Signalized Intersection Countermeasures

Reference Image	Countermeasures	Details	
	Add intersection lighting	Crash Type	Night
	Includes the installation of new streetlights, upgraded lighting fixtures, or the enhancement of existing lighting to improve visibility for all road users at intersections. This may involve increasing the number of luminaires, improving lighting levels, or adjusting lighting patterns to enhance visibility and safety for all road users.	CRF	40%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Improve signal hardware: lenses, back-plates with retroreflective borders, mounting, size, and number	Crash Type	All
	Includes New LED lighting, signal back plates, retro-reflective tape outlining the back plates, or visors to increase signal visibility, larger signal heads, relocation of the signal heads, or additional signal heads.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	Improve signal timing (coordination, phases, red, yellow, or operation)	Crash Type	All
	Includes adding phases, lengthening clearance intervals, eliminating or restricting higher-risk movements, and coordinating signals at multiple locations.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High

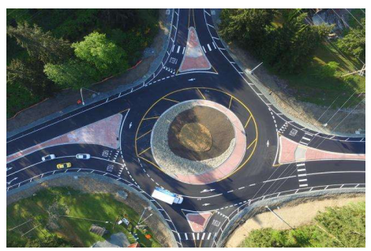
	Install emergency vehicle pre-emption systems	Crash Type	Emergency Vehicle
	Corridors that have a history of collisions involving emergency response vehicles. The target of this strategy is signalized intersections where normal traffic operations impede emergency vehicles and where traffic conditions create a potential for conflicts between emergency and nonemergency vehicles. These conflicts could lead to almost any type of crash, due to the potential for erratic maneuvers of vehicles moving out of the paths of emergency vehicles.	CRF	70%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install left-turn lane and/or add turn phase (signal has no left-turn lane or phase before)	Crash Type	All
	Intersections that do not currently have a left turn lane or a related left-turn phase that are experiencing a large number of collisions. Many intersection safety problems can be traced to difficulties in accommodating left-turning vehicles, in particular where there is currently no accommodation for left turning traffic. A key strategy for minimizing collisions related to left-turning vehicles (angle, rear-end, sideswipe) is to provide exclusive left-turn lanes and the appropriate signal phasing, particularly on high-volume and high-speed major-road approaches.	CRF	55%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Low
	Provide protected left turn phase (left turn lane already exists)	Crash Type	All
	Left turns are widely recognized as the highest-risk movements at signalized intersections. Providing Protected left-turn phases for signalized intersections with existing left turn pockets significantly improve the safety for left-turn maneuvers by removing the need for the drivers to navigate through gaps in oncoming/opposing through vehicles.	CRF	30%
		Expected Life (Years)	20
		Systemic Approach Opportunity	High
	Red light violation cameras	Crash Type	All
	A red light camera is a form of automated enforcement of traffic safety laws. Red light cameras photograph a vehicle's license plate if the driver fails to stop at a red light, and the vehicle owner or driver is sent a ticket. Red light cameras should be used to aid traditional enforcement efforts or in locations where traffic stops are impractical or unsafe.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A

	Convert signal to mast arm (from pedestal-mounted)	Crash Type	All
	Converting a signal to a mast arm from a pedestal-mounted base provides better visibility of intersection signs and signals that aid the drivers' advance perception of the upcoming intersection. Visibility and clarity of the signal should be improved without creating additional confusion or distraction for drivers.	CRF	30%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Improve pavement friction (High Friction Surface Treatments)	Crash Type	All
	Improving the skid resistance at locations with high frequencies of wet road collisions and/or failure to stop collisions.	CRF	55%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Medium
	Install raised median on approaches	Crash Type	All
	Raised medians next to left turn lanes at intersections offer a cost effective means for reducing collisions and improving operations at higher volume intersections.	CRF	25%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Convert intersection to roundabout	Crash Type	All
	For signalized intersections that have a significant crash problem, one alternative to change the nature of the intersection itself is to convert the intersection into a roundabout. Roundabouts can also be very effective at intersections with complex geometry and intersections with frequent left-turn movements.	CRF	Varies
		Expected Life (Years)	20
		Systemic Approach Opportunity	Low

	Install pedestrian countdown signal heads	Crash Type	P & B
	Installing pedestrian countdown signal heads at signalized pedestrian crossings with walk/don't walk indicators, particularly at locations with a history of pedestrian-vehicle collisions, provides pedestrians with a countdown of remaining crossing time, encouraging safer and more timely crossing decisions.	CRF	25%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Very High
	Accessible Pedestrian Signal (APS)	Crash Type	P & B
	Accessible pedestrian signals provide information in alternative formats such as verbal message, audible tones and vibrating surfaces to communicate information on the status of pedestrian crossing (Walk, Flashing Don't Walk, or Don't Walk) to people who are visually impaired. Speech messages and wayfinding tones aid in navigation to the pedestrian push button and to the far side of the street. Speech messages also aid sighted pedestrians by alerting them to the pedestrian signal indication changing from Don't Walk to Walk, reducing instances of late crossings. Messaging that includes street names aids in wayfinding and orientation.	CRF	45%
		Expected Life (Years)	15
		Systemic Approach Opportunity	Very High
	Install pedestrian crossing	Crash Type	P & B
	Signalized Intersections with no marked crossing and pedestrian signal heads, where pedestrians are known to be crossing intersections that involve significant turning movements. They are especially important at intersections with (1) multiphase traffic signals, such as left-turn arrows and split phases, (2) school crossings, and (3) double-right or double-left turns. At signalized intersections, pedestrian crossings are often safer when the left turns have protected phases that do not overlap the pedestrian walk phase.	CRF	25%
		Expected Life (Years)	20
		Systemic Approach Opportunity	High
	Pedestrian Scramble	Crash Type	P & B
	Pedestrian Scramble is a form of pedestrian "WALK" phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians/bicyclists to safely cross through the intersection in any direction, including diagonally. Pedestrian Scramble may be considered at signalized intersections with very high pedestrian/bicycle volumes, e.g. in an urban business district.	CRF	40%
		Expected Life (Years)	20
		Systemic Approach Opportunity	High

	Install advance stop bar before crosswalk	Crash Type	P & B
	Installing an advance stop bar before the crosswalk at signalized intersections with marked crossings, particularly where significant bicycle and/or pedestrian volumes are known to occur, helps to improve driver compliance with the red light and enhance pedestrian safety.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	Bicycle Turn Box	Crash Type	P & B
	A designated, painted box at signalized intersections that offers bicyclists a multi-stage process to safely and more visibly make a left turn across an intersection from a bike lane.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	Modify signal phasing to implement a Leading Pedestrian Interval (LPI)	Crash Type	P & B
		CRF	60%
	Addition of LPI gives pedestrians the opportunity to enter an intersection 3-7 seconds before vehicles are given a green indication; only minor signal timing alteration is required.	Expected Life (Years)	10
		Systemic Approach Opportunity	Very High

Non-signalized Intersection Countermeasures

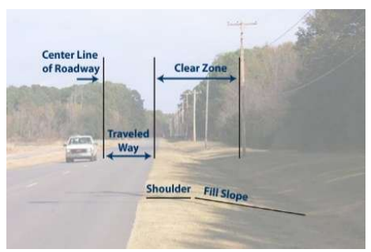
Reference Image	Countermeasures	Details	
	Convert to all-way STOP control (from 2-way or Yield control)	Crash Type	All
	Unsignalized intersection locations that have a crash history and have no controls on the major roadway approaches. However, all-way stop control is suitable only at intersections with moderate and relatively balanced volume levels on the intersection approaches. Under other conditions, the use of all-way stop control may create unnecessary delays and aggressive driver behavior.	CRF	50%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install signals	Crash Type	All
	Installing traffic signals at unsignalized intersections or locations with high traffic volumes and complex movements can improve traffic flow, reduce congestion, and enhance safety for all road users.	CRF	30%
		Expected Life (Years)	20
		Federal Funding Eligibility	90%
		Systemic Approach Opportunity	Low
	**Convert intersection to roundabout or mini roundabout**	Crash Type	All
	Intersections that have a high frequency of right-angle and left-turn type collisions. Whether such intersections have existing crash patterns or not, a roundabout provides an alternative to signalization. The primary target locations for roundabouts should be moderate-volume unsignalized intersections.	CRF	Varies
		Expected Life (Years)	20
		Systemic Approach Opportunity	Low

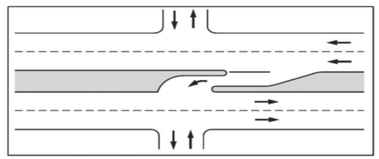
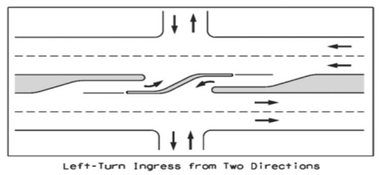
	Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	Crash Type	All
	Installing/upgrading larger or additional stop signs or other intersection warning/regulatory signs at or prior to intersections will enhance the ability of approaching drivers to perceive them, improving driver awareness and reducing the risk of collisions.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	Upgrade intersection pavement markings	Crash Type	All
	Upgrading intersection pavement markings, which typically includes the addition of "Stop Ahead" markings, centerlines, and stop bars, can improve driver guidance, reduce confusion, and enhance overall safety at the intersection.	CRF	25%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	Install Flashing Beacons at Stop-Controlled Intersections	Crash Type	All
	Flashing beacons can reinforce driver awareness of the Non-Signalized intersection control and can help mitigate patterns of right-angle collisions related to stop sign violations. Post-mounted advanced flashing beacons or overhead flashing beacons can be used at stop-controlled intersections to supplement and call driver attention to stop signs.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Improve sight distance to intersection (Clear Sight Triangles)	Crash Type	All
	Unsignalized intersections with restricted sight distance and patterns of collisions related to lack of sight distance where sight distance can be improved by clearing roadside obstructions without major reconstruction of the roadway.	CRF	55%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Medium

	Install splitter-islands on the minor road approaches	Crash Type	All
	The installation of a splitter island allows for the addition of a stop sign in the median to make the intersection more conspicuous.	CRF	40%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Install right-turn lane	Crash Type	All
	Many collisions at unsignalized intersections are related to right-turn maneuvers. A key strategy for minimizing such collisions is to provide exclusive right-turn lanes, particularly on high-volume and high-speed major-road approaches. When considering new right-turn lanes, potential impacts to non-motorized users should be considered and mitigated as appropriate.	CRF	20%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Low
	Install left-turn lane (where no left-turn lane exists)	Crash Type	All
	Many collisions at unsignalized intersections are related to left-turn maneuvers. A key strategy for minimizing such collisions is to provide exclusive left-turn lanes, particularly on high-volume and high-speed major-road approaches. When considering new left-turn lanes, potential impacts to non-motorized users should be considered and mitigated as appropriate.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Low
	Install raised medians / refuge islands	Crash Type	P & B
	Intersections that have a long pedestrian crossing distance, a higher number of pedestrians, or a crash history may benefit from the installation of raised medians/ refuge islands. Raised medians/refuge islands decrease the level of exposure for pedestrians and allow pedestrians to concentrate on (or cross) only one direction of traffic at a time.	CRF	45%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium

	Install pedestrian crossing at uncontrolled locations	Crash Type	P & B
	Installing pedestrian crossings at uncontrolled locations where pedestrians are known to cross intersections involving significant vehicular traffic, particularly at school crossings and intersections with right and/or left-turn pockets, improves pedestrian safety by providing designated crossing areas and enhancing driver awareness. The FHWA report "**Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations."** Provides additional detail on appropriate locations for this tool.	CRF	25%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)	Crash Type	P & B
		CRF	60%
	Installing/upgrading pedestrian crossings at uncontrolled locations with enhanced safety features, such as flashing beacons, curb extensions, advanced "stop" or "yield" markings, and other safety features, at locations where pedestrians are known to cross intersections with significant vehicular traffic, particularly at school crossings and intersections with turn pockets, improves pedestrian safety by providing designated crossing areas and enhancing driver awareness.	Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	Install Rectangular Rapid Flashing Beacon (RRFB)	Crash Type	P & B
	Rectangular Rapid Flashing Beacon (RRFB) includes pedestrian-activated flashing lights and additional signage that enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings. It uses an irregular flash pattern that is similar to emergency flashers on police vehicles. RRFBs are installed at unsignalized intersections and mid-block pedestrian crossings.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Install Pedestrian Signal (including Pedestrian Hybrid Beacon (HAWK))	Crash Type	P & B
		CRF	55%
	Intersections noted as having a history of pedestrian vs. vehicle collisions and in areas where the likelihood of the pedestrian presence is high. Corridors should also be assessed to determine if there are adequate safe opportunities for non-motorists to cross and if a pedestrian signal, or a Pedestrian Hybrid Beacon (PHB) (also called High-Intensity Activated crossWalK beacon (HAWK)) are needed to provide an active warning to motorists when a pedestrian is in the crosswalk.	Expected Life (Years)	20
		Systemic Approach Opportunity	Low

Roadway Segment Countermeasures

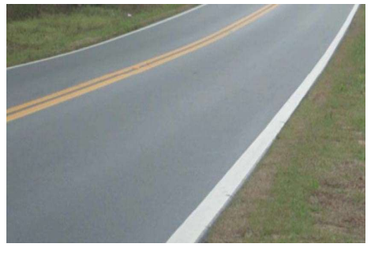
Reference Image	Countermeasures	Details	
	Add segment lighting	Crash Type	Night
	Adding segment lighting along roadways improves visibility for all road users, especially during nighttime and low-visibility conditions, enhancing safety and reducing the risk of collisions.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Install flashing beacons as advance warning	Crash Type	All
	Includes the installation of flashing beacons (e.g., yellow beacons, LED beacons) to alert drivers to an upcoming signalized intersection or stop sign. This provides drivers with increased visual cues, allowing for earlier identification of the upcoming intersection and improved reaction time.	CRF	30%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Medium
	Install pedestrian median fencing on approaches	Crash Type	P & B
	Signalized Intersections with high pedestrian-generators nearby (e.g. transit stops) may experience a high volumes of pedestrians J-walking across the travel lanes at mid-block locations instead of walking to the intersection and waiting to cross during the walk-phase.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Low
	**Remove or relocate fixed objects outside of Clear Recovery Zone**	Crash Type	All
	Removing or relocating fixed objects outside of the Clear Recovery Zone, such as utility poles, drainage structures, trees, and other fixed objects, from locations or roadway segments prone to collisions, including the outside of curves, end of lane drops, and within traffic islands, can significantly reduce the severity of run-off-road collisions. Where public right-of-way is limited, steps should be taken to request assistance from property owners, as appropriate.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	High

	Concrete Curb Extensions (Bulb-Outs)	Crash Type	All
	Concrete curb extensions, also known as bulb-outs or neckdowns, are safety features designed to improve visibility and reduce crossing distances at intersections and midblock crossings. By extending the curb line into the roadway, they narrow the travel lane, calm traffic, and shorten pedestrian exposure to moving vehicles. Curb extensions are especially effective in urban or downtown settings with high pedestrian activity, schools, or transit stops. They support complete streets principles by creating safer and more accessible intersections for all road users. These extensions enhance pedestrian safety by slowing vehicle speeds, improving sight lines between drivers and pedestrians, and providing additional space for signage, lighting, or stormwater management. Constructed from durable concrete, they require minimal maintenance and offer long service life.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
 	**Create directional median openings to allow (and restrict) left-turns and U-turns (S.I.)**	Crash Type	All
	Collisions related to turning maneuvers include angle, rear-end, pedestrian, and sideswipe (involving opposing left turns) type collisions. If any of these crash types are an issue at an intersection, restriction or elimination of the turning maneuver may be the best way to improve the safety of the intersection.	CRF	50%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Install Median Barrier	Crash Type	All
	Areas where crash history indicates drivers are unintentionally crossing the median and the cross-overs are resulting in high severity collisions. The installation of median barriers can increase the number of PDO and non-severe injuries. The net result in safety from this countermeasure is connected more to reducing the severity of collisions not the number of collisions.	CRF	25%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium

	Install Guardrail	Crash Type	All
	Guardrail is installed to reduce the severity of lane departure collisions. However, guardrail can reduce crash severity only for those conditions where striking the guardrail is less severe than going down an embankment or striking a fixed object. Guardrail should only be installed where it is clear that crash severity will be reduced, or there is a history of run-off-the-road collisions at a given location that have resulted in severe collisions.	CRF	25%
		Expected Life (Years)	20
		Systemic Approach Opportunity	High
	Install raised median	Crash Type	All
	Areas experiencing head-on collisions that may be affected by both the number of vehicles that cross the centerline and by the speed of oncoming vehicles. Installing a raised median is a more restrictive approach in that it represents a more rigid barrier between opposing traffic.	CRF	25%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Install median (flush)	Crash Type	All
	Areas experiencing head-on collisions that may be affected by both the number of vehicles that cross the centerline and by the speed of oncoming vehicles. Roadways with oversized lanes offer an opportunity to restripe the roadway to reduce the lanes to standard widths and use the extra width for the median.	CRF	15%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Add two-way left-turn lane	Crash Type	All
	Roadways having a high frequency of drivers being rear-ended while attempting to make a left turn across oncoming traffic. Also can be effective for drivers crossing the centerline of an undivided multilane roadway inadvertently.	CRF	30%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium

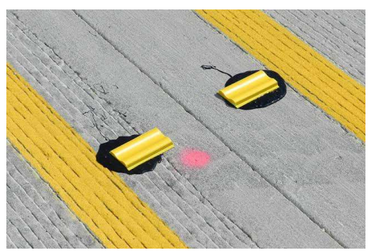
	Road Diet (Reduce travel lanes and add a two way left-turn and bike lanes)	Crash Type	All
	Areas noted as having a higher frequency of head-on, left-turn, and rear-end collisions with traffic volumes that can be handled by only 2 free flowing lanes. Using this strategy in locations with traffic volumes that are too high could result in diversion of traffic to routes less safe than the original four-lane design.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Widen shoulder	Crash Type	All
	Roadways that have a frequent incidence of vehicles leaving the travel lane resulting in an unsuccessful attempt to reenter the roadway. The probability of a safe recovery is increased if an errant vehicle is provided with an increased paved area in which to initiate such a recovery.	CRF	30%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Improve horizontal alignment (flatten curves)	Crash Type	All
	Roadways with horizontal curves that have experienced lane departure collisions as a result of a roadway segment having compound curves or a severe radius. This strategy should generally be considered only when less expensive strategies involving clearing of specific sight obstructions or modifying traffic control devices have been tried and have failed to ameliorate the crash patterns.	CRF	50%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Low

	Convert from two-way to one-way traffic	Crash Type	All
	One-way streets can offer improved signal timing and accommodate odd-spaced signals. One-way streets can simplify crossings for pedestrians, who must look for traffic in only one direction. While studies have shown that conversion of two-way streets to one-way generally reduces pedestrian collisions and the number of conflict points, one-way streets tend to have higher speeds which creates new problems.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Install/Upgrade signs with new fluorescent sheeting (regulatory or warning)	Crash Type	All
	Additional or new signage with fluorescent sheeting can address collisions caused by lack of driver awareness or compliance of roadway signing, especially at night.	CRF	15%
		Expected Life (Years)	10
		Federal Funding Eligibility	90%
		Systemic Approach Opportunity	Very High
	Install chevron signs on horizontal curves	Crash Type	All
	Installing chevron signs on roadways with an unacceptable level of collisions on relatively sharp curves during periods of light and darkness can improve driver awareness of upcoming curves and help prevent run-off-road collisions.	CRF	40%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	Install curve advance warning signs	Crash Type	All
	Installing curve advance warning signs, which may also include horizontal alignment and/or advisory speed warning signs, can improve driver awareness of upcoming curves and help prevent run-off-road collisions.	CRF	25%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High

	Install dynamic/variable speed warning signs	Crash Type	All
	Curvilinear roadways that have an unacceptable level of collisions due to excessive speeds on relatively sharp curves may benefit from the addition of dynamic/variable speed warning signs (also known as Radar Speed Feedback Signs).	CRF	30%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Vehicle Speed Feedback Sign	Crash Type	All
	With the goal of improving drivers speed compliance while making streets safe, vehicle speed feedback signs use radar to ascertain the speed of the vehicle and provide information through LED signs.	CRF	30%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install delineators, reflectors and/or object markers	Crash Type	All
	Installation of delineators, reflectors and/or object markers are intended to warn drivers of an approaching curve or fixed object that cannot easily be removed.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High
	**Install edge lines and centerlines**	Crash Type	All
	Any road with a history of run-off-road right, head-on, opposite-direction-sideswipe, or run-off-road-left collisions is a candidate for edge line or centerlines should be installed where the existing lane delineation is not sufficient to assist the motorist in understanding the existing limits of the roadway. Depending on the width of the roadway, various combinations of edge line and/or center line pavement markings may be the most appropriate.	CRF	25%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High

	Install centerline rumble strips/stripes	Crash Type	All
	Center Line rumble strips/stripes can be used on virtually any roadway – especially those with a history of head-on collisions.	CRF	20%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install edge line rumble strips/stripes	Crash Type	All
	Shoulder and edge line milled rumble strips/stripes should be used on roads with a history of roadway departure collisions.	CRF	15%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install bike lanes	Crash Type	P & B
	Installing bike lanes on roadway segments noted as having collisions between bicycles and vehicles, or collisions that may be preventable with a buffer/shoulder, can significantly improve bicycle safety and reduce the risk of these types of collisions.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	High
	Install Separated Bike Lanes	Crash Type	P & B
	Separated bike lanes are most appropriate on streets with high volumes of bike traffic and/or high bike-vehicle collisions, typically in an urban or suburban area. Separation types range from simple, painted buffers and flexible delineators, to more substantial separation measures including raised curbs, grade separation, bollards, planters, and parking lanes.	CRF	45%
		Expected Life (Years)	20
		Systemic Approach Opportunity	High

	Green Pavement for Bicycle Facilities	Crash Type	Bicycle
	This is an easy to maintain, cost effective measure, created with paint, epoxy, thermoplastic, or colored asphalt used to designate bike lanes, bike boxes, bike conflict zones or intersection crossings.	CRF	40%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install sidewalk/pathway (to avoid walking along roadway)	Crash Type	P & B
	Areas noted as not having adequate or no sidewalks and a history of walking along roadway pedestrian collisions. In rural areas asphalt curbs and/or separated walkways may be appropriate.	CRF	80%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	Mid-block Crosswalks	Crash Type	P & B
	When incorporated with a pedestrian refuge island and appropriate signage and advance warning, mid-block crossings may increase safety by decreasing random and unexpected pedestrian crossings while allowing drivers to predict and expect pedestrian traffic.	CRF	25%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Install raised pedestrian crossing	Crash Type	P & B
	Installing raised pedestrian crossings on lower-speed roadways where pedestrians are known to be crossing roadways involving significant vehicular traffic can improve pedestrian visibility, slow traffic, and reduce the risk of pedestrian-vehicle collisions.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium

	Install Rectangular Rapid Flashing Beacon (RRFB)	Crash Type	P & B
	Rectangular Rapid Flashing Beacon (RRFB) includes pedestrian-activated flashing lights and additional signage that enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings. RRFB uses an irregular flash pattern that is similar to emergency flashers on police vehicles. RRFBs can be installed at unsignalized intersections and mid-block pedestrian crossings.	CRF	35%
		Expected Life (Years)	20
		Systemic Approach Opportunity	Medium
	**Install raised pavement markers and striping**	Crash Type	All
	When drivers approach and traverse through complex intersections, drivers may be required to perform unusual or unexpected maneuvers, so adding raised pavement markings and striping can guide motorists through complex intersections safely.	CRF	10%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Very High

Additional Countermeasures

Reference Image	Countermeasures	Details	
	High-Visibility Crosswalk Markings	Crash Type	All
	High-Visibility Crosswalk Markings use distinctive patterns (like bar pairs, continental, or zebra stripes) to make pedestrian crossings more noticeable to drivers, increasing driver recognition distance and improving pedestrian safety.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Variable Speed Limits	Crash Type	All
	Speed limits are established with an engineering study based on inputs like traffic volumes, operating speeds, roadway characteristics, and crash history. However, conditions on the roadway are susceptible to change in a short amount of time (e.g., congestion, collisions, weather).	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Speed Safety Cameras	Crash Type	All
	Agencies can use Speed Safety Cameras (SSCs) as an effective and reliable technology to supplement traditional methods of enforcement, engineering measures, and education to help shift social norms around speeding. While the use of SSCs is currently limited in California, expanded implementation is anticipated pending approval and guidance from the California Transportation Commission.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A

	Appropriate Speed Limits for All Road Users	Crash Type	All
	There is broad consensus among global roadway safety experts that speed control is one of the most important methods for reducing fatalities and serious injuries. Speed is an especially important factor on non-limited access roadways where vehicles and vulnerable road users mix.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Reduced Speed School Zone	Crash Type	All
	Reduction in speed limits in school zones brings significant safety benefits by reducing vehicular speeds and fatal and injury collisions.	CRF	30%
		Expected Life (Years)	10
		Systemic Approach Opportunity	Medium
	Speed Cushions, Speed Humps and Speed Tables	Crash Type	All
	Speed tables are extended and wide speed humps with a flat top that may include a pedestrian crossing. Speed cushions are traffic calming devices that reduce vehicle speeds and can be speed humps or speed tables with wheel cutouts for large vehicles. They are often used on emergency response routes.	CRF	30%
		Expected Life (Years)	10
		Systemic Approach Opportunity	High
	Green Bollards for Intersection Visibility	Crash Type	All
	Green bollards are vertical posts installed near intersections to improve visibility, safety, and delineation. They serve as visual cues for both drivers and pedestrians, clearly marking roadway edges, pedestrian crossings, and restricted areas. The use of green color enhances visibility and indicates environmental or safety-related zones, aligning with sustainable streetscape design principles. These bollards help reduce conflicts at intersections by guiding vehicle movement, protecting vulnerable users such as pedestrians and cyclists, and improving overall traffic control. They can be made from durable, flexible materials that withstand impact while minimizing maintenance costs.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	High

	Educational Campaign	Crash Type	All
	Create and actively implement a branding, promotional, and educational campaign for safe systems approach to enhance knowledge and understanding of its principles. Work together with community organizations to distribute materials, spread messages, and organize public events that promote active transportation and transit as responsible choices.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Safe Routes to School Program	Crash Type	All
	Expand the Safe Routes to School Program to include safe systems approach training material for students, parents and teachers.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Rapid Response Safety Communication Protocol	Crash Type	All
	Create a Rapid Response Safety Communication Protocol for safe systems approach. Implement a communication plan that addresses recent severe and fatal collisions, with a specific focus on promoting traffic safety and health-conscious behaviors to the community.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Safe Routes Programs	Crash Type	All
	Implement additional Safe Routes educational programming to include Safe Routes to Parks, Safe Routes for Seniors and Safe Routes for People with Disabilities to prioritize vulnerable population.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A

	Community Partnership	Crash Type	All
	Partner with School District to distribute targeted safety messaging for students and employees.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Share the Road Awareness Program	Crash Type	All
	Create a Share the Road Awareness Program for motorists, bicyclists and pedestrians that is easily accessible.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Alcohol Use Disorder (AUD) Assessment & Treatment Programs	Crash Type	All
	Long-term, tailored, and specialized treatment programs can serve as an opportunity to assess drinking habits and refer them for brief interventions or specialized treatment.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	High Visibility Enforcement	Crash Type	All
	Direct traffic enforcement efforts to prioritize the most critical high-injury corridors identified in the safe systems approach. Concentrate enforcement activities in areas of City where engineering and educational initiatives have already been implemented.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A

	Traffic Safety Diversion Program	Crash Type	All
	Design a traffic safety diversion program specifically for bicycle and pedestrian traffic violations, with the primary goal of facilitating access to safety courses and programs centered on biking and walking.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
	Educational Initiatives over Citations	Crash Type	All
	Prioritize educational initiatives while issuing citations during traffic enforcement by actively seeking opportunities to provide educational resources.	CRF	N/A
		Expected Life (Years)	N/A
		Systemic Approach Opportunity	N/A
		Expected Life (Years)	20
		Systemic Approach Opportunity	N/A