Geometry


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Geometry

2

Introduction

1st Avenue and 100th Street, Manhattan

About this Chapter

The geometric design of streets is integral to their use; for instance, overly wide roadways and corners with large turning radii tend to invite speeding and create an environment that is uncomfortable for pedestrians, while pedestrian ramps improve transitions from curbs to crosswalks for all users, and make sidewalks accessible for people with disabilities. Geometric changes also affect an area's economy, community and services, and environment.

This chapter establishes general guidelines for the geometric design of streets as well as a "toolbox" of geometric treatments that may be used to enhance safety, mobility, and sustainability.

The recommendations of this chapter supplement rather than replace existing sources of detailed engineering guidance and do not supersede any existing federal, state, or city laws, rules, and regulations. All projects remain subject to relevant statutes, such as the Zoning Resolution of the City of New York, CEQR, and appropriate reviews and approvals of oversight agencies.

Guidance Sources

Guidance on the geometric design and operations of streets and roadways is contained in such sources as *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2018), the *Manual of Uniform Traffic Control Devices* (FHWA, 2012), the *2010 ADA Standards for Accessible Design* (USDOJ, 2010), *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way* (US Access Board, 2011), *Guide for the Development of Bicycle Facilities* (AASHTO, 2012), the *Urban Bikeway Design Guide, Second Edition* (NACTO, 2014), and the *Urban Street Geometric Design Handbook* (ITE, 2008).

Other resources include the *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (AASHTO, 2004), *Inclusive Design Guidelines: New York City 2nd Edition* (MOPD, 2017), *Designing Walkable Urban Thoroughfares: Context Sensitive Approach* (ITE, 2010), the *Urban Street Design Guide* (NACTO, 2013), the *Transit Street Design Guide* (NACTO, 2016), and *New York City's Active Design Guidelines* (2010). Readers should also refer to *New York City's Borough Pedestrian Safety Action Plans* (2019), the DOT Typical Pavement Markings Drawings, and the latest version of MOR's *Climate Resiliency Design Guidelines*. Readers are directed to the sources noted above, those listed in APPENDIX B, and any other applicable resources.

Applicability and Exceptions

All projects that significantly impact public and private streets should follow these guidelines. DOT approval will be based on site-specific conditions and cost-effective engineering standards and judgment, with safety and access for all street users being of paramount importance.

Usage Categories

Geometric treatments are divided into three categories: Wide, Limited, and Pilot applications.

Wide

Geometric treatments of this type are in wide use throughout New York City. They constitute the basic set of elements that are typically found on city streets. Designs should incorporate them wherever appropriate. These treatments generally require less intensive review than limited or pilot treatments.

Limited

Geometric treatments of this type are currently in limited use in New York City. While the designs are well-established, their application is contingent on site-specific conditions. These treatments will require more in-depth review of appropriateness and feasibility.

Pilot

Geometric treatments of this type are currently in, at most, limited use in New York City, but have been employed successfully in other US and international cites. Appropriate design criteria are still under development for application in New York City. Proposals for pilot usage of these treatments will be evaluated on a case-by-case basis.

Implementation

Many of the treatments in this chapter may be implemented in operational or capital materials. Use of operational materials enables DOT to test and deploy treatments more rapidly. When implementing geometric treatments in operational materials, special attention must be paid to edge delineation and street-sweeping needs. For more information on the difference between operational and capital projects, see the PROCESS chapter.

TABLE 2A: GEOMETRY REFERENCE GUIDE

Section	Geometric Treatment	Wide	Limited	Pilot
2.1	**Roadway & Lanes**			
2.1.1a	Conventional Bike Lane	●		
2.1.1b	Protected Bike Lane	●		
2.1.1c	Two-Way Bike Lane		●	
2.1.1d	Grade-Separated Bike Lane		●	
2.1.2	Bus Lane	●		
2.1.3	Shared Street		●	
2.1.4	Pedestrian Plaza	●		
2.2	**Sidewalks & Raised Medians**			
2.2.1a	Full Sidewalk	●		
2.2.1b	Ribbon Sidewalk	●		
2.2.2	Pedestrian Ramp	●		
2.2.3a	Curb Extension	●		
2.2.3b	Mid-Block Narrowing	●		
2.2.3c	Bus Bulb	●		
2.2.4	Bus Boarding Island	●		
2.2.5	Raised Median	●		
2.2.6	Pedestrian Safety Island	●		
2.2.7	Median Barrier		●	
2.3	**Traffic Calming**			
2.3.1	Lane Narrowing and Lane Removal	●		
2.3.2	Raised Speed Reducer	●		
2.3.3	Gateway		●	
2.3.4	Raised Crosswalk		●	
2.3.5	Raised Intersection			●
2.3.6	Chicane			●
2.3.7	Neighborhood Traffic Circle			●
2.3.8	Roundabout		●	

General Guidelines

Pulaski Bridge at 11th Street and Jackson Avenue, Queens

The following guidelines expand on the general policies and principles outlined in the Introduction, with more detailed information specific to geometric street design.

Safe by Design

As part of New York City's Vision Zero commitment to eliminating preventable traffic deaths and injuries, the city is redesigning many of its streets to make them safer. Using roadway geometry like lane width and type, intersection design, and elements such as curb extensions, raised medians, and roundabouts, DOT aims to encourage safe driving, reduce crossing distances for pedestrians, and create dedicated space for cyclists. A redesigned street can both lessen the likelihood of a crash and reduce the severity of crashes that do occur. An expanded program of Street Improvement Projects drawing upon the tools outlined in this section of the Manual contributed to five consecutive years of declines in road deaths following the establishment of Vision Zero as citywide policy. DOT will continue to implement these design elements to further decrease fatalities and serious injuries on New York City streets.

Streets should be designed to protect the most vulnerable users, particularly pedestrians and cyclists, while maintaining necessary vehicular access. The two goals are not mutually exclusive. In fact, improvements made explicitly to enhance safety can also simplify the flow of traffic and eliminate confusion among roadway users. DOT's commitment to safety is paramount, and while street design improvements may require changes in parking allocations or vehicular access, DOT strives to minimize disruption and encourages community feedback on projects.

Vehicle Target Speed

Streets should be designed with target speeds (see GLOSSARY) and speed limits appropriate to their surrounding uses and desired role in the vehicular network. The citywide speed limit is 25 mph, except where otherwise noted. New York State Vehicle & Traffic Law (VTL) Section 1642(a)(26) and (27) currently allow speed limits below 25 mph, and as low as 15 mph in New York City if used in conjunction with traffic calming measures. Slower target speeds and speed limits should be considered on local streets and residential streets; on streets adjacent to schools; in areas with higher populations of older adults or people with disabilities; and on waterfronts, in parks, or in and around other significant pedestrian destinations.

As part of its efforts to enhance safety, DOT deploys traffic calming devices in neighborhoods around schools and in areas with high numbers of crashes involving older adults. Some traffic calming treatments, such as raised medians, can also enhance the public realm by expanding pedestrian space and incorporating greenery. Community groups can also request certain traffic calming interventions, such as raised medians and corner bulbouts, at specific locations by contacting their DOT Borough Commissioner.

Roadway Width, Corner Radii, and Crossing Distance

The roadway—the portion of a street ordinarily used by motor vehicles and cyclists, exclusive of the sidewalk—should be designed to be the minimum possible width, with the minimum number of lanes, that safely and cost-effectively allows for the travel of motor vehicles and cyclists. Narrower roadways minimize pedestrian crossing distances, encourage safe driving behavior, and reduce impermeable, heat-absorbing asphalt coverage.

Roadway modifications should be designed for the expected traffic volumes in the year that construction will be complete. Additional consideration should be given to recent trends in traffic and mode choice—as documented in DOT's *Mobility Report*—and their implication for traffic volumes in future years (e.g., five years after the build year). Excess width should be reallocated to provide walking, transit, and bicycling facilities, public open space, green cover, and/or stormwater source control measures. If financial limitations preclude capital implementation of street redesigns (e.g., curbing or streetscaping), the reallocation of space should still proceed with less costly operational approaches such as restriping.

To reduce pedestrian crossing distances further and slow turning vehicles, all roadway corners should be designed with the smallest possible radius that still accommodates the design vehicle (see GLOSSARY) and emergency vehicles.

Pedestrian crossing distances should be minimized in all locations utilizing treatments such as curb extensions (i.e., neckdowns) with detectable warnings to make edge conditions clear to pedestrians with vision disabilities. See GEOMETRY: CURB EXTENSION. Sidewalk narrowings and roadway widenings should be avoided.

E 42nd Street and Madison Avenue, Manhattan

Design Vehicles and Emergency Access

The design vehicle (see GLOSSARY) used for geometric street designs, typically a single-unit truck, with a 30-foot long wheelbase (SU-30), should be appropriate to the predominant intended uses of the given street and should not include commercial vehicles larger than New York City's maximum allowable length. In addition, all street designs must consider FDNY, other emergency vehicle, and sanitation vehicle access needs (e.g., for street sweeping and snow clearing). Larger design vehicles, such as tractor-trailer trucks with wheelbases varying from 40 feet (WB-40) to 62 feet (WB-62) in length, are used on bus and designated truck routes depending on the route type, context, and special route provisions.

Complex Intersections

Multi-leg or skewed angle intersections should be redesigned (to the extent practicable) to simplify operations and reduce or separate conflicts. This can include the removal of intersection legs and slip lanes that are inconsequential to the traffic network, creation of right-angled intersection alignments, and simplified traffic patterns. Resulting space should be consolidated to create new public open space and shorter, more direct crossings.

The use of slip lanes should generally be avoided except where conflicts are mitigated and overall safety is significantly improved by their use. If one is necessary, it should produce a conflict-free crosswalk from the island.

Maintenance

Unless a maintenance partner can be identified, new geometric treatments, including curb and sidewalk extensions in operational materials, must leave a minimum of 11 feet of roadway width to accommodate standard street sweepers and snow plow operations.

Shore Front Parkway, Queens

Kappock Street and Netherland Avenue, Bronx

Inclusive Design

Projects should be designed to make it easier for New Yorkers with disabilities, older adults, and children to navigate the city. To this end, designs should consider how people with diverse ability levels will use and move through the space.

Pedestrian spaces should have clearly defined pathways with minimal clutter that are easy to understand, regardless of users' ability level or experience. Delineation treatments should be developed in conjunction with stakeholders to meet the mobility needs of the intended users. Designs should incorporate multiple ways of communicating effectively with users. Examples include pedestrian ramps and detectable edge treatments. Projects must meet or exceed all applicable federal, state, and/or local accessibility standards for facilities and public rights-of-way, including minimum clear-path widths, inclusion of ADA-compliant ramps, and provision of accessible transit facilities.

Drainage and Stormwater Control

All modifications to street geometry should avoid unintended changes in the direction and disposition of stormwater runoff so as not to create ponding or flooding issues. Adequate roadway grades (i.e., 1.5% desired, with a minimum of 0.5%) are required to direct runoff to catch basins. Include planted areas and stormwater source controls within the roadway wherever feasible. For more information on green infrastructure treatments, see LANDSCAPE: STORMWATER MANAGEMENT PRACTICES. Stormwater control within the street network may offer opportunities for resiliency benefits in areas that experience frequent flooding.

Resiliency

Resilient design enhances a street's ability to return to service quickly and without excessive cost or inconvenience to the public following a climate-related event, like flooding or extreme heat. At the network level, resiliency helps maintain access to critical facilities, such as hospitals and storm shelters, during flood events.

Climate-related risks and their triggers and thresholds should be evaluated during the design process. Mitigation strategies include, but are not limited to, raising streets, creating landscaped berms, and installing permanent or deployable flood walls. Designs should seek to minimize damage to DOT assets while allowing traffic circulation for all vehicle types. Projects in the current and future 100-year floodplain should consult the latest version of MOR's *Climate Resiliency Design Guidelines*.

Sustainability

In 2017, New York City recommitted to the Paris Climate Agreement through Executive Order 26. Releasing the *1.5 Climate Action Plan*, the city committed to more aggressive near-term climate change mitigation goals, building upon the existing sustainability efforts in the *Roadmap to 80x50* and the *DOT Strategic Plan*. A core goal in the city's climate change mitigation strategy is growing the share of trips made using sustainable modes—transit, walking, and biking—from 66% to 80% by 2050. Prioritizing these modes in order to enhance safety and inclusivity also creates a more sustainable transportation system.

NEXT PAGE: *Queens Boulevard, Queens*


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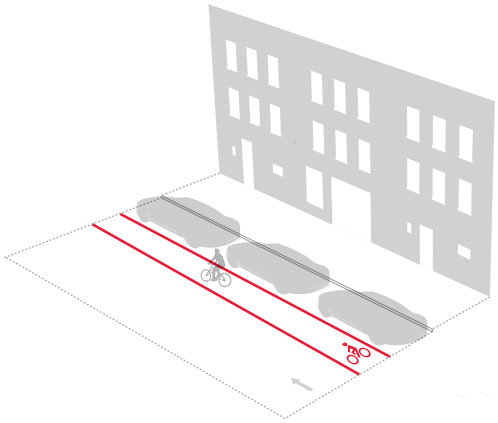
MBULETTE

Roadways & Lanes

Conventional Bike Lane

Usage: Wide

A portion of a roadway that has been designated by pavement markings and/or signs for the preferential or exclusive use of cyclists.



Greenpoint Avenue, Queens

Hoyt Street, Brooklyn

Benefits

Provides dedicated space for cyclists, enhancing safety, comfort, and mobility

In combination with other bikeways, provides a comprehensive network of recommended routes for cyclists, thereby encouraging bicycling

On-roadway bike lanes that narrow or replace motor vehicle lanes can calm traffic

Considerations

Conduct outreach to people with disabilities and stakeholders working with these population groups early in the planning and implementation process. Provide notification of street geometry changes before implementation. Consideration should be given to commercial vehicles loading/unloading

Without physical separation, vehicles can block bike lanes, making enforcement of violations critical

Application

On streets with high current or anticipated bike volumes or that offer important linkages to destinations or between routes, and where speeds are lower and double parking/ illegal parking (i.e. potential bike lane blocking) is not prevalent

When excess roadway exists, conventional lanes can be used to calm traffic and make the street safer for all road users

Consider using a protected bike lane rather than, or in addition to, a conventional bike lane where conditions permit (e.g., street width, traffic volume, etc.). See GEOMETRY: PROTECTED BIKE LANE

Design

See Table 2b for a listing of typical bikeway designs and their respective spatial requirements, ideal applications, and advantages and disadvantages

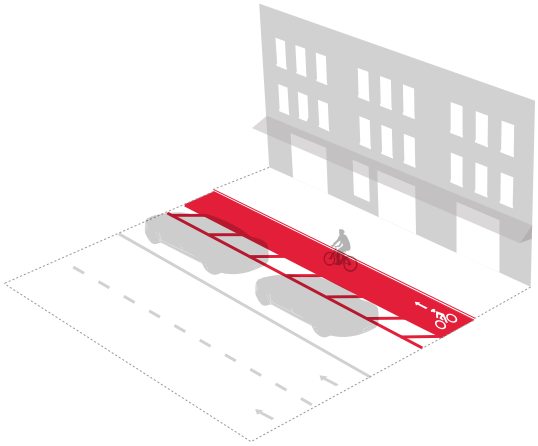
Create connectivity with adjoining bikeways, bike parking, transit, and commercial or cultural destinations

Bikeways in parks, or in other places with heavy pedestrian traffic, light cycling traffic, and insufficient right-of-way for separated facilities, can be designated using bike stamps

Protected Bike Lane

Usage: Wide

A bike lane with a physical separation from motorized vehicle traffic by a parking lane or barrier. Physical separation of bikeways is preferable on wide or busy streets, on major bike routes, or along long, uninterrupted stretches. Separation can take the form of floating parking, a curb or raised median, or other vertical elements preventing motor vehicles from accessing the bikeway.



6th Avenue, Manhattan

1st Avenue, Manhattan

Benefits

See benefits of GEOMETRY: CONVENTIONAL BIKE LANE

Offers greater cyclist separation from motor vehicle traffic on mid-block sections

Reduces risk of "dooring" (a motor-vehicle occupant opening their door into the path of an oncoming cyclist)

Reduces or eliminates blocking of the bike lane by motor vehicles and the swerving of cyclists into mixed traffic

Encourages novice and less confident cyclists to choose cycling

Considerations

Design consideration must be given to pedestrians with vision or ambulatory disabilities; emergency vehicle and paratransit access to adjacent buildings; snow-clearing and street-sweeping needs; commercial vehicles loading and unloading; bicycling visibility at intersections; and establishment of right of way

Application

Where the street is an important bike network connection, or a truck route, or has high motor vehicle volumes, high speeds, or multiple moving lanes

Consider wherever a conventional bike lane is appropriate. See GEOMETRY: CONVENTIONAL BIKE LANE

Design

See Table 2b for a listing of typical bikeway designs and their respective spatial requirements, ideal applications, and advantages and disadvantages

Care must be given to the design of bike lanes at intersections and driveways to maintain visibility of cyclists to motorists and to reduce the risk of turning conflicts with motor vehicles

Designs to mitigate turning conflict at intersections may utilize mixing zones, signal-protected turns, or offset crossings

In some circumstances (e.g., long paths along open space or waterfront), facilities can be designed for shared use by cyclists, pedestrians, skaters, users with mobility devices, and other non-motorized users (a "shared-use" facility) rather than as a separate bike lane and sidewalk

If designed as a shared-use facility, provide adequate space appropriate to anticipated volumes of low-speed users (pedestrians) and higher-speed users (cyclists) so as to provide safe and comfortable accommodation of both and minimize conflicts

Design raised medians that separate bike lanes according to the GEOMETRY: RAISED MEDIAN section

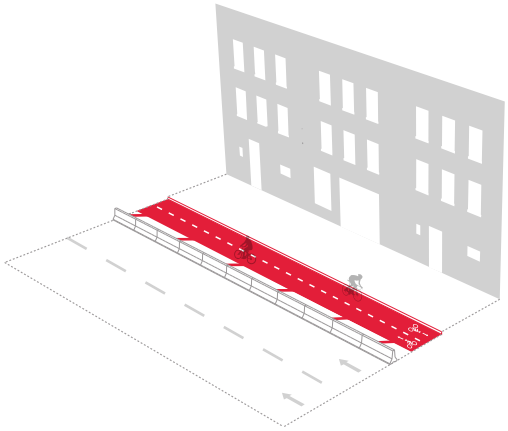
If a protected bike lane uses raised medians, see the LANDSCAPE: RAISED MEDIAN (CURB HEIGHT) section or the LANDSCAPE: RAISED MEDIAN (12-24 INCHES) section for information on planting

One-way bike path separated from roadway by parking: Skillman Avenue, Queens

Two-Way Bike Lane

Usage: Limited

A bike lane that accommodates cyclists traveling in both directions, and is typically separated from vehicle traffic by an open space or barrier. Physical separation of two-way bike lanes is often preferable on wide or busy streets, on major bike routes, or along long, uninterrupted stretches. However, two-way bike lanes may also exist without physical separation on streets with low traffic volumes, low operating speeds, or low risk of conflict.



S 5th Street, Brooklyn

Clinton Street, Manhattan

Benefits

See benefits of GEOMETRY: PROTECTED BIKE LANE

A single buffer can protect both directions, thereby requiring less street width than a pair of protected bike lanes

Enhances bike network connectivity on one-way streets

When located adjacent to parks or public space, improves access to and circulation around those locations

Allows for greater passing width for cyclists traveling at different speeds

Considerations

Design consideration must be given to pedestrians with vision or ambulatory disabilities; emergency vehicle and paratransit access to adjacent buildings; snow-clearing and street-sweeping needs; commercial vehicles loading and unloading; bicycling visibility at intersections; and establishment of right of way

Additional traffic control devices may be necessary for cyclists riding against the traffic direction in the adjacent vehicular lane

Application

Where a conventional bike lane is appropriate and the street is an important bike network connection, or is along a park, waterfront, or other open space where cross streets are infrequent

Consider wherever a conventional bike lane is appropriate. See GEOMETRY: CONVENTIONAL BIKE LANE

Design

See Table 2b for a listing of typical bikeway designs and their respective spatial requirements, ideal applications, and advantages and disadvantages

Two-way bike lanes require 4 feet of width in each direction (or 8 feet total) and an additional 2 feet when protected by a concrete barrier, or a 3-foot buffer in a parking-protected configuration to safely accommodate opening vehicle doors

A two-way bike lane can be protected using a single section of buffer with reflective vertical elements (e.g.,flexible delineator, Jersey barrier, or concrete median)

Care must be given to the design of bike lanes at intersections and driveways to maintain visibility of the cyclist to motorists and to reduce the risk of turning conflicts with motor vehicles

Special provisions for turns or turn bans may be required, especially left turns which require a protected phase to cross both opposing vehicle traffic and the bikeway

In some circumstances (e.g., long stretches along open space or waterfront) with low volumes, two-way bike lanes can be designed for shared use by cyclists, pedestrians, skaters, pedestrians using mobility devices, and other non-motorized users (a "shared-use" facility) rather than as a separate bike lane and sidewalk

If designed as a shared-use facility, provide adequate space for anticipated volumes of low-speed users (pedestrians) and higher-speed users (cyclists) to provide safe and comfortable accommodation of both and minimize conflicts

Design raised medians that separate bike lanes according to the GEOMETRY: RAISED MEDIAN section

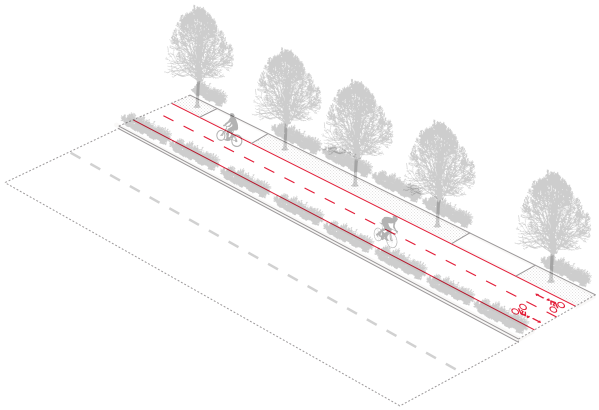
At intersections with complex traffic patterns — or when bike lanes are located immediately adjacent to the curb — bike lanes can be given visual emphasis through the application of green-colored pavement

Chrystie Street, Manhattan

Grade-Separated Bike Lane

Usage: Limited

A bike lane that is raised above the roadway to sidewalk grade, or in between sidewalk and roadway grade. Grade-separated bike lanes are utilized where there is adequate right-of-way adjacent to the roadway or connecting through parks or other properties. Grade-separated bike lanes are typically designed as two-way facilities.



Queensboro Bridge Greenway, Queens

Van Brunt Street, Brooklyn

Benefits

See benefits of GEOMETRY: PROTECTED BIKE LANE

Provides the greatest protection for cycling

Can be located either within the public right-of-way or on properties owned by private entities allowing for connection of cycling facilities where on-street facilities are not feasible

Grade-separated bike lanes that require capital construction can often include planted areas or trees

Because grade-separated bike lanes are not located in the street, curbside access is maintained for motor vehicle loading, parking, or other uses

Considerations

Design consideration must be given to pedestrians with vision or ambulatory disabilities; emergency vehicle and paratransit access to adjacent buildings; snow-clearing and street-sweeping needs; commercial vehicles loading and unloading; bicycling visibility at intersections; and establishment of right of way

Grade change should be clear to all road users

If lane is also two-way, see considerations for GEOMETRY: TWO-WAY BIKE LANE

Application

Where the bike lane serves as an important connection to the bike network, or is along a park, waterfront, other open space where cross streets and driveways are infrequent

Design

See Table 2b for a listing of typical bikeway designs and their respective spatial requirements, ideal applications, and advantages and disadvantages

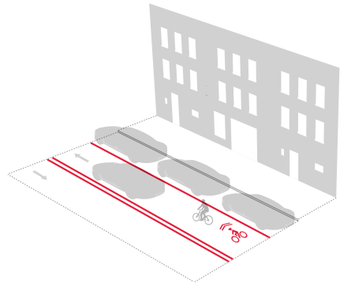
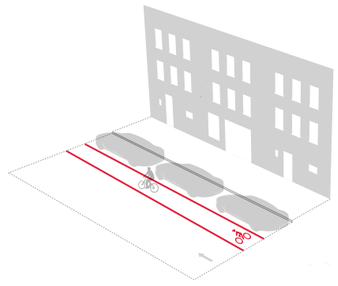
Adjust buffer width to avoid door swing from vehicles and to ensure that placement of signs, utilities, and street furniture does not obstruct cyclists

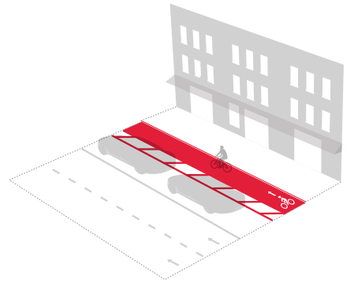
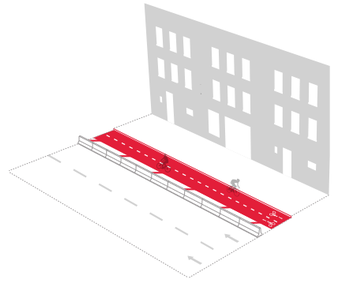
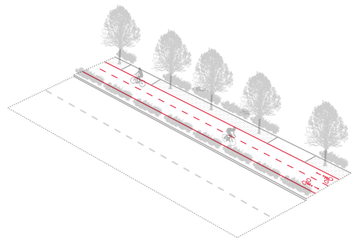
Care must be given to the design of grade-separated bike lanes at intersections and driveways to maintain visibility of the cyclist to motorists and to reduce the risk of turning conflicts with motor vehicles

In some circumstances (e.g., long stretches along open space or waterfront), a grade-separated bike lane can be designed for biking, walking, and other non-motorized uses rather than as a separate bike facility and sidewalk

If designed as a shared-use facility, provide adequate space to accommodate anticipated volumes of lower- and higher-speed users and minimize conflicts

TABLE 2B: BIKE LANES

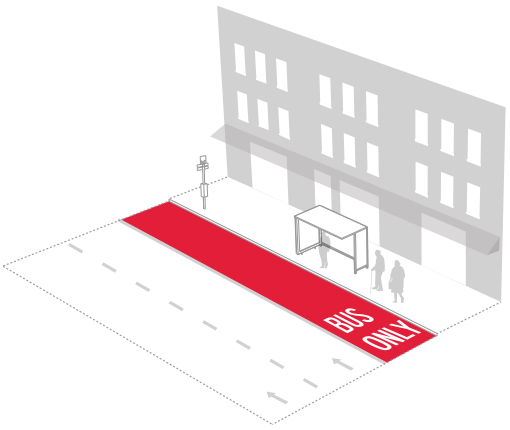
		Conventional Bike Lane
	Shared Lane *Ex: 48th Street, Queens*	**Conventional Bike Lane** *Ex: Van Duzer Street, Staten Island*
		
Space Required	None	5-6' standard
Ideal Application	o One- or two-lane street o No excess road space o Connected to other bike facilities	o One- or two-lane street o Excess road space o Low potential for intrusion into bike lane
Advantages	o Clear, easy to follow bike route o Heightens driver awareness of cyclists o Preserves curbside access o Simple implementation	o Dedicated roadway space for cycling o Preserves curbside access o Simple implementation
Disadvantages	o Does not provide dedicated roadway space for cycling o Cyclists not separated from traffic	o Vehicular intrusion remains possible o Cyclists have minimal separation from traffic o Perceived as less safe than protected lanes
Green Pavement	o None	o Standard if lane is immediately adjacent to curb, especially in areas with high pedestrian volumes o Standard if lane is located between a travel lane and a turn lane ("pocket lane")
Intersection Treatments	o Chevrons to indicate bike facility	o Chevrons to indicate bike facility

	Protected Bike Lane		
	One-Way Protected Bike Lane *Ex: 55th Street, Manhattan*	**Two-Way Protected Bike Lane** *Ex: Prospect Park West, Brooklyn*	**Grade-Separated Bike Lane** *Ex: Sands Street, Brooklyn*
			
Space Required	4' min. lane + 3' min. buffer + 4' min. buffer if no maintenance plan (does not apply if parking-protected)	8' min. (4' min. each lane) + 3' min. buffer if no maintenance plan + 2' if protected by Jersey barrier	5' min. one-way, 8' min. two-way + buffer for edge treatments and any obstructions
Ideal Application	o Excess road space o Low-speed vehicular traffic o High potential for intrusion into bike lane	o Favorable edge conditions o Excess road space o Adjacent to parks and waterfront public spaces o Within industrial areas	o As part of a continuous "Greenway" o Adjacent to or through parks and waterfront public spaces
Advantages	o Protection for cyclists o Proven safety benefits for all modes o Enhanced pedestrian safety and comfort o Allows for pedestrian improvements like safety islands	o More spatially efficient than two separate one-way bike lanes o Enhanced visibility of cyclists o Enhanced access and circulation next to parks and public spaces o Safer passing for cyclists traveling at different speeds	o Greatest safety benefit to cyclists o Connects cycling facilities where on-street facilities are infeasible o Preserves curbside access
Disadvantages	o Parking impacts o Loading activity occurs across bike lane o Challenging to regulate floating parking o Bike signal timing may impact traffic o Maintenance plan required at ped. safety islands for lanes under 11' wide o Complex review and implementation	o Parking impacts o Bike signal timing may impact traffic o Requires turn controls or restrictions on a two-way street o Complex review and implementation	o Often requires capital reconstruction o Complex review and implementation
Green Pavement	o Standard if there is high parking turnover; not recommended at locations with low turnover o Not used when protected by a permanent, continuous vertical element	o Preferred if lane is exclusive to cyclists and/or is in an area with high pedestrian volumes	o Not used when protected by a permanent, continuous vertical element (e.g., curb, Jersey barrier)
Intersection Treatments	o Turn restrictions may be needed at complex intersections o Shared crossing ("mixing zone"), separated crossing ("signal-protected turn"), or offset crossing ("protected intersection") to manage turning conflict o Chevrons to indicate bike facility	o Turn restrictions may be needed at complex intersections o Separated crossing ("signal-protected turn") or offset crossing ("protected intersection") to manage turning conflict o Chevrons to indicate bike facility	o Separated crossing ("signal-protected turn") or offset crossing ("protected intersection") to manage turning conflict o Chevrons to indicate bike facility

Bus Lane

Usage: Limited

A dedicated on-street facility for buses. Bus lanes are delineated within the roadway with markings. Bus lanes can either be designed to run along the median of the street or along the outside (curbside or offset from a parking lane) of the street.



Woodhaven Boulevard, Queens

W 81st Street, Manhattan

Benefits

Improves bus speeds and reliability by separating buses from potential congestion in mixed traffic and by reducing or eliminating their need to merge in and out of traffic at bus stops

Bus lanes can improve speed for buses anywhere between 10-100%, saving time for thousands of New Yorkers and reducing reliance on cars

Provides means for emergency vehicles to bypass traffic

Considerations

If curbside, may result in restriction or relocation of curbside parking or commercial vehicles loading/unloading

Application

Consider on all streets where buses experience slow speeds due to congestion, particularly on higher ridership corridors

Avoid on streets where the roadway geometry prevents the safe operation of a bus lane in conjunction with other necessary uses of the roadway

Design

See Table 2c for a listing of typical bus lane and busway designs and their respective widths, ideal applications, and advantages and disadvantages

Bus lanes can be located immediately adjacent to the curb (curbside bus lane), adjacent to the right hand parking lane (offset bus lane), or in the middle of a road with boarding island stations (median bus lane or center-running bus lane). Note that buses can only load/unload on the right-hand side

All bus lane types can be one or two lanes per direction based on bus volume, operating characteristics, and road width; one lane per direction is more common

Use an offset bus lane where possible, particularly when parking needs to be maintained; stops can be made at the curb or at bus bulbs. See GEOMETRY: BUS BULB

Use a curbside bus lane when right-of-way may be constrained and where parking impacts can be managed

For curbside bus lanes, curbside deliveries can be accommodated with truck loading windows or reserved truck loading around the corner

A median bus lane should be considered on two-way streets when sufficient right-of-way is available to accommodate the bus facility and the associated boarding islands, and the operation of the busway (including pedestrian movements) can be safely managed

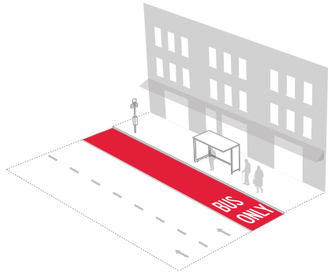
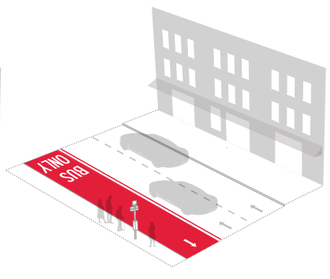
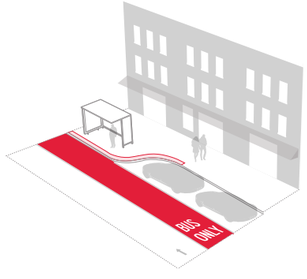
For median bus lane designs, boarding platforms must be included for bus passengers at bus stops; these islands can also function as pedestrian safety islands. See GEOMETRY: PEDESTRIAN SAFETY ISLAND

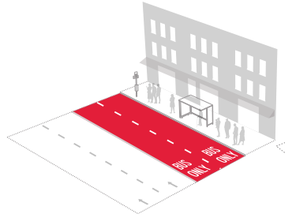
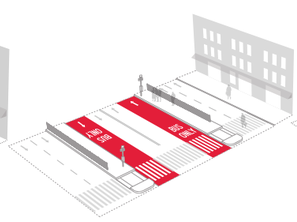
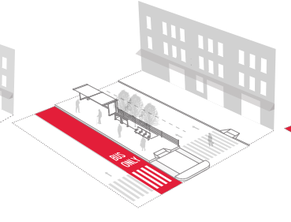
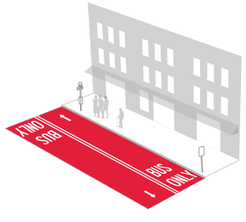
For median bus lane designs, left turns across the bus facility should either be prohibited or provided a protected signal phase

All bus lane designs can accommodate one or two directions of bus traffic. Special care must be paid to the signalization and design of intersections so as to not introduce turning conflicts

Webster Avenue, Bronx

TABLE 2C: BUS LANES

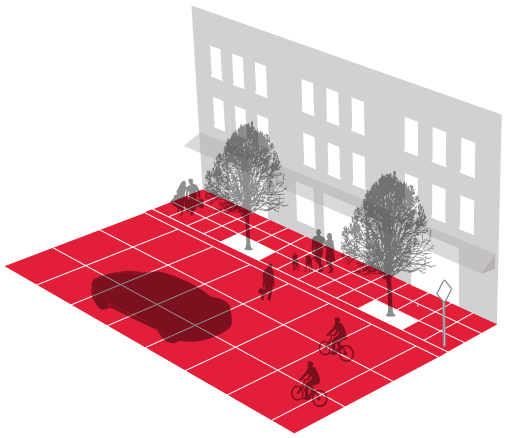
	Curbside Bus Lane	Contraflow Bus Lane	Offset Bus Lane
	Ex: Hylan Boulevard, Staten Island	*Ex: Glenwood Road, Brooklyn*	*Ex: Utica Avenue, Brooklyn*
			
Width	11-14′	12-14′	11-12′
Ideal Application	o Streets with narrow right-of way where an offset bus lane is not geometrically feasible o Streets with minimal curb demand	o Simplifying bus routing o Very high-volume bus corridors o Streets with narrow right-of-way where two-way general traffic is not feasible or desired	o Congested streets with heavy demand at the curb
Advantages	o Preserves vehicular travel lanes o Bus lane can be used for parking/loading off-hours	o Eliminates conflicts at the curb o Allows buses to use a simpler routing than the street network currently allows o Can be grade-separated	o Avoids conflicts at the curb o Can be in effect 24 hours/7 days per week allowing for uncomplicated signage to drivers o Provides opportunity to construct bus bulbs, adding more space for pedestrians and bus stop amenities o Buses can pass buses who are stopped at the curb
Disadvantages	o Removes parking/curb access o Only effective if properly enforced	o Removes parking/curb access o Requires sufficient right-of-way	o Requires removal of travel lane o For two-way streets ~60′-70′, left turns must often be restricted or bus lanes must often transition to the curb to accommodate a left turn bay (example: Utica Avenue, Brooklyn; Main Street, Queens)
Parking Loss	Medium-High o Parking removed when bus lane is in effect	High o All parking should be removed	Low-Medium o Parking typically preserved. Truck loading zones and meters should be added to prevent double-parking in bus lane
Red Color Treatment	o Preferred when bus lane is in effect for at least six hours per day	o Preferred	o Preferred

	Double Bus Lane	Median Bus Lane	Center-Running Bus Lane	Limited Access Transit Street
	Ex: Madison Avenue, Manhattan	*Ex: Woodhaven Boulevard, Queens*	*Ex: 161st Street, Bronx*	*Ex: 14th Street, Manhattan*
				
	21-24′	11-12′	11-12′	24-48′
	o Very high-volume bus corridors o Corridors with a high frequency of bus stops used by many lines (i.e. express bus corridors)	o Streets with a main line / service road design	o Streets with chronic double-parking issues o Streets where boarding islands can be accommodated	o Very high-volume bus corridors
	o Allows buses to pass each other	o Separates buses from curb conflicts o Allows for robust median bus stops	o Removes right-turn and curb conflicts	o Fully grade-separated right-of-way
	o Removes parking/curb access o Requires sufficient right-of-way	o Vehicle intrusion remains possible	o Left turns must be restricted or have separate signal phasing o Requires sufficient right-of-way	o Typically requires a capital project o Loading challenges for businesses
	Medium-High o Curbside parking typically removed but could allow curb access during off-peak hours (causing the bus facility to function as a de facto offset bus lane)	Very Low o Parking is sometimes gained due to relocating bus stops from service road to main line	Very Low o Parking is sometimes gained due to relocating bus stops from service road to main line	High o All parking should be removed
	o Preferred	o Preferred	o Preferred	o Preferred but less necessary since no traffic is allowed in right-of-way

Shared Street

Usage: Limited

Also known as a "pedestrian-priority" street, a shared street is a roadway designed for slow travel speeds where pedestrians, cyclists, and motorists all share the right of way. Typically employed on low vehicle volume and/or high pedestrian volume streets, vehicles are advised to drive 5 mph, and the roadway may be flush from building line to building line, separated by bollards or pedestrian amenities rather than the typical curb line grade separation. Slow speeds are encouraged through traffic calming, signage, and use of furnishings, plantings, and other visual cues in the roadway that caution drivers. Street users generally negotiate the right-of-way cooperatively rather than relying on traffic controls, allowing the entire street to effectively function as a public space. Shared streets can be designed and managed in a variety of different ways to balance the needs of all users while enhancing the safety, aesthetics, and overall experience of the street.



Flatiron Shared Street, Broadway between 24th Street and 25th Street, Manhattan

University Place Shared Street, University Place between 13th Street and 14th Street, Manhattan

Benefits

Encourages freer pedestrian movement within pedestrian-dominated areas and to and from adjacent destinations

Reduces sidewalk crowding on narrow streets

Comfortable, attractive environment encourages "staying" activities such as relaxing, shopping, eating, and socializing, fostering a vibrant public realm

Allows for a range of different management and operational parameters based on changing peak street users

Design treatments, including street furniture and landscaping, prioritize pedestrian use while still allowing for local access

Creates more space for event programming

Considerations

Coordinate access for transit, buildings, loading, sanitation, and emergency services to facilitate daily operations

Attention should be given to accommodation of and navigation by people with vision and cognitive disabilities

May impact street drainage or require catch basin relocation

May require loss of on-street parking

Any public space amenity, such as street furniture or plantings, generally requires a maintenance agreement

Coordinate streetscape/utility work to minimize street cuts

May require pedestrian security measures

Consider as an alternative to a fully pedestrianized street when pedestrian volumes are high, vehicle volumes are low, and vehicle access is not required during daytime hours

Application

Consider on narrower streets (at most two moving lanes) or outer roadways of boulevard-type streets, with little or no through traffic, and which are not major vehicular or cyclist through routes or designated truck routes

Consider on streets adjacent to major pedestrian destinations, where vehicle volumes are low and pedestrian desire lines are diffuse (i.e., pedestrians would like to cross the street in many places)

Consider on local residential streets whose design priority is to allow safe use of street space for recreational activities and green space, in partnership with residents or neighborhood groups

Design

Curbs should be avoided, but pedestrian paths of travel alongside vehicle zones should be provided for people with ambulatory, vision, and cognitive disabilities

Guideways using tactile cues and maximum visual contrast should be included for people with vision disabilities

In the absence of curbs, special attention should be given to providing adequate drainage

Institute an advisory reduced speed of 5 mph (New York State VTL Section 1642(a)(26) and (27) allow actual enforceable speed limits as low as 15 mph) along with the physical traffic calming of the shared street

Design should utilize whatever horizontal, vertical, and material treatments are necessary to encourage low vehicle speeds throughout, whether or not pedestrians are present

Use gateway or similar treatments and proper signage at entries to discourage through traffic, indicate the change in street environment, and slow entering vehicles. See GEOMETRY: GATEWAY

Attractive street materials, furnishings, and other objects within the street can be used to alert drivers and emphasize the pedestrian orientation of the space, subject to permits, maintenance agreements, or revocable consents as required

DOT standard concrete is appropriate for the portion of the shared street intended for vehicles

Include planted areas and stormwater source controls within the roadway where possible. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

Staggered sections of parking or loading zones can be used as a design option to constrict wider streets

To maintain the streetscape elements required for creating a low-speed environment and fostering a vibrant public space, careful attention should be paid to proper programming and management of the space, with the participation of an active maintenance partner where appropriate

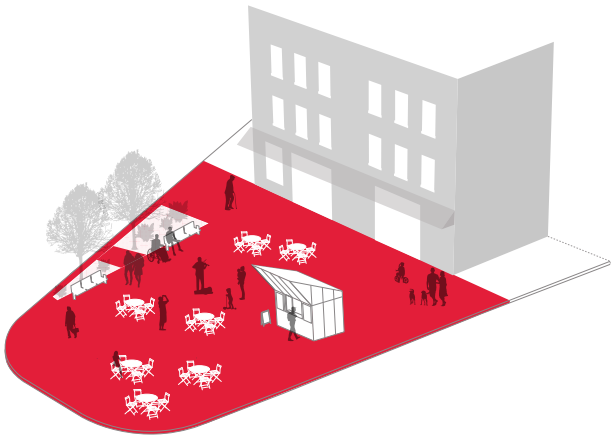
Maximize trees and other green cover. See LANDSCAPE: TREE BEDS and LANDSCAPE: ROADWAY PLANTINGS

Utilize recycled content in paving materials

Pedestrian Plaza

Usage: Limited

An area located fully within the public right-of-way that is designated by DOT for use by pedestrians. The space may contain benches, tables, or other facilities. Plazas are maintained and managed by local, not-for-profit partner organizations or other entities, such as Parks.



Special event at Corona Plaza: National Street and Roosevelt Avenue, Queens

Interim pedestrian plaza at 71st Avenue Plaza: 71st Avenue and Myrtle Avenue, Queens

Benefits

Promotes social interaction and builds neighborhood identity

Encourages pedestrian activity and associated health benefits

Catalyzes local economic development

Serves as a venue for a diverse range of community, cultural, and/or commercial events

Enhances safety by removing conflicts, narrowing wide roadways, and/or normalizing intersections

Considerations

The road segment's relevance to the traffic network

Open-space needs

Local deliveries and loading/unloading

Income eligibility: neighborhoods designated by HUD as Community Development Block Grant (CDBG) eligible receive greater consideration

Surrounding land uses and site appropriateness

Organizational and maintenance capacity of community partner

Advertising is generally prohibited in plazas

Generally requires a maintenance agreement

May require pedestrian security measures

Attention should be given to accommodation of and navigation by people with vision and cognitive disabilities

Conduct outreach to people with disabilities and stakeholders working with these population groups early in the planning and implementation process. Provide notification of street geometry changes after implementation

Application

Underutilized, DOT-owned road segments

Locations with high crash rates

Neighborhoods that support repurposing streets for plazas

Neighborhoods with active organizations that can serve as Pedestrian Plaza Partners to maintain and manage plazas

Areas with appropriate adjacent land uses, sufficient population density, proximity to transit, historic sites, and significant view corridors

Design

Each permanent plaza is designed to reflect the character and context of its neighborhood. DOT and the Pedestrian Plaza Partner conduct a public process to develop an appropriate design that is responsive to the needs of the community

A consultant design team bases its plans on feedback from the public process

Sites smaller than 2,000 square feet are not encouraged

Plazas may include movable and/or formal and informal fixed seating, trees and plants (see LANDSCAPE: TREE BEDS and LANDSCAPE: PLAZA PLANTINGS), lighting, paving, information and wayfinding signage, sub-concessions, temporary and permanent public art, bike parking, and drinking water fountains

Permanent or temporary art can be included in plaza design. For more information, see PROGRAMMING: DOT ART PROGRAM

Plaza designs should support year-round events and programs. See PROGRAMMING: PLAZA EVENT (CIVIC)

Provide clear paths with minimum clutter, and tactile and visual cues to accommodate people with disabilities

Provide furniture that accommodates people with ambulatory disabilities; for example, space for knee clearance for people using mobility devices

Utility boxes should be screened from public view

Incorporate trees and other green cover. See LANDSCAPE: TREE BEDS and LANDSCAPE: PLAZA PLANTINGS

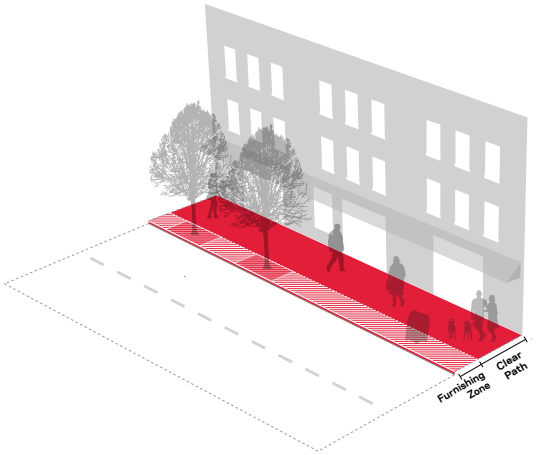
Utilize stormwater source controls wherever feasible

Sidewalks & Raised Medians

Full Sidewalk

Usage: Wide

A sidewalk is the portion of a street, intended for the use of pedestrians, between the roadway and adjacent property lines. A full sidewalk accommodates both pedestrian traffic and a range of street furnishings and fixtures. The area of the sidewalk closest to the curb, where light poles, tree pits and other vegetation, signs, fire hydrants, and street furniture are typically located, is referred to as the "furnishing zone."



Canal Street, Manhattan

Main Street, Queens

Benefits

Provides space for walking, the most widely used mode of travel in New York City

Creates linkages to transit and connects neighborhood destinations

Facilitates straight and unobstructed pedestrian movement, free of vehicle conflicts except at intersections and driveways

With adequate width, can provide space for "staying" activities such as relaxing, shopping, eating, and socializing

Manages roadway drainage

Considerations

Coordinate streetscape/utility work to minimize street cuts

The adjacent property owner is responsible for any sidewalk maintenance and repair, pursuant to NYC Charter Section 2904 and Section 19-152 of the New York City Administrative Code

Application

On both sides of all streets that are 22 feet wide or wider. Exceptions include shared streets and streets in certain historic districts per LPC. See GEOMETRY: SHARED STREET

Ribbon sidewalks are appropriate in R1-R6 zoning districts; full sidewalks are used elsewhere

Design

Sidewalks should be as wide as possible appropriate to foot traffic and available street width

Sidewalks should always be provided on both sides of the street

See SIDEWALKS in the MATERIALS chapter for information on options for sidewalk materials

A park's internal path located near a roadway does not substitute for a sidewalk

If the sidewalk is more than 25 feet wide, there should be a clear path adjacent to the building line and an 8-foot clear path adjacent to the curbside furnishing zone. See FURNITURE chapter

Sidewalks must conform to ADA requirements for a minimum clear-path width and provision of spaces where wheelchair users can pass one another or turn around

Provide an unobstructed clear path of 8 feet or one half the sidewalk width (whichever is greater) in commercial, high-density residential, and transit-adjacent areas

Sidewalks in low-rise residential areas should be at least 5 feet wide

Wherever possible, sidewalk cross-slope should not be greater than 2%

Sidewalks must meet load-bearing, friction, and other requirements per relevant standard specifications and regulations

ADA-compliant pedestrian ramps must be provided at all pedestrian crossings; separate ramps should be aligned with each crosswalk and be centered with the sidewalk. See GEOMETRY: PEDESTRIAN RAMP

Color of detectable warning strips on pedestrian ramps should contrast with surrounding pavement: red for unpigmented concrete, bright white for dark pigmented concrete. See MATERIALS: UNPIGMENTED CONCRETE and MATERIALS: PIGMENTED CONCRETE (DARK). See DOT Standard Details of Construction drawing H-1011

The area within 18 inches of the curb should be kept free of all obstructions

New York City Mayor's Executive Order No.22 of 1995 (the "Clear Corner Policy") states that to the maximum extent possible, structures and objects should not be placed in the corner quadrant

For recommended clearances between obstructions, see FURNITURE chapter, Revocable Consent Rules (Rules of the City of New York, Title 34, Chapter 7, Section 7-06(c)), DOT Highway Rules (Rules of the City of New York, Title 34, Chapter 2, Sections 2-10 and 2-14), DCWP's rules regarding newsstands (Rules of the City of New York, Title 6, Chapter 2, Subchapter G), and Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (US Access Board, 2011)

Include planted areas and stormwater source controls within sidewalks wherever possible when a maintenance partner is identified

If work includes tree planting, consider the location of utility infrastructure, including DEP sewers and water mains

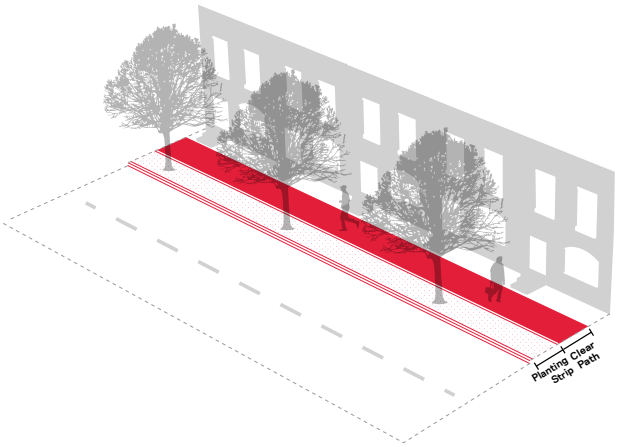
Maximize trees and other green cover wherever clearance allows. See LANDSCAPE: TREE BEDS and LANDSCAPE: SIDEWALK PLANTINGS

Utilize recycled content in paving materials

Ribbon Sidewalk

Usage: Wide

A sidewalk that is separated from the roadway by a continuous, unpaved planting strip. Most existing ribbon sidewalks in the city have a lawn planting strip, but more sustainable landscaping options should be utilized whenever possible. Alternatively, planting strips can be designed as pilot stormwater management practices to help collect stormwater runoff. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES.



Ocean Parkway Service Road, Brooklyn

Rockaway Beach, Queens

Benefits

See benefits of GEOMETRY: FULL SIDEWALK

Provides greater space for tree roots than a full sidewalk with individual tree beds, improving long-term tree health. See GEOMETRY: FULL SIDEWALK and LANDSCAPE: TREE BEDS

Provides a modest improvement in stormwater detention from the sidewalk and/or roadway as compared to a full sidewalk. See GEOMETRY: FULL SIDEWALK

Provides a more attractive streetscape in areas of low- to moderate-density residential land use

Application

Areas within zoning districts R1 through R6

Consider wherever pedestrian volumes can be accommodated and curbside activity is low

Design

See geometric design guidance for GEOMETRY: FULL SIDEWALK and materials guidance for MATERIALS: SIDEWALKS

Ribbon sidewalks should be at least 5 feet wide or as required to match the existing ribbon width in the adjacent surrounding sidewalk; they should be wider along arterials and collector roads

Planting strips adjacent to ribbon sidewalks must be planted with groundcover vegetation for erosion control if a stormwater management practice is not used; herbaceous plant material, preferably native or adapted species, should be used rather than grass wherever possible, as turf absorbs water from tree roots, has little benefit to habitat, and requires the use of pesticides, herbicides, fungicides, and lawnmowers that can potentially damage tree roots. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

Where there are fire hydrants in the planting strip adjacent to a ribbon sidewalk, a 5-foot-by-5-foot slab of 6-inch-thick concrete on 6-inch, crushed-stone base extending from the curb to the sidewalk is required

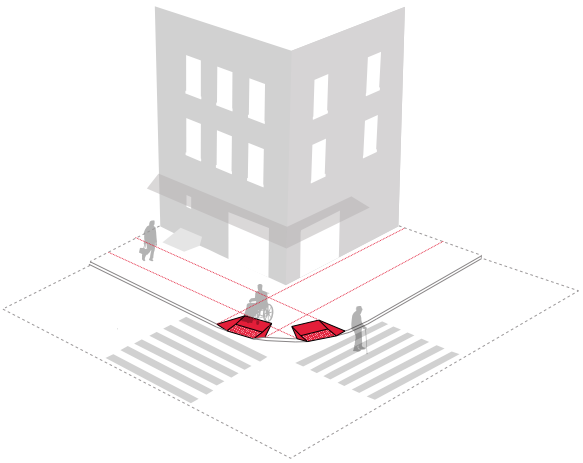
Similar considerations apply to other elements, such as lampposts and signal posts

Where feasible and if there is a maintenance partner, utilize stormwater management practice within planting strip rather than groundcover vegetation alone. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

Pedestrian Ramp

Usage: Wide

Pedestrian ramps are a critical component in providing safe and accessible means of travel. Pedestrian ramps provide safe transitions between the roadway and sidewalk and are an essential tool for all pedestrians, particularly the aging population and people with ambulatory and vision disabilities. Ramps are required to include a color-contrasting detectable warning surface to communicate boundaries between pedestrian and vehicular paths and unprotected drop-offs to pedestrians who have vision disabilities.



2nd Avenue, Manhattan.

96th Street, Manhattan

Benefits

Maintains an accessible path of travel for pedestrians with mobility disabilities and those with strollers or other wheeled devices

Provides visual and tactile cue for pedestrians with vision disabilities when entering or exiting pedestrian space

Considerations

Pedestrian ramps are needed wherever a sidewalk or other pedestrian walkway crosses a curb

Any corner, corner quadrant, or crosswalk alteration triggers the obligation to provide ADA-compliant ramps to the maximum extent feasible

Perpendicular (dual) pedestrian ramps are preferred over apex (single) ramps. Each corner should have one pedestrian ramp for each crosswalk. Single ramps are allowed as a design solution in the absence of a feasible ADA-compliant solution. Apex ramps require DOT approval

Application

At all corners, medians, and mid-block crossings where pedestrian walkways exist

Design

The design and construction of a pedestrian ramp must follow the Americans with Disabilities Act (ADA) *2010 Standards for Accessible Design*, best practice guidelines found in the Public Right-of-Way Accessibility Guidelines, and local rules, specifications, and bulletins

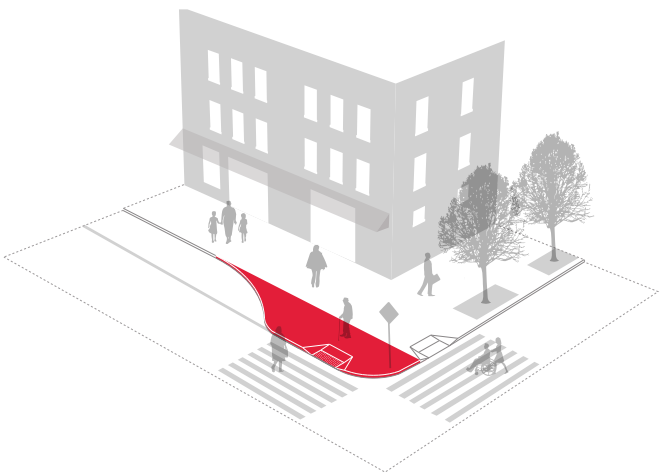
If the minimum design standards cannot be met, provide ADA compliance to the maximum extent feasible. Coordinate with DOT to demonstrate and document alternative designs in cases where it is structurally impracticable or technically infeasible to provide a fully ADA-compliant pedestrian ramp. (See **www.nycpedramps.info** for inspection forms.)

Detectable warning surfaces should be red when adjoining light-colored sidewalks, such as unpigmented concrete. Detectable warning surfaces should be bright white when adjoining dark-colored surfaces, such as pigmented concrete, asphalt pavers, or bluestone. See MATERIALS: UNPIGMENTED CONCRETE, MATERIALS: PIGMENTED CONCRETE, MATERIALS: HEXAGONAL ASPHALT PAVER, and MATERIALS: BLUESTONE FLAG

Curb Extension

Usage: Wide

An expansion of the curb line into the lane of the roadway adjacent to the curb (typically a parking lane) for a portion of a block either at a corner or mid-block. Also known as neckdowns, curb extensions can enhance pedestrian safety by reducing crossing distances, relieve sidewalk crowding, and provide space for functional elements such as seating, plantings, bike share stations, and furniture. In addition, two curb extensions can be located on either side of a street to create a mid-block narrowing or at an intersection to create a gateway. See GEOMETRY: MID-BLOCK NARROWING and GEOMETRY: GATEWAY.



Metropolitan Avenue, Brooklyn

Bay Street, Staten Island

Benefits

Calms traffic by narrowing the roadway

Makes the crosswalk more apparent to drivers, encouraging them to stop in advance of the crosswalk, and reduces illegal parking within crosswalk

At a corner, slows turning vehicles and emphasizes the right-of-way of pedestrians

Shortens crossing distance, reducing pedestrian exposure

Enhances visibility of pedestrians to drivers

Reinforces lane discipline through intersection, preventing vehicle passing maneuvers in parking lane

Provides additional pedestrian space and reduces crowding, particularly for queuing at crossings and bus stops or at a subway entrance

Reduces sidewalk clutter by creating space for street furniture, bus stops, street vendors, etc.

Defines the ends of angle parking

Discourages truck turns onto streets with No Truck regulations and discourages or prevents vehicles from taking banned turns (see Rules of the City of New York, Title 34, Chapter 4, Section 4-13)

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

May require loss of curbside parking

May complicate delivery access and garbage removal

May impact snow plows and street sweepers

May impact ability to install future curbside bike or bus facilities

Permits, revocable consents, and/or maintenance agreements may be required for certain furniture elements

Application

Within a curbside parking lane

Corners with marked pedestrian crosswalks in retail districts, directly adjacent to schools, at intersections with demonstrated pedestrian safety issues, on wide streets, or in areas of high foot traffic

At mid-block crossings (see GEOMETRY: MID-BLOCK NARROWING)

Intersections where a two-way road transitions to oncoming one-way operation so as to block wrong-way traffic from proceeding straight onto the one-way portion (a "blockbuster")

Next to subway entrances or other sidewalk pinch points so as to increase pedestrian walking or queuing space

Consider elongated curb extensions for some or most of a block (i.e., a widened sidewalk with lay-by areas) in areas where a full sidewalk widening would be desirable but some loading, drop-off, or parking access must be maintained

Cannot be used where curbside travel (including bus, bike, or general traffic) lane exists, such as those created through peak-period parking restrictions

Feasibility is evaluated based on engineer review of design vehicle turning movements

Design

Curb extension width is typically two feet less than the width of the parking lane. Minimum curb extension length is typically equal to the full width of the crosswalk, however it can be longer when appropriate or necessary

Must accommodate design vehicle; when a curb extension conflicts with design vehicle turning movements, the curb extension should be reduced in size rather than eliminated wherever possible

At crossings that have low pedestrian visibility, curb extension should be long enough to "daylight" the crossing, i.e., provide open sight-lines to the pedestrian crossing for approaching motorists; the additional curb extension space can be used to provide plantings (see LANDSCAPE: CURB EXTENSION) or community facilities such as bike parking

Detectable warning strips are required at pedestrian crossings where the transition from pedestrian space to roadway is flush, and should be red when adjoining light-colored sidewalks, such as unpigmented concrete, or bright white when adjoining dark-colored surfaces, such as pigmented concrete, asphalt pavers, or bluestone. See MATERIALS: UNPIGMENTED CONCRETE, MATERIALS: PIGMENTED CONCRETE, MATERIALS: HEXAGONAL ASPHALT PAVER, and MATERIALS: BLUESTONE FLAG

Edge objects, such as planters, granite blocks, and flexible delineators, should be placed in and around the painted curb extensions to create a consistent boundary and sense of enclosure, buffer it from motor vehicle traffic, and clearly indicate the crosswalk to pedestrians with vision disabilities. Paint is used to distinguish it visually from the adjacent roadway

The design and placement of street furniture, trees, and plantings on a curb extension must not impede pedestrian flow, obstruct clear path, or interfere with "daylighting" the intersection, emergency operations, or sight lines

When constructed in concrete, pedestrian ramps with detectable warning surfaces are required at pedestrian crossings. See GEOMETRY: PEDESTRIAN RAMP

Reflective vertical elements should be used to alert drivers and snow plow operators to the presence of curb extensions in operational materials

Curb extension must be designed so as to maintain drainage of stormwater from the gutter and not cause ponding; depending on site-specific grading conditions, this might include properly locating or relocating catch basins or utilizing design treatments that channel water through, around, or in between curb extension and the curbline

When a curb extension is used adjacent to a fire hydrant, the length of the curb extension should be equal to or greater than the No Parking zone (typically 15 feet in either direction) and the hydrant should be moved onto the curb extension

Where space permits, more functional curb extension designs, such as those with plantings, seating, or bike parking, should be used whenever possible. See LANDSCAPE: SIDEWALK PLANTINGS

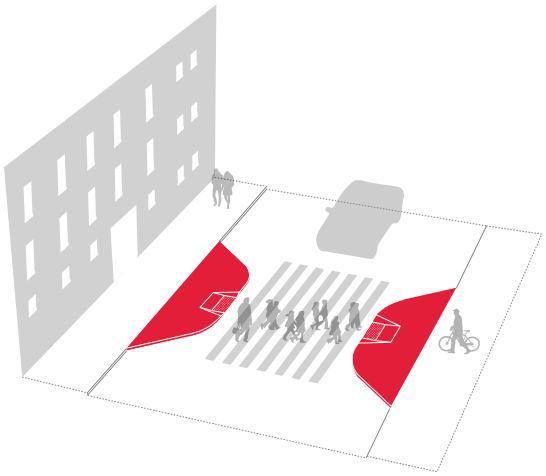
Where feasible and if there is a maintenance partner, design planted areas within curb extension so as to capture stormwater according to current standards. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

Paving on a curb extension should match that of the surrounding sidewalks

Mid-Block Narrowing

Usage: Wide

Two curb extensions that create a pinch point. A mid-block narrowing (also referred to as a "choker") physically or visually constricts the roadway, thereby slowing vehicular traffic or alerting drivers to the presence of a mid-block crosswalk. The curb extensions themselves can be of any variety, for example with plantings or other functional elements. A mid-block narrowing is equivalent to a gateway located mid-block. See GEOMETRY: GATEWAY.



Interim mid-block narrowing at Midtown Arcades: W 51st Street, Manhattan

Permanent mid-block narrowing: 97th Street, Queens

Benefits

Provides safety and traffic calming benefits as described in GEOMETRY: CURB EXTENSION

Calms mid-block traffic speeds, particularly when vertical elements (e.g., bollards, trees, bike parking, etc.) are included in curb extensions

Enhances drivers' awareness of presence of crosswalk at mid-block crossing

Provides space for greening, community facilities, bike parking, and/or stormwater source control measures

Considerations

At mid-block crossings on two-way streets, it is generally preferable to include a raised median or pedestrian safety island rather than or in addition to a mid-block narrowing, when space allows. See GEOMETRY: RAISED MEDIAN and GEOMETRY: PEDESTRIAN SAFETY ISLAND

Application

See application guidance for GEOMETRY: CURB EXTENSION

Local streets with demonstrated speeding issues and/or a mid-block crossing

Design

See design guidance for GEOMETRY: CURB EXTENSION

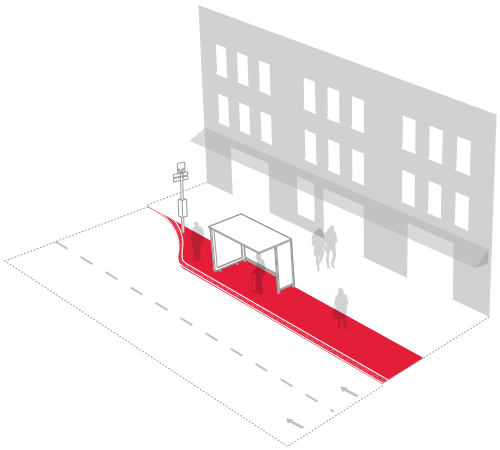
Reduce lane width at mid-block narrowing to impact vehicle speeds; on low-traffic residential streets, mid-block narrowing can be combined with other design treatments, including raised crosswalks, raised speed reducers, or vertical elements for maximum effectiveness. See GEOMETRY: RAISED CROSSWALK and GEOMETRY: RAISED SPEED REDUCER

Locate trees and/or plantings within curb extensions of mid-block narrowing where appropriate. See LANDSCAPE: TREE BEDS and LANDSCAPE: CURB EXTENSION

Bus Bulb

Usage: Wide

A curb extension at a bus stop that allows buses to remain in the moving lane while picking up and discharging passengers. Bus bulbs may also be designed to better support bus passengers through the inclusion of higher curbs, bus stop shelters, seating, pre-boarding payment equipment, and other bus-supportive facilities.



Nostrand Avenue and Fulton Street, Brooklyn

Benefits

Provides safety and traffic calming benefits as described in GEOMETRY: CURB EXTENSION

Speeds bus movement on streets with traffic congestion by eliminating the need for buses to maneuver in and out of the moving lane

Speeds bus movement by reducing the likelihood of bus stops being blocked by other vehicles

Can allow faster bus passenger boarding

Can provide comfort and convenience to bus riders through dedicated waiting space and inclusion of bus-related amenities

When utilized at a bus stop under an elevated train line, where the bus does not pull over to the sidewalk and passengers regularly stand in the roadway, provides a safer waiting space

Application

See application guidance for GEOMETRY: CURB EXTENSION

At bus stops along bus routes where it has been determined by DOT and MTA NYCT that bus bulbs improve bus service

Design

For detailed design guidance, see Select Bus Service Station Design Guidelines (DOT & MTA NYCT, 2018)

See additional design guidance for GEOMETRY: CURB EXTENSION

Bus bulbs should be long enough to encompass the front and rear doors of the buses that will be using it, and should extend the length of the bus stop whenever possible

Design bus bulbs with care to accommodate accessibility needs, taking into account the full range of buses that might be using the stop

Bus bulbs that are not at sidewalk grade must be accessible via ramp with a maximum cross-slope of 2%

To achieve near level boarding, bus bulbs may have a higher curb-reveal, up to 10.5 inches

A detectable edge treatment should be applied to the street edge of the bus bulb, and should be red when adjoining light-colored sidewalks, such as unpigmented concrete, or bright white when adjoining dark-colored surfaces, such as pigmented concrete, asphalt pavers, or bluestone. See MATERIALS: UNPIGMENTED CONCRETE, MATERIALS: PIGMENTED CONCRETE, MATERIALS: HEXAGONAL ASPHALT PAVER, and MATERIALS: BLUESTONE FLAG

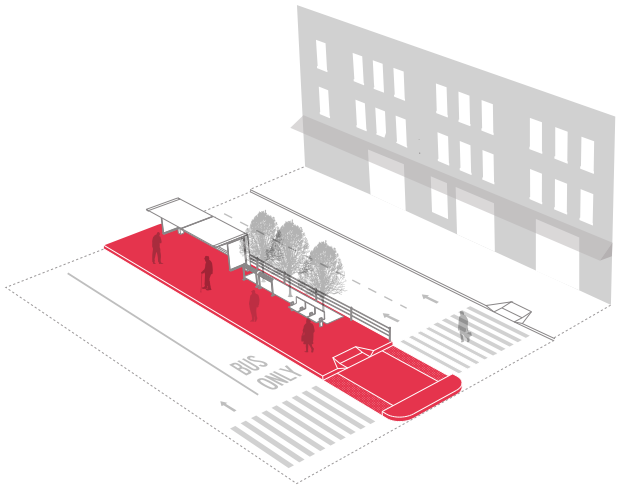
While bus bulbs are typically constructed in concrete, it is possible to use operational materials which can be implemented more quickly and at lower cost

Nostrand Avenue and Clarkson Avenue, Brooklyn

Bus Boarding Island

Usage: Wide

A raised area, not connected to the adjacent sidewalk, with dedicated waiting and boarding area for bus passengers. Boarding islands provide many of the benefits of bus bulbs while also avoiding curb, bike, and catch-basin conflicts. Usage is most desirable on streets with parking-protected bike lanes and frequent bus service.



3rd Avenue and 57th Street, Manhattan

E 161st Street, Bronx

Benefits

See benefits of GEOMETRY: BUS BULB

See benefits of GEOMETRY: PEDESTRIAN SAFETY ISLAND

Reduces conflicts with curb activity by moving bus stop away from the curb

Reduces conflicts with bikes by physically separating bus stop from bike path

Avoids need to relocate existing catch basins

When utilized at a bus stop under an elevated train line, where the bus does not pull over to the sidewalk and passengers regularly stand in the roadway, provides a safer waiting space

Application

Streets with high curb demand or heavy right-turn volumes

Streets with parking-protected bike lanes

Streets under elevated trains where the bus does not pull over to the sidewalk, and bus bulbs are unsuitable or costly

Design

See design guidance for GEOMETRY: PEDESTRIAN SAFETY ISLAND

Minimum bus boarding island widths vary from 8.5 feet to 12 feet depending on the type of bus using the island, the space necessary to deploy the wheelchair ramp, and whether a fence is placed on the back of the island

Boarding island length varies depending upon the buses using the island, the likelihood of two buses arriving at once, and the necessary length of the cut-through and access ramp

For shorter blocks, island should extend to full length of block. This allows for a pedestrian access on both sides of the island and serves as a pedestrian refuge at two crosswalks. If not possible, a secondary signalized crossing or enhanced crossing should be considered at one end of the island

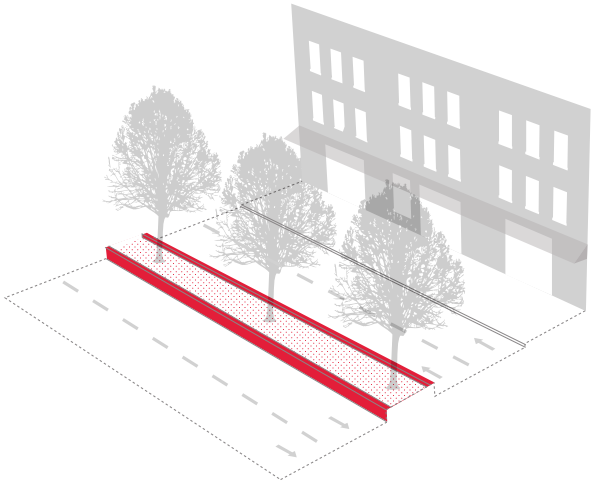
To achieve near-level boarding, bus boarding islands should have a higher curb-reveal, up to 10.5 inches

A shelter should be sited on the island as an amenity to bus riders and to provide a vertical element signal to drivers

Raised Median

Usage: Wide

A raised area separating different lanes, traffic directions, or roadways within a street. The raised median can be either curb height (6–7 inches) or, where appropriate, 12–24 inches high. The width as well as design of raised medians can vary widely. They can range from narrow raised concrete islands to tree-lined promenades to intensively landscaped boulevard medians. In contrast to pedestrian safety islands, raised medians extend for most or all of the street block. See GEOMETRY: PEDESTRIAN SAFETY ISLAND.



Grand Concourse, Bronx

253rd Street, Queens

Benefits

Reduces risk of left-turn and vehicle head-on collisions

Calms traffic by narrowing roadway

Enhances pedestrian safety and accessibility by reducing crossing distances and providing refuge for pedestrians to cross road in stages

Discourages dangerous mid-block crossing when used with fencing or planting

If designed for walking access, can provide additional pedestrian activities and amenities such as benches

Greens and beautifies the streetscape if trees and/or plantings are incorporated. See LANDSCAPE: RAISED MEDIAN

Improves environmental quality and can incorporate stormwater source controls

Can provide space for a pedestrian walkway and/or grade-separated bike lane, particularly as part of a boulevard treatment. See GEOMETRY: GRADE-SEPARATED BIKE LANE

Considerations

May impact underground utilities and manholes

Design must account for impact of raised median on emergency vehicle movement and access

Design must account for impact of raised median on driveway access where roadway narrowing makes it more difficult for vehicles to maneuver

Landscaping (excluding street trees) or stormwater source controls require a partner for ongoing maintenance, including executing a maintenance agreement

If there is a maintenance partner, design of the landscaped area should consider the inclusion of an irrigation system to reduce the cost of long-term maintenance and enhance overall plant health

Changes in traffic circulation resulting from addition of raised median should be understood so as to not force drivers to travel on inappropriate routes or make U-turns

Application

Consider on all two-way multi-lane streets

On streets of limited width, it may be preferable in some situations to include other treatments (e.g., expanded sidewalks or dedicated transit or bike facilities) rather than a raised median if there is not adequate room for all treatments and travel lanes

Design

Raised medians should be a minimum of 7 feet wide to provide detectable warnings and refuge to pedestrians at crossings

Raised medians should extend beyond the crosswalk at intersections wherever possible, while accommodating vehicle turning movements; the "nose" of the raised median should include bollards to protect pedestrians from wayward vehicles

Turning radii must be sufficient for the design vehicle and may constrain the length or width of the median "nose." This adjustment may shift the pedestrian cut through away from the desire line

Provide a walkable path across the raised median at crossings. When the median (with a standard 7-inch curb) is less than 17 feet wide, an 8- to 10-foot-wide cut-through, flush with the roadway, is appropriate. On medians wider than 17 feet, pedestrian ramps (1:12 grade with 5-foot landing areas) can be used to provide access

Provide a large area at crossings to permit groups of pedestrians to safely wait

Provide tactile cues for pedestrians with vision disabilities to indicate the border between the pedestrian refuge area and the motorized travel lanes

Include street trees, plantings, and unpaved or permeable surfaces wherever safe and feasible, using structural soil where appropriate. See LANDSCAPE: TREE BEDS, LANDSCAPE: RAISED MEDIAN, and MATERIALS: PERVIOUS CONCRETE

Where feasible and if there is a maintenance partner, design planted areas within raised median so as to capture stormwater according to current standards. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

If work includes tree planting, consider the location of utility infrastructure, including DEP sewers and water mains; also consider visibility for motorists, cyclists, and pedestrians

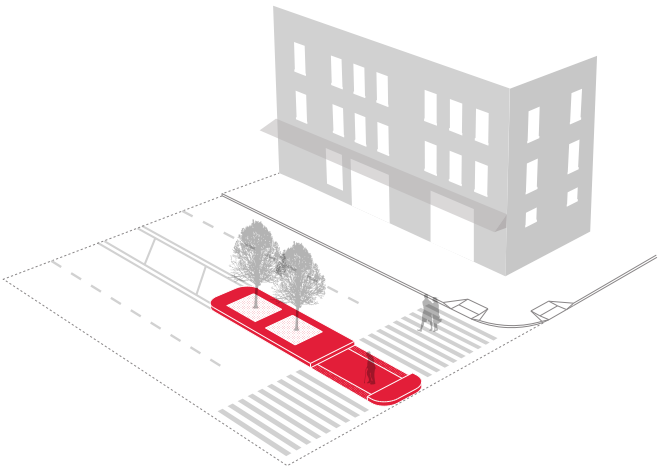
Grade roadways to direct stormwater towards raised medians if the raised medians include stormwater source controls, for example through the use of double or inverted roadway crown

Raised medians must be designed so as to maintain drainage of stormwater and not cause ponding

Pedestrian Safety Island

Usage: Wide

A raised area located at crosswalks that serves as pedestrian refuge separating traffic lanes or directions, particularly on wide roadways. Also known as a "median refuge island." Used at pedestrian crossings when a full raised median is not feasible. A pedestrian safety island confers most of the same benefits as full raised medians at pedestrian crossings. Full raised medians should be used rather than pedestrian safety islands wherever possible. See GEOMETRY: RAISED MEDIAN.



211th Street and 23rd Avenue, Queens

Riverside Drive, Manhattan

Benefits

Enhances pedestrian safety and accessibility by reducing crossing distances and providing refuge for pedestrians to cross road in stages

Calms traffic, especially left turns and through-movements, by narrowing roadway at intersection

Reduces risk of vehicle left-turn and head-on collisions at intersection

Can green and beautify the streetscape with trees and/or vegetation, potentially including stormwater source controls

Trees increase the visibility of the island, potentially enhancing safety

Considerations

May impact underground utilities

Landscaping (excluding street trees) or stormwater source controls require a partner for ongoing maintenance, including executing a maintenance agreement

If there is a maintenance partner, design should consider the inclusion of irrigation system for long term maintenance

Application

See application guidance for GEOMETRY: RAISED MEDIAN

Design

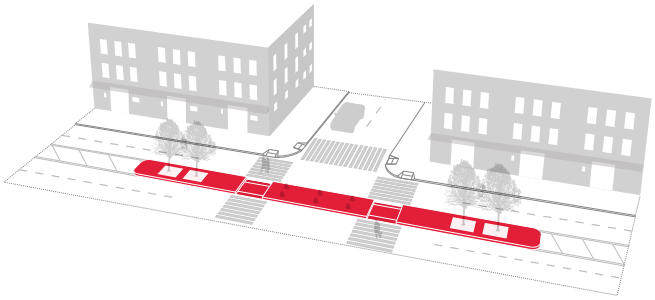
See design guidance for GEOMETRY: RAISED MEDIAN

Typical island accommodates two street trees and, where appropriate, safety bollards. See LANDSCAPE: TREE BEDS and LANDSCAPE: RAISED MEDIAN (CURB HEIGHT). Street trees must not block vehicles' line of sight to the traffic signal

Median Barrier

Usage: Limited

A raised median or pedestrian safety island extended through an intersection to prevent turns and through-movements to and from the intersecting street. Pedestrian access can be maintained with pedestrian refuges and bike access with gaps in the median. As with typical raised medians, trees or plantings can be included within the median barrier. See GEOMETRY: RAISED MEDIAN and GEOMETRY: PEDESTRIAN SAFETY ISLAND.



Grand Concourse, Bronx

Benefits

- Reduces or eliminates short-cut and cut-through traffic
- When applied consistently to an area, reduces traffic speeds
- Can green and beautify the streetscape with trees and/or vegetation, improving environmental quality and potentially incorporating stormwater source controls
- Enhances pedestrian safety by discouraging dangerous mid-block crossing
- Enhances safety at the intersection by reducing potential vehicle movements and conflicts, particularly left turns
- Reduces risk of vehicle head-on collisions
- Reduces risk of motorists running a red light or stop sign when approaching from side street
- Calms traffic on side street by requiring turn and on major street by narrowing roadway
- Enhances pedestrian safety and accessibility by reducing crossing distances and providing refuge for pedestrians to cross the road in stages

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

Emergency vehicle access needs must be accommodated

Landscaping (excluding street trees) or stormwater source controls require a partner for ongoing maintenance, including executing a maintenance agreement

If there is a maintenance partner, design should consider the inclusion of irrigation system for long term maintenance

If outfitted to capture stormwater, careful consideration must be given to design, overflow control, and plant species

Application

Consider on local streets with speeding or cut-through/ short-cutting problems

One-way or two-way local streets at their intersections with two-way collector or arterial roadways

Design

Design median barriers to impact motor vehicle movement but not bike movement; utilize bike channels or similar design strategies to allow passage by cyclists

Include planted areas and stormwater source controls within median barriers wherever possible when a maintenance partner is identified

Include street trees, plantings, and unpaved or permeable surfaces wherever safe and feasible, using structural soil where appropriate. See LANDSCAPE: TREE BEDS, LANDSCAPE: RAISED MEDIAN, and MATERIALS: PERVIOUS CONCRETE

If work includes tree planting, consider the location of utility infrastructure, including DEP sewers and water mains

Design any planted areas within median barrier so as to capture stormwater according to current standards

See additional design guidance for GEOMETRY: RAISED MEDIAN

Traffic Calming

Lane Narrowing & Lane Removal

Usage: Wide

Lane narrowings remove excess width from existing traffic lanes without changing the number of lanes. Lane removals, also known as "road diets," reassign underused traffic lanes to other functions. These design techniques, while not traffic calming devices, have powerful traffic calming benefits. Both may be accomplished by adding markings, turning lanes, pedestrian safety islands, expanded pedestrian space, on-street or separated bike lanes, parking, or other functions.

LEFT *and* **RIGHT:** *Before and after DOT installed a "road diet" in 2016: Grand Concourse and E 149th Street, Bronx*

Benefits

Reduces opportunities for speeding and aggressive driving, thereby decreasing the severity and frequency of crashes

Organizes the roadway to provide clearer instruction to drivers, cyclists, and pedestrians

Provides space for pedestrian safety islands, assigned turn lanes, wide parking lanes, bus lanes, bike lanes, expanded sidewalks/pedestrian space, or other uses

Considerations

Traffic conditions must be considered in planning lane removals; detailed analysis may be needed

Commercial loading and other uses should be considered in planning lane narrowing

Planned uses, such as bus lanes or bike lanes, should be taken into consideration

Effects of narrowings on turning movements should be tested

Application

Consider lane narrowings on corridors with excessively wide lanes

Multi-lane corridors with excess capacity (more traffic lane capacity than traffic volume) are excellent candidates for lane removal

Multi-lane corridors may be good candidates for lane removal in concert with other treatments, such as signal timing changes

Lane narrowing and removal should be prioritized on corridors with safety or speeding concerns, or where prioritization of non-general traffic is desirable

Design

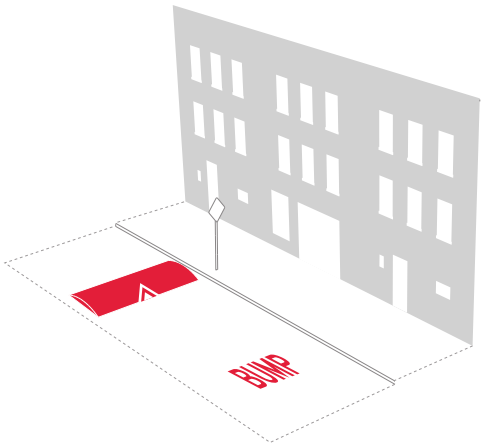
Lane narrowings and removals should result in standard-width lanes

When other treatments are included in a lane narrowing/removal, see specific guidelines for those treatments

Raised Speed Reducer

Usage: Wide

A raised area of a roadway that deflects both the wheels and frame of a traversing vehicle with the purpose of reducing vehicle speeds. The two basic types of raised speed reducers are speed humps and speed cushions. Both are typically raised 3 to 4 inches above the level of the roadway, and both have a proven speed-reducing track record in New York City. While speed humps span the width of the street, a speed cushion is divided into narrow segments, so that vehicles with wider wheel bases (buses, emergency vehicles, large trucks) are not affected.



Benefits

Compels drivers to travel at speeds no higher than the street's design speed

Considerations

Speed humps may impact emergency vehicle movement

May generate additional noise

Application

May be requested by the public, Community Boards, or elected officials with approval based upon speed, crash, street-geometry, and street-operations criteria

Speed humps are not appropriate on "local" or "through" truck routes or MTA bus routes, emergency vehicle response routes, or street blocks with FDNY houses or hospitals located on them

Neither speed humps nor speed cushions are appropriate on streets with more than one moving lane per direction

School locations are given priority

Design

Space raised speed reducers to maintain desired operating speeds

Appropriate warning signs and roadway markings should accompany raised speed reducers

Sterling Place, Brooklyn

Locate raised speed reducers in the middle of the roadway, with the gutters kept clear for proper road drainage

Use signage or other methods to alert operators of snow-clearing vehicles to the presence of raised speed reducers

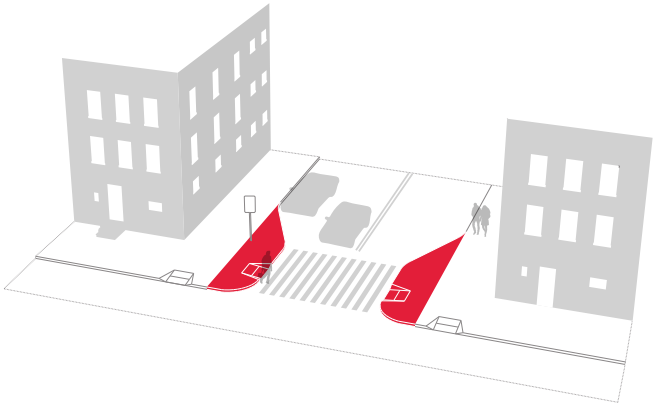
While raised speed reducers are an effective method to retrofit streets to reduce motor vehicle speeds in lieu of street reconstruction, all reconstructed streets should be designed to achieve desired speeds, e.g., using appropriate roadway width and alignment, horizontal deflection, traffic controls, trees, and other traffic calming treatments

Utilize recycled content in paving materials

Gateway

Usage: Limited

A combination of traffic calming and visual measures used at the entrance to a low-speed street to slow entering vehicles and discourage through traffic. Useful at all roadway transitions to slower-speed environments, gateways are especially suited to entrances to residential side streets and shared streets. The design elements of a gateway can include curb extensions, a raised crosswalk or driveway treatment, a raised median, landscaping or trees, and community facilities such as seating and public art. See GEOMETRY: SHARED STREET, GEOMETRY: CURB EXTENSION, GEOMETRY: RAISED CROSSWALK, and GEOMETRY: RAISED MEDIAN.



Prospect Place and Kingston Avenue, Brooklyn

Benefits

Decreases vehicular speeds and discourages through traffic without blocking or prohibiting vehicular access

Demarcates transitions to low-speed, shared street, or pedestrian-oriented areas. See GEOMETRY: SHARED STREET

Provides pedestrians with priority movement across the treated leg of the intersection

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

May require loss of curbside parking in some cases

Planted materials typically require a maintenance partner, and may require a permit or revocable consent

May impact ability to install future curbside bike or bus facility

If gateway includes a raised crosswalk, snow plows must be given advance warning. See GEOMETRY: RAISED CROSSWALK

Application

Entrances to shared streets. See GEOMETRY: SHARED STREET

Consider at entrances to streets with low vehicle volumes or speeds from streets with high vehicle volumes or speeds

Design

Include at a minimum curb extensions to narrow the roadway; preferably, vertical deflection should also be created using a raised crosswalk or ramped driveway treatment; if the street is two-way, a raised median or pedestrian safety island can be included, space permitting. See GEOMETRY: CURB EXTENSION, GEOMETRY: RAISED CROSSWALK, GEOMETRY: RAISED MEDIAN, and GEOMETRY: PEDESTRIAN SAFETY ISLAND

Other design elements can "narrow" a street visually, including plantings, public art, bike parking, and community facilities such as seating

If work includes tree planting, consider the location of utility infrastructure, including DEP sewers and water mains

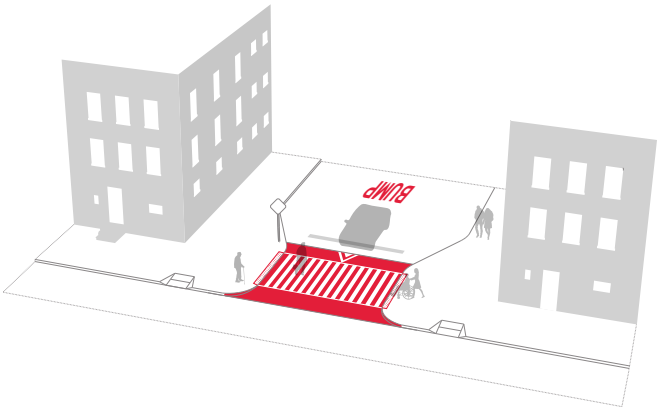
Where feasible and if there is a maintenance partner, design planted areas within gateway so as to capture stormwater according to current standards. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

If gateway includes planted curb extensions, see LANDSCAPE: CURB EXTENSION for design guidance

Raised Crosswalk

Usage: Limited

A marked pedestrian crosswalk at an intersection or a mid-block location constructed at a higher elevation than the adjacent roadway. A raised crosswalk is essentially a speed table that meets the adjacent curbs, and has a full-width crosswalk contained within the flat portion of the table, usually 10- to 15-feet wide. It combines the benefits of a raised speed reducer with increased accessibility and enhanced visibility for the pedestrians crossing. See GEOMETRY: RAISED SPEED REDUCER.



Benefits

Enhances access for people with ambulatory disabilities by providing level crossing

Compels drivers to travel at speeds no higher than the street's design speed

Improves drivers' awareness of presence of pedestrian crossing, particularly at mid-block crossing locations

Can alert drivers that they are entering a slower-speed, pedestrian-oriented street environment

Allows convenient pedestrian circulation between high foot traffic destinations on opposite sides of a street

Encourages motorists to yield to pedestrians

Considerations

May impact street drainage or require catch basin relocation

Attention should be given to accommodation of and navigation by people with vision disabilities

Application

Any crosswalk location that also meets the criteria for raised speed reducers. See GEOMETRY: RAISED SPEED REDUCER

Consider at areas of particularly high pedestrian crossing demand on narrower streets (maximum of two moving lanes), such as locations with pedestrian generators, particularly for children and seniors (e.g., major commercial or cultural destinations, transit entrances, parks, schools) on opposite sides of the street

Consider as a more robust option for mid-block crossings, particularly enhanced crossings

E 5th Street and Fort Hamilton Parkway, Brooklyn

Consider on the outer roadways of multi-lane boulevards at crossings

Not appropriate for arterial roadways

Design

Appropriate warning signs and roadway markings should accompany raised crosswalk

Use signage or other methods to alert snow-clearing vehicle operators to the presence of raised crosswalk

Detectable warning strips should be provided at crosswalk location. They should be red when adjoining light-colored sidewalks, such as unpigmented concrete, or bright white when adjoining dark-colored surfaces, such as pigmented concrete, asphalt pavers, or bluestone. See MATERIALS: UNPIGMENTED CONCRETE, MATERIALS: PIGMENTED CONCRETE, MATERIALS: HEXAGONAL ASPHALT PAVER, and MATERIALS: BLUESTONE FLAG

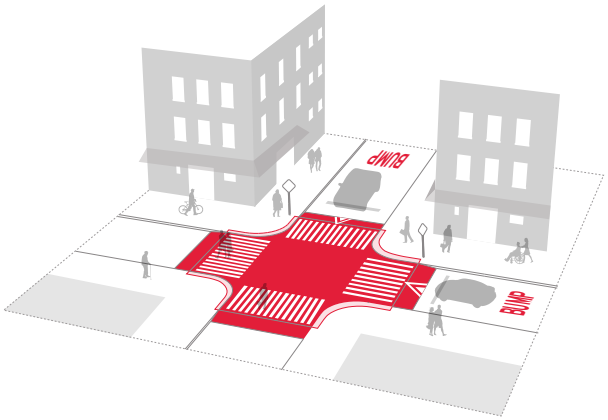
See design guidance for GEOMETRY: RAISED SPEED REDUCER

Utilize recycled content in paving materials

Raised Intersection

Usage: Pilot

An entire intersection raised above the level of the surrounding roadways. The intersection is typically raised to sidewalk height.



Cambridge, Massachusetts (Credit: Cara Seiderman)

London, United Kingdom (Note: for illustrative purposes only)

Benefits

Vertical deflection at entry to intersection encourages reduced vehicle speeds

Improves drivers' awareness of presence of pedestrian crossings

Visually turns intersection into a pedestrian-oriented zone

Enhances access for people with ambulatory disabilities by providing level crossing

Encourages motorists to yield to pedestrians

Considerations

May impact street drainage or require catch basin relocation

Application

Intersections with a high volume of pedestrian crossings and low target vehicle speeds

Intersections with a history of pedestrian crashes or speeding issues

Intersections where enhancing pedestrian movement is a major goal, such as transit stops or commercial areas

Avoid on truck and transit routes and at other locations where speed humps and speed tables are not appropriate

Design

Appropriate warning signs and roadway markings should accompany raised crosswalk

Use enhanced, high-visibility street materials to further draw attention to raised intersection

Detectable warning strips should be provided to delineate the edge between the sidewalk and the roadway. They should be red when adjoining light-colored sidewalks, such as unpigmented concrete, or bright white when adjoining dark-colored surfaces, such as pigmented concrete, asphalt pavers, or bluestone. See MATERIALS: UNPIGMENTED CONCRETE, MATERIALS: PIGMENTED CONCRETE, MATERIALS: HEXAGONAL ASPHALT PAVER, and MATERIALS: BLUESTONE FLAG

Use signage or other methods to alert operators of snow-clearing vehicles to the presence of raised speed reducers

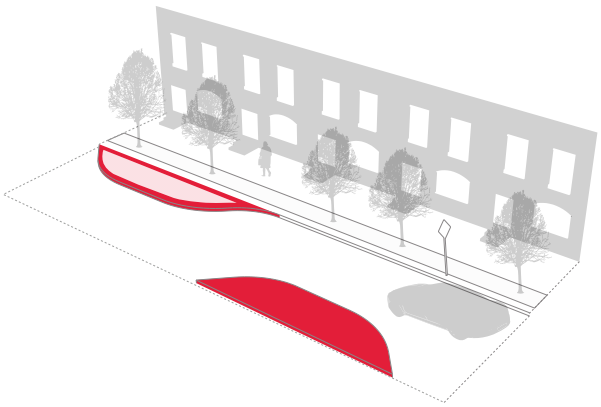
Utilize recycled content in paving materials

Coordinate streetscape/utility work to minimize street cuts

Chicane

Usage: Pilot

A series of narrowings or curb extensions that alternate from one side of the street to the other forming S-shaped curves to slow traffic. Chicanes discourage or make it impossible for drivers to drive in a straight line. This can reduce vehicular speeds. See GEOMETRY: CURB EXTENSION.



71st Avenue, Queens

E 53rd Street, Brooklyn

Benefits

Forces drivers to drive more slowly and with greater awareness, particularly at mid-block locations

Can green and beautify the streetscape with trees and/or vegetation, improving environmental quality and potentially incorporating stormwater source controls

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

May require loss of curbside parking

Landscaping or stormwater source controls require a partner for ongoing maintenance, including executing a maintenance agreement

May impact snow plows and street sweepers

Application

Consider on wide, low-volume, local streets (maximum of two moving lanes) with demonstrated speeding issues

Avoid on bus routes, truck routes, and major bike routes

Design

Interim chicanes use roadway markings to delineate a curving travel lane, with rubber speed bumps placed at curves to discourage vehicles from driving over markings

Interim chicanes are offset from the parking lane and do not result in parking loss

Permanent chicanes use concrete curb extensions that alternate from one side of the street to the other, and may involve parking loss. See GEOMETRY: CURB EXTENSION

Use reflective vertical elements to alert drivers and snow plow operators to presence of chicanes

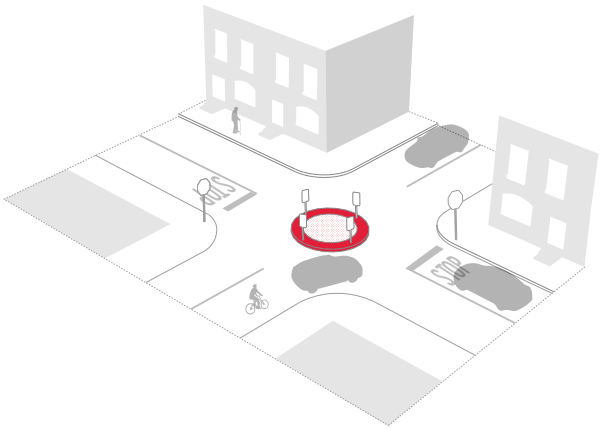
Locate trees and/or plantings within chicane curb extensions when appropriate. See LANDSCAPE: TREE BEDS and LANDSCAPE: ROADWAY PLANTINGS

Where feasible and if there is a maintenance partner, design planted areas within chicane curb extensions to capture stormwater according to current standards. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

Neighborhood Traffic Circle

Usage: Pilot

A round traffic island in the center of a traditional intersection. Primarily applicable to lower-traffic intersections as a horizontal speed reduction method for through traffic.



Greeley Avenue and Freeborn Street, Staten Island

Benefits

Reduces speeds, particularly when applied consistently to an area, while maintaining traffic flow

Can green and beautify the streetscape with trees and/or vegetation, improving environmental quality

Inclusion of plantings or art within the island creates an attractive focal point for the neighborhood

Considerations

May impact underground utilities

Landscaping requires a partner for ongoing maintenance, including executing a maintenance agreement

Landscaping must be designed and maintained so that it does not hinder visibility

Attention should be given to accommodation of and navigation by people with ambulatory and vision disabilities

Application

Consider at existing stop-controlled intersections, particularly all-way stops

Consider at intersections of streets with low target speeds (25 mph or below) or low vehicle volumes

A roundabout should be considered instead where traffic volumes on intersecting roads are more than 10% of overall traffic volumes. See GEOMETRY: ROUNDABOUT

Design

Design speeds for movement around the circle should be 10 to 15 mph; exit speeds should be limited to 15 mph through the circle's design wherever possible

Daylight parking spaces adjacent to the traffic circle to facilitate emergency vehicle and truck access

Use signs within the center island and reflective materials on the curb to improve center island visibility

A protective apron of concrete or textured pavement may be provided around the circle to accommodate wide-turning vehicles; where geometric constraints exist and truck volumes are low, trucks may be accommodated by use of a fully mountable roundabout island or allowing left turns in front of the island

Install approved circulatory signage directing through traffic to proceed to the right of the circle through the intersection

Locate trees and/or plantings when possible. See LANDSCAPE: TREE BEDS and LANDSCAPE: ROADWAY PLANTINGS

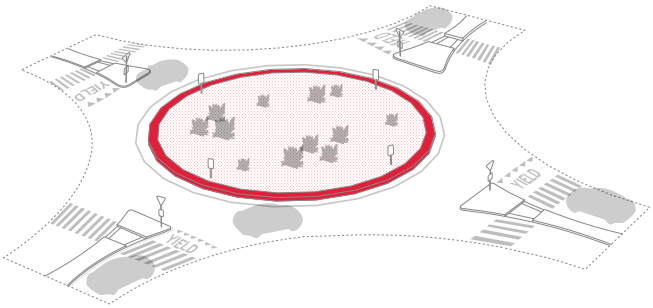
Where feasible and if there is a maintenance partner, design planted areas to capture stormwater according to current standards. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

If work includes tree planting, consider the location of utility infrastructure, including DEP sewers and water mains

Roundabout

Usage: Limited

An intersection with circular, one-way (counter-clockwise) traffic around a central circle in which entering traffic yields to traffic already in the roundabout. Roundabouts can vary in size (diameter) and number of lanes and can be modified with signalized crosswalks. Roundabouts are distinguished from "old-style" traffic circles/rotaries by their rules for yielding on entry and key design features targeting low design speeds.



Intervale Avenue and Dawson Street, Bronx

153rd Avenue and 88th Street, Queens

Benefits

Slows all traffic in all directions at all times, thereby decreasing the number and severity of crashes

Allows simultaneous movement of crossing vehicular streams, often processing vehicular traffic more efficiently than signalization

Eliminates possibility of vehicle head-on collisions

Reduces the number of potential vehicular conflict points as compared to a standard signalized intersection

Eliminates left turns, a primary cause of crashes

Enhances pedestrian safety when used at appropriate intersections

When used in place of a stop- or signal-controlled intersection, may reduce vehicle emissions and travel times by reducing start-and-stop driving

Reduces need to widen streets approaching intersection to store vehicles under signalized operation

Can green and beautify the streetscape with trees and/or plantings, improving environmental quality and potentially incorporating stormwater source controls

Inclusion of features not directly accessed by the public within the roundabout island, such as landscaped areas or art, creates an attractive focal point for the neighborhood

Considerations

May require increased spatial footprint for intersection, but not approaches

May impact street drainage or require catch basin relocation

May impact underground utilities

May require loss of curbside parking

May impact circulation at existing driveways adjacent to intersection

May impact direct pedestrian access and circulation

Landscaping or stormwater source controls require a partner for ongoing maintenance, including executing a maintenance agreement

If outfitted to capture stormwater, careful consideration must be given to design, overflow control, and plant species

Attention should be given to accommodation of and navigation by people with ambulatory and vision disabilities

Application

Intersections with 1) no more than 90% of volume on the main facility and 2) having at least three approaches, high vehicle-turning volumes or percentages, or speeding issues

Consider at locations with poor safety records, or where signalization has led or may lead to operational issues for pedestrians and/or cyclists

Design

Deflection should be created for entering vehicles to reinforce yielding behavior; at two-way legs of the intersection, use splitter islands to provide deflection as well as to allow pedestrians to cross in two segments

Detectable warning strips should be provided at all crosswalk locations, and should be red when adjoining light-colored sidewalks, such as unpigmented concrete, or bright white when adjoining dark-colored surfaces, such as pigmented concrete, asphalt pavers, or bluestone. See MATERIALS: UNPIGMENTED CONCRETE, MATERIALS: PIGMENTED CONCRETE, MATERIALS: HEXAGONAL ASPHALT PAVER, and MATERIALS: BLUESTONE FLAG

Limit entry and exit speeds through deflection and/or raised crosswalks

Roundabout geometry should accommodate the design vehicle; use an apron of visually-contrasting paving around the central island and/or adjacent to intersection corners to slow motor vehicle movements while accommodating larger vehicles such as trucks

To improve center island visibility, use reflective signs within the center island and reflective materials along the curb

Locate trees and/or plantings within roundabout center islands; include planted areas and stormwater source controls when a maintenance partner is identified where compatible with required sight distance. See LANDSCAPE: TREE BEDS and LANDSCAPE: ROADWAY PLANTINGS

Where feasible and if there is a maintenance partner, design planted areas within roundabout islands so as to capture stormwater according to current standards. See LANDSCAPE: STORMWATER MANAGEMENT PRACTICES

If work includes tree planting, consider the location of utility infrastructure, including DEP sewers and water mains