



ACTIVE TRANSPORTATION PLAN

Technical Memorandum IV: Bicycle Facility Types & Related Standards

Updated April 2024



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2024 UPDATE

The 2020 Forward Pinellas Active Transportation Plan (ATP) created a facility guide for infrastructure, crossing treatment, and traffic signal features related to bicycle and pedestrian facilities. The facility guide also included neighborhood bikeway features and traffic calming.

As part of the 2024 Active Transportation Plan update, the facility guide treatments were updated to align with best practices and reflect national design standards that have been released since the 2020 ATP, including the Public Right-of-Way Accessibility Guidelines (PROWAG) released in September of 2023 and the Manual on Uniform Traffic Control Devices (MUTCD) 11th Edition released in December 2023. The 2024 ATP facility guide also added the following bicycle and pedestrian treatments: accessible pedestrian signal (APS), directional curb ramps, adequate nighttime lighting levels, exclusive pedestrian phase / pedestrian scramble, appropriate speed limits for all road users, and lane repurposing.

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Bicycle/Pedestrian Infrastructure Types

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
BIKE LANE			
	<ul style="list-style-type: none"> • Portion of the street designated for preferential use by bicyclists. • One-way facilities that typically carry bicycle traffic in the same direction as adjacent motor vehicle traffic on the left or right side of the street. • Used in locations with limited right-of-way, lower travel speeds and volume. 	<ul style="list-style-type: none"> • Provide dedicated space for bicyclists to ride separated from vehicular traffic. • Reduces stress caused by acceleration and operating speed differentials between bicyclists and motorists. • Approved for use within Manual On Uniform Traffic Control Devices (MUTCD). 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: Federal Highway Administration (FHWA) Bikeway Selection Guide, National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide, Florida Department of Transportation (FDOT) Design Manual (FDM), MUTCD</p>			
BUFFERED BIKE LANE			
	<ul style="list-style-type: none"> • Created by painting a flush buffer zone between a bike lane and the adjacent travel lane. • Buffers may also be provided between bike lanes and parking lanes to demarcate the door zone and discourage bicyclists from riding closely next to parked vehicles. • Used in locations where separation between active travel lanes and/or parked cars is needed. 	<ul style="list-style-type: none"> • Provides a warning for motorists and bicyclists that the street is multi-purpose. • Buffered bike lanes increase the riding comfort for bicyclists as they increase separation from vehicular traffic and/or parked vehicles. • Approved for use within MUTCD. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: FHWA Bikeway Selection Guide, NACTO Urban Bikeway Design Guide, FDOT FDM, MUTCD</p>			
SHARROW/SHARED LANE MARKING			
	<ul style="list-style-type: none"> • Marking alerts road users to the lateral position bicyclists are likely to occupy within the traveled way to be most visible to drivers and to help avoid conflicts with parked cars. • Used in locations to connect adjacent bicycle facilities and along neighborhood bikeways. • Can provide wayfinding guidance for bicyclists. 	<ul style="list-style-type: none"> • Provide guidance to bicyclists and motorists in situations where separate bicycle facilities are not provided. • Encourages safer passing practices (including changing lanes, if necessary). • Encourages bicyclists to ride outside of the parked vehicle door zone. • Approved for use within MUTCD. 	<p>Low (<\$10,000)</p> 
<p>Guidance: FHWA Bikeway Selection Guide, NACTO Urban Bikeway Design Guide, FDOT FDM, MUTCD</p>			



Bicycle/Pedestrian Infrastructure Types

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
SEPARATED BIKEWAY (CYCLE TRACK / PROTECTED BIKEWAY)			
	<ul style="list-style-type: none"> Physically separated lane for bicycles using a vertical element within a buffer area such as bollards, parked vehicles, raised curbs, or landscaping/planters. Used in locations where physical protection and separation is required to improve bicyclist comfort. Also known as a cycle track or protected bikeway. 	<ul style="list-style-type: none"> Physical barrier provides added level of separation between travel lane and bicyclist, increasing bicyclist comfort and attracting a wider range of users. Combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. Approved for use within MUTCD. 	<p>High (>\$100,000)</p> 
<p><i>Guidance: FHWA Bikeway Selection Guide, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, FHWA Separated Bike Lane Planning & Design Guide, NACTO Urban Bikeway Design Guide, MUTCD</i></p>			
TRAIL (SHARED-USE TRAIL / MIXED-USE PATH)			
	<ul style="list-style-type: none"> Physically separated from motorized traffic by an open space or barrier within the right of way or within an independent right of way. Designed typically for two-way pedestrian and bicycle traffic. Often run parallel to roadways, following alignments through natural areas and parks and along corridors with limited crossings like waterfronts, creeks, and current/former railroad lines. 	<ul style="list-style-type: none"> Provides low-stress environment for bicycling and pedestrian activity away from roadway traffic. Can serve as arterials of the active transportation system for urban and suburban communities. Compared with other facility types, can be the most expensive to construct. 	<p>High (> \$100,000)</p> 
<p><i>Guidance: AASHTO Guide for the Development of Bicycle Facilities; FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts; NACTO Urban Street Design Guide; FDOT FDM</i></p>			
SIDEWALK			
	<ul style="list-style-type: none"> Continuous, paved walkway along the side of a road. Typically provided on all curbed roadways. Sidewalk width varies by context classification, normally five feet wide. Sidewalk grade typically mirrors roadway profile. 	<ul style="list-style-type: none"> Ideal to provide on both sides of roadway to optimize convenience for pedestrians, although some environments may be exempt or challenging due to available right of way. Focus sidewalk connections in major residential areas and activity generators including schools, recreation centers, libraries, transit areas, and other pedestrian heavy locations. 	<p>High (>\$100,000)</p> 
<p>Guidance: <i>FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, FDOT FDM, FDOT Traffic Engineering Manual (TEM)</i></p>			



Bicycle/Pedestrian Crossing Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
MARKED CROSSWALKS			
	<ul style="list-style-type: none"> • FDOT standard is high-emphasis markings. • Typically used at signalized, all-way stop-controlled intersections, and midblock crossing locations. • Designated pedestrian crossings should be considered at locations with pedestrian volumes greater than 20 per hour and/or with high vehicle-pedestrian collisions. 	<ul style="list-style-type: none"> • Driver compliance can be poor, especially at uncontrolled crossings; consider installing additional improvements to reduce vehicle speeds, shorten the crossing distance, or increase the likelihood of motorists stopping. 	<p>Low (<\$10,000)</p> 
<p>Guidance: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Street Design Guide, FDOT FDM, FDOT TEM</p>			
ADVANCED STOP BARS			
	<ul style="list-style-type: none"> • White stop bars are placed in advance of marked, uncontrolled crosswalks at crossing with Rectangular Rapid Flashing Beacons (see page 7). • Used to establish the location in which drivers should stop to pedestrian (used in conjunction with R1-5 "Stop Here For Pedestrians" sign). • Useful in areas where pedestrian visibility is low. 	<ul style="list-style-type: none"> • Increases the visibility between pedestrians and motorists. • Reduces the number of vehicles encroaching on the crosswalk when a pedestrian is present. • Helps reduce multiple threat crash typology where two lanes of traffic approach a crosswalk from the same direction and one driver stops for the pedestrian but the other does not due to limited visibility of the pedestrian caused by the first vehicle. 	<p>Low (<\$10,000)</p> 
<p>Guidance: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Street Design Guide</p>			
ACCESSIBLE PEDESTRIAN SIGNAL (APS)			
	<ul style="list-style-type: none"> • Audible and vibrotactile features that accompany a pedestrian signal head and indicate the walk interval to assist a person who is blind or has low vision in crossing the street. 	<ul style="list-style-type: none"> • Pedestrian push button must be located within a reach range accessible by someone seated in a wheelchair. • Pedestrian Right-of-Way Accessibility Guidelines (PROWAG) and MUTCD include standards for placement and spacing of APS. 	<p>Low (<\$10,000)</p> 
<p>Guidance: PROWAG, MUTCD</p>			



Bicycle/Pedestrian Crossing Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
IN-STREET PEDESTRIAN CROSSING SIGNS			
	<ul style="list-style-type: none"> Regulatory pedestrian signage posted on lane edge lines and road centerlines. Used to remind road users of laws regarding right of way at an unsignalized pedestrian crossing, especially midblock crossings. Typically installed on raised median island along single-lane streets. 	<ul style="list-style-type: none"> Highly visible to motorists and has a positive impact on pedestrian safety at crosswalks. Good driver compliance with stopping for pedestrians though compliance decreases on multi-lane streets. 	<p>Low ($< \\$10,000$)</p> 
Guidance: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations			
CURB EXTENSIONS / BULBOUTS			
	<ul style="list-style-type: none"> Consists of an extension of the sidewalk space into the street, narrowing the street at a pedestrian crossing. Considered at intersection and midblock locations where there is high crossing activity, and no travel lane conflicts. Typical application in locations with on-street parking. 	<ul style="list-style-type: none"> Shortens the distance pedestrians have to cross, decreasing pedestrian exposure time. Provides opportunity to increase the sidewalk space. Improves pedestrian visibility. Lowers vehicle turning speeds. Where applicable, allows for traffic control and warning devices to be placed closer to travel lane. Provides opportunity to store and treat stormwater runoff. 	<p>Medium ($\\$10,000$-$\\$100,000$)</p> 
Guidance: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, Institute of Transportation Engineers (ITE) Implementing Context Sensitive Design on Multimodal Throughfares, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Street Design, NACTO Urban Bikeway Design Guide, FDOT FDM			
REDUCED CURB RADII			
	<ul style="list-style-type: none"> The radius of a curb is reduced requiring motorists to make a tighter turn. Considered in locations with non-traditional intersection geometry or larger radii and minimal truck traffic. 	<ul style="list-style-type: none"> Shortens the distance pedestrians have to cross. Reduce traffic speeds and increase driver awareness (like curb extensions). Improves ADA ramp alignment and provides more sidewalk space. Improves traffic control device visibility. 	<p>High ($> \\$100,000$)</p> 
Guidance: ITE Implementing Context Sensitive Design on Multimodal Throughfares, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Street Design Guide, FDOT FDM			








Bicycle/Pedestrian Crossing Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
RAISED CROSSWALK AT CHANNELIZED RIGHT TURN			
	<ul style="list-style-type: none"> Marked crosswalks that are raised to slow driver turning speed and increase yielding compliance. Tighter angles in right turn channelization make crossing pedestrians more visible, slow down right turning vehicles, and make turns easier for drivers (don't have to turn their head as far to check for gaps in traffic). Used in locations with high bicycle/pedestrian activity combined with higher speed right turning vehicular traffic. 	<ul style="list-style-type: none"> Provide safety advantage to pedestrians with demonstrated increased yielding by drivers. Slows driver turning speeds. 	<p>Medium (\$10,000-\$100,000)</p>
Guidance: ITE Implementing Context Sensitive Design on Multimodal Thoroughfares, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts			
RAISED CROSSWALKS			
	<ul style="list-style-type: none"> Speed tables outfitted with crosswalk markings and signage to facilitate pedestrian crossings. Located at crosswalks to provide pedestrians with a level street crossing. Applied in locations where modal hierarchy is desired to promote better bicycling and pedestrian stopping compliance by drivers. 	<ul style="list-style-type: none"> Provide safer crossing for pedestrians. Channelize pedestrians to an enhanced crossing. Reduces excessive vehicular travel speeds. Improve pedestrian visibility and accessibility. 	<p>Medium (\$10,000-\$100,000)</p>
Guidance: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, NACTO Urban Bikeway Design Guide, FDOT Design Manual 2024			
RAISED INTERSECTIONS			
	<ul style="list-style-type: none"> Flat raised areas covering an entire intersection, with ramps on all approaches and often textured materials. The raised intersection makes crosswalks more visible by motorists and provides level street crossing. Applied in locations where modal hierarchy is desired to promote better bicycling and pedestrian yielding compliance by drivers. Also considered in locations where neighborhood or commercial gateway is desired. 	<ul style="list-style-type: none"> Increases awareness of pedestrians. May be used as a neighborhood gateway feature. Calm two streets at once. Moderate vehicular travel speeds. Improve pedestrian visibility and accessibility. 	<p>High (> \$100,000)</p>
Guidance: NACTO Urban Street Design Guide			




Bicycle/Pedestrian Crossing Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
MEDIAN ISLANDS			
	<ul style="list-style-type: none"> • Raised islands in the center of a street, separating opposing lanes of traffic with cutouts for pedestrian access along the pedestrian route, providing a refuge area for people crossing a street. • Used in locations on single lane or multi lane streets where there is a defined midblock crossing desire line or at intersections. 	<ul style="list-style-type: none"> • This measure allows pedestrians to cross the street in two stages, focusing on each direction of traffic separately. • The refuge provides pedestrians with a better view of oncoming traffic as well as allowing drivers to see pedestrians more easily. • It can also split up a multi-lane road and act as a supplement to other pedestrian facility treatments. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, ITE Implementing Context Sensitive Design on Multimodal Thoroughfares, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Street Design Guide, NACTO Urban Bikeway Design Guide, FDOT FDM</p>			
STAGGERED MEDIAN ISLANDS			
 	<ul style="list-style-type: none"> • Crosswalks in the street are staggered such that a pedestrian crosses half the street and then must walk towards traffic to reach the second half of the crosswalk. • Used in locations on single lane or multi lane streets where there is a defined midblock crossing desire line. 	<ul style="list-style-type: none"> • Increase the concentration of pedestrians at a crossing and the provision of better traffic views for pedestrians (forces them to look towards traffic on the second half of the crossing). • Motorists are better able to see pedestrians as they walk through the staggered refuge. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: NACTO Urban Bikeway Design Guide</p>			
DIRECTIONAL CURB RAMPS			
	<ul style="list-style-type: none"> • Curb ramps that are oriented in line with the crosswalk and preferred path of travel. • Directional curb ramps typically provide a straight line between the departing and the receiving curb ramp. 	<ul style="list-style-type: none"> • Best for smaller corner radius and bulb-out locations. • Perpendicular curb ramps are more suitable for large radius corners. 	<p>Low (<\$10,000)</p> 
<p>Guidance: PROWAG</p>			



Bicycle/Pedestrian Crossing Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
RECTANGULAR RAPID FLASH BEACONS (RRFB)			
	<ul style="list-style-type: none"> Rapid flashing LED strobe lights post-mounted in between a pedestrian or trail crossing warning sign and down arrow sign. The beacons may be push-button activated or activated with passive pedestrian detection. Typically applied on two-lane or four-lane streets where there is a defined midblock crossing desire line and meets established evaluation criteria. 	<ul style="list-style-type: none"> Increased driver stopping compliance. Solar panels reduce energy costs associated with the device. Wireless capabilities reduces installation cost. Approved for use within MUTCD. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Bikeway Design Guide, FDOT TEM, MUTCD</p>			
PEDESTRIAN HYBRID BEACON (PHB) / HIGH INTENSITY ACTIVATED CROSSWALK (HAWK)			
 	<ul style="list-style-type: none"> Pedestrian-actuated beacon that is a combination of a beacon flasher and a traffic control signal. When actuated, the beacon displays a yellow (warning) indication followed by a solid red. During pedestrian clearance, the driver sees a flashing red “wig-wag” pattern until the clearance interval has ended and the signal goes dark. Can be considered along higher speed multi-lane streets where increased driver visibility of multimodal crossing is desired and meets established evaluation criteria. 	<ul style="list-style-type: none"> Reduces pedestrian-vehicle conflicts and increases driver compliance with stopping for pedestrians. Reduces vehicle delay when compared to standard pedestrian traffic signal. Lower warrant threshold than traditional traffic signal. Context of roadway and bicycle/pedestrian mode split of the crossing can negatively impact effectiveness. 	<p>High (> \$100,000)</p> 
<p>Guidance: NACTO Urban Bikeway Design Guide, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Bikeway Design Guide, FDOT TEM</p>			
PEDESTRIAN COUNTDOWN SIGNALS			
	<ul style="list-style-type: none"> Pedestrian signal head that displays the amount of time remaining during the pedestrian clearance interval. Standard treatment for signalized intersections that have pedestrian signals. 	<ul style="list-style-type: none"> Reduces pedestrian-vehicle conflicts and slows traffic speeds. Provides pedestrians with increased awareness of how much time they have remaining to finish crossing the street. 	<p>Low (< \$10,000)</p> 
<p>Guidance: FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, FDOT FDM</p>			








Bicycle/Pedestrian Crossing Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
GRADE-SEPARATED CROSSING			
	<ul style="list-style-type: none"> • Pedestrian and bicyclist-only overpass or underpass over or under a street or topographical barrier. • Provides complete separation of pedestrians and bicyclists from motor vehicle traffic, normally where no other pedestrian facility is available. • Typically applied in locations with defined pedestrian/bicycle desire line that extends across a major barrier. 	<ul style="list-style-type: none"> • Bypasses delay caused by intersection traffic control, but can add additional travel distance and delay if it is not part of a larger, integrated facility. • Underpass configuration can reduce energy expenditure for bicyclists by spanning existing topography. • Eliminates conflict between pedestrians, bicyclists, and moving traffic. 	<p>High (> \$100,000)</p> 
Guidance: AASHTO Guide for the Development of Bicycle Facilities; ITE Transportation Planning Handbook: Bicycle and Pedestrian Facilities			
INTERSECTION DAYLIGHTING			
 	<ul style="list-style-type: none"> • Parking is restricted 20 feet back from any flashing beacon or traffic control signal. • Applied in locations to improve sightlines between drivers and pedestrians and bicyclists. 	<ul style="list-style-type: none"> • Improves visibility of pedestrians or bicyclists to drivers. • Works well in conjunction with bulbouts which help slow vehicles as they approach the intersection. 	<p>Low (< \$10,000)</p> 
Guidance: NACTO Urban Street Design Guide			
ADEQUATE NIGHTTIME LIGHTING LEVELS			
	<ul style="list-style-type: none"> • Lighting source levels that provide adequate visibility for motorists and people walking and biking. • Lighting can be installed in combination with high visibility crosswalks, and signing and pavement markings at crosswalks. 	<ul style="list-style-type: none"> • FHWA's Informational Report on Lighting Design for Midblock Crosswalks recommends a vertical luminance of 20 lx in the crosswalk measured at the height of 5 ft from the road surface provided adequate detection distances. • Road curvature and grade can impact visibility. 	<p>Low (< \$10,000)</p> 
Guidance: FHWA Proven Safety Countmeasures, FHWA Informational Report on Lighting Design for Midblock Crosswalks			



Other Bicycle Features & Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
NEIGHBORHOOD GREENWAY			
	<ul style="list-style-type: none"> • Low traffic volume and low speed streets that are designated to give bicyclists and pedestrians priority. • Use signs, pavement markings, and traffic calming measures to discourage through trips by motor vehicles and provide bicyclists with enhanced crossing of arterial streets. • Typically applied along low-volume, low-speed residential streets to define multimodal priority and wayfinding. 	<ul style="list-style-type: none"> • Provide bicyclists of all abilities with low stress route. • Enhanced safety due to reduced exposure to moving traffic. • Provide enhanced wayfinding. • Approved for use within MUTCD. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: FHWA Bikeway Selection Guide, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Bikeway Design Guide, MUTCD</p>			
BIKE / BUS LANE			
	<ul style="list-style-type: none"> • Marking is intended to alert bicyclists and bus drivers that both users are encouraged to occupy the same travel way space. • Special pavement markings warn motorists of their presence. • Include special stop designs to allow passing by bicyclists when buses are stopped. • Applied in locations with low frequency and low speed bus service and limited right of way. 	<ul style="list-style-type: none"> • Encourage safer passing practices (including changing lanes, if necessary). • Allow bicyclists to remove themselves from flow of traffic. • Approved for use within MUTCD. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: NACTO Urban Bikeway Design Guide, MUTCD</p>			
CONTRA-FLOW BIKE LANE			
	<ul style="list-style-type: none"> • Bike lanes that allow bicyclists to legally ride in the opposite direction of traffic. • Requires conversion of a one-way street into a two-way street which maintains a one-way orientation for motor vehicles while providing two-way traffic for bicyclists. • Used to connect two-way bicycle facility across one-way street, typically on lower-volume residential streets. 	<ul style="list-style-type: none"> • Enhances connectivity for bicyclists traveling in both directions. • Decreases sidewalk riding. • Decreases out of direction travel for bicyclists. • Approved for use within MUTCD. 	<p>Low (< \$10,000)</p> 
<p>Guidance: NACTO Urban Bikeway Design Guide, MUTCD</p>			



Other Bicycle Features & Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
ADVISORY BIKE LANE			
	<ul style="list-style-type: none"> • Uses dashed lane line to distinguish bike lane and allow for drivers to encroach into the bike lane when bicyclists are not present to avoid an oncoming vehicle in the opposite direction. • Used on streets with less than 4,000 vehicles per day (vpd), no centerline, and limited right-of-way. 	<ul style="list-style-type: none"> • Brings greater awareness to the street as shared space. • Encourages slower vehicular travel speeds and reduces cut through traffic. • Experimental within MUTCD. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: FHWA Bikeway Selection Guide</p>			
INTERSECTION MARKINGS			
	<ul style="list-style-type: none"> • Consists of using green and white colored pavement markings at conflict points such as at the start of right turn lanes adjacent to bike lanes, or additional bike symbols such as turn queue boxes within the intersection. • Increase the visibility of bicyclists to drivers, identify areas of potential conflict, and provide guidance to bicyclists on their intended alignment through the intersection. • Typically applied on high ease-of-use facilities and at high conflict locations. 	<ul style="list-style-type: none"> • Increases visibility of bicyclists. • Raises driver and bicyclists awareness of conflict areas. • Increases driver yielding behavior. • Increases bicyclists comfort level. • Approved for use within MUTCD. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: NACTO Don't Give up at the Intersection, Designing All Ages and Abilities Bicycle Crossings, FHWA Separated Bike Lane Planning and Design Guide, NACTO Urban Bikeway Design Guide, FDOT FDM, MUTCD</p>			
BIKE BOXES			
	<ul style="list-style-type: none"> • Applied in locations with high volumes of bicyclists where there may be right or left turning conflicts with vehicles. • Also applied in conjunction with red signal indication where there is a desire for bicyclists to transition from one side of the street to the other at signalized intersections. 	<ul style="list-style-type: none"> • Provides dedicated space at the intersection for bicyclists, improving visibility to drivers during a red signal indication. • Brings bicyclists to the front of the queue, prioritizing bicycle traffic. • Does not benefit bicyclists approaching on a green signal indication. • Approved for use within MUTCD. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: FHWA Separated Bike Lane Planning and Design Guide, NACTO Urban Bikeway Design Guide, FDOT FDM, MUTCD</p>			



Other Bicycle Features & Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
PROTECTED INTERSECTIONS			
 	<ul style="list-style-type: none"> • Intersection design that provides separated space for pedestrians and bicyclists leading up to and through an intersection. • Typically applied at the intersection of two protected bike lanes or in locations where additional intersection protection is desired. 	<ul style="list-style-type: none"> • Protected Intersections reduce the potential for people on bicycles to mix with vehicular traffic at the intersection, providing a continuous low-stress facility when combined with protected bike lanes. • Combines multiple treatments in one intersection (reduced curb radii, intersection markings, and protected bike lanes). • Enhances right-turning driver's visibility of approaching cyclist through setback of bike lane crossing. • Works better with larger setbacks between the bikeway and adjacent lane, which provide better visibility and more space for vehicles to wait and yield to people on bikes. • Challenging to implement at intersections with large volumes of turning trucks. • Approved for use within MUTCD. 	<p>High (> \$100,000)</p> 
Guidance: NACTO Don't Give up at the Intersection, Designing All Ages and Abilities Bicycle Crossings, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, MUTCD			
SHARED USE SIDEWALK			
	<ul style="list-style-type: none"> • Designed for bicycle usage to avoid conflicts between single direction motor vehicle traffic in low volume pedestrian locations. • Sidewalks will include additional signage, pavement markings, and special curb cuts to facilitate bicycle travel. • Physical separation between wheeled and non-wheeled users is recommended to minimize potential conflicts between users. • Used sparingly to facilitate connections in locations with limited right-of-way and high speed travel lanes. 	<ul style="list-style-type: none"> • Physically removes bicyclists from travel lanes • Approved for use within MUTCD. 	<p>High (> \$100,000)</p> 
Guidance: NACTO Urban Bikeway Design Guide, MUTCD			









Other Bicycle Features & Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
RAISED CYCLE TRACK			
	<ul style="list-style-type: none"> Physically protected and raised lane for bicycles using raised curbs or landscaping/planters. Used in locations where physical protection and separation is required to improve bicyclist comfort. Can be installed as one-way, two-way, or contra-flow. 	<ul style="list-style-type: none"> Raised barrier provides added level of separation between travel lane and bicyclist, increasing bicyclist comfort. Can be raised to same elevation as adjacent sidewalk or in between sidewalk and adjacent roadway elevation. Approved for use within MUTCD. 	<p>High (>\$100,000)</p> 
Guidance: NACTO Urban Bikeway Design Guide, MUTCD			
WAYFINDING SIGNS			
	<ul style="list-style-type: none"> Posting a series of pedestrian and bicycle wayfinding signs that orient pedestrians and bicyclists to destinations. Used along bikeways and pedestrian walking corridors to identify destinations and travel times and distances. 	<ul style="list-style-type: none"> Encourages more walking and bike trips by providing people with a reference point to a destination. Standards for bicycle destination and distance signage are included in the MUTCD. 	<p>Low (<\$10,000)</p> 
Guidance: NACTO Urban Bikeway Design Guide			
BIKE CORRALS			
	<ul style="list-style-type: none"> Installation of a bicycle parking area in an on-street parking space, typically on a main street or business corridor. 	<ul style="list-style-type: none"> Provides parking for 10-20 bicycles in the same space it takes to park one car. Gives bicyclists the best spot right in front of businesses. Increases amenity zone and sidewalk space. 	<p>Medium (\$10,000-\$100,000)</p> 
Guidance: Association of Pedestrian and Bicycle Professionals (APBP) Bicycle Parking Guidelines, 2nd Edition			









Traffic Signal Features & Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
BICYCLE DETECTION			
	<ul style="list-style-type: none"> In pavement or above ground detection system that allows bicyclists to be detected at signalized intersections. Typically installed at signalized locations along bike routes with lower side street approach volumes. 	<ul style="list-style-type: none"> Decreases delay for bicyclists at signalized intersection. Encourages bicyclists to wait for signal indication. Identifies where bicyclist should position themselves to be detected. Allows for implementation of lengthened clearance interval when bicyclists are present. 	<p>Medium (\$10,000-\$100,000)</p> 
<p>Guidance: NACTO Urban Bikeway Design Guide</p>			
BICYCLE SIGNALS			
	<ul style="list-style-type: none"> Dedicated signal head for bicyclists. Used in locations with separated bicycle facilities. 	<ul style="list-style-type: none"> Provides ability to provide separate signal phase for bicyclists when desired for enhanced safety or non-traditional signal operations. Past national studies have shown an increase in compliance with signal indication. Approved for use within MUTCD. 	<p>Low (< \$10,000)</p> 
<p>Guidance: NACTO Don't Give up at the Intersection, Designing All Ages and Abilities Bicycle Crossings, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, FHWA Separated Bike Lane Planning and Design Guide, NACTO Urban Bikeway Design Guide, MUTCD</p>			
LEADING PEDESTRIAN / BICYCLE INTERVALS			
	<ul style="list-style-type: none"> Traffic signal timing that provides pedestrians/bicyclists with a few seconds head start prior to motor vehicles on the parallel street being given the green light. Typically applied in locations with high pedestrian/bicyclist conflicts with turning vehicles or vulnerable pedestrian populations. 	<ul style="list-style-type: none"> Increases pedestrian/ bicyclist visibility for turning vehicles and driver yielding compliance for pedestrians. Helps reduce conflicts between turning vehicles and pedestrians/ bicyclists. 	<p>Low (< \$10,000)</p> 
<p>Guidance: NACTO Don't Give up at the Intersection, Designing All Ages and Abilities Bicycle Crossings, ITE Implementing Context Sensitive Design on Multimodal Thoroughfares, FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, FHWA Separated Bike Lane Planning and Design Guide, NACTO Urban Street Design Guide, FDOT TEM</p>			







Traffic Signal Features & Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
PROTECTED TURN PHASING			
	<ul style="list-style-type: none"> Traffic signal phasing and signal equipment that only allows turning vehicles to enter the intersection during a dedicated signal phase separate from the pedestrian and/or bicycle through phases. Typically applied in locations with high pedestrian/bicyclist conflicts with turning vehicles or vulnerable pedestrian populations. 	<ul style="list-style-type: none"> Eliminates conflicts between left turning vehicles and pedestrians which is one of the most common type of crash involving pedestrians/bicyclists and vehicles. 	<p>Low ($< \\$10,000$)</p> 
<p>Guidance: NACTO Don't Give up at the Intersection, Designing All Ages and Abilities Bicycle Crossings</p>			
TURN RESTRICTION BLANK-OUT SIGNS			
	<ul style="list-style-type: none"> Digital sign typically mounted on signal mast arm that displays message prohibiting turning movements, such as 'No Turn on Red', which can also show supplementary messages such as 'Yield to Peds'. Turn prohibition linked to pedestrian actuation or set to recall automatically. Also applied at locations with bike boxes or protected intersections. 	<ul style="list-style-type: none"> Reduces potential conflicts between turning vehicles and pedestrians or bicyclists that might be crossing during the conflicting traffic signal phase. 	<p>Low ($< \\$10,000$)</p> 
<p>Guidance: NACTO Don't Give up at the Intersection, Designing All Ages and Abilities Bicycle Crossings</p>			
RETIMING CLEARANCE INTERVALS			
	<ul style="list-style-type: none"> Modifying the pedestrian clearance intervals at signalized intersections to provide adequate time for all pedestrians to cross the intersection at a walking speed slower than 3.5 ft/second. Typically applied at locations with pedestrians moving at slower speeds. Also applied in locations with designated bicycle routes to allow bicycles to clear the intersection. 	<ul style="list-style-type: none"> Increases the comfort level for all pedestrians and reduces the need to rush to cross the street. Federal signal timing standards require pedestrian clearance intervals to be timed for a walking speed of 3.5 ft/second. Slower walking speeds can be accommodated in locations where slow moving pedestrians are present such as around schools, senior facilities, etc. 	<p>Low ($< \\$10,000$)</p> 
<p>Guidance: MUTCD</p>			



Traffic Signal Features & Treatments

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
SIGNAL COORDINATION (LOWER SPEED LIMIT PROGRESSION)			
	<ul style="list-style-type: none"> Developing a traffic signal coordination plan that is based around a slower travel speed usually between 12-18mph for bicyclists and slower for pedestrians. Applied along signalized corridors with high pedestrian or bicyclist volume. Often referred to as a "Green Wave". 	<ul style="list-style-type: none"> Reduces start and stop delay for bicyclists. Promotes a more uniform travel speed for all road users. Makes for a more comfortable street to bike. Reduces crash severity based on slower vehicular travel speeds. 	<p>Low (<\$10,000)</p> 
Guidance: FHWA Achieving Multimodal Networks, Applying Design Flexibility & Reducing Conflicts, NACTO Urban Street Design Guide			
EXCLUSIVE PEDESTRIAN PHASE / PEDESTRIAN SCRAMBLE			
	<ul style="list-style-type: none"> Pedestrians have WALK signal on all approaches and all vehicle movement is stopped. Pedestrians can cross individual legs or diagonally across the intersection. 	<ul style="list-style-type: none"> Treatment is more common in downtown where high pedestrian and motorist volumes both occur. Can be limited to certain times of the day based on context, such as weekends or evenings near entertainment districts or commuter hours near large transit hubs. 	<p>Medium (\$10,000-\$100,000)</p> 
Guidance: FDOT Traffic Engineering Manual, NACTO Don't Give up at the Intersection			











Neighborhood Greenway Features / Traffic Calming

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
STOP SIGN REORIENTATION			
<p>Turning stop signs to favor through movement on bike blvd.</p>	<ul style="list-style-type: none"> Reorienting two-way or reconfiguring all-way stop controlled approaches to provide neighborhood bikeway approaches with the right-of-way at the intersection. Utilized along neighborhood bikeway facilities to minimize stop delay for bicyclists. 	<ul style="list-style-type: none"> Reduces delay and energy expenditure for bicyclists and thereby encourages more bicyclists to use the street. Need to consider current traffic control configuration to understand impacts of changing stop control and the potential to create unintended traffic operational or safety consequences. 	<p>Low ($< \\$10,000$)</p>
Guidance: NACTO Urban Bikeway Design Guide			
SPEED CUSHIONS			
	<ul style="list-style-type: none"> Humps or speed tables with wheel cutouts to allow large vehicles to pass at regular speed while slowing down smaller vehicles. Extend across one direction of travel from centerline with longitudinal gap for wide wheel base vehicles to avoid going over hump. 	<ul style="list-style-type: none"> Allow emergency vehicles and transit vehicles to pass with vehicle wheels on either side of the raised area. Calms automobile traffic while allowing critical service vehicles to maintain travel times. 	<p>Low ($< \\$10,000$)</p>
Guidance: NACTO Urban Street Design Guide, NACTO Urban Bikeway Design Guide			
DIVERTERS			
	<ul style="list-style-type: none"> Landscaped islands placed diagonally across an intersection, blocking through movements and creating two separate, L-shaped streets. They are often staggered to create circuitous routes through the neighborhood as a whole, discouraging non-local traffic while maintaining access for local residents. Used along neighborhood bikeways or in locations where reduction in cut-through traffic is desired, while accommodating through bicycle and pedestrian traffic. 	<ul style="list-style-type: none"> Do not require a full intersection closure, only a redirection of existing streets. Able to maintain full pedestrian, bicycle, and emergency vehicle access. May result in a diversion of traffic to adjacent streets. 	<p>High ($> \\$100,000$)</p>
Guidance: NACTO Urban Bikeway Design Guide			









Neighborhood Greenway Features / Traffic Calming

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
HALF CLOSURES			
 	<ul style="list-style-type: none"> Landscaped islands that block travel in one direction for a short distance on otherwise two-way streets. Used along neighborhood bikeways or in locations where reduction in vehicular traffic is desired, while accommodating through bicycle and pedestrian traffic. 	<ul style="list-style-type: none"> Maintain two-way bicycle access. Effective in reducing traffic volumes. Provides opportunities for controlled crossing by pedestrians and bicyclists. May result in a diversion of traffic to adjacent streets. 	<p>High (> 100,000)</p> 
Guidance: NACTO Urban Bikeway Design Guide			
FULL CLOSURES			
 	<ul style="list-style-type: none"> Barriers placed across a street to completely close the street to through-traffic, usually leaving access open only for bicyclists and pedestrians via cut-throughs. Can be applied at the end of the block or within a median of an intersecting street. Used along neighborhood bikeways or in locations where reduction in vehicular traffic is desired, while accommodating through bicycle and pedestrian traffic. 	<ul style="list-style-type: none"> Maintain pedestrian and bicycle access. Barrier can be landscaped. Provides opportunities for controlled crossing by pedestrians and bicyclists. May result in a diversion of traffic to adjacent streets. 	<p>High (> \$100,000)</p> 
Guidance: NACTO Urban Bikeway Design Guide			
CHOKERS / NECKDOWNS			
	<ul style="list-style-type: none"> Curb extensions at midblock locations that narrow a street. Applied at midblock locations along single lane streets where reduced speeds are desired. 	<ul style="list-style-type: none"> Easily negotiable by large vehicles. Can have positive aesthetic value. Shortens pedestrian crossing distance when combined with pedestrian treatment. Slows vehicular travel speeds. 	<p>Medium (\$10,000 - \$100,000)</p> 
Guidance: NACTO Urban Bikeway Design Guide			

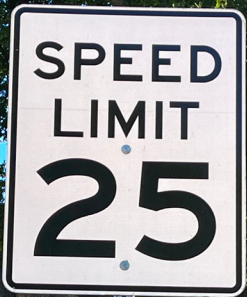





Neighborhood Greenway Features / Traffic Calming

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
TRAFFIC CIRCLES / MINI-ROUNDBABOUTS			
 	<ul style="list-style-type: none"> • Installation of a small circulating island in the middle of residential street intersection. Traffic circulates counter-clockwise around the central island. • Applied on local, residential streets (often neighborhood bikeways) where increased traffic control, speeding and cut-through traffic compliance are desired. • Can be installed as mountable in locations where larger vehicles may not be able to circulate around the circle. 	<ul style="list-style-type: none"> • Can reduce crash frequency and severity. • Can have positive aesthetic value. • Placed at an intersection, they can calm two streets at once • Can often be developed to fit within existing right-of-way constraints. • Larger vehicles and emergency responders can turn left in front of island when no conflicting traffic is present. • If designed as mountable, can accommodate occasional large truck traffic. • Can be installed as an all-way yield condition or as an all-way stop condition depending on location. 	<p>Medium (\$10,000- \$100,000)</p> 
Guidance: NACTO Urban Street Design Guide, NACTO Urban Bikeway Design Guide			
CHICANES			
 	<ul style="list-style-type: none"> • Curb extensions that alternate from one side of the street to the other, forming S-shaped curves along the street. They interrupt straight stretches of street and force vehicles to shift horizontally. • Chicanes can be created by alternating onstreet parking between each side of the street. • Applied in residential or neighborhood locations where increased traffic control, speeding and cut-through traffic compliance are desired. 	<ul style="list-style-type: none"> • Can be as restrictive as necessary. • Negotiable by large vehicles except under heavy traffic conditions. 	<p>Medium (\$10,000 - \$100,000)</p> 
Guidance: NACTO Urban Street Design Guide, NACTO Urban Bikeway Design Guide			



Neighborhood Greenway Features / Traffic Calming

SAFETY TREATMENT	DESCRIPTION	KEY FACTORS	COST (per mile or unit)
APPROPRIATE SPEED LIMITS FOR ALL ROAD USERS			
	<ul style="list-style-type: none"> Speed limits that are set at appropriate levels to reduce risks drivers may impose on others, particularly vulnerable road users, and themselves. Speed control is a critical component to reducing fatalities and severe injuries, especially where motorists mix with vulnerable road users. 	<ul style="list-style-type: none"> Bicycle and pedestrian activity, crash history, land use context, intersection spacing, driveway density, roadway geometry, roadside conditions, roadway functional classification, traffic volume, and observed speeds should all be considered when setting speed limits. 	<p>Low (<\$10,000)</p> 
Guidance: FHWA Proven Safety Countermeasures, FHWA Safe System Approach for Speed Management			
LANE REPURPOSING (ROAD DIET)			
	<ul style="list-style-type: none"> Repurposing lane markings to accommodate multi-modal facilities, such as bike lanes. A typical road diet converts a four lane undivided roadway to two travel lanes, with a two-way left-turn lane, and bike lanes. 	<ul style="list-style-type: none"> A road diet can be installed during resurfacing to provide cost savings. Roadways most suitable for a road diet have a typical average daily traffic of 25,000 or less. 	<p>Low (<\$10,000)</p> 
Guidance: FHWA Proven Safety Countermeasures, FHWA Safe System Approach for Speed Management, FDOT Systems Management Lane Repurposing			