn.

Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☒ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Prohibit Right-Turn-on-Red

SIGNALS



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.

Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☒ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Prohibit Turns During Pedestrian Phase (Blank-out Signs)

SIGNALS



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.

Context

Urban

LRSID

N/A

Cost

\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

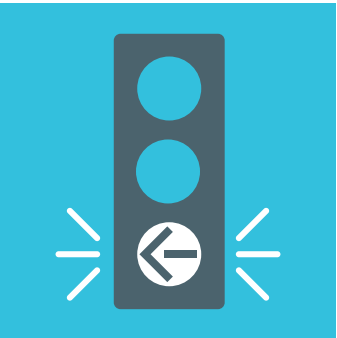
Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Protected Left Turns

SIGNALS



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.

Context

Urban/Rural

LRSID

N/A

Cost

\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

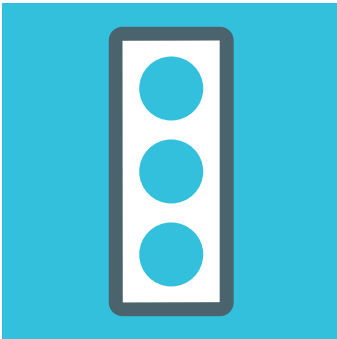
Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Retroreflective Tape on Signals

SIGNALS



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.

Context

Urban/Rural

LRSID

N/A

Cost

\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

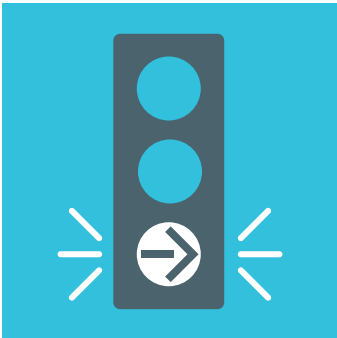
Increase Attentiveness and Awareness

Low-Cost / Quick-Build

Alternative Available

Separate Right-Turn Phasing

SIGNALS



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.

Context

Urban

LRSID

N/A

Cost

\$\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Shorten Cycle Length

SIGNALS



Description

The traffic signal cycle length—how long it takes to go through all the green, yellow, and red lights—can greatly affect how easy and pleasant it is to walk, bike, drive, or take transit. When signals stay red for too long, especially at several intersections in a row, it can make even short trips feel slow and frustrating. Shorter signal cycles, ideally between 60 and 90 seconds, are better for urban areas because they help keep people moving and make streets more welcoming for everyone.

Safe System Hierarchy

Context Urban
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Signal Interconnectivity and Coordination / Green Wave

SIGNALS



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.

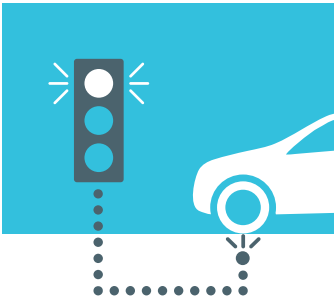
Safe System Hierarchy

Context Urban
LRSM ID S03
Cost \$\$

- ☐ Tier 1 Remove Severe Conflicts
- ☒ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Speed Sensitive Rest in Red Signal

SIGNALS



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.

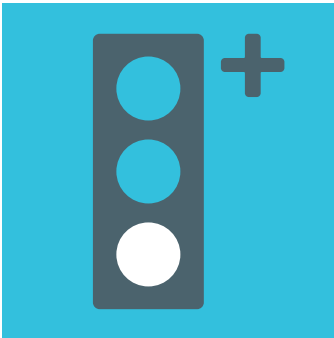
Safe System Hierarchy

Context Urban/Rural
LRSM ID R26
Cost \$\$

- ☐ Tier 1 Remove Severe Conflicts
- ☒ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Supplemental Signal Heads

SIGNALS



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.

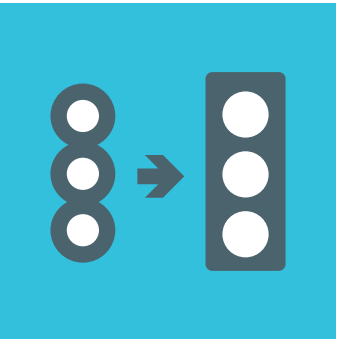
Safe System Hierarchy

Context Urban/Rural
LRSM ID S02
Cost \$\$

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Upgrade Signal Head

SIGNALS



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.

Context

Urban/Rural

LRSM ID

S02

Cost

\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

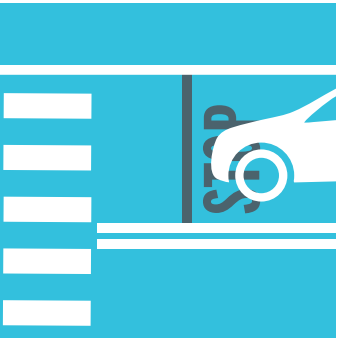
Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Advance Stop Bar

SIGNING & STRIPING



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.

Context

Urban/Rural

LRSM ID

S20PB

Cost

\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Low-Cost / Quick-Build

Alternative Available

Chevron Signs on Horizontal Curves

SIGNING & STRIPING



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

Rural

LRSM ID

R23

Cost

\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Low-Cost / Quick-Build

Alternative Available

Curve Advance Warning Sign

SIGNING & STRIPING



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

Rural

LRSM ID

R24

Cost

\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

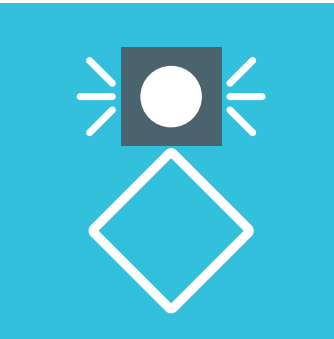
Increase Attentiveness and Awareness

Low-Cost / Quick-Build

Alternative Available

Flashing Beacon as Advance Warning

SIGNING & STRIPING



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

Context Rural
LRSM ID S10
Cost \$\$

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

LED-Enhanced Sign

SIGNING & STRIPING



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

Context Urban or Rural
LRSM ID NS08
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Painted Centerline and Raised Pavement Markers at Curves on Residential Streets

SIGNING & STRIPING



Description

Installing a centerline with raised pavement markers on curves along residential streets enhances lane guidance and helps reduce the risk of head-on collisions. The tactile and visual feedback from the markers improves driver awareness, especially at night or in low-visibility conditions.

Safe System Hierarchy

Context Urban
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Speed Feedback Sign

SIGNING & STRIPING



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

 FHWA PROVEN COUNTERMEASURE

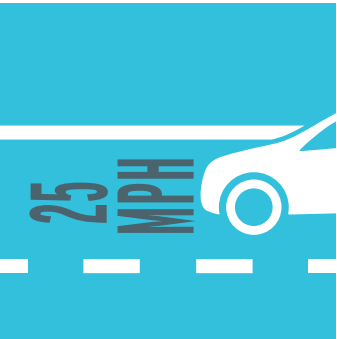
Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Speed Legends on Pavement at Neighborhood Entries

SIGNING & STRIPING



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 transistions to slower streets.

Context Urban

LRSM ID N/A

Cost \$

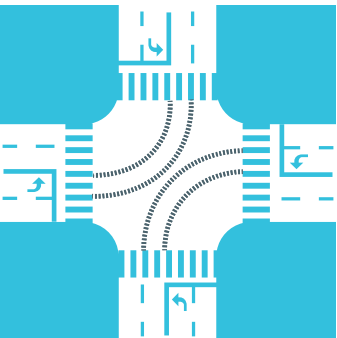
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Striping Through Intersection

SIGNING & STRIPING



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.

Context Urban/Rural

LRSM ID N/A

Cost \$

Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Time-Based Turn Restriction

SIGNING & STRIPING



Description

Restricts left turns or right turns during certain time periods when there may be increased potential for conflict (e.g., peak periods, school hours).

Context Urban

LRSM ID N/A

Cost \$

Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☒ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Upgrade Intersection Pavement Markings

SIGNING & STRIPING



Description

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

Context Urban/Rural

LRSM ID N/A

Cost \$

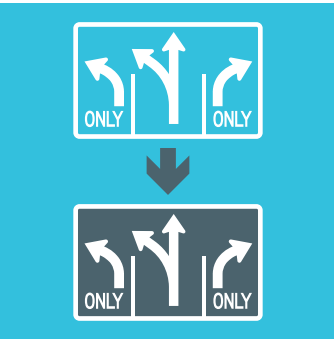
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Upgrade Signs with Fluorescent Sheeting

SIGNING & STRIPING



Description

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

Context Urban/Rural

LRSID ID N/A

Cost \$

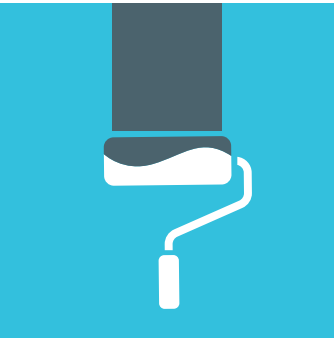
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Upgrade Striping

SIGNING & STRIPING



Description

Restriping lanes with reflective materials such as thermoplastic and pavement markers improves visibility and helps clarify lane assignments, especially where lane configurations change.

Context Urban/Rural

LRSID ID N/A

Cost \$

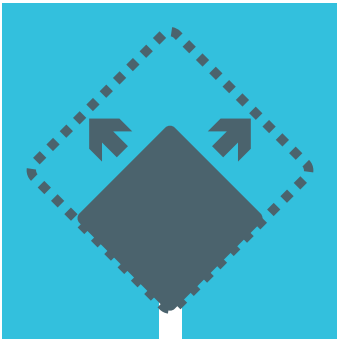
Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Upgrade to Larger Warning Signs

SIGNING & STRIPING



Description

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

Context Urban/Rural

LRSID ID N/A

Cost \$

Low-Cost / Quick-Build
Alternative Available

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Wayfinding

SIGNING & STRIPING



Description

A network of directional signs highlighting nearby destinations and pedestrian or bicycle facilities can reduce erratic driving and guide users away from crossings with poor visibility or limited safety features.

Context Urban/Rural

LRSID ID N/A

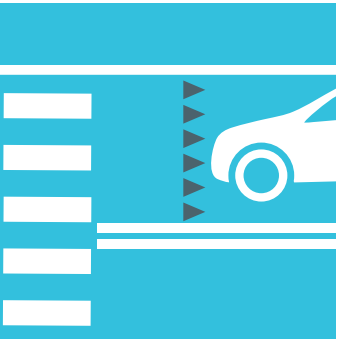
Cost \$

Safe System Hierarchy

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Yield Markings

SIGNING & STRIPING



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

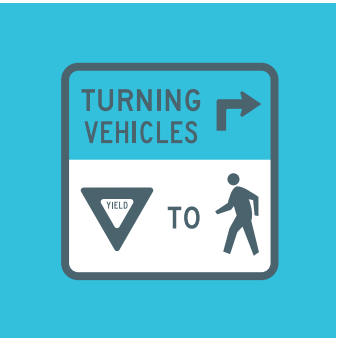
Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Yield To Pedestrians Sign

SIGNING & STRIPING



Description

“Yield Here to Pedestrians” signs alert drivers to pedestrian crossings and are required when advance yield lines are used. Additional smaller, flexible, warning signs can also be placed on the roadway centerline to enhance visibility.

Safe System Hierarchy

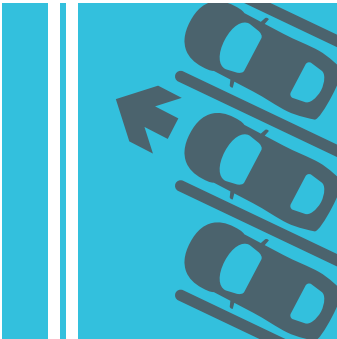
Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Back-In Angled Parking

OTHER



Description

Back-in angled parking requires motorists to reverse into an angled on-street parking spot and drive forward when exiting. This method increases the visibility of passing bicyclists and vehicles when exiting a spot. Additionally, it allows trunk unloading to occur on the curb rather than in the street, reducing exposure.

Safe System Hierarchy

Context Urban/Rural
LRSM ID N/A
Cost \$

Low-Cost / Quick-Build
Alternative Available

- ☐ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☒ Tier 4 Increase Attentiveness and Awareness

Clear Zone

OTHER



Description

A clear zone is an unobstructed, traversable roadside area that allows a driver to stop safely or regain control of a vehicle that has left the roadway. The width of the clear zone is informed by roadway context, desired vehicle speeds, and agency design standards.

Safe System Hierarchy

Context Rural
LRSM ID N/A
Cost \$\$

- ☒ Tier 1 Remove Severe Conflicts
- ☐ Tier 2 Reduce Vehicle Speeds
- ☐ Tier 3 Manage Conflicts in Time
- ☐ Tier 4 Increase Attentiveness and Awareness

Curbside Management

OTHER



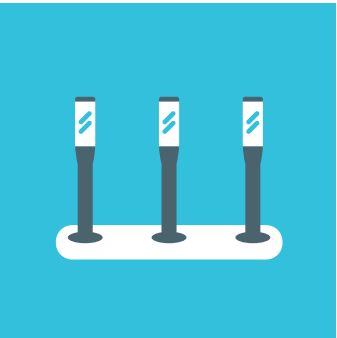
Description

Curbside management helps prioritize and align different uses of the space along curbs that would otherwise be in conflict with one another. This includes the location of bus stops, bicycle infrastructure, space for freight deliveries, passenger pick-ups/drop-offs, green stormwater infrastructure, public spaces, and parking spaces.

Safe System Hierarchy	
Context	Urban
LRSM ID	N/A
Cost	\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Delineators, Reflectors, and/or Object Markers

OTHER



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.

Safe System Hierarchy	
Context	Rural
LRSM ID	N/A
Cost	\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Low-Cost / Quick-Build
Alternative Available

Driveway Consolidation

OTHER



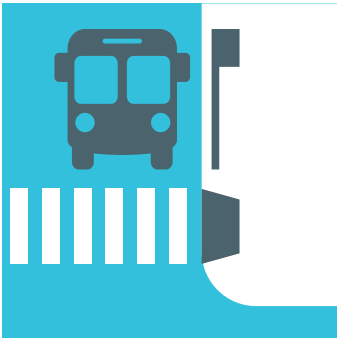
Description

Consolidating driveways reduces conflict points between vehicles entering/exiting the roadway and pedestrians, bicyclists, and vehicles traveling along the roadway. Particular attention should be considered to driveways within 250 feet of intersections.

Safe System Hierarchy	
Context	Urban/Rural
LRSM ID	N/A
Cost	\$\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Far-Side Bus Stop

OTHER



Description

Far-side bus stops are placed just after an intersection, so the bus crosses the street before picking up or dropping off passengers. This setup helps in a few ways: it keeps traffic moving more smoothly, makes it easier for pedestrians to be seen by drivers when crossing the street, and can help buses stay on schedule. It also encourages people to cross behind the bus, which is usually safer.

Safe System Hierarchy	
Context	Urban/Rural
LRSM ID	N/A
Cost	\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Impact Attenuators

OTHER



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	
Context	Rural
LRSM ID	N/A
Cost	\$\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Red Light Camera

OTHER



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	
Context	Urban
LRSM ID	N/A
Cost	\$\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Relocate Hazardous Utility Poles

OTHER



Description

Removing utility poles from the roadside can help reduce the risk of serious crashes. If it's not possible to remove the poles completely, it can still help to move them farther away from the road's edge, or away from outside of curves where vehicles may be more likely to depart the roadway.

Safe System Hierarchy	
Context	Rural
LRSM ID	N/A
Cost	\$\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Remove Obstructions For Sightlines

OTHER



Description

Removing visual obstacles near intersections helps drivers and pedestrians see each other more easily. This might include painting red curbs to stop cars from parking too close to corners (a practice known as “daylighting”), trimming overgrown trees or bushes, or moving signs or other objects that may block the view.

Safe System Hierarchy	
Context	Urban/Rural
LRSM ID	NS11
Cost	\$
Tier 1 Remove Severe Conflicts	
Tier 2 Reduce Vehicle Speeds	
Tier 3 Manage Conflicts in Time	
Tier 4 Increase Attentiveness and Awareness	

Low-Cost / Quick-Build
Alternative Available

Speed Limit Reduction

OTHER



Description

Lower speeds help reduce the risk and severity of crashes. New industry standards for speed limits consider factors like roadway characteristics, adjacent land use context, as well as the presence of people walking and biking.

Context

Urban/Rural

LRSM ID

N/A

Cost

\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

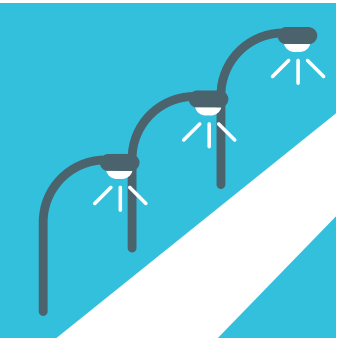
Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Street Lighting

OTHER



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.

Context

Urban

LRSM ID

R01

Cost

\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Upgrade Lighting to LED

OTHER



Description

LED street lights are brighter and more efficient than olderr high-pressure sodium lights. Upgrading street lights improves visibility—especially at crosswalks—by providing better color contrast and lighting a wider area. As a result, it becomes easier for drivers to see people walking.

Context

Urban

LRSM ID

N/A

Cost

\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Traffic Camera/Closed Circut TV Camera

OTHER



Description

Real-time traffic cameras enable live monitoring and integration with law enforcement and emergency service systems for faster rescue and investigation.

Context

Urban/Rural

LRSM ID

N/A

Cost

\$\$

Tier 1

Remove Severe Conflicts

Tier 2

Reduce Vehicle Speeds

Tier 3

Manage Conflicts in Time

Tier 4

Increase Attentiveness and Awareness

Rail Crossing Engineering Countermeasures

The Yuba-Sutter region is traversed by several active and historical rail lines, primarily operated by Union Pacific Railroad. These lines run through key communities such as Marysville, Wheatland, Yuba City, Olivehurst, and Plumas Lake. These communities and others experience safety concerns related to railroad crossings with local roads, particularly in rural locations with less safety infrastructure. The following countermeasure suggestions could separate users in time and/or enhance awareness of these sensitive crossings.

Uncontrolled Railroad Crossings

For uncontrolled railroad crossings, consider these countermeasures:

Install Active Warning Systems

Automatic gates and flashing lights are proven to significantly reduce crash frequency at crossings by alerting drivers and preventing crossing when trains approach.

Pavement markings and advanced warning

Advance pavement markings and signage improve driver awareness.

Relocate/clear roadside features

Remove or relocate roadside hazards near crossings to improve sight lines.

Consider grade separation

Where feasible, build overpasses or underpasses.

Controlled Railroad Crossings

For controlled railroad crossings, consider these countermeasures:

Install gates

Consistent with engineering requirements, install gates and ensure functionality of warning systems.

Improve lighting and pavement markings

Use brighter, reflective pavement markings and lighting to enhance nighttime visibility.

Preemption of Traffic Signals

Integrate railroad crossing signals with adjacent traffic signals to clear queues before a train arrives.

Pedestrian Gates or Swing Gates

In areas with higher foot traffic, install pedestrian gates prior to railroad crossing to prevent pedestrians from entering the track area during train approaches.



Roundabout Countermeasure

Roundabouts have been increasing in popularity in the U.S. for decades due to their safety and operational benefits. Several concerns and benefits of roundabouts are provided below.

Safety

Roundabouts reduce the number of intersection crossing conflict points compared to typical intersections, reducing the likelihood of crashes, as shown below. By creating a curved movement in the intersection, roundabouts slow down the speed of vehicles, which lessens both the likelihood and severity of crashes when they do occur. Additionally, the types of crashes that occur in a roundabout (e.g., sideswipes) are typically less severe than those of typical intersections (e.g., broadside/T-bone crashes) because the different crash angles reduce the kinetic energy involved in a crash.

Operations and Costs

Although roundabouts have higher upfront costs compared to traffic signals, they are cheaper to maintain over their usable lifetime. Unlike traffic signals, which create stop-and-go traffic patterns, roundabouts allow continuous movement, reducing congestion, delay, and idling time.

In rural areas, where visibility and road conditions can be compromised by nearby canals and agricultural activity, roundabouts can help manage traffic more predictably and safely than stop signs or signals.

Space Constraints

If available right-of-way is limited, traffic signals do typically require less space than roundabouts. However, compact roundabout designs tailored to fit tighter intersections can be implemented and still provide safety benefits compared to traditional signals

In rural areas in Yuba and Sutter County, a common concern is the ability of roundabouts to accommodate heavy vehicles like semi-trucks, farm tractors, and trailers. However, modern roundabout designs can include truck aprons and a wider turning radius to allow such vehicles to pass through at manageable speeds with minor issues.

Driver Familiarity

U.S. drivers are typically accustomed to traditional traffic signals so the transition to roundabouts may initially cause confusion. However, experiences from around California show that adaptation can be quick given proper education and roundabout design. Once drivers adapt, roundabouts can significantly reduce delays and improve traffic flow.

Trucks in Roundabout

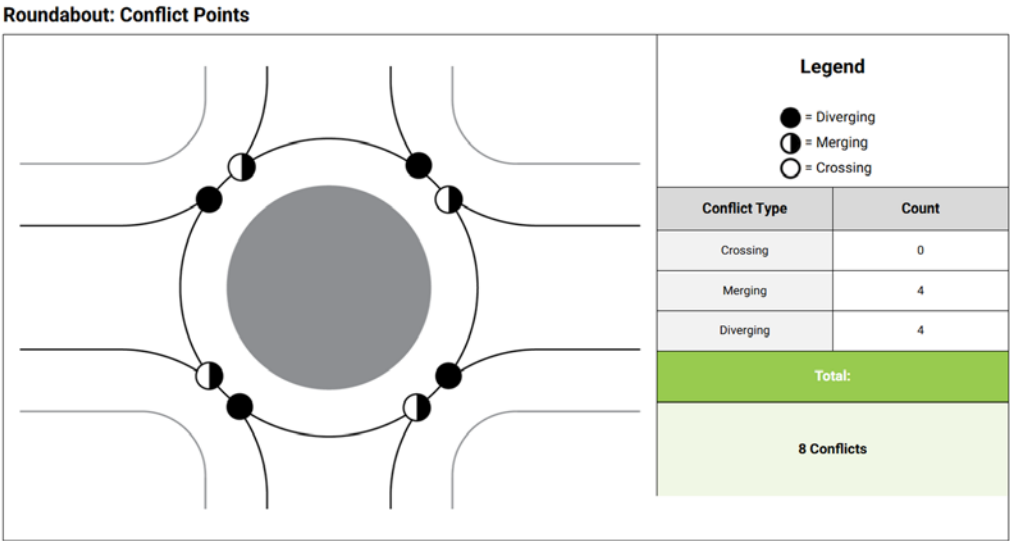
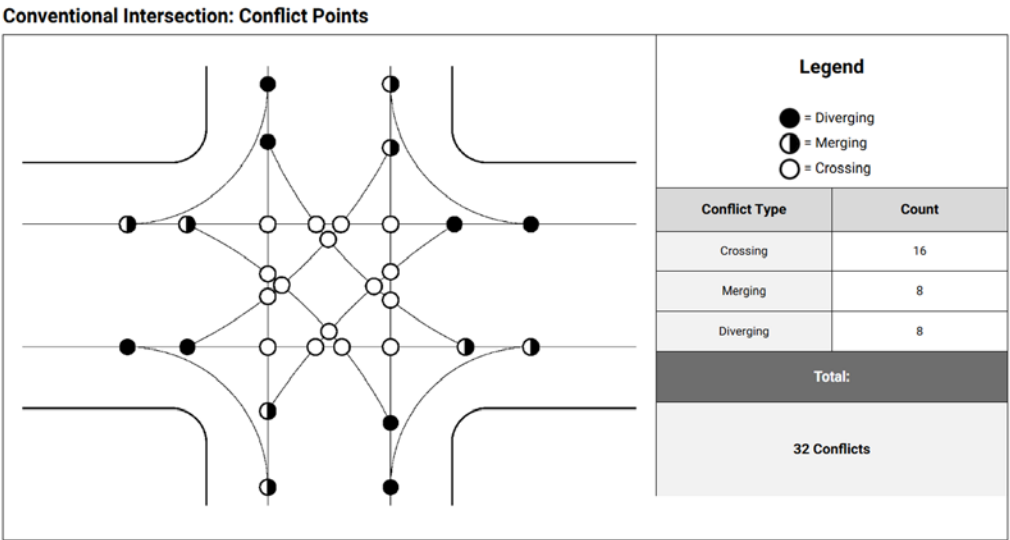


Space Constraints

If available right-of-way is limited, traffic signals do typically require less space than roundabouts. However, compact roundabout designs tailored to fit tighter intersections can be implemented and still provide safety benefits compared to traditional signals

Space Constraints

Busy intersections near schools, parks, and shopping centers raise concerns about pedestrian and cyclist safety in roundabouts. Roundabouts have been shown to reduce crash likelihood and severity for people walking and biking by slowing vehicle speeds and reducing conflict points. Features like splitter islands and clearly marked crosswalks allow pedestrians to cross one direction of traffic at a time, reducing exposure and improving visibility. Cyclists benefit from lower vehicle speeds and the option to either merge with traffic or use designated bike paths around the roundabout.



Source: Virginia Department of Transportation

Programmatic Countermeasures

Programmatic countermeasures include education, enforcement, and other strategies that influence crash likelihood and severity. *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, 11th Edition*, published by the National Highway Traffic Safety Administration (NHTSA) in 2023, served as a resource for the programmatic countermeasures presented in this section. Below is the effectiveness ratings based on NHTSA.

- ★★★★★

Demonstrated to be effective by several high-quality evaluations with consistent results
- ★★★★☆

Demonstrated to be effective in certain situations
- ★★★☆☆

Likely to be effective based on balance of evidence from high-quality evaluations or other sources
- ★★☆☆☆

Effectiveness still undetermined as different methods of implementation produce different results
- ★☆☆☆☆

Limited or no high-quality evaluation evidence

Public Health Partnerships on DUI Prevention

Description

Prevention and education policies focus on mobilizing and educating the community and intervening before driving under the influence takes place. According to NHTSA research, alcohol problem assessment and treatment programs, as well as alcohol intervention in settings such as a doctor’s office, are highly effective strategies for improving safety outcomes. Health departments could partner with partner agency police and sheriff departments to share information and conduct screenings.

Resources

Behavior Change Campaigns to Improve Traffic Safety Toolkit

Countermeasures that Work, 11th Edition

★★★★★

Cost: Varies

Crash History-Based Enforcement

Description

Called an Enforcement Priorities Mandate, use crash history and emphasis area corridors to direct enforcement efforts, with a focus on driving under the influence, distracted driving, and dangerous driving. This may require additional funding for California Highway Patrol, County Sheriff, and Local Police Departments.

Resources

Evidence-Based Behavior Change Campaigns to Improve Traffic Safety Toolkit (AAA Foundation, <https://aaafoundation.org/evidence-based-behavior-change-campaigns-to-improve-traffic-safety-toolkit/>)

Countermeasures that Work, 11th Edition

Effectiveness and cost information is not available for this countermeasure

Education & Public Awareness Campaigns Targeted at Speeding, Driving Under the Influence, and Increasing Awareness of People Walking and Biking

Description

Coordinating with public communications staff/public information officers from each jurisdiction to use existing social media accounts (e.g. Facebook, NextDoor, Twitter, etc.) can help establish an ongoing public education campaign focused on safe and responsible driving, discouraging drinking and driving, and increasing awareness of pedestrians and bicyclists. Campaigns could also involve collaborating with local radio station to disseminate safety messages in English, Spanish, and Punjabi.

Continue existing safety education campaign targeting safe speeds. This could include yard signs, wall boards/posters along high-injury corridors and neighborhoods, ads on bus exteriors, radio ads, etc. Safe Speeds is also applicable to those who bike and scooter. Potential partners include local Health Departments, community-based organizations like Blue Zones, local media outlets, and OTS Go Safely California Campaign.

Resources

The OTS Go Safely California campaign has free resources for local agencies to use in implementing public awareness campaigns.

★★★☆☆

Cost: \$\$\$

Pair Education with Engineering Countermeasures

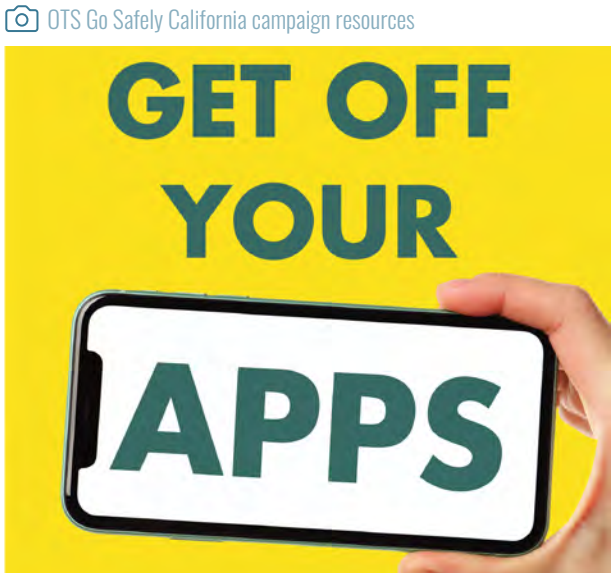
Description

Educational materials can be used to teach people how to use new and unfamiliar safety countermeasures, such as roundabouts or protected bikeways. These materials can consist of informational signs or demonstration videos, and should be presented in multiple languages, including English, Spanish, and Punjabi. The California Office of Traffic (OTS) has grants to support these educational campaigns.

Resources

City of Sacramento Bicycling videos: The City of Sacramento has used demonstration videos to engage residents in bicycling safety procedures. The videos feature a series of safety improvements such as protected bike lanes, bike boxes, and bike signals, and inform residents how to use these new roadway features, both as a bicyclist and a driver.

Effectiveness and cost information is not available for this countermeasure





High-Visibility Enforcement for DUI

Description

Deterrence policies, such as high visibility enforcement, focus on raising the actual and perceived risk of high-risk behaviors. County sheriffs and local police departments should implement high visibility enforcement for DUIs to deter and increase awareness of the risks of this behavior.

High visibility enforcement for driving under the influence, such as publicized sobriety checkpoints and saturation patrols, has been found to be effective to improve safety outcomes. Officers can focus their efforts along corridors with a history of speeding-related crashes since they must observe driving behavior on the road.

Integrated enforcement would include coordination with Public Awareness Campaigns. For example, widespread dissemination of multi-lingual educational messaging and promotion of safe rides home opportunities in advance of major DUI enforcement efforts.

Resources

Massachusetts Saving Lives – Enforcement Strategies, <https://solutions.edc.org/solutions/prevention-solutions>

This program combines community engagement events, high-visibility enforcement including sobriety checkpoints, and media communication to discourage DUI.



Cost: \$\$



High-Visibility Enforcement for Other Key Issues

Description

In the High-Visibility enforcement model, law enforcement targets high-crash or high-violation locations for enhanced enforcement, and publicizes the enforcement widely to maximize general deterrence of key issues including speeding, cell phone use, and lack of yielding at pedestrian crossings. If done well, such a campaign should be perceived as fair, as drivers are being put on notice that the enforcement is occurring, and that it is being done to improve safety. The objective is to convince the driving public that speeding is likely to be detected and therefore not worth the risk of receiving fines, points, or other punishment. Enforcement actions for violations should be consistent with local and State statutes, and taken in the interest of preventing traffic crashes.

Effective communications and outreach have long been deemed an essential part of successful enforcement programs. Key objectives of these communications are to provide information about the program and expected safety benefits, to incorporate public input, and to increase community support.



Cost: \$\$\$



Safe Ride Home Program

Description

Develop partnerships between the partner agencies' public works and police departments, Transportation Network Company (TNC) operators, and local businesses to offer promotional codes for free or discounted rides home from establishments or events throughout the reservation to reduce the potential for DUI, drowsy driving, or distracted driving. This program could be especially important during weekends, holidays, and other special events.

Resources

Portland Bureau of Transportation Safe Ride Home Program, <https://www.portlandoregon.gov/transportation/76611>

PBOT partnered with the Portland Police Bureau, TriMet, Old Town Hospitality Group, and Portland cab companies Radio Cab, Broadway Cab, New Rose City Cab and United Independent Cab, as well as transportation network companies Lyft and Uber to provide promo codes for discounted rides. The program is funded by a 50-cent fee charged for every taxi and TNC ride in Portland.



Cost: \$\$



Safe Route to School Program

Description

Safe Routes to School (SRTS) programs aim to create safer, more accessible options for children to walk and bike to school. Per the US Department of Transportation, 10% to 14% of all car trips during the morning rush hour nationwide are for school-related traffic, emphasizing the need for safer travel environments. Beyond safety, encouraging active travel supports healthier lifestyles and can contribute to better student well-being and academic performance.

SRTS programs achieve these outcomes through a combination of infrastructure and programmatic strategies. Infrastructure improvements, such as sidewalks, crosswalks, and traffic calming, reduce collision risk and make walking and biking more comfortable. Complementary education, enforcement, and encouragement activities promote safe travel behaviors and build community support.

Resources

Countermeasures that Work, 11th Edition
Yuba City Safe Routes to School Plan
FHWA Safe Routes to School Online Guide, <http://guide.saferoutesinfo.org/>



Cost: \$\$



Speed Limit Modification

Description

California Assembly Bill (AB) 43 was passed in 2021 to provide a means to lower speed limits on corridors that meet certain criteria. AB 43 focused on giving local jurisdictions more flexibility in setting speed limits, especially regarding vulnerable road users:

- Speed Limit Reduction: Reduction of additional 5 mph based on several factors, including designation of Safety Corridors, as described in Chapter 3
- Prima Facie Speed Limits: Options for 15 and 25 mph in certain areas such as school zones depending on context
- Business Activity Districts: Option for 20 or 25 mph speed limits



Cost: \$



Automated Enforcement

Description

Automated enforcement, such as red-light cameras or speed cameras, target the specific drivers who are behaving dangerously. Such enforcement is already allowed in all of or at least in several cities in California. Automated speed detection devices can identify speeding violations and provide citations. Such enforcement is currently allowed on a pilot basis in six cities in California and may be allowed to be implemented in all cities in the future.

A strictly data-driven approach to automated enforcement might place red-light or speed cameras in locations with the highest number of crashes. However, given that many low-income neighborhoods have historically received fewer infrastructure investments, which often results in a higher rate of crashes, this approach could lead to a disproportionate burden of enforcement. Therefore, automated enforcement should be implemented evenly across a jurisdiction at problem locations.



Cost: Varies