Proven Safety Countermeasures (PSC)

Strategies	Description	Broad Category	Secondary Category	Online Resources / PSC Information	Guidance Notes (countermeasure percent, priorities, equity concerns, local initiatives, etc.)
Adequate Lighting	Increase visibility for all road users, especially at crossings and intersections. Ensure adequate illuminance levels and continuous lighting along roadway segments.	Design and Engineering	Roadways	https://highways.dot.gov/safety/proven-safety-countermeasures/lighting	Lighting can reduce crashes up to 42% for nighttime injury pedestrian crashes at intersections. 33-38% for nighttime crashes at rural and urban intersections. 28% for nighttime injury crashes on rural and urban highways. High concern for vulnerable communities along mixed use corridors.
Appropriate Speed Limits for All	Review current speed limits by looking at a range of factors such as pedestrian and bicyclist activity, land use context, and intersection and driveway density and establish non-statutory speed limits and designate reduced speed zones.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/appropriate-speed-limits-all-road-users	Systemwide process for reevaluating how speed limits are being set. Traffic fatalities in Seattle decreased 26% after the city implemented city-wide speed management strategies and countermeasures, including setting speed limits on all non-arterial streets at 20 mph and 200 miles of arterial streets at 25 mph.
Backplates with Retroreflective Borders	Use backplates for Signal Heads that have retroreflective borders making them more visible and conspicuous. Also supports better orientation for older and color vision deficient drivers.	Design and Engineering	Intersections	https://highways.dot.gov/safety/proven-safety-countermeasures/backplates-retroreflective-borders	15% reduction in total crashes. Low cost application.
Bicycle Lanes / Buffered Bicycle Lanes	Provide dedicated, on-road space for bicycling. Buffered lanes provide dedicated on-road space for bicycling with additional marked space between vehicles and bicyclists.	Design and Engineering	Bicyclists	https://highways.dot.gov/safety/proven-safety-countermeasures/bicycle-lanes	Bicycle Lane additions can reduce crashes up to 49% for total crashes on urban 4-lane undivided collectors and local roads and 30% for total crashes on urban 2-lane undivided collectors and local roads. See MRMPO Long Range Bicycle System recommendations or local bike / trail plan.
Bicycle Lanes: Separated	On road space for bicyclists that include a separated bicycle lane delineated with flexible posts or other barriers. Sometimes called Protected.	Design and Engineering	Bicyclists	https://www.arlingtonva.us/Government/Programs/Transportation/Vision-Zero/Tools-and-Guidelines/Multimodal-Safety-Engineering-Toolbox-Web-Format/Separated-Bicycle-Facilities	Converting traditional or flush buffered bicycle lanes to a separated bicycle lane with flexible delineator posts can reduce crashes up to 53%. See MRMPO Long Range Bicycle System recommendations or local bike / trail plan.
Corridor Access Management	Design, application, and control of entry and exit points along a roadway, including other intersections and driveways. Ensure enhanced safety for all modes that facilitates walking and biking.	Design and Engineering	Roadways	https://highways.dot.gov/safety/proven-safety-countermeasures/corridor-access-management	Reducing driveway density 5-23% reduction in total crashes along 2-lane rural roads. 25-31% reduction in fatal and injury crashes along urban/suburban arterials. Reduce driveway density. Manage spacing of intersection and access points. Limit allowable movements at driveways. Place driveways on an intersection approach corner rather than a receiving corner. Utilize designs such as roundabouts or reduced left-turn conflicts. Use lower speed one-way or two-way off-arterial circulation roads.
Crosswalk Visibility Enhancements	Increase visibility at crosswalks with lighting, signing, and pavement markings such as bar pairs, continental or ladder crosswalk patterns.	Design and Engineering	Pedestrians / Bicyclists	https://highways.dot.gov/safety/proven-safety-countermeasures/crosswalk-visibility-enhancements	High-visibility crosswalks can reduce pedestrian injury crashes up to 40%. Intersection lighting can reduce pedestrian crashes up to 42%. Advance yield or stop markings and signs can reduce pedestrian crashes up to 25%. Prioritize locations based on crash data analyses (like the HFIN) and the location of vulnerable communities.

Curb Extension / Bulb-out	Extensions of the sidewalk or curb line into the parking lane to narrow roadway width.	Design and Engineering	Pedestrians	https://www.arlingtonva.us/Government/Programs/Transportation/Vision-Zero/Tools-and-Guidelines/Multimodal-Safety-Engineering-Toolbox-Web-Format/Curb-Extensions-and-Modifications	An official CMF has not yet been determined; initial research indicates this treatment may be effective at increasing driver yielding and improving pedestrian safety (Johnson et al. 2005; Thomas et al., 2016).
Daylighting	Removes / prevents parking right at the intersection (typically 20' of the intersection). Improves visibility of people crossing the street and also for drivers to safely see if there's oncoming traffic when making a turn.	Design and Engineering	Intersections	https://www.strongtowns.org/journal/2023/11/24/how-to-daylight-your-citys-intersections-and-why-it-matters	30% for vehicle-pedestrian crashes (Gan et al. 2005).
Dedicated Left- and Right-Turn Lanes at Intersections	Turn lanes that provide physical separation between slower turning traffic with adjacent through traffic.	Design and Engineering	Intersections	https://highways.dot.gov/safety/proven-safety-countermeasures/dedicated-left-and-right-turn-lanes-intersections	Left-Turn Lane 28-48% reduction in total crashes. Positive Offset Left-Turn Lanes 36% reduction in fatal and injury crashes. Right-Turn Lanes 14-26% reduction in total crashes.
Enhanced Delineation for Horizontal Curves	A variety of strategies that can warn drivers of a change in roadway direction that can be implemented in advance of or within curves, such as chevrons or retroreflective signs.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/enhanced-delineation-horizontal-curves	Chevron Signs 25% reduction in night-time crashes, 16% reduction in non-intersection fatal and injury crashes. Oversized Chevron Signs 15% reduction in fatal and injury crashes. Sequential Dynamic Chevrons 60% reduction in fatal and injury crashes. In-Lane Curve Warning Pavement Markings 35-38% reduction in all crashes. New Fluorescent Curve Signs or Upgrade Existing Curve Signs to Fluorescent Sheeting 18% reduction in non-intersection, head-on, run-off-road, and sideswipe in rural areas. Priority strategy in areas with multiple roadway departures. Many of these are in rural areas.
Hardened Centerlines and Turn Wedges	Hardened centerlines are flexible delineator posts or raised speed humps at an intersection to block the diagonal path through the intersection and encourage drivers to turn left at a slower speed. Turn wedges include pavement markings wedged between the sides of perpendicular crosswalks at an intersection to reduce turning speeds and encourage driver yielding.	Design and Engineering	Speed Management	https://www.arlingtonva.us/Government/Programs/Transportation/Vision-Zero/Tools-and-Guidelines/Multimodal-Safety-Engineering-Toolbox-Web-Format/Hardened-Centerlines-and-Turn-Wedges	46% for all crashes at raised medians (Bahar et al. 2007). Can be constructed rapidly and inexpensively using markings and flexible delineators. The turning radius of trucks and buses should be considered when installing turn wedges.
Hawk Signals / Pedestrian Hybrid Beacons	A traffic control device designed to help pedestrians (and bicyclists) safely cross higher-speed roadways at midblock crossings and uncontrolled intersections.	Design and Engineering	Pedestrians / Bicyclists	https://highways.dot.gov/safety/proven-safety-countermeasures/pedestrian-hybrid-beacons	55% reduction in pedestrian crashes. 29% reduction in total crashes. 15% reduction in serious injury and fatal crashes. PHBs are used where it is difficult for pedestrians to cross a roadway, such as when gaps in traffic are not sufficient or speed limits exceed 35 miles per hour. They are very effective at locations where three or more lanes will be crossed or traffic volumes are above 9,000 annual average daily traffic.

Leading Pedestrian Interval (LPI)	Provide pedestrians with a head start when entering an intersection.	Design and Engineering	Pedestrians	https://highways.dot.gov/safety/proven-safety-countermeasures/leading-pedestrian-interval	13% reduction in pedestrian-vehicle crashes at intersections. Reduces conflicts between pedestrians and bicyclists from vehicular turning movements. Costs for implementing LPIs are very low when only signal timing alteration is required, but can be costly when the hardware is not already available.
Left-Turn Conflict Reduction	Improved geometric design at intersections that reduce the number of severe crashes associated with left-turn movements. Highly effective designs include U-turns to complete certain left-turn movements such as the Restricted Crossing U-turn (RCUT) or the Median U-turn (MUT).	Design and Engineering	Intersections	https://highways.dot.gov/safety/proven-safety-countermeasures/reduced-left-turn-conflict-intersections	Two-Way Stop-Controlled to RCUT 54% reduction in fatal and injury crashes. Signalized Intersection to Signalized RCUT 22% reduction in fatal and injury crashes. Unsignalized Intersection to Unsignalized RCUT 63% reduction in fatal and injury crashes. MUT 30% reduction in intersection-related injury crash rate. The RCUT is suitable for and adaptable to a wide variety of circumstances, ranging from isolated rural, high-speed locations to urban and suburban high-volume, multimodal corridors. It is a competitive and less costly alternative to constructing an interchange.
Longitudinal Rumble Strips and Stripes	Milled or raised elements on the pavement intended to alert drivers that their vehicle has left the travel lane. Rumble strips are markings placed over the rumble strips.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/longitudinal-rumble-strips-and-stripes-two-lane-roads	Center Line Rumble Strips 44-64% reduction in head-on fatal and injury crashes on two-lane rural roads. Shoulder Rumble Strips 13-51% reduction in single vehicle, run-off-road fatal and injury crashes on two-lane rural roads. Rumble strips are relatively low-cost, and economic analyses have indicated benefit / cost ratios that exceed 100.
Median Barriers	Longitudinal barriers that separate opposing traffic on a divided highways to reduce cross median crashes. Includes metal-beam guard rails, concrete and cable barriers.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/median-barriers	8% of all fatalities on divided highways are due to head-on crashes. Median Barriers Installed on Rural Four-Lane Freeways 97% reduction in cross-median crashes. Potential risk factors include: Traffic volumes. Vehicle classifications. Median crossover history. Crash incidents. Vertical and horizontal alignment. Median terrain configurations.
Medians and Pedestrian Crossing Islands	Pedestrian safety islands or refuges decrease pedestrian exposure in the intersection or when crossing the road.	Design and Engineering	Pedestrians	https://highways.dot.gov/safety/proven-safety-countermeasures/medians-and-pedestrian-refuge-islands-urban-and-suburban-areas	Median with Marked Crosswalk 46% reduction in pedestrian crashes. Pedestrian Refuge Island 56% reduction in pedestrian crashes. Highly recommended where pedestrians must cross multiple lanes of traffic in one direction.
Paved Shoulders	Paved area of a roadway between the travel lane and the edge of pavement. Provided for accommodation of stopped vehicles for emergency use, and for bicyclists, pedestrians, or wheelchair use typically on rural roadways.	Design and Engineering	Pedestrians / Bicyclists	https://highways.dot.gov/safety/proven-safety-countermeasures/walkways	Paved Shoulders 71% reduction in crashes involving pedestrians walking along roadways. High priority for rural areas.

Pavement Friction Management	Monitoring and maintaining pavement friction at locations where vehicles are frequently turning, slowing and stopping. Pavement friction produces vibration and sound to prevent roadway departure, intersection and pedestrian involved crashes.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/pavement-friction-management	High Friction Surface Treatment can reduce crashes up to 63% for injury crashes at ramps, 48% for injury crashes at horizontal curves, and 20% for total crashes at intersections. Horizontal curves. Interchange ramps. Intersection approaches. Higher-speed signalized and stop-controlled intersections. Steep downward grades. Locations with a history of rear-end, failure to yield, wet-weather, or red-light-running crashes. Crosswalk approaches
Raised Crosswalks	Crosswalks that are elevated above roadway pavement in the form of an elongated speed hump with a flat section in the middle and at-grade with adjacent sidewalks.	Design and Engineering	Pedestrians / Bicyclists	https://www.arlingtonva.us/Government/Programs/Transportation/Vision-Zero/Tools-and-Guidelines/Multimodal-Safety-Engineering-Toolbox-Web-Format/Speed-Humps-Raised-Crossings-and-Similar-Raised-Areas	45% for pedestrian crashes (Elvik et al. 2004). 51% for bicycle-vehicle crashes on entrances or exits to streets and driveways (Schepers et al. 2011). Raised crosswalks are typically installed on 2-lane or 3-lane roads with speed limits of 30 mph or less and annual average daily traffic (AADT) below about 9,000.
Rectangular Rapid Flashing Beacons (RRFBs)	RRFBs flash with an alternating high frequency when activated to enhance awareness of pedestrians at the crossing to drivers. Increases driver yielding to pedestrians and bicyclists (or equines) at uncontrolled crossings.	Design and Engineering	Pedestrians / Bicyclists	https://highways.dot.gov/safety/proven-safety-countermeasures/rectangular-rapid-flashing-beacons-rrfb	The RRFB is applicable to many types of pedestrian crossings but is particularly effective at multilane crossings with speed limits less than 40 miles per hour.
Roadway Reconfigurations / Road Diets, BAT, and Lane Diets	Reduce the speed of traffic, crossing distances, and/or provide additional space for other uses of the roadway such as bicycle lanes or parking, transit lanes, and narrowing travel lanes.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/road-diets-roadway-reconfiguration	4-Lane to 3-Lane, Road Diet Conversions result in 19-47% reduction in total crashes. Low cost application that can be done along with pavement maintenance. See MRMPO's Potential Road Diet Candidates map.
Roundabouts	An intersection with a circular configuration that reduces vehicle speed and minimizes conflict points.	Design and Engineering	Intersections	https://highways.dot.gov/safety/proven-safety-countermeasures/roundabouts	Signalized Intersection to a Roundabout 78% reduction in fatal and injury crashes.
SafetyEdgeSM	This technology shapes the edge of the pavement at approximately 30 degrees from the pavement cross slope. Particularly useful for rural road crashes involving edge drop-offs because they are 2-4 times more likely to include a fatality than other crashes on similar roads.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/safetyedgesm	11% reduction in fatal and injury crashes. 21% reduction in run-off road crashes. 19% reduction in head-on crashes. Benefit-Cost Ratio Range 700:1 to 1,500:1.Systemwide on all new asphalt paving and resurfacing projects where curbs and/or guardrail are not present, while also encouraging standard application for concrete pavements.
Sidewalks / Walkways	Defined pathway adjacent to the roadway for pedestrian travel or use of a wheelchair. Consider wide separation from vehicular traffic and providing facilities that are beyond ADA requirements.	Design and Engineering	Pedestrians	https://highways.dot.gov/safety/proven-safety-countermeasures/walkways	65-89% reduction in crashes involving pedestrians walking along roadways. Implement with ADA plan in systemic matter prioritized by safety needs and vulnerable communities.
Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections	A package of multiple low-cost countermeasures, including enhanced signing and pavement markings at a large number of stop-controlled intersections.	Design and Engineering	Intersections	https://highways.dot.gov/safety/proven-safety-countermeasures/systemic-application-multiple-low-cost-countermeasures-stop	10% reduction of fatal and injury crashes at all locations. 15% reduction of nighttime crashes at all locations. 27% reduction of fatal and injury crashes at rural intersections. 19% reduction of fatal and injury crashes at 2-lane by 2-lane intersections. Average Cost-Benefit Ratio 12:1.

Variable Speed Limits (VSLs)	VSLs use current roadway conditions like traffic speed, volumes, weather, and road surface conditions to determine appropriate speeds and display them to drivers.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/variable-speed-limits	VSLs can reduce crashes on freeways up to 34% for total crashes, 65% for rear-end crashes, 51% for fatal and injury crashes. Because humans are unlikely to survive high-speed crashes, VSLs reduce speeds so that human injury tolerances are accommodated in three ways: improving visibility, providing additional time for drivers to stop, and reducing impact forces.
Wider Edge Lines	Marking a wider roadway edge line to increase visibility to drivers. Potential risk factors for two-lane rural roads include Pavement and shoulder widths, Presence of curves, Traffic volumes, and History of nighttime crashes.	Design and Engineering	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/wider-edge-lines	Wider edge lines can reduce crashes up to 37% for non-intersection, fatal and injury crashes on rural, two-lane roads. Benefit-Cost Ratio is 25:1 for fatal and serious injury crashes on two-lane rural roads. 22% for fatal and injury crashes on rural freeways.
Local Road Safety Plans	Developing a plan that analyzes and prioritizes safety improvements on local roads. Particularly of importance in neighborhoods and rural areas.	Policies and Programs	Planning / Engineering	https://highways.dot.gov/safety/proven-safety-countermeasures/local-road-safety-plans	25% reduction in county road fatalities in Minnesota. 17% reduction in fatal and serious injury crashes on county-owned roads in Washington State. 35% reduction in severe curve crashes in Thurston County, WA.
Road Safety Audits	Conduct RSAs in key locations based on public feedback and crash data analysis. Consider prioritizing these in vulnerable communities.	Policies and Programs	Planning / Engineering	https://highways.dot.gov/safety/proven-safety-countermeasures/road-safety-audit	Road Safety Audits can result in a 10-60% reduction in total crashes.
Mobile Automated Speed Cameras	A portable system that uses a camera and a speed measurement device to detect and capture images of vehicles travelling in excess of the speed limit. It may also include other offenses such as running through a red light or unauthorized use of a bus lane.	Traffic Technologies	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/speed-safety-cameras	Mobile units can reduce crashes on urban principal arterials up to 20% for fatal and injury crashes. Automated traffic enforcement supports the objective of consistent and unbiased enforcement of speeding, red light running and other traffic violations without regard to driver race or socioeconomic status. However, choosing locations for camera enforcement should include members of the BIPOC community.
Speed Cameras	A camera which may be mounted beside or over a road or installed in an enforcement vehicle or mobile device to detect speeding, vehicles going through a red traffic light, and other offenses.	Traffic Technologies	Speed Management	https://highways.dot.gov/safety/proven-safety-countermeasures/speed-safety-cameras	Fixed units can reduce crashes on urban principal arterials up to 54% and 47% for injury crashes. P2P units (multiple angles) can reduce crashes on urban expressways, freeways, and principal arterials up to 37% for fatal and injury crashes. In New York City, fixed units reduced speeding in school zones up to 63% during school hours. Automated traffic enforcement supports the objective of consistent and unbiased enforcement of speeding, red light running and other traffic violations without regard to driver race or socioeconomic status. However, choosing locations for camera enforcement should include members of the BIPOC community.
Yellow Change Intervals	Adequate timing on yellow signal following a green signal. Appropriately timed yellow change intervals can reduce red-light running and improve overall intersection safety.	Traffic Technologies	Intersections	https://highways.dot.gov/safety/proven-safety-countermeasures/yellow-change-intervals	Yellow Change Intervals can result in a 36-50% reduction in red-light running, 8-14% reduction in total crashes, and 12% reduction in injury crashes.