2 Geometry

		Usage		
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Introduction

About this Chapter

The geometric design of streets is integral to how motorists, bicyclists, pedestrians, and other street users behave on them. Geometry also affects streets' economic, community, and environmental impacts.

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, City Environmental Quality Review (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, 2004), the *Manual of Uniform Traffic Control Devices* (FHWA, 2003), and *Urban Street Geometric Design Handbook* (ITE, 2008).

Other resources include the *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (AASHTO, 2004), *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities* (ITE, 2006), and NYC DOT's own *School Safety Engineering Project: General Mitigation Measures Final Report* (2004). For additional references, see Appendix C.

Applicability and Exceptions

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

Usage Categories

Geometric treatments are divided into three categories: wide application, limited application, or pilot projects.

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 U.S. and international cites. Appropriate design criteria are still under development for application in New York City. Proposals for pilot usage of these treatments are encouraged and will be evaluated on a case–by–case basis.

General Guidelines

The following guidelines expand on the general policies and principles outlined in Chapter 1, with more detailed information specific to geometric street design.

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. New York State Vehicle & Traffic Law (VTL) Section 1642(a)(26)(a) currently allows 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, residential streets, alleys; on streets adjacent to schools, and senior or disabled pedestrian trip generators; and waterfronts, parks, or other significant pedestrian destinations.

Roadway Width, Curb Radii & Crossing Distance

To minimize pedestrian crossing distances and reduce impermeable, heat–absorbing asphalt coverage, the paved roadway of all streets should be designed to be the minimum width —and have the minimum number of lanes—that safely and cost–effectively allow for the desired operations of motor vehicles, buses, and bicyclists. Roadway reconstructions should be designed for traffic volumes expected in the actual build year. Additional consideration should be given to recent trends in traffic and mode choice —as documented in NYC DOT's *Sustainable Streets Index* — 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 final implementation of street retrofits (e.g., curbing, streetscaping, etc.), the reallocation of space should still proceed with temporary or least costly approaches such as restriping.

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

Pedestrian crossing distances should be minimized in all locations utilizing the above methods and other treatments, such as curb extensions (neckdowns) and medians. Sidewalk narrowings and roadway widenings should be avoided.

Design Vehicles & Emergency Access

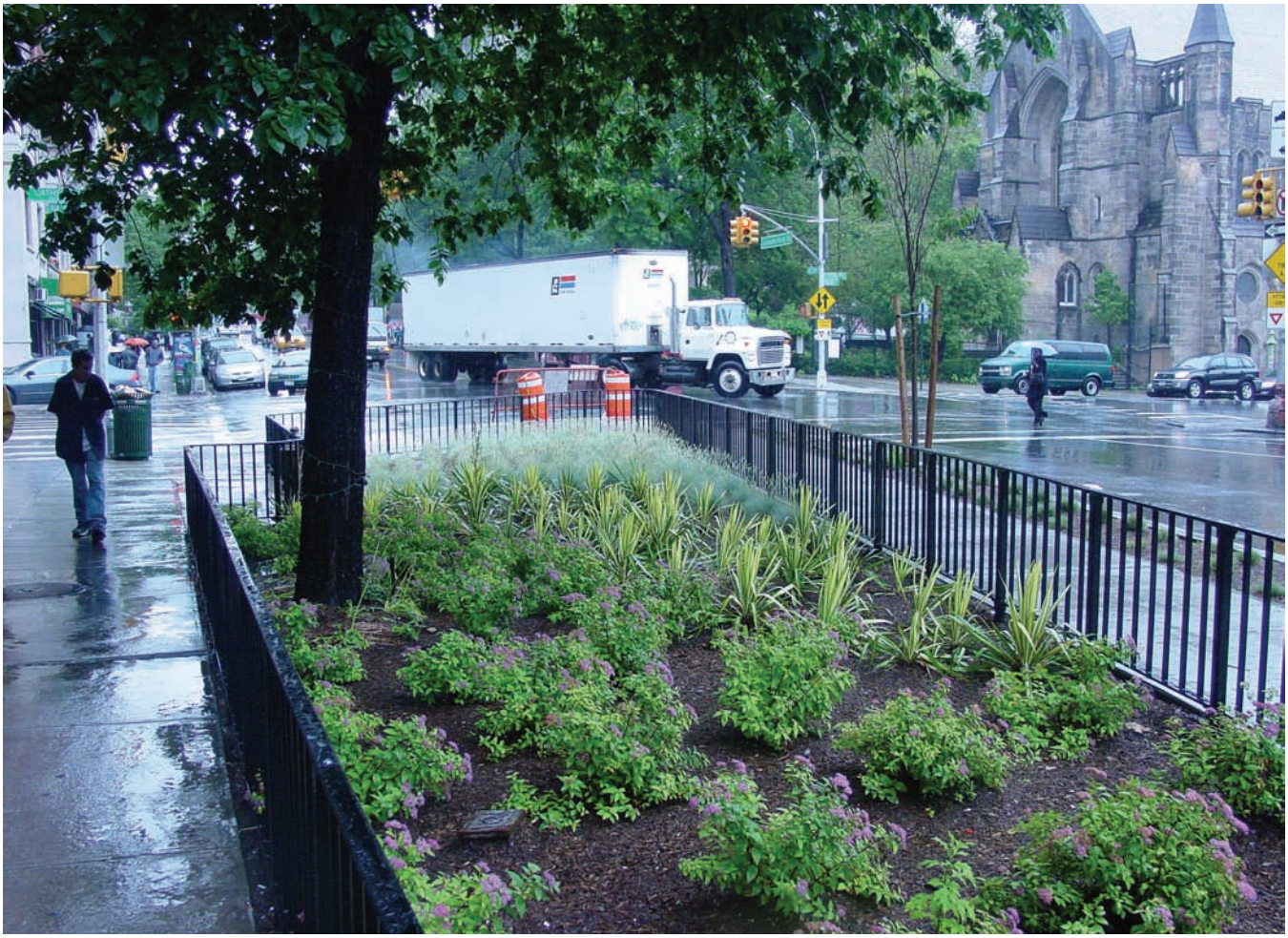
The design vehicles (see Glossary) used for geometric street designs, typically a single unit truck, should be appropriate to the predominant intended uses of the given street and should not include commercial vehicles larger than the allowed New York City maximum length. In addition, all street designs must consider FDNY, other emergency vehicle, and sanitation vehicle access needs (street cleaning and snow clearing).

Complex Intersections

Multi–leg or skewed angle intersections should be redesigned (to the extent possible) to simplify operations and reduce or separate conflicts. This can include the removal of intersection legs and slip lanes that are unimportant to the traffic network, creation of right–angled intersection alignments, and simplified traffic patterns. Resulting pedestrian space should be consolidated into its most usable form to create new public open space and shorter, more direct crossings. The use of slip lanes should generally be avoided.

Accessibility

Projects should meet all applicable federal, state, and/or local accessibility standards for public rights–of–way, including minimum clear sidewalk widths, inclusion of ADA–compliant pedestrian ramps, and provision of accessible waiting and boarding areas at transit stops.



Greenstreet with stormwater-capturing design: Amsterdam Avenue, Manhattan (Credit: NYC DPR)

Detail of stormwater-capturing design during rain event (Credit: NYC DPR)

Vegetation, BMPs & Drainage

All modifications to street geometry should consider and avoid unintended changes in the direction and disposition of stormwater runoff. Designs for planted areas, stormwater source controls, and BMPs within the public right–of–way are still evolving and being tested.

Because these treatments may ultimately revert to city agencies for ongoing maintenance, the appropriate agencies (e.g., NYC DOT, NYC DPR, and/or NYC DEP) should be consulted early in the design process so that all such treatments are technically viable and maintainable. Street construction, infrastructure replacement, tree planting, and Greenstreets construction should be coordinated to avoid damage to underlying infrastructure and minimize costs.

Roadways & Lanes

Mixed Roadway

USAGE: WIDE

That portion of a street designed, improved or ordinarily used for vehicular travel, exclusive of the shoulder and slope.

This predominant roadway design generally emphasizes motor vehicle access and flow, but it can be augmented with dedicated facilities for other modes (such as BUS or BIKE LANES or PATHS). The design leaves significant flexibility to calm traffic and enhance the public realm. However, unlike a SHARED STREET, vehicles and pedestrians are typically separated, rather than cooperatively sharing the roadway space.

Low–traffic, local roadway: Argyle Road, Brooklyn

Benefits

Can be designed to provide basic accommodation for all transportation modes

Provides intra–city network for vehicular through and local access

Application

Streets that are not SHARED STREETS (2.1.4) or pedestrian–only streets

On relatively narrow (e.g., two or fewer moving lanes), low vehicle volume and/or high pedestrian volume streets and alleys, instead consider SHARED STREET or pedestrian–only street treatments

Design

Provide SIDEWALKS (2.2.1) on both sides of all roadways, except in certain historic districts as per Landmarks Preservation Commission (LPC)

Roadways must meet technical requirements as per relevant standard specifications and regulations

Minimize roadway width and maximize sidewalk (and planting strip, if applicable) width maximized to the greatest extent possible

Exclusive or preferential facilities for buses and/or bicycles should be used as per those treatments' criteria or when deemed appropriate by NYC DOT

Provisions of street trees should be maximized

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

Grade roadways to direct stormwater towards any stormwater source controls (such as in a MEDIAN (2.2.3) or CURB EXTENSION (2.2.2))

Sustainability Opportunities

Minimize impervious paved areas and utilize permeable paving wherever possible

Maximize trees and other green cover

Utilize stormwater source controls wherever feasible

Increase SRI value of paved surfaces to reduce urban heat island impact

Utilize recycled content in paving materials

Coordinate streetscape/utility work to minimize street cuts

High–traffic roadway with median: Delancey Street, Manhattan

Bike Lanes & Paths

USAGE: WIDE

A dedicated on–street lane or path for bicycles (see Glossary).

Bikeways are typically designed as BIKE LANES within the roadway delineated with markings (2.1.2a, also known as Class 2 bike lanes) or as BIKE PATHS physically separated from traffic for most of their length (2.1.2b, also known as Class 1 bike lanes). Another typical design is the shared lane (Class 3 bike lane) described in Table 1. The shared lane is not covered by the Manual.

Buffered bike lane: 9th Street, Brooklyn

One–way, parking–separated bike path on a crosstown street: Grand Street, Manhattan

Benefits

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

Cumulative with other bikeways, provides a comprehensive network of recommended routes for bicyclists, thereby encouraging bicycling

Application

NYC Bicycle Master Plan routes

Streets not on the Master Plan when identified by NYC DOT as priority routes

Consider on streets with high current or anticipated bicycle volumes

Design

See Table 1 (following 2.1.2b) 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, and bicycle destinations

Sustainability Opportunities

Utilize permeable paving and/or paving with a high SRI value within BIKE LANE or BIKE PATH

Utilize recycled content in paving materials

Bike Lanes & Paths:

Bike Lane

USAGE: WIDE

A portion of a roadway that has been designated by striping, signs, and pavement markings for the preferential or exclusive use of bicyclists. Also known as a Class 2 bike lane.

Physical separation of bike lanes is desirable, but is not always possible due to physical or operational constraints.

Green, buffered bike lane: Broadway, Manhattan

Bike lane: 164th Street, Queens

Benefits

See benefits of BIKE LANES & PATHS (2.1.2)

Addition of on–roadway bike lanes that narrows or replaces motor vehicle lanes can calm traffic

Considerations

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

Application

See application guidance for BIKE LANES & PATHS

Consideration should be given to use of BIKE PATH (2.1.2b) rather than, or in addition to, BIKE LANE whenever possible

Design

See design guidance for BIKE LANES & PATHS

BIKE LANES should be buffered when possible, typically with 3 feet of channelization

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

Sustainability Opportunities

See sustainability opportunities for BIKE LANES & PATHS

Bike Lanes & Paths:

Bike Path

USAGE: LIMITED

A path intended for the use of bicycles that is physically separated from motorized vehicle traffic by an open space or barrier and either within the highway right–of–way or within an independent right–of–way. Also known as a Class 1 bike lane.

Physical separation of bikeways can sometimes be preferable on wide or busy streets, on major bike routes, or along long, uninterrupted stretches. Separation can take the form of a painted buffer demarcating the bike lane behind a "floating" parking lane, a narrow curb or median, or a wider median with landscaping.

An alternative form of separation is grade–separation, where the bike path is located at sidewalk grade or in between sidewalk and roadway grade.

Wide, one–way, median–separated bike path on a busy avenue: 9th Avenue, Manhattan

Parking–separated bike path showing mixing zone at intersection: Grand Street, Manhattan

Benefits

See benefits of BIKE LANES & PATHS (2.1.2)

Offers greatest bicyclist separation from motor vehicle traffic on mid–block sections

Reduces risk of "dooring" (vehicle occupants opening their door into the path of an oncoming bicyclist)

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

Considerations

Design consideration must be given to emergency vehicle access to adjacent buildings and to snow–clearing and street–sweeping needs

Application

Where a BIKE LANE is appropriate and the street is an important bicycle network connection, or has high motor vehicle volumes or speeds or multiple moving lanes, or is along a park, waterfront, or other open space where cross streets and driveways are infrequent

Consider wherever a BIKE LANE is appropriate

2.1.2b Separated Bike Path

Two–way bike path separated with landscaped median: Canal Street, Manhattan

Two–way bike path located outside the sidewalk: Columbia Street, Brooklyn

Design

See design guidance for BIKE LANES & PATHS (2.1.2)

Care must be given to the design of bike paths at intersections and driveways to maintain visibility of the bicyclist to motorists (and vice–versa) and to reduce the risk of turning conflicts with motor vehicles

In some circumstances (e.g., long paths along open space or waterfront) paths can be designed for shared–use by bicyclists, pedestrians, skaters, wheelchair users, and other non–motorized users ("a shared–use path") rather than as a separate bike path and SIDEWALK (2.2.1)

If designed as a shared–use path, provide adequate space appropriate to anticipated volumes of low–speed users (pedestrians) and higher–speed users (bicyclists) so as to provide safe and comfortable accommodation of both and minimize conflicts between the two

Design MEDIANS that separate bike paths according to the MEDIAN section (2.2.3)

Sustainability Opportunities

See sustainability opportunities for BIKE LANES & PATHS

If a separated bike path uses medians, see Sustainability Opportunities for MEDIANS

Table 1

Guide to New York City On–Street Bicycle Facilities

	Class 1: Bike Path (2.1.2b)	
	Signal Protected Path *9th Avenue, 31st to 16th Streets, Manhattan*	**Protected Path with Mixing Zones** *Grand Street, Manhattan*
		
Space Required	**14 feet**	**8 feet**
Parking Loss	**High** 5 – 6 parking spaces/ turn bay (usually every other block)	**High** 4 – 5 parking spaces/ mixing zone (usually every other block)
Ideal Application	**Commercial Avenues** • Wide one–way multilane street • Excess road space • High–speed vehicular traffic • High potential for motor vehicle intrusion into standard lane	**Commercial Cross–Streets** • One or two lane street • Excess road space • Low–speed vehicular traffic for safe mixing zone • High potential for motor vehicle intrusion into standard lane
Advantages	• Full protection for cyclists • Major enhancement to pedestrian safety and comfort	• Protection for cyclists midblock • Mixing zone to manage turning conflict • Simpler implementation than Signal Protected Path • Signal timing unchanged
Disadvantages	• Space needs • Parking impacts • Signal timing and loading activity increase delays • Cyclist mobility • Complex review and implementation • Turn restrictions may be needed at complex intersections to maintain acceptable operations	• Parking impacts • Cyclist mobility • Unproven (Pilot) • Complex review and implementation • Challenging to regulate floating parking

Class 2: Bike Lane (2.1.2a)		Class 3: Bike Route (Not Included in Manual)	
Buffered Lane *DeKalb Avenue, Brooklyn*	**Standard Lane** *20th & 21st Streets, Manhattan*	**Shared Lane** *48th Street, Queens*	**Signed Route**
			
8 feet	**5 feet**	**None** A wide (13–foot) travel lane is preferred	**None** A wide (13–foot) travel lane is preferred
Medium – Low Parking typically preserved unless space unavailable. Strict curb regulations sometimes needed	**Medium – Low** Parking typically preserved unless space unavailable. Strict curb regulations sometimes needed	**Low** Parking is typically preserved	**None**
Residential Avenues o Wide multilane street o Excess road space o Low potential for intrusion into bicycle lane	**Residential Cross–Streets** o One or two lane street o Excess road space o Low potential for intrusion into bicycle lane	**Narrow Streets** o One or two lane street o No excess road space o Connected to other bicycle facilities	**Limited Use** o Interim treatment o Connected to other bicycle facilities o Indicates a preferred bicycle route o Preserves curbside access
o Dedicated cycling space o Buffer zone enhances comfort for cyclists o Preserves curbside access o Simple implementation	o Dedicated roadway space for cycling o Preserves curbside access o Simple implementation	o Clear easy to follow bicycle route o Heightens driver awareness of cyclists o Preserves curbside access o Simple implementation	o Indicates a preferred bicycle route o Preserves curbside access o Simple implementation.
o Vehicular intrusion remains possible o Width tempts motorists to intrude o Perceived as less safe than protected paths	o Vehicular intrusion remains possible o Cyclists have minimal separation from traffic o Perceived as less safe than protected paths	o Does not provide dedicated roadway space for cycling o Cyclists not separated from traffic	o Does not provide dedicated roadway space for cycling o Cyclists not separated from traffic o Sign placement critical, can be challenging

Bus Lanes & Busways

USAGE: LIMITED

A dedicated on–street facility for buses.

BUS LANES are delineated within the roadway with markings (2.1.3a) while BUSWAYS are physically separated from traffic for most of their length (2.1.3b). Both facility types can either be designed to run along the median of the street or along the outside (curbside or interior to a parking lane) of the street.

Red, curb–aligned, on–street busway with "soft separation" from traffic: 34th Street, Manhattan

Benefits

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

Provides means for emergency vehicles to bypass traffic

Considerations

If curbside, may result in loss of curbside parking

Application

Streets with high bus volumes or Bus Rapid Transit (BRT) and moderate to high traffic congestion

Consider on all streets with high bus volumes or BRT and adequate space, regardless of congestion

Avoid on streets where the roadway geometry prevents the safe operation of a BUS LANE OR BUSWAY in conjunction with other necessary uses of the roadway

Design

BUS LANES & BUSWAYS can be located immediately adjacent to the curb (curb bus lane or busway), adjacent to the righthand parking lane (interior bus lane), or in the middle of a road with boarding island stations (median bus lane or busway)

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

A median BUS LANE or BUSWAY 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 or busway designs, boarding platforms must be included for bus passengers at bus stops; these islands can also function as MEDIAN SAFETY ISLANDS (2.2.4)

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

Use an interior bus lane when parking needs to be maintained; stops can be made at the curb or at BUS BULBS (2.2.2c)

Use a curb–aligned bus lane or busway when right–of–way may be constrained or a median facility cannot be operated safely and where parking impacts can be managed

For curb–aligned designs, curbside deliveries can be accommodated with, lay–bys, and reserved commercial loading around the corner, e.g., delivery windows, delivery

All BUS LANE & BUSWAY 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

Consider queue–jump lanes for buses where buses need to merge with mixed traffic, where the roadway width reduces (such as at the end of a bus lane, a roadway choke point, or a bridge or tunnel approach), and at turn priority locations

For improved roadway longevity, a concrete roadway should be considered for BUS LANES & BUSWAYS when conditions permit

Sustainability Opportunities

Utilize paving with a high SRI value within bus lane or busway unless red–colored pavement is to be used as per 2.1.3a

Utilize recycled content in paving materials

Bus Lanes & Busways:

Bus Lane

USAGE: LIMITED

A portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of buses.

Physical separation of bus lanes is often inadvisable due to physical or operational constraints. Painted lanes, overhead signs, and soft barriers can minimize intrusion of other vehicles. Where land use and street width permit, full or partial physical separation can help enforce the lanes (see 2.1.3b).

Curb–aligned double bus lane: Madison Avenue, Manhattan

Red, curb–aligned, bus lane: East Fordham Road, The Bronx

Bus queue–jump lane: West 207th Street, Manhattan

Benefits

See benefits of BUS LANES & BUSWAYS (2.1.3)

Considerations

See considerations for BUS LANES & BUSWAYS

Application

See application guidance for BUS LANES & BUSWAYS

Design

See design guidance for BUS LANES & BUSWAYS

Red–colored pavement can be considered for bus lanes that operate twelve or more hours per day

At intersections, the allowance or prohibition of turns from the bus lane should be clear, such as ending the red paint where cars can enter to make right turns

Sustainability Opportunities

See sustainability opportunities for BUS LANES & BUSWAYS

Bus Lanes & Busways:
Busway

USAGE: PILOT

A physically separated lane reserved for bus traffic.

Busways are similar to BUS LANES (2.1.3a) in most respects, however full or partial physical separation (typically through a narrow curb or wider MEDIAN (2.2.3)) further improves bus speeds by minimizing blocking of the bus lane by other vehicles.

Curb–aligned busway: Paris, France (Note: For illustrative purposes only)

Benefits

See benefits of BUS LANES & BUSWAYS (2.1.3)

Reduces or eliminates blocking of BUS LANE

Considerations

Design consideration must be given to emergency vehicle access, deliveries and pick–up/drop–off to adjacent buildings, and to snow–clearing and street–sweeping needs

Application

See application guidance for BUS LANES & BUSWAYS

Consider where a BUS LANE is appropriate and the street is a high–volume bus route and has adequate right–of–way to accommodate a busway

Consider wherever a BUS LANE is appropriate

Design

See design guidance for BUS LANES & BUSWAYS

Busways should be designed to allow emergency vehicles to bypass traffic

On routes with multiple tiers of bus service, passing needs (e.g., express buses) should be accommodated

If a median busway design is not separated with a wide median, then the median must widen to provide boarding platforms for bus passengers at bus stops, which must meet ADA standards

Turns across busways need to be controlled for safety; bus–only signals may be needed

MEDIANS used to separate busway should be designed according to the MEDIAN section

Sustainability Opportunities

Utilize paving with a high SRI value within busway, for example concrete

For median–separated busway, see Sustainability Opportunities for MEDIANS

A short section of separated busway through a busy intersection: Willis Avenue, The Bronx

Separated median busway: Paris, France (Note: for illustrative purposes only)

Shared Street

USAGE: PILOT

Often referred to as a "pedestrian-priority street," a shared street is a low-speed, typically curbless roadway designed as a single surface shared among pedestrians, bicyclists, and low-speed motor vehicles.

Typically employed on local-access streets, vehicles are slowed to very low speeds through a reduced speed limit, traffic calming, signage, and use of distinctive materials, furnishings, and other visual cues in the roadway that encourage drivers to travel with increased caution. Street users generally negotiate right of way cooperatively rather than relying on traffic controls, allowing pedestrians to dominate the street. The entire street thus effectively functions as a public space. Different forms of shared streets can be used in different contexts.

Shared street: Mainz, Germany
(Note: for illustrative purposes only)

Shared street in a commercial area: Brighton, UK (Credit: Gehl Architects)
(Note: for illustrative purposes only)

Benefits

Allows freer pedestrian movement within walking–oriented areas and to and from surrounding land uses and destinations

Reduces sidewalk crowding on narrow streets

Maintains bicycle, local vehicle, and delivery access while creating an exceptionally pedestrian–oriented street that accommodates recreational and social activities

Allows active land uses to spread into the surrounding street network, fostering a vibrant public realm

Comfortable, attractive environment encourages "staying" activities such as relaxing, shopping, eating, and socializing

Integrated design can incorporate art, street furniture, landscaping, and other innovative and attractive design elements

Encourages partnerships with the community in beautification, maintenance and programming of street space

Considerations

Accommodation of and navigation by the visually impaired should be given particular attention

May impact street drainage or require catch basin relocation

May require loss of on-street parking

Any community facilities integrated into the design (such as street furniture or public art) will typically necessitate the presence of a maintenance partner and a permit or revocable consent from the city

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 bicyclist through–routes or designated truck routes

Consider on streets adjacent to major pedestrian destinations such as retail, waterfront, park, plaza, civic, cultural or transit hub land uses, 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

Consider on narrow, alley-type streets

Depending on the specific land uses, width, vehicle and pedestrian volumes and other access and operational characteristics of the street, a shared street may not be appropriate, in which case consideration should be given to a standard MIXED ROADWAY with alternative design options such as traditional traffic calming and/or a mid-block crossing

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

Design

Sidewalks and curbs should not be used, but accessible path(s) must be provided as per ADA guidelines

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

Vehicle–free, accessible routes must be provided for the visually impaired

Design should utilize whatever horizontal, vertical, and material treatments are necessary to encourage vehicle speeds that are low (15 mph or lower) throughout, whether or not pedestrians are present

Use GATEWAY (2.3.2) or similar treatments and proper signage at entries to discourage through-traffic, indicate the change in street environment, and slow entering vehicles

Institute a reduced speed limit (New York State VTL Section 1642(a)(26)(a) currently allows as low as 15mph) along with the physical traffic calming of the shared street

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

Pedestrian–priority zone: Fordham Plaza, The Bronx

Shared intersection: Seven Dials, London (Credit: Aaron Naparstek/streetsblog.org)
(Note: For illustrative purposes only)

Maximize street trees

Include planted areas and stormwater source controls within the roadway wherever possible

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 must be paid to proper programming and management of the space, with the participation of an active maintenance partner where appropriate

Sustainability Opportunities

Minimize impervious paved areas and utilize permeable paving wherever possible

Maximize trees and other green cover

Utilize stormwater source controls wherever feasible

Increase SRI value of paved surfaces to reduce urban heat island impact

Utilize recycled content in paving materials

Coordinate streetscape/utility work to minimize street cuts

Sidewalks & Medians

Sidewalk

USAGE: WIDE

That portion of a street, whether paved or unpaved, between the curb lines or the lateral lines of a roadway and the adjacent property lines intended for the use of pedestrians. Where it is not clear which section is intended for the use of pedestrians, the sidewalk will be deemed to be that portion of the street between the building line and the curb.

In denser areas a FULL SIDEWALK (2.2.1a) reaching all the way to the curb is used, while in less built–up areas a RIBBON SIDEWALK (2.2.1b), with a vegetated or grass planting strip between the sidewalk and the roadway, can often be used.

Sidewalk with standard paving treatment: 11th Avenue, Manhattan

Benefits

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

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

Application

Streets that are not SHARED STREETS (2.1.4) or pedestrian–only, except in certain historic districts as per LPC

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

Design

Sidewalks should always be provided on both sides of the street roadway

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

Sidewalks (and planting strip, if applicable) should be as wide as possible appropriate to foot traffic and available street width

Sidewalks must conform to ADA requirements for minimum clear path width and provision of spaces where wheelchair users can pass one another or turn around; beyond the ADA minimum, provide an unobstructed clear path of 8 feet or one–half the sidewalk width (whichever is greater)

Sidewalk cross–slope can be 2% maximum, for a width of at least 5 feet

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

ADA–compliant pedestrian ramps must be provided at all pedestrian crossings; separate ramps should be used aligned with each crosswalk; color of detectable warning strip should contrast with surrounding pavement: dark gray in areas of light pavement and white in areas of dark pavement

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 and the corner quadrant

For recommended clearances between obstructions, see Revocable Consent Rules (RCNY Title 34, Chapter 7), Section 7–06(c)(5)), NYC DOT Highway Rules (RCNY Title 34, Chapter 2, Section 2–10) and DCA's rules regarding newsstands (RCNY Title 6, Chapter 2, Subchapter G)

Maximize street trees

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 NYC DEP sewers and water mains

Sustainability Opportunities

Minimize impervious paved areas and utilize permeable paving wherever possible

Maximize trees and other green cover whenever clearance allows

Utilize stormwater source controls wherever feasible

Increase SRI value of sidewalk materials to reduce urban heat island impact

Utilize recycled content in paving materials

Coordinate streetscape/utility work to minimize street cuts

Sidewalk:

Full Sidewalk

USAGE: WIDE

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, signs, fire hydrants, telephone booths, newspaper boxes, etc., are typically located, is referred to as the "furnishing zone" (see section 3.4).

Sidewalk: Seventh Avenue, Brooklyn (Credit: NYC DCP)

Sidewalk corner quadrant with pedestrian ramps: West 110th Street, Manhattan

Benefits

See benefits of SIDEWALK (2.2.1)

Provides increased space for pedestrian movement and improved curbside access as compared to a RIBBON SIDEWALK (2.2.1b)

Application

See application guidance for SIDEWALK

Design

See design guidance for SIDEWALK

Sustainability Opportunities

See sustainability opportunities for SIDEWALK

Sidewalk:

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, more sustainable landscaping options should be utilized whenever possible. Alternatively, planting strips can be designed as pilot STREET SWALES (2.4.3) to help collect stormwater runoff.

Ribbon sidewalk with lawn planting strip: Rockaway Beach Boulevard, Queens

Benefits

See benefits of SIDEWALK (2.2.1)

Provides greater space for tree roots than a FULL SIDEWALK (2.2.1a) with INDIVIDUAL TREE PITS (2.4.1a), improving long–term tree health

Provides a modest improvement in stormwater detention from the sidewalk and/or roadway as compared to a 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 design guidance for SIDEWALK

Ribbon sidewalks should be at least 5 feet wide or as required to match the existing ribbon width in the immediate neighborhood; 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 STREET SWALE 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

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

Sustainability Opportunities

See sustainability opportunities for SIDEWALK

Utilize STREET SWALE within planting strip rather than groundcover vegetation alone to better manage stormwater

Ribbon sidewalk with street swale planting strip: Seattle, Washington (Credit: Abby Hall)

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, can relieve sidewalk crowding, and can provide space for functional elements such as seating, plantings, and furniture. In addition, two curb extensions can be located on either side of a street to create a MID–BLOCK NARROWING (2.2.3) or at an intersection to create a GATEWAY (2.3.2).

Curb extension: Fifth Avenue, Brooklyn

Benefits

Calms traffic by physically and visually narrowing the roadway

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

Shortens crossing distance, reducing pedestrian exposure and minimum required signal time for crossing

Improves the ability of crossing pedestrians and drivers to see each other

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

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 when located at a subway entrance or other protrusion

Creates space that may be used to locate street furniture, bike parking, bus stop, public seating, street vendors, etc., potentially reducing sidewalk clutter

Keeps fire hydrant zone clear when located in front of a hydrant

Defines the ends of angle parking

Can discourage truck turns onto streets with No Truck regulations (See RCNY 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

Curb Extension: Seventh Avenue, Manhattan

A curb extension "blockbuster" with Greenstreet: Amsterdam Avenue, Manhattan

Lay–bys for curbside loading between curb extensions: Greenwich Street, Manhattan

Application

Only applicable 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 school crosswalks

At mid–block crossings (see MID–BLOCK NARROWING 2.2.2d)

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

In front of fire hydrants so as to keep clear of parked vehicles

Consider at all corners and pedestrian crossings

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, bicycle, or general traffic) lane exists, such as those created through peak–period parking restrictions

Feasibility of curb extensions is evaluated based on engineer review of design vehicle turning movements and vehicle turning volumes

Design

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

A fire truck turning zone with a 50–foot outside radius should be maintained clear of physical obstructions (signs, planters, non–flexible bollards, trees)

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 may 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 or community facilities such as bicycle parking as long as visibility is not hindered

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

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 catch basins or utilizing design treatments that channel water through, around, or in between curb extension and the curbline

When space permits, more functional curb extension designs, such as those with GREENSTREET/PLANTED AREAS (2.2.2d) or COMMUNITY FACILITIES (2.2.2b) such as seating or bicycle parking should be used whenever possible

Vertical elements should be used to alert drivers and snow plow operators to presence of the curb extension

To reduce the cost and implementation time of curb extension, trench drains can be considered instead of catch–basin relocation if a maintenance partner exists to clean the trench drain

When curb extension is used at 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

Paving on curb extension should match that of the surrounding sidewalks

Sustainability Opportunities

Locate trees and/or plantings within curb extension when appropriate

Maximize permeable surface of curb extension, e.g., with vegetation, permeable paving or both

Design any planted areas within curb extension so as to capture stormwater according to current standards

Curb Extension:

Curb Extension with Greenstreet/ Plantings

USAGE: WIDE

A CURB EXTENSION that is planted rather than paved (typically as a NYC DPR Greenstreet), for example as a landscaped bioswale.

Curb extension with planted area: Mulry Square, Manhattan

Landscaped curb extension: Christopher Street, Manhattan

Curb extension with a planted swale that captures stormwater from the gutter: Beach 19th Street, Queens

Benefits

Provides safety and traffic calming benefits as described in CURB EXTENSION (2.2.2)

Vegetation helps to mitigate air pollution and capture carbon dioxide from the air, improving environmental health and public health

Green cover reduces the urban heat island effect and decreases energy costs related to air temperatures

Landscaping provides visual improvement to the city streetscape

Can be designed to provide stormwater detention from sidewalk and street

Considerations

Landscaping or stormwater source controls require a partner for ongoing maintenance

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

Application

See application guidance for CURB EXTENSION

Areas without sidewalk crowding where NYC DPR will maintain a Greenstreet or a committed partner other than NYC DPR will maintain the vegetated area

Design

See design guidance for CURB EXTENSION

Pedestrian crossings must remain paved

If curb extension is designed to capture stormwater, catch basins should be located on the downhill side of the curb extension rather than the uphill side

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

Guards or wickets are permitted around planted areas where their use does not impede pedestrian traffic

Sustainability Opportunities

See sustainability opportunities for CURB EXTENSION

Design planted areas within curb extension to capture stormwater according to current standards

Curb Extension:

Curb Extension with Community Facilities

USAGE: WIDE

A CURB EXTENSION that provides space for community facilities such as bicycle parking, seating, and other street furniture.

In areas with inadequate sidewalk width to accommodate needed functional sidewalk elements for the community, the extra space provided by a curb extension can be used for bike parking, seating, public art, gardens, plantings, or trees, alone or in combination.

Similarly, all paved curb extensions can also provide space for consolidating basic sidewalk furnishings such as trash cans, newspaper racks, newsstands, and light or signal poles, where foot traffic permits.

Curb extension with trees and bike parking: 46th Street, Queens

Benefits

Provides safety and traffic calming benefits as described in CURB EXTENSION (2.2.2)

Provides space for functional sidewalk elements outside of the sidewalk clear path, freeing sidewalk space for movement

Improves the public realm and creates useful public space, particularly in areas where public open space is in short supply

Allows limited street space to serve multiple functions, thereby increasing the performance of street infrastructure

Considerations

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

Bike racks must be standard NYC DOT design unless a permit is obtained from NYC DOT

Application

See application guidance for CURB EXTENSION

Areas without sidewalk crowding where demand exists for the community facilities and a committed partner is willing to maintain any elements that require maintenance, such as seating; a maintenance partner is not needed for a NYC DOT bike rack

Design

See design guidance for CURB EXTENSION

Sustainability Opportunities

See sustainability opportunities for CURB EXTENSION

Curb extension with bike parking: North 7th Street, Brooklyn

Curb Extension:
Bus Bulb

USAGE: WIDE

A CURB EXTENSION at a bus stop that avoids the need for buses to pull in and out of the moving lane to stop.

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.

Bus loading at a bus bulb "island": Broadway, Manhattan

Bus bulb: San Francisco, California

A bus bulb under an "El" (elevated subway): Jerome Avenue, The Bronx

Benefits

Provides safety and traffic calming benefits as described in CURB EXTENSION (2.2.2)

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 stopped vehicles

Discourages non–bus encroachment into bus–only lanes

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, provides a safer space for passengers to wait, as many currently stand in the roadway

Allows additional on–street parking as compared to a standard bus stop

Application

See application guidance for CURB EXTENSION

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

Design

For detailed design guidance, see *Select Bus Service Station Design Guidelines* (NYC DOT & MTA NYCT, 2009)

See additional design guidance for 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

Sustainability Opportunities

See sustainability opportunities for CURB EXTENSION

Curb Extension:
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 crossing. 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 (2.3.2) located mid–block.

Mid–block narrowing (Note: use of walls is not recommended by this manual): West 94th Street, Manhattan

Mid–block crossing with Curb Extensions: West 125th Street, Manhattan

Benefits

Provides safety and traffic calming benefits as described in CURB EXTENSION (2.2.2)

Calms mid–block traffic speeds, particularly if vertical elements (e.g., bollards, trees, bicycle parking etc) are included in CURB EXTENSIONS

Improves drivers' awareness of presence of crosswalk at mid–block crossing

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

Application

See application guidance for CURB EXTENSION

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

At mid–block crossings on two–way streets, it is generally preferable to include a MEDIAN (2.2.3) or MEDIAN SAFETY ISLAND (2.2.4) rather than or in addition to a mid–block narrowing, when space allows

Design

See design guidance for 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 CROSSINGS (2.3.7), RAISED SPEED REDUCERS (2.3.1), or vertical elements for maximum effectiveness

Sustainability Opportunities

See sustainability opportunities for CURB EXTENSION

Locate trees and/or plantings within curb extensions of mid–block narrowing when appropriate

Design any planted areas within CHICANE (2.3.4) curb extensions so as to capture stormwater according to current standards

Median

USAGE: WIDE

An area separating different lanes, traffic directions, or roadways within a street. For the purpose of this Manual, a MEDIAN is raised rather than flush or painted.

The width as well as design of medians can vary widely. They can range from narrow raised concrete islands to tree–lined promenades to intensively landscaped boulevard medians.

In contrast to MEDIAN SAFETY ISLANDS (2.2.4), medians extend for most or all of the street block.

Median with landscaping and sidewalk: Carlton Avenue, Brooklyn

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

If designed for walking access, can provide additional pedestrian capacity

Greens and beautifies the streetscape with trees and/or plantings

Improves environmental quality and can incorporate stormwater source controls

Can provide space for a SIDEWALK (2.2.1) and/or SEPARATED BIKE PATH (2.1.2b), particularly as part of a boulevard treatment

Considerations

May impact underground utilities

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

Landscaping or stormwater source controls require a partner for ongoing maintenance

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

If continuous, median may prevent left turns into driveways on opposite side of street

Application

Two–way streets with three or more roadway travel lanes in total

Consider on all two–way multilane 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 bicycle facilities) rather than a median if there is not adequate room for all treatments and travel lanes

2.2.3 Median

Median on a local residential street: Glenwood Road, Brooklyn

Design

Medians should be wide enough to provide refuge to pedestrians at crossings: 5 feet minimum, 6 feet or greater preferred; when planted, 6 feet minimum

Medians should extend beyond the crosswalk at intersections wherever possible, while accommodating vehicle turning movements; the "nose" of the median should not infringe on the crosswalk width at intersections and should include bollards to protect pedestrians from wayward vehicles

Provide a path across the median at crossings, flush with the roadway and as at least as wide as the crosswalk

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

Medians must provide tactile cues for pedestrians with visual impairments to indicate the border between the pedestrian refuge area and the motorized travel lanes

Include street trees or plantings wherever safe and feasible, using structural soil where appropriate

Use unpaved and permeable surfaces wherever possible with medians

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

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

Grade roadways to direct stormwater towards medians if the medians include sufficient stormwater source controls

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

Sustainability Opportunities

Locate trees and/or plantings within median

Maximize permeable surface of median, e.g., with vegetation, permeable paving, or both

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

Median 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" and "green refuge island." Used at pedestrian crossings when a full MEDIAN is not feasible.

A median safety island confers most of the same benefits as full MEDIANS at pedestrian crossings. Full MEDIANS should be used rather than median safety islands wherever possible.

Median safety island: Vanderbilt Avenue, Brooklyn

Median safety island with landscaping and tree: Empire Boulevard, Brooklyn

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, thereby usually improving safety

Considerations

May impact underground utilities

Landscaping or stormwater source controls require a partner for ongoing maintenance

Application

See application guidance for MEDIAN (2.2.3)

Design

See design guidance for MEDIAN

Typical island accommodates two street trees and, where appropriate, bell bollards

Sustainability Opportunities

See sustainability opportunities for MEDIAN

Traffic Calming

Raised Speed Reducers

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 tables. 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 a speed hump is relatively short in length (e.g., 13 feet long), a speed table is longer (e.g., 22 to 30 feet long), with a flat section in the middle, sometimes including a RAISED PEDESTRIAN CROSSING (2.3.7). SPEED CUSHIONS (2.3.1a) are a variation of speed humps designed to allow easier emergency vehicle, bus, or truck passage.

Benefits

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

A speed table can be used to provide a raised mid–block crossing in conjunction with a stop control

Considerations

Impacts emergency vehicle movement

Snow plows must be given advance warning

May generate additional noise

Application

Must be requested by a community, with approval based on a NYC DOT field study of the location using speed survey, geometric, and street operations criteria

Avoid on streets that: are designated as a "local" or "through" truck route; are on an MTA bus route, tour bus route, or route of any other bus operator; are on an emergency vehicle response or snow emergency route; have a Fire Department house located on the block; have more than one moving lane per direction; or are wider than 44 feet

The location can be investigated by NYC DOT for a "Reduced School Speed Zone" if a speed reducer is not feasible but the street has an 85th percentile speed of 25 mph or higher and is near an eligible school

Design

Space raised speed reducers to maintain desired operating speeds

Appropriate warning signs and roadway markings should accompany raised speed reducers

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

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

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

Sustainability Opportunities

Utilize recycled content in paving materials

Speed hump: Bolton Avenue, The Bronx

Raised Speed Reducers:
Speed Cushion

USAGE: PILOT

Narrow speed humps that reduce traffic speeds without causing vertical displacement of vehicles with wide wheel bases (trucks, buses, and emergency vehicles).

Wide vehicles can travel over speed cushions at moderate speed after aligning properly, making them potentially appropriate for use on streets with low- to moderate-frequency emergency, truck, or bus routes.

Speed cushions are typically made from modular, temporary materials.

Speed cushions showing impact on typical vehicles: Vancouver, Canada (Credit: Richard Drdul) (Note: for illustrative purposes only)

Speed cushions showing ease of bus passage: Vancouver, Canada (Credit: Richard Drdul) (Note: for illustrative purposes only)

Benefits

See benefits of RAISED SPEED REDUCERS (2.3.1)

Reduces motor vehicle speeds without hampering bus service or most commercial vehicles

Quieter than speed humps on commercial routes

Can be easily removed, relocated, or repositioned

Available as an off–the–shelf product

Considerations

Snow plows must be given advance warning

Application

See application guidance for RAISED SPEED REDUCERS

Streets that qualify for RAISED SPEED REDUCERS, except for the presence of a truck, bus or emergency vehicle route

Consider on non–arterial roadways with speeding concerns

Avoid on arterial roadways

Design

See design guidance for RAISED SPEED REDUCERS

Spacing and dimensions of speed cushions are typically similar to those of other RAISED SPEED REDUCERS

Sustainability Opportunities

See sustainability opportunities for RAISED SPEED REDUCERS

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 (2.2.2), a RAISED CROSSING (2.3.7) or driveway treatment, a MEDIAN (2.2.3), landscaping or trees, and community facilities such as seating and public art.

Gateway to residential street including Greenstreets: Mulry Square, Manhattan

Benefits

- Decreases vehicular speeds and discourages through–traffic without blocking or prohibiting vehicular access
- Demarcates transitions to low–speed, SHARED STREET (2.1.4). or pedestrian–oriented areas
- 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
- Community facilities typically necessitate the presence of a maintenance partner
- Many community facilities and sidewalk items require a permit or revocable consent from the city
- If gateway includes a RAISED CROSSING (2.3.7), snow plows must be given advance warning

Application

- Entrances to SHARED STREETS
- 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 (2.2.2) to narrow the roadway; preferably, vertical deflection should also be created using a RAISED CROSSING or ramped driveway treatment; if the street is two–way, a MEDIAN (2.2.3) or MEDIAN SAFETY ISLAND (2.2.4) can be included, space permitting
- Other design elements can "narrow" a street visually, including plantings, public art, bicycle parking, and community facilities such as seating
- If work includes tree planting, consider the location of utility infrastructure, including NYC DEP sewers and water mains

Sustainability Opportunities

- If gateway includes CURB EXTENSIONS, see sustainability opportunities for CURB EXTENSIONS

Gateway at transition from local residential street: Prospect Place, Brooklyn

Traffic Diverters

USAGE: LIMITED

A family of traffic calming treatments that can be used to slow, redirect or block motor vehicle traffic, primarily at intersections.

In areas where a goal is to reduce motor vehicle through–traffic, it may be desirable to create physical barriers that make it impractical or impossible to use local streets for anything other than local access trips.

Forced turn at two–way to one–way transition: West 24th Street, Manhattan

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

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

Emergency vehicle access needs must be accommodated

Landscaping or stormwater source controls require a partner for ongoing 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 issues

Design

Design traffic diversion devices to impact motor vehicle movement but not bicycle movement; utilize bike channels or similar design strategies to allow passage by bicyclists

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

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

Sustainability Opportunities

Locate trees and/or plantings within diverter when appropriate

Maximize permeable surface of diverter, e.g., with vegetation, permeable paving, or both

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

Traffic Diverters:

Median Barrier

USAGE: LIMITED

An elevated MEDIAN or MEDIAN SAFETY ISLAND extended through an intersection to prevent left turns and through–movements to and from the intersecting street.

Pedestrian access can be maintained with pedestrian refuges and bicycle access with gaps in the median. As with typical MEDIANS, trees or plantings can be included within the median barrier.

Median barrier: Canal Street, Manhattan

Median barrier: Cooper Square, Manhattan

Benefits

See benefits for TRAFFIC DIVERTERS (2.3.3)

Enhances safety at 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

Application

See application guidance for TRAFFIC DIVERTERS

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

Design

See design guidance for TRAFFIC DIVERTERS

See additional design guidance for MEDIAN (2.2.3)

Sustainability Opportunities

See sustainability opportunities for TRAFFIC DIVERTERS and MEDIAN

Traffic Diverters:

Forced Turn

USAGE: LIMITED

An island or sidewalk extension at the approach to an intersection that prevents left or right turns and through–movements from the intersecting street.

Like other traffic islands and sidewalk extensions, a forced turn can include plantings or other design features.

Forced turn: Riverside, California (Credit: Ryan Snyder)

Forced turn with bike channel: Berkeley, California (Credit: Jessica Roberts)
(Note: for illustrative purposes only)

Benefits

See benefits for TRAFFIC DIVERTERS (2.3.3)

Enhances safety at intersection by reducing potential vehicle movements and conflicts, particularly left turns

Reduces risk of motorists running a red light or stop sign when approaching from side street

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

Application

See application guidance for TRAFFIC DIVERTERS

Two–way local streets at their intersections with one–way streets or with two–way streets on which a MEDIAN BARRIER (2.3.3a) is not possible

Design

See design guidance for TRAFFIC DIVERTERS

Sustainability Opportunities

See sustainability opportunities for TRAFFIC DIVERTERS

Traffic Diverters:
Diagonal Diverter

USAGE: PILOT

A barrier or median placed diagonally across an intersection that blocks vehicular through–movements and up to half of their turning movements.

Implementation of a diagonal diverter results in two separate, L–shaped roadways for motor vehicles. Bicycle and walking access can be maintained through the diverter with gaps or ramps, and emergency vehicle access can be maintained with a gap and removable bollards or a mountable curb.

Diagonal diverter: Vancouver, Canada (Credit: Richard Drdul)
(Note: for illustrative purposes only)

Diagonal diverter with landscaping: Berkeley, CA (Credit: Jessica Roberts)

Benefits

See benefits for TRAFFIC DIVERTERS (2.3.3)

Strongly discourages motor vehicle through–traffic on side streets

Slows traffic by forcing turns

Greatly enhances safety at intersection by eliminating turning conflicts between motor vehicles

Reduces the risk of motorists running red lights or stop signs

Application

See application guidance for TRAFFIC DIVERTERS

Intersections of two one–way or two–way local streets on which short–cutting traffic is a severe problem

Design

See design guidance for TRAFFIC DIVERTERS

Sustainability Opportunities

See sustainability opportunities for TRAFFIC DIVERTERS

Traffic Diverters:

Half Closure

USAGE: PILOT

A physical barrier at an intersection to prohibit traffic in one direction on an otherwise two–way street, while permitting entry or exit in the other direction.

Also referred to as a partial closure or one–way closure, half closures realize many of the benefits of a FULL CLOSURE (2.3.3e) without fully converting a street to a cul–de–sac. Bicycle access can be maintained through the use of a dedicated bicycle channel or other design element.

Half closure with landscaping and bike access: Portland, Oregon (Credit: Ryan Snyder)

Half closure: Vancouver, Canada (Credit: Richard Drdul)
(Note: for illustrative purposes only)

Benefits

See benefits for TRAFFIC DIVERTERS (2.3.3)

Enhances safety at intersection by reducing potential vehicular movements and conflicts

Calms traffic on affected block by creating a partial cul–de–sac

Enhances pedestrian safety and accessibility by shortening crossing at closure

Larger closures can create a sizeable public space with community facilities

Application

See application guidance for TRAFFIC DIVERTERS

Two–way local streets on which short–cutting traffic is a severe problem but for which a FULL CLOSURE (2.3.3e) (cul–de–sac) is not feasible or desirable

Design

See design guidance for TRAFFIC DIVERTERS

Sustainability Opportunities

See sustainability opportunities for TRAFFIC DIVERTERS

Traffic Diverters:

Full Closure

USAGE: PILOT

A physical barrier at an intersection to fully close a street segment to motor vehicle access at one end.

The barrier can be a fence or bollards, a basic sidewalk, or a more elaborate landscaped space or plaza. The affected street segment becomes a cul–de–sac for motor vehicles, while bicycle access can be maintained through the use of a dedicated bicycle channel or other design element. Emergency vehicle access can be maintained by using mountable curbs and a clear path.

Full closure with Greenstreet and turnaround: Jewel Avenue, Queens

Full closure with landscaping and bike channel: Berkeley, California (Credit: Ryan Snyder)

Benefits

See benefits for TRAFFIC DIVERTERS (2.3.3)

Completely eliminates motor vehicle through–traffic on side street

Enhances safety at intersection by reducing potential vehicular movements and conflicts

Calms traffic on closed block by creating a cul–de–sac

Enhances pedestrian safety and accessibility by eliminating crossing at closure

Larger closures can create a sizeable public space with community facilities such as seating, plantings, etc.

Considerations

Closure of a publicly mapped street to vehicular access for over 180 days is subject to §19–107 of the Administrative Code of the City of New York

Application

See application guidance for TRAFFIC DIVERTERS

One–way or two–way local streets on which short–cutting traffic is a severe problem and for which conversion to a cul–de–sac is feasible and desirable

Design

See design guidance for TRAFFIC DIVERTERS

Depending on the length of the block, a turnaround usable by emergency vehicles may be necessary at the closed end of the block

Sustainability Opportunities

See sustainability opportunities for TRAFFIC DIVERTERS

Chicane

USAGE: PILOT

The creation of a "slalom" effect along a relatively narrow, low-volume road through the use of staggered CURB EXTENSIONS or a serpentine roadway alignment.

Chicanes discourage or make it impossible for drivers to drive in a straight line, which can reduce vehicular speeds.

Chicane: Vancouver, Canada (Credit: Richard Drdul) (Note: For illustrative purposes only)

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

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

May impact snow plows and street sweepers

Application

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

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

Design

The simplest and most basic approach to create a chicane is to alternate on–street parking (parallel or angled) from one side to the other; in this case, CURB EXTENSIONS (2.2.2) at the beginning and end of each grouping of parking

If utilizing CURB EXTENSIONS, see CURB EXTENSION section for general design considerations

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

Sustainability Opportunities

Locate trees and/or plantings within chicane curb extensions when appropriate

Maximize permeable surface of chicane curb extensions, e.g., with vegetation, permeable paving, or both

Design any planted areas within chicane curb extensions to capture stormwater according to current standards

Chicane at entry to residential neighborhood: San Francisco, California (Credit: SF MTA)

Neighborhood Traffic Circle

USAGE: PILOT

A round traffic island in the center of a traditional intersection.

Primarily applicable to lower–traffic intersections, neighborhood traffic circles can provide many of the advantages of full ROUNDABOUTS, (2.3.6) but using much less space.

Neighborhood traffic circle with tree: West Palm Beach, Florida (Credit: Ian Lockwood and Timothy Stillings)

Neighborhood traffic circle with landscaping: Berkeley, California (Credit: John Allen)

Benefits

Reduces speeds and accident rates, particularly when applied consistently to an area

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

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

ROUNDABOUT (2.3.6) should be used instead at high–volume or large intersections

2.3.5 Neighborhood Traffic Circle

Neighborhood traffic circle with landscaping: Vancouver, Canada (Credit: Richard Drdul)
(Note: for illustrative purposes only)

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

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

Include street tree(s) wherever possible; include planted areas when a maintenance partner is identified

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

Use small curb radii where right turns are made

Install "Keep Right" or similar signs directing drivers to proceed to the right around the circle through the intersection

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

Sustainability Opportunities

Minimize impervious paved areas and utilize permeable paving wherever possible

Locate trees and/or plantings within neighborhood traffic circle island

Maximize permeable surface of neighborhood traffic circle island, e.g., with vegetation, permeable paving, or both

Design any planted areas within neighborhood traffic circle island so as to capture stormwater according to current standards

Roundabout

USAGE: PILOT

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 designed as unsignalized or signalized intersections. Roundabouts are distinguished from "old–style" traffic circles/rotaries by their rules for yielding and key design features such as horizontal deflection at entries.

Recently installed roundabout in downtown neighborhood: Asheville, North Carolina (Credit: Anthony Butzek)

Benefits

- Reduces top vehicular speeds at signalized intersections, reducing the severity of accidents
- Eliminates left turns, a primary cause of accidents
- Enhances pedestrian safety when used at appropriate intersections
- Allows simultaneous movement of crossing vehicular streams, often processing vehicular traffic more efficiently than signalization
- 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 public open space, vegetation or art within the roundabout island 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
- Landscaping or stormwater source controls require a partner for ongoing maintenance
- If outfitted to capture stormwater, careful consideration must be given to design, overflow control, and plant species

Application

- Intersections with 1) no more than 80–90% of volume on the main facility and 2) having either existing all–way stop control, at least three approaches, high vehicle turning volumes or percentages, or speeding issues
- Consider at locations with heavy vehicle turning movements, low pedestrian crossing compliance, poor safety records, or where signalization has led or may lead to operational issues for pedestrians or bicyclists

Roundabout with public art and landscaping in residential neighborhood: Delft, Netherlands (Note: for illustrative purposes only)

As a gateway treatment for low–speed (25 mph speed limit or less) or SHARED STREETS (2.1.4)

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

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

Curves should accommodate the design vehicle; use an apron of textured paving around the central island 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 paint on the curb

Include street tree(s) wherever possible; include planted areas and stormwater source controls when a maintenance partner is identified

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

Sustainability Opportunities

Minimize impervious paved areas and utilize permeable paving wherever possible

Locate trees and/or plantings within Roundabout islands

Maximize permeable surface of roundabout islands, e.g., with vegetation, permeable paving, or both

Design any planted areas within roundabout islands so as to capture stormwater according to current standards

Raised Crossing

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 crossing is essentially a speed table, with the full width of the crosswalk contained within the flat portion of the table, usually 10– to 15–feet wide. It combines the benefits of a RAISED SPEED REDUCER (2.3.1) with enhanced visibility for the pedestrian crossing.

Raised crossing at a Gateway to side street: Paris, France
(Note: for illustrative purposes only)

Benefits

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

Used at street GATEWAYS (2.3.2), 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

Considerations

May impact street drainage or require catch basin relocation

Application

Existing stop–controlled crosswalks or other locations where demand exists for a stop–controlled pedestrian crossing that also meet the criteria for RAISED SPEED REDUCERS (2.3.1)

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

Consider as a more robust option for mid–block crossings

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

Avoid on arterial roadways

Design

Appropriate warning signs and roadway markings should accompany raised crossing

Use signage or other methods to alert snow–clearing vehicle operators to the presence of raised crossing

Use enhanced, high–visibility street materials to further draw attention to raised crossing

Sustainability Opportunities

See sustainability opportunities for RAISED SPEED REDUCERS

Utilize recycled content in paving materials

Raised Crossing: London, UK
(Note: For illustrative purposes only)

Raised Intersection

USAGE: PILOT

An entire intersection raised above the level of the surrounding roadways.

The intersection is typically raised to sidewalk height.

Raised Intersection: Cambridge, Massachusetts

Benefits

Vertical deflection at entry to intersection encourages reduced vehicle speeds

Improves drivers' awareness of presence of crossings

Visually turns intersection into a pedestrian–oriented zone

Considerations

May impact street drainage or require catch basin relocation

Snow plows must be given advance warning

Application

Stop–controlled intersections with a high volume of pedestrian crossings and low target vehicle speeds (e.g., 25 mph or below)

Stop–controlled intersections with a history of pedestrian accidents or speeding issues

Stop–controlled intersections where enhancing pedestrian movement is a major goal, such as transit stops or commercial areas

Avoid on truck routes and at other locations where RAISED SPEED REDUCERS (2.3.1) are not appropriate

Design

Slope of entrance ramps for motorized traffic can be steep or shallow, depending on target speeds

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

Sustainability Opportunities

Minimize impervious paved areas and utilize permeable paving wherever possible

Maximize trees and other green cover

Utilize stormwater source controls wherever feasible

Increase SRI value of paved surfaces to reduce urban heat island impact

Utilize recycled content in paving materials

Coordinate streetscape/utility work to minimize street cuts

Raised intersection: London, UK
(Note: for illustrative purposes only)

Raised intersection: Cologne, Germany
(Credit: Aaron Naparstek)
(Note: for illustrative purposes only)

Street Trees & Plantings

Tree Pits

USAGE: WIDE

Excavated pits that allow for the planting of street trees within the public right–of–way.

Tree pits are used extensively all over the city and should be used wherever sidewalks exist if subsurface conditions allow. INDIVIDUAL TREE PITS (2.4.1a) are currently the only required design, however CONNECTED TREE PITS (2.4.1b) should be used wherever possible to provide improved tree health, and STORMWATER–CAPTURING TREE PITS (2.4.1c)—those that take water from the roadway—can be considered for pilot projects.

Street trees planted in individual tree pits: Avenue S, Brooklyn

Benefits

Vertical elements, such as trees, make streets appear narrower to drivers, causing them to drive slower

Street trees help to mitigate air pollution and capture carbon dioxide from the air, improving environmental and public health

Green cover reduces the urban heat island effect and decreases energy costs related to air temperatures

Street trees provide natural stormwater management

Street trees dampen street noise, providing health and psychological benefits

Street trees provide urban wildlife habitat opportunities

Trees make streets more attractive

Considerations

May impact underground utilities

NYC DPR contractors will maintain tree pits (individual or connected) for two years after planting, after which each individual property owner is responsible for maintaining the tree pit(s), while NYC DPR retains responsibility for and jurisdiction over the tree itself

For NYC DOT projects, any street trees included beyond NYC DOT's approved funding must be funded by NYC DPR or another entity

Tree placement near subsurface steam lines may transmit too much heat to tree roots, compromising tree health

Application

All areas with FULL SIDEWALKS (2.2.1a)

CONNECTED TREE PITS (2.4.1b) should be utilized as an alternative to INDIVIDUAL TREE PITS (2.4.1a) wherever feasible

RIBBON SIDEWALK (2.2.1b) should be used as an alternative to a FULL SIDEWALK in areas of low– to moderate–land use density as per its application guidance, in which case street trees do not require tree pits

Design

Meet minimum size and design requirements of NYC DPR's *Tree Planting Standards* (see Appendix C) contingent upon accommodation of pedestrian capacity and subsurface constraints

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

The New York City Zoning Resolution requires that one tree be provided for every 25 feet of curb frontage for new developments and major alterations

Maximize exposed soil to allow more water and air to get to the roots of the tree; use paving or other surface treatments over the tree pit in high pedestrian traffic areas

Tree pit guards or wickets enclosing the perimeter of the tree pit are permitted where their use does not impede pedestrian traffic and should not impede stormwater flow into the tree pit

Do not use tree pit grates that are flush with the sidewalk to cover tree pits

Vertical tree guards that enclose the tree trunk are not permitted

Stagger street tree species along a block to avoid species blight

Design tree pits to discourage the encroachment of pets

Design sidewalks to direct stormwater into tree pits wherever advisable

Sustainability Opportunities

Maximize size of tree pit while adequately accommodating pedestrian movement and curbside access needs

Utilize no paving or use permeable paving over tree pit

Use CONNECTED TREE PITS instead of INDIVIDUAL TREE PITS to increase root space and stormwater intake

Consider the pilot use of STORMWATER–CAPTURING TREE PIT (2.4.1c)

Tree Pits:

Individual Tree Pit

USAGE: WIDE

A tree pit within the sidewalk, disconnected from other tree pits, where a street tree is planted.

While this is currently the predominant design around the city, other designs that give tree roots more space and air (such as CONNECTED TREE PITS) can improve tree health and longevity.

Individual tree pits in a median (deep irrigation bags are secured to tree bases): Page Avenue, Staten Island (Credit: NYC DPR)

Individual tree pit with tree guard: Prospect Avenue, Brooklyn

Benefits

See benefits of TREE PITS (2.4.1)

Considerations

See considerations for TREE PITS

Application

See application guidance for TREE PITS

Use CONNECTED TREE PITS (2.4.1b) rather than INDIVIDUAL TREE PITS wherever possible

Design

See design guidance for TREE PITS

NYC DPR standard tree pit size is 5 feet by 10 feet

Sustainability Opportunities

See sustainability opportunities for TREE PITS

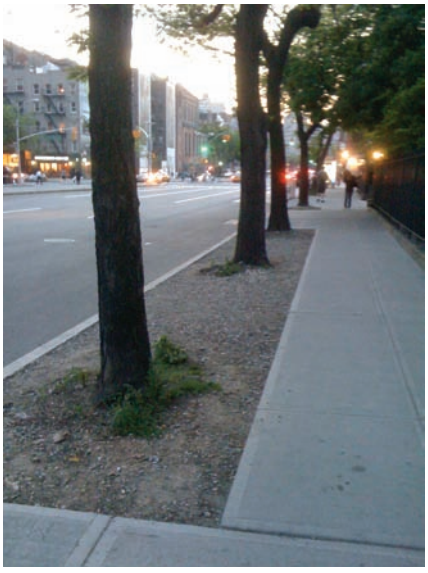
Tree Pits:
Connected Tree Pits

USAGE: LIMITED

A series of tree pits connected with a continuous trench in order to provide increased root space and stormwater detention.

The trench of connected tree pits should be left uncovered (and, optionally, landscaped) to improve tree root health. However, in areas of heavy pedestrian volumes and limited sidewalk space, the trench can be bridged by sidewalk slabs supported either by structural soil or a subsurface frame system.

Connected tree pits with permeable paver–covered trench: Columbia Street, Brooklyn



Connected tree pits with uncovered trench: West Houston Street, Manhattan

Benefits

See benefits of TREE PITS (2.4.1)

Provides greater space for tree roots than INDIVIDUAL TREE PITS (2.4.1a), improving tree health and longevity

In areas where a RIBBON SIDEWALK (2.2.1b) is inappropriate, connected tree pits provide many of the same benefits

Additional soil provides increased stormwater detention capacity over INDIVIDUAL TREE PITS

Considerations

See considerations for TREE PITS

Application

See application guidance for TREE PITS

Whenever possible in lieu of INDIVIDUAL TREE PITS

Consider RIBBON SIDEWALK as an alternative in areas of low–to–moderate land use density as per its application guidance and zoning requirements

Design

See design guidance for TREE PITS

Where sidewalk coverage is necessary (areas of high foot traffic, limited sidewalk space, or frequent curbside access), the sidewalk slab or permeable pavers can be bridged over the tree pit trench using structural soil or a subsurface frame system to increase soil volume

Sustainability Opportunities

See sustainability opportunities for TREE PITS

Tree Pits:

Stormwater–Capturing Tree Pit(s)

USAGE: PILOT

An INDIVIDUAL TREE PIT or CONNECTED TREE PITS designed to capture stormwater from the adjacent roadway.

If designed well, stormwater–capturing tree pits could benefit tree health by increasing the amount of water the tree receives and reducing the need for manual watering. The design of the pit is crucial to tree health; stormwater should be filtered through an appropriate soil mixture.

Stormwater–capturing tree pit with plantings: San Francisco (Credit: San Francisco Planning Department)

Stormwater–capturing tree pit with plantings: Wellington, NZ (Credit: NYC DCP) (Note: for illustrative purposes only

Benefits

See benefits of TREE PITS (2.4.1)

May improve tree health and reduce sidewalk heaving by providing increased water to tree

Adopting effective stormwater–capturing tree pit designs on a wide–scale basis could reduce stormwater volumes entering the sewer system during storms

Considerations

See considerations for TREE PITS

Careful consideration must be given to design and overflow control

Application

See application guidance for TREE PITS

Pilot implementations can be pursued in partnership with NYC DPR or another maintenance partner

Use connected stormwater–capturing tree pits as an alternative to individual stormwater–capturing tree pits wherever feasible

Use RIBBON SIDEWALK (2.2.1b) and STREET SWALE (2.4.3) instead of STORMWATER–CAPTURING TREE PITS in areas of low–to–moderate land use density as per their application guidance

Design

See design guidance for TREE PITS

Special care must be given to the siting of stormwater–capturing tree pits; if superior sub–drainage doesn't exist and overflow drains are not used, tree plantings may fail

Stormwater–capturing CONNECTED TREE PITS (2.4.1b) should be used wherever feasible instead of INDIVIDUAL TREE PITS (2.4.1a)

Sustainability Opportunities

See sustainability opportunities for TREE PITS

Greenstreet/ Planted Area

USAGE: LIMITED

A planted area within the public right–of–way maintained by NYC DPR (through an agreement between NYC DOT and NYC DPR) or another entity such as a business or neighborhood group (through a concession or maintenance agreement).

Greenstreets and other planted areas not only provide beauty but also enhance green cover and can help manage stormwater. They can range in size and shape from small ribbons in medians or along sidewalks to traffic triangles to large stormwater–collection swales.

Large Greenstreet: First Avenue, Manhattan

Benefits

Vegetation helps to mitigate air pollution and capture carbon dioxide from the air, improving environmental and public health

Green cover reduces the urban heat island effect and decreases energy costs related to air temperatures

Landscaping beautifies neighborhood streets

Stormwater capture reduces need for regular watering, reducing maintenance costs

Can incorporate community facilities such as seating or other furnishings to encourage social and recreational activities, depending on its size and maintenance partner

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

Landscaping or stormwater source controls require a partner for ongoing maintenance

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

Application

Wherever NYC DPR has made a greenstreet project a priority and there is adequate space to accommodate one

Consider a greenstreet wherever NYC DPR is willing to maintain the space and either (1) existing underutilized sidewalk space exists, (2) existing underutilized roadway space (e.g., channelized areas) exists that can be converted, or (3) reclaimable excess street right–of–way exists beyond the edge of the constructed street

Consider a non–greenstreet planted area wherever the above criteria are met and a committed partner other than NYC DPR is willing to maintain the planted area

Design

Design details should be determined on a site–specific basis in consultation with NYC DPR, NYC DOT, or other relevant agencies.

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

Guards or wickets are permitted around planted areas where their use does not impede pedestrian traffic

Sustainability Opportunities

Design greenstreet/planted area so as to capture stormwater according to current standards

Greenstreet with stormwater–capturing design: Furmanville Avenue, Queens (Credit: NYC DPR)

Landscaped areas incorporating public seating maintained by a private partner: Greenwich Street, Manhattan

Street Swale

USAGE: PILOT

A vegetated depression running alongside the road into which stormwater is directed.

The function of a street swale is both to detain stormwater—allowing it to infiltrate the soil—and to convey any overflow into the sewer system. As long as plant species are chosen that can tolerate periodic flooding and salt, street swales can also beautify the street. They typically require a maintenance entity to clean and occasionally unclog the swale and drains.

Street swale: Church Street at 35th Street and 14th Avenue, Brooklyn

Street swale: Eugene, Oregon

Street swale: Church Street at 35th Street and 14th Avenue, Brooklyn

Benefits

Provides superior stormwater detention from sidewalk and street

Permits greening of the streetscape

Beautifies neighborhood streets, if well–maintained

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

Street swales require an ongoing partner for such maintenance activities as vegetation replacement, debris and garbage removal, and clearing of sediment and debris from any drainage structures

Careful consideration must be given to design, overflow control, and plant species

Application

Consider in areas of lower–density land use where a RIBBON SIDEWALK (2.2.1b) would be appropriate in partnership with NYC DPR or another maintenance partner

Consider along parks and open space

Avoid in areas of high foot traffic or curbside activity

Design

Special care must be given to the siting of street swale based on subsurface conditions and infiltration rates

Should be at least 10 feet from building foundations

Should be between 5– and 10–feet wide with a 2–foot flat bottom where possible

Longitudinal slope should not be greater than 5%

To help sustain plant health, plants used in a street swale must be comprised of species that require low maintenance and can tolerate salt, frequent inundation, and periods of drought

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

Sustainability Opportunities

Maximize size of swale while adequately accommodating pedestrian movement and curbside access needs, through flush or cut curbs and other design elements