Geometry
# Geometry

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About this Chapter

The geometric design of streets is integral to their use; for instance, overly wide roadways and corners with large turning radii tend to invite speeding and create an environment that is uncomfortable for pedestrians. 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


Applicability and Exceptions

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

Usage Categories

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

Wide

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

Limited

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

Pilot

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

Introduction

Recent streetscape enhancements on Columbus Avenue between West 76th and 77th Streets included CityBenches, new planting areas demarcated by reused granite pavers, and new tree-bed guards: Manhattan
As the New York State DOT’s Project Development Manual states, it is understood that, even for a federally funded project, it “…may not always be practicable to…fully accommodate design year traffic, or even to fully address existing traffic congestion.” Further, “…traffic forecasts alone do not dictate project scope. Forecasts are only one of many factors (safety needs, mobility needs, environmental issues, community needs, etc.) to be addressed.” (See p. 5–2 Design Year Traffic Forecasts section of the Project Development Manual for more information: www.dot.ny.gov/divisions/engineering/design/dqab/dqab-repository/pdmapp5.pdf.)

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, and alleys; on streets adjacent to schools and senior- or disabled-pedestrian trip generators; and on waterfronts, in parks, or in and around other significant pedestrian destinations.

DOT applies design interventions as necessary to slow down fast and aggressive driving. These interventions, known as “traffic-calming” measures, include SPEED CUSHIONS (2.3.2a), CURB EXTENSIONS (2.2.2), and RAISED CROSSWALKS (2.3.4), and sometimes are intended also to improve pedestrian comfort. As part of its efforts to enhance safety, DOT deploys traffic-calming devices in neighborhoods around schools and in areas with high numbers of crashes involving elderly pedestrians. Community groups can also request certain traffic-calming interventions at specific locations by requesting them from their DOT Borough Commissioners. Some traffic-calming treatments can be designed in such a way as also to enhance the public realm.

Roadway Width, Corner Radii, and Crossing Distance
The roadway — the portion of a street designed, enhanced, or ordinarily used for vehicular travel, exclusive of the sidewalk — should be designed to

Wide roadways like Queens Boulevard can be mitigated with measures such as pedestrian facilities on medians: Queens
be the minimum possible width, with the minimum number of lanes, that safely and cost-effectively allows for the desired operations of motor vehicles, buses, and bicyclists. Narrower roadways minimize pedestrian crossing distances, encourage safe driving behavior, and reduce impermeable, heat-absorbing asphalt coverage.

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

Pedestrian crossing distances should be minimized in all locations utilizing the above methods and other treatments, such as CURB EXTENSIONS (2.2.2) (neckdowns) and RAISED MEDIANS (2.2.3). Sidewalk narrowings and roadway widenings should be avoided.

Design Vehicles and Emergency Access
The design vehicle (see Glossary) used for geometric street designs, typically a 30-foot-long single-unit truck, should be appropriate to the predominant intended uses of the given street and should not include commercial vehicles larger than New York City’s maximum allowable length. In addition, all street designs must consider FDNY, other emergency-vehicle, and sanitation-vehicle-access needs (e.g., for street 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 unless they produce a conflict-free crosswalk from the island that can provide an important pedestrian-safety enhancement.

Accessibility
Projects must 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.

Drainage
All modifications to street geometry should consider and avoid unintended changes in the direction and disposition of stormwater runoff so as not to create ponding or flooding issues. Minimize impervious paved areas and utilize permeable paving wherever possible. Include planted areas and stormwater source controls within the roadway wherever feasible.
Roadways & Lanes
Bike Lane & Path

A dedicated on-street lane or path for bicycles (see Glossary). Bikeways are typically designed as BIKE LANEs within the roadway delineated with markings (2.1.1a, also known as Class 2 bike lanes) or as BIKE PATHS physically separated from traffic for most of their length (2.1.1b, also known as Class 1 bike lanes). Another typical design is the shared lane (Class 3 bike lanes) described in Table 1. The shared lane is not covered by the Manual. Bikeways in parks, or in other places with heavy pedestrian traffic can also be designated by bike stamps.

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

On streets with high current or anticipated bicycle volumes or that offer important linkages to destinations or between routes

Design

See Table 1 (following 2.1.1b) for a listing of typical bikeway designs and their respective spatial requirements, ideal applications, and advantages and disadvantages

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

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

Utilize recycled content in paving materials

LEFT: Two-way, parking-separated bike path: Prospect Park West, Brooklyn

ABOVE: Buffered bike lane: 9th Street, Brooklyn
2.1.1a Bike Lane

**BIKE LANE & PATH**

**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 designated by bike stamps.

**Benefits**

See benefits of **BIKE LANES & PATHS** (2.1.1)

On-roadway bike lanes that narrow or replace 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**

Consider using a **BIKE PATH** (2.1.1b) rather than, or in addition to, a **BIKE LANE** where street conditions permit (e.g., street width, traffic volume, etc.)

**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 are located immediately adjacent to the curb — bike lanes can be given visual emphasis through the application of green-colored pavement
BIKE LANE & PATH

Bike Path

Usage: Limited

Benefits
See benefits of BIKE LANES & PATHS (2.1.1)

- Offers greatest bicyclist separation from motor vehicle traffic on mid-block sections
- Reduces risk of “dooring” (a motor-vehicle occupant opening her 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
- Encourages novice and less confident cyclists to opt for cycling

Considerations
Design consideration must be given to vision-impaired pedestrians, emergency-vehicle and paratransit access to adjacent buildings, snow-clearing and street-sweeping needs, and commercial vehicles loading and unloading

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

Design
See design guidance for BIKE LANES & PATHS (2.1.1)

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

If a separated bike path uses raised medians, see the CURB-HEIGHT MEDIAN section (6.2.1a) or the RAISED MEDIAN section (6.2.1b) for information on plantings
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<th>TABLE 1</th>
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<td><strong>Guide to New York City On-Street Bicycle Facilities</strong></td>
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<td><strong>Signal-Protected Path</strong></td>
<td><strong>Protected Path with Mixing Zones</strong></td>
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<tr>
<td>9th Avenue, West 59th to 16th Streets, Manhattan</td>
<td>Grand Street, Manhattan</td>
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<tr>
<td><strong>Space Required</strong></td>
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<td>14 feet</td>
<td>8 feet</td>
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<td><strong>Parking Loss</strong></td>
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<td>5–6 parking spaces/turn bay (usually every other block)</td>
<td>4–5 parking spaces/mixing zone (usually every other block)</td>
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<tr>
<td><strong>Ideal Application</strong></td>
<td><strong>Commercial Avenues</strong></td>
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</table>
|  | • 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 mid-block  
|  | • 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  |
### 2.1.1 Bikeway

#### Class 2: Bike Lane (2.1.2a)

**Buffered Lane**  
*DeKalb Avenue, Brooklyn*

- **Width:** 8 feet  
- **Parking:** Medium-Low  
- **Potential for Intrusion:** Low

#### Class 3: Bike Route (Not Included in Manual)

**Standard Lane**  
*21st Street, Manhattan*

- **Width:** 5 feet  
- **Parking:** Medium-Low  
- **Potential for Intrusion:** Low

**Signed Route**  
*48th Street, Queens*

- **Width:** None  
- **Parking:** None  
- **Potential for Intrusion:** None

#### Class 3: Bike Route (Not Included in Manual)

**Shared Lane**

- **Width:** None  
- **Parking:** Low  
- **Potential for Intrusion:** Low

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**Residential Avenues**

- Wide multilane street  
- Excess road space  
- Low potential for intrusion into bicycle lane

**Residential Cross-Streets**

- One- or two-lane street  
- Excess road space  
- Low potential for intrusion into bicycle lane

**Narrow Streets**

- One- or two-lane street  
- No excess road space  
- Connected to other bicycle facilities

**Limited Use**

- Interim treatment  
- Connected to other bicycle facilities  
- Indicates a preferred bicycle route  
- Preserves curbside access

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**Dedicated cycling space**

- Buffer zone enhances comfort for cyclists  
- Preserves curbside access  
- Simple implementation

**Dedicated roadway space for cycling**

- Preserves curbside access  
- Simple implementation

**Clear, easy to follow bicycle route**

- Heightens driver awareness of cyclists  
- Preserves curbside access  
- Simple implementation

---

**Vehicular intrusion remains possible**

- Width tempts motorists to intrude  
- Perceived as less safe than protected paths

**Vehicular intrusion remains possible**

- Cyclists have minimal separation from traffic  
- Perceived as less safe than protected paths

**Does not provide dedicated roadway space for cycling**

- Cyclists not separated from traffic  
- Sign placement critical, can be challenging

---

**Does not provide dedicated roadway space for cycling**

- Cyclists not separated from traffic  
- Sign placement critical, can be challenging
**Benefits**

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

SBS buses operate up to 20% more efficiently than the same bus models operating on other routes, thereby reducing emissions.

Provides means for emergency vehicles to bypass traffic.

**Considerations**

If curbside, may result in restriction of curbside parking/loading.

**Application**

Streets with SBS or high bus volumes and moderate to high traffic congestion or excessive road space.

Consider on all streets with high bus volumes or existing or planned SBS 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.

**A dedicated on-street facility for buses.** BUS LANES are delineated within the roadway with markings (2.1.2a) while BUSWAYS are physically separated from traffic for most of their length (2.1.2b). Both facility types can either be designed to run along the median of the street or along the outside (curbside or offset from a parking lane) of the street. Select Bus Service (SBS) is a high-quality bus service operated by MTA New York City Transit that uses several techniques to improve the speed and reliability of bus service, including BUS LANES.
Design

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

ALL BUS LANE AND 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.

Use an offset bus lane where possible, particularly when parking needs to be maintained; stops can be made at the curb or at BUS BULBS (2.2.2b).

Use a curb-aligned bus lane or busway when right-of-way may be constrained and where parking impacts can be managed.

For curb-aligned designs, curbside deliveries can be accommodated with loading windows, lay-bys, and/or reserved commercial loading around the corner.

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 PEDESTRIAN 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.

All BUS LANE AND 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 LINES AND BUSWAYS when conditions permit.

Utilize paving with a high SRI value within bus lane or busway unless red-colored pavement is to be used per 2.1.2a.

Utilize recycled content in paving materials.
2.1.2a Bus Lane & Busway: Bus Lane

**Bus Lane**

**Usage:** Limited

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**Benefits**

See benefits of BUS LANES & BUSWAYS (2.1.2)

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**Considerations**

See considerations for BUS LANES & BUSWAYS (2.1.2)

---

**Application**

See application guidance for BUS LANES & BUSWAYS (2.1.2)

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**Design**

See design guidance for BUS LANES & BUSWAYS

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

At intersections, the allowance or prohibition of turns from the bus lane should be clear, such as breaking the solid white line where cars can enter to make right turns

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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 2.1.2b).

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*Red, curb-aligned bus lane: East Fordham Road, Bronx*

*Curb-aligned double bus lane: Madison Avenue, Manhattan*
Busway

Usage: Pilot

A physically separated lane reserved for bus traffic. Busways are similar to BUS LANES (2.1.2a) in most respects, however full or partial physical separation (typically through a narrow curb or wider RAISED MEDIAN [2.2.3]) further improves bus speeds by minimizing blocking of the bus lane by other vehicles.

Benefits
See benefits of BUS LANE & BUSWAY (2.1.2)
Reduces or eliminates blocking of BUS LANE (2.1.2a)

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

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

Utilize paving with a high SRI value within busway, for example concrete
For median-separated busway, see the CURB-HEIGHT MEDIAN section (6.2.1a) for information on plantings
2.1.3 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 low-vehicle-volume and/or high-pedestrian-volume 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.

**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
- Coordinate streetscape/utility work to minimize street cuts
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, 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 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 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.

Use GATEWAY (2.3.3) 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.

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.

Minimize impervious paved areas and utilize permeable paving wherever possible.

Maximize trees and other green cover. See TREE BEDS (6.1) and ROADWAY PLANTINGS (6.2).

Utilize stormwater source controls wherever feasible. See STORMWATER-CAPTURING INSTALLATIONS (6.6).

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

Utilize recycled content in paving materials.
Plaza

An area located fully within the roadway that is designated by DOT for use by pedestrians. The space may contain benches, tables, or other facilities. DOT builds both temporary and permanent plazas. Many plazas are built through DOT’s Plaza Program, which aims to enhance the public realm. See Chapter 1: PROCESS for more information on how DOT projects are planned, designed, and implemented.

Benefits
- Promotes social interaction and builds neighborhood identity
- Encourages pedestrian activity and associated health benefits
- Catalyzes local economic development
- Serves as a venue for a diverse range of community, cultural, and/or commercial events
- Enhances safety by narrowing wide roadways and/or normalizing intersections

Considerations
- The road segment’s relevance to the traffic network
- Open-space needs
- Surrounding land uses and site appropriateness
- Anyone can apply to the Street Activity Permit Office (SAPO) to stage events on DOT plazas. To learn more about the event permitting process, contact SAPO by phone at (212) 788-7567 or visit www.nyc.gov/cecm
- Advertising is not permitted in plazas
- Generally requires a maintenance agreement

Application
- Under-utilized, DOT-owned road segments and other city property
- Locations with high crash rates
- Neighborhoods that support repurposing streets for plazas

Design
- Plaza designs should support year-round events and programs
- See design guidance for PERMANENT PLAZA (2.1.4a) and TEMPORARY PLAZA (2.1.4b)
Permanent Plaza

Usage: Limited

Benefits
See benefits of PLAZA (2.1.4)

Considerations
See considerations for PLAZA (2.1.4)

Application
See application guidance for PLAZA (2.1.4)

Neighborhoods with active not-for-profit organizations that can serve as Partners to maintain and manage plazas

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

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

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

Sites smaller than 2,000 square feet are not encouraged

Plazas may include movable and/or formal and informal fixed seating; trees and plants (see TREE BEDS [6.1] and PLAZA PLANTINGS [6.4]); lighting; paving; information and wayfinding signage; subconcessions; public art (temporary and permanent); bicycle parking; and drinking-water fountains

Incorporate public art where feasible

All permanent public art must be coordinated through the Department of Cultural Affairs (DCA) Percent for Art Program and requires approval by the Public Design Commission (PDC). Permanent art may be completely integrated and functional (e.g., benches, tables, etc.), or it may be stand-alone art (e.g., a sculpture)

Temporary art can be installed as a one-time project or cycled through on a temporary basis at a designated space in the plaza. Temporary art must be coordinated through DOT’s Urban Art Program. For guidelines and to apply to the Urban Art Program, visit www.nyc.gov/urbanart

Minimize impervious paved areas and utilize permeable paving wherever possible

Incorporate trees and other green cover. See TREE BEDS (6.1) and PLAZA PLANTINGS (6.4)

Utilize stormwater source controls wherever feasible

Increase SRI (solar reflective index) value of paved surfaces to reduce urban heat island impact

Utilize recycled content in paving materials

Completed in spring 2013, Willoughby Plaza features new trees and a flexible, open space that lends itself well to a wide range of events and programming, including the art displays shown here: Brooklyn
2.1.4b Temporary Plaza

Temporary Plaza

Usage: Wide

Benefits
See benefits of PLAZA (2.1.4)

Catalyzes community support for the space

DOT can study the temporary plaza and incorporate its observations and feedback into the eventual capital design of the space

Tests the maintenance partner’s capacity to maintain and program the plaza

Epoxy gravel or paint creates a more reflective surface, making the space feel safer at night

Much more cost-effective than a PERMANENT PLAZA

Considerations
See considerations for PLAZA (2.1.4)

Maintenance partner replaces elements over time as needed

Application
See application guidance for PLAZA (2.1.4)

Appropriate in place of a PERMANENT PLAZA (2.1.4a) when either the community or traffic network circumstances call for a test period

As requested by a community and/or where a safety project provides a public-space opportunity

Design
Geometry is engineered by DOT and is typically delineated with roadway markings and flexible reflective bollards

DOT places planters and granite blocks in and around the space to create a sense of enclosure and to buffer it from motor vehicle traffic. DOT also applies epoxy gravel or paint to distinguish it visually from the adjacent roadway

DOT and/or Partners provide publicly accessible furniture, such as moveable chairs and tables

Incorporate temporary public art where feasible. See guidance for temporary public art in PERMANENT PLAZA (2.1.4a)
Sidewalks & Raised Medians
2.2.1 Sidewalk

Sidewalk

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.

Benefits
Provides infrastructure for the most widely used mode of travel in New York City—walking
Creates linkages to transit, connects neighborhood destinations, and allows trip chaining
Supports mobility for the majority of New Yorkers
Facilitates straight and unobstructed pedestrian movement, free of vehicle conflicts except at intersections and driveways
With adequate width, can provide space for "staying" activities such as relaxing, shopping, eating, and socializing

Considerations
Coordinate streetscape/utility work to minimize street cuts

Application
On both sides of all streets that are 22 feet wide or wider. Exceptions include SHARED STREETS (2.1.4), pedestrian-only, and streets in certain historic districts 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
See SIDEWALKS (3.1) in the Materials chapter for information on options for sidewalk materials

Sidewalk with standard paving treatment: 11th Avenue, Manhattan
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.

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

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

Sidewalk cross-slope can be 2% maximum.

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

ADA-compliant pedestrian ramps must be provided at all pedestrian crossings; separate ramps should be used aligned with each crosswalk and be centered on a continuation of the sidewalk; color of detectable warning strip should contrast with surrounding pavement: dark gray in areas of light pavement and white in areas of dark pavement. See DOT Standard Details of Construction drawing H-1011.

The area within 1.8 inches of the curb should be kept free of all obstructions.

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

For recommended clearances between obstructions, see Revocable Consent Rules (Rules of the City of New York, Title 34, Chapter 7, Section 7-06(c)(5)), DOT Highway Rules (Rules of the City of New York, Title 34, Chapter 2, Section 2-1.0) and DCA’s rules regarding newsstands (Rules of the City of New York, Title 6, Chapter 2, Subchapter G).

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

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

Minimize impervious paved areas and utilize permeable paving wherever possible.

Maximize trees and other green cover wherever clearance allows. See TREE BEDS (6.1) and SIDEWALK PLANTINGS (6.3).

Utilize stormwater source controls wherever feasible.

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

Utilize recycled content in paving materials.
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, waste receptacles, telephone booths, newspaper boxes, etc., are typically located, is referred to as the “furnishing zone.”

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 (2.2.1)

Design
See design guidance for SIDEWALK (2.2.1)
Ribbon Sidewalk

Usage: Wide

Benefits

See benefits of SIDEWALK (2.2.1)

Provides greater space for tree roots than a FULL SIDEWALK (2.2.1a) with INDIVIDUAL TREE BEDS (6.1.1a), 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 geometric design guidance for SIDEWALK (2.2.1) and materials guidance for SIDEWALKS (3.1)

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 STORMWATER-CAPTURING INSTALLATION (6.6) 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

Utilize STORMWATER-CAPTURING INSTALLATION (6.6) within planting strip rather than groundcover vegetation alone to better manage stormwater
2.2.2 Curb Extension

Curb Extension

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 (2.2.2 c) or at an intersection to create a GATEWAY (2.3.3).

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 reduces 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 Rules of the City of New York, Title 34, Chapter 4, Section 4-13)

Considerations

May impact street drainage or require catch basin relocation

May impact underground utilities

May require loss of curbside parking

May complicate delivery access and garbage removal

May impact snow plows and street sweepers
**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 2.2.2c)

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

Near fire hydrants, 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

**Design**

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

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 (see CURB EXTENSION [6.3.3]) 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

Pedestrian ramps should be aligned such that they serve as a continuation of the sidewalk, rather than within the radius of the curb extension, to accommodate direct pedestrian path

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...
2.2.2a Curb Extension: Community Facilities

CURB EXTENSION

Curb Extension: 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.

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

May encourage mode shift to walking by creating a more comfortable and enjoyable walking environment

Considerations

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

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

Application

See application guidance for CURB EXTENSION (2.2.2)

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 DOT bike rack

Design

See design guidance for CURB EXTENSION (2.2.2)
**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 pick up and discharge passengers. Bus bulbs may also be designed to better support bus passengers through the inclusion of higher curbs, bus stop shelters, seating, pre-boarding payment equipment, and other bus-supportive facilities.

**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 (2.2.2)

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

**Design**

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

See additional design guidance for Curb Extension (2.2.2)

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
Mid-Block Narrowing

Usage: Wide

**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 (2.2.2)
- 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 (2.2.2)
- 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 RAISED MEDIAN (2.2.3) or PEDESTRIAN 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 (2.2.2)
- Reduce lane width at mid-block narrowing to impact vehicle speeds; on low-traffic residential streets, mid-block narrowing can be combined with other design treatments, including RAISED CROSSWALKS (2.3.4), RAISED SPEED REDUCERS (2.3.2), or vertical elements for maximum effectiveness
- Locate trees and/or plantings within curb extensions of mid-block narrowing where appropriate. See TREE BEDS (6.1) and CURB EXTENSION (6.3.3)
- Maximize permeable surface of curb extension with vegetation, permeable paving, or both
- Design any planted areas within mid-block curb extensions so as to capture stormwater according to current standards

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

Usage: Wide

A raised area separating different lanes, traffic directions, or roadways within a street. The raised median can be either curb height (6–7 inches) or, where appropriate, 12–24 inches high. The width as well as design of raised medians can vary widely. They can range from narrow raised concrete islands to tree-lined promenades to intensively landscaped boulevard medians. In contrast to PEDESTRIAN SAFETY ISLAND (2.2.4), raised medians extend for most or all of the street block.

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 if it incorporates trees and/or plantings. See RAISED MEDIAN (6.2.1)
- Improves environmental quality and can incorporate stormwater source controls

Can provide space for a SIDEWALK (2.2.1) and/or SEPARATED BIKE PATH (2.1.1b), particularly as part of a boulevard treatment

Considerations

- May impact underground utilities
- Design must account for impact of raised 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 raised median should be understood so as to not force drivers to travel on inappropriate routes or make U-turns
- If continuous, raised median may prevent left turns into driveways on opposite side of street
## Application

Two-way streets with two 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 raised median if there is not adequate room for all treatments and travel lanes

## Design

Raised 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. See RAISED MEDIANS (6.2.1)

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

Provide a walkable path across the raised median at crossings. When the median is less than 15 feet wide, an 8–10-foot-wide cut-through, flush with the roadway, is appropriate. On medians wider than 15 feet, pedestrian ramps can be used to provide access

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

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, plantings, and unpaved or permeable surfaces wherever safe and feasible, using structural soil where appropriate. See TREE BEDS (6.1), RAISED MEDIAN (6.2.1), and POROUS CONCRETE (3.1.13)

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

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

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

Locate trees and/or plantings within raised median. See TREE BEDS (6.1) and RAISED MEDIAN (6.2.1)

Maximize permeable surface of raised median

Design any planted areas within raised median so as to capture stormwater according to current standards
**Pedestrian Safety Island**

**Usage:** Wide

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

**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 RAISED MEDIAN (2.2.3)

**Design**

See design guidance for RAISED MEDIAN (2.2.3)

Typical island accommodates two street trees and, where appropriate, bell bollards. See TREE BEDS (6.1) and RAISED MEDIAN (CURB HEIGHT) (6.2.1a)
2.2.5 Median Barrier

**Median Barrier**

**Usage:** Limited

**Benefits**

- Reduces or eliminates short-cut and cut-through traffic
- When applied consistently to an area, reduces traffic speeds
- Can green and beautify the streetscape with trees and/or vegetation, improving environmental quality and potentially incorporating stormwater source controls
- Enhances 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

**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

**A RAISED MEDIAN OR PEDESTRIAN 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 RAISED MEDIANS, trees or plantings can be included within the median barrier.

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

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

**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 DEP sewers and water mains

Locate trees and/or plantings within diverter when appropriate. See TREE BEDS (6.1) and RAISED MEDIAN (6.2.1)

Maximize permeable surface of diverter. See POROUS CONCRETE (3.1.13)

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

See additional design guidance for RAISED MEDIAN (2.2.3)
Traffic Calming
2.3.1 Lane Narrowing and Lane Removal

Lane Narrowing & Lane Removal

Usage: Wide

Benefits

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

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

Provides space for pedestrian refuge islands, assigned turn lanes, angle parking, wide parking lanes, bus lanes, bicycle lanes, expanded sidewalks/pedestrian space, or other uses

Considerations

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

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

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

Effects of narrowings on turning movements should be tested

Application

Consider lane narrowings on corridors with excessively wide lanes

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

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

Lane narrowings remove excess width from existing moving lanes without changing the number of moving/traffic lanes. Lane Removals reassign underused traffic lanes to other functions. These design techniques, while not traffic-calming devices, have powerful traffic-calming benefits. Both may be accomplished by adding markings, turning lanes, pedestrian refuge islands, expanded pedestrian space, on-street or separated bicycle lanes, parking, or other functions.

Before: After two fatalities occurred at the same intersection in one year, DOT found that the roadway was over capacity: West 6th Street, Brooklyn

After: DOT installed a "road diet" in 2010, resulting in a 25% reduction in crashes

Design Guidelines

Lane narrowings and removals should result in standard-width lanes

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

Usage: Wide

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 DOT field study of the location using speed survey, geometric, and street operations criteria

Avoid on streets that have any of the following characteristics:
- designated as “local” or “through” truck routes
- on MTA bus routes, tour-bus routes, or routes of any other bus operator
- emergency-vehicle response or snow emergency routes
- Fire Department house located on the block
- more than one moving lane per direction
- wider than 44 feet

The location can be investigated by 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 to 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

Utilize recycled content in paving materials
2.3.2a Raised Speed Reducer: Speed Cushion

**RAISED SPEED REDUCER**

**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.

**Benefits**

- See benefits of RAISED SPEED REDUCERS (2.3.2)
- 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 (2.3.2)
- 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 (2.3.2)
- Spacing and dimensions of speed cushions are typically similar to those of other 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 CROSSWALK (2.3.4) or driveway treatment, a RAISED MEDIAN (2.2.3), landscaping or trees, and community facilities such as seating and public art.

**Benefits**

- Decreases vehicular speeds and discourages through-traffic without blocking or prohibiting vehicular access
- Demarcates transitions to low-speed, SHARED STREET (2.1.3), 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

**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 CROSSWALK or ramped driveway treatment; if the street is two-way, a RAISED MEDIAN (2.2.3) or PEDESTRIAN 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 DEP sewers and water mains
- If gateway includes PLANTED CURB EXTENSIONS, see design guidance for PLANTED CURB EXTENSIONS (6.3.3)
Raised Crosswalk

Usage: Limited

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 (2.3.3), 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

Design

- Appropriate warning signs and roadway markings should accompany raised crosswalk
- Use signage or other methods to alert snow-clearing vehicle operators to the presence of raised crosswalk
- Use enhanced, high-visibility street materials to further draw attention to raised crosswalk
- See design guidance for RAISED SPEED REDUCERS (2.3.2)
- Utilize recycled content in paving materials

A marked pedestrian crosswalk at an intersection or a mid-block location constructed at a higher elevation than the adjacent roadway. A raised crosswalk is essentially a speed table, 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 (2.3.2) with enhanced visibility for the pedestrian crossing.
Chicane

**Usage:** Pilot

**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.
- Locate trees and/or plantings within chicane curb extensions when appropriate. See TREE BEDS (6.1) and ROADWAY PLANTINGS (6.2).
- Maximize permeable surface of chicane curb extensions.
- Design any planted areas within chicane curb extensions to capture stormwater according to current standards. See STORMWATER-CAPTURING INSTALLATIONS (6.6).

**A serpentine roadway alignment or series of staggered CURB EXTENSIONS to encourage lower driving speeds through horizontal deflection.** Chicanes discourage or make it impossible for drivers to drive in a straight line. This can reduce vehicular speeds.
2.3.6 Neighborhood Traffic Circle

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, (2.3.7) but using much less space.

Usage: Pilot

Benefits

- Reduces speeds and crash rates, particularly when applied consistently to an area
- Eliminates possibility of vehicle head-on collisions
- 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 (2.3.7) should be used instead at high-volume or large intersections

Design

- Design speeds for movement around the circle should be 10 to 15 mph; exit speeds should be limited to 1.5 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
- 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 DEP sewers and water mains
- Minimize impervious paved areas and utilize permeable paving wherever possible
- Locate trees and/or plantings within neighborhood traffic circle island. See TREE BEDS (6.1) and ROADWAY PLANTINGS (6.2)
- Maximize permeable surface of neighborhood traffic circle island
- Design any planted areas within neighborhood traffic circle island so as to capture stormwater according to current standards
Roundabout

Usage: Pilot

Benefits

- Reduces top vehicular speeds at signalized intersections, thereby decreasing the severity of crashes
- Eliminates possibility of vehicle head-on collisions
- Eliminates left turns, a primary cause of crashes
- 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

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.
### 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
- As a gateway treatment for low-speed (25 mph speed limit or less) or SHARED STREETS (2.1.3)

### 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 crosswalks
- 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 DEP sewers and water mains
- Minimize impervious paved areas and utilize permeable paving wherever possible
- Locate trees and/or plantings within roundabout islands. See TREE BEDS (6.1) and ROADWAY PLANTINGS (6.2)
- Maximize permeable surface of roundabout islands
- Design any planted areas within roundabout islands so as to capture stormwater according to current standards
2.3.8 Raised Intersection

**Raised Intersection**

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

**Usage:** Pilot

**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 crashes 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 (2.3.2) 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
- Minimize impervious paved areas and utilize permeable paving wherever possible
- 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

**Application**

**Design**