Materials
# Materials

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### Introduction

**About this Chapter**
This chapter identifies materials for sidewalks, curbs, and roadways that are either approved citywide standards or alternatives for specified locations.

**Applicability and Exceptions**
All projects that significantly impact public and private streets should follow these guidelines. DOT approval will be based on site-specific conditions and cost-effective engineering standards and judgment based on the policies outlined in the Introduction to this Manual, with the safety of all street users being of paramount importance.

**Usage Categories**
Materials are divided into four usage categories: Standard, Distinctive, Historic, and Pilot.

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### Standard
Standard materials are required for use in all contexts outside of historic districts, unless DOT and PDC approve a Distinctive treatment. Projects utilizing the Standard materials in the identified contexts will generally only require a permit from DOT.

DOT is responsible for the maintenance of roadways and crosswalks. As such, materials not listed here as Standard are rarely installed in these contexts.

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### Distinctive
Any material not deemed Standard by DOT will be considered Distinctive and requires review and approval by DOT and the New York City Public Design Commission (PDC). Distinctive materials identified in this chapter are visually appealing and are proven to be durable, and DOT encourages their use in certain circumstances.

All Distinctive sidewalk and curb materials require a maintenance agreement between DOT and the entity proposing the materials (typically the adjacent property owner(s) or a jurisdictional organization). Per Rules of the City of New York Section 2-09(f)(4)(xvi), all approved Distinctive materials must be replaced in kind; however, any changes to existing Distinctive materials must be approved by DOT and PDC prior to their implementation.

**The review process for Distinctive sidewalk and curb materials is as follows:**

1. Adjacent property owner or jurisdictional organization submits proposal to DOT’s Urban Design and Art Unit at udau@dot.nyc.gov. The submission usually comprises architectural drawings, site photographs, project descriptions, and other supporting materials as necessary, and must meet at least one of the following criteria:
   - Encompasses an entire block
   - Pertains to a streetscape project
   - Features a design integral to a building or open space that significantly enhances the public realm, or
   - Is compatible with the prevailing material on blocks adjacent to the site for which it is proposed

2. DOT reviews the proposal for consistency with this Manual and for compliance with the criteria listed above. If the proposal does not satisfy these requirements, DOT may require design revisions or reject the proposal. If the proposal is acceptable, DOT submits it to PDC for an initial review

3. PDC reviews the proposal for its aesthetic impact on the streetscape and conformance with the criteria listed above. PDC strongly discourages proposals for piecemeal treatments. For more information on the PDC’s guidelines, visit their website at nyc.gov/designcommission
4. If PDC preliminarily approves the proposal, the applicant submits a Sidewalks, Curbs, and Roadways Application (SCARA) to DOT.

5. DOT reviews the SCARA. Distinctive materials identified in this chapter will receive an expedited review.

6. If the SCARA is approved, DOT and the applicant enter into a maintenance agreement.

7. DOT submits proposal to PDC for Final Approval.

8. If the proposal receives Final Approval from PDC, the applicant applies for the appropriate DOT construction permits and commences installation of the Distinctive sidewalk and/or curb materials.

**Specification Sources**

The recommendations in this chapter supplement rather than replace existing engineering standards. Readers are directed to the sources noted below, those listed in Appendix B, and any other applicable resources.

Detailed information on the specifications for standard materials is contained in the DOT/DDC Standard Highway Specifications. Typical construction details are provided in the DOT Standard Details of Construction. Information regarding standard procedures and approval requirements is provided in the Instructions for Filing Plans and Guidelines for the Design of Sidewalks, Curbs, Roadways, and Other Infrastructure Components.

The design guidance described here does not supersede any existing federal, state, or local laws, rules, or 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.

**Sidewalk and curb materials**

Not included in this chapter may be proposed, but are generally discouraged and require full engineering and design review by DOT, LPC, or PDC, as well as approvals from other governmental entities. Such materials, if approved, require a maintenance agreement.

**Sidewalk Permits**

Installation of sidewalks associated with new building construction is coordinated by the Department of Buildings through the Builder’s Pavement Plan. For more information on sidewalk permits, reviews, and approvals, see DOT’s Street Works Manual. For the Instructions for Filing Plans and Guidelines for the Design of Sidewalks, Curbs, Roadways, and Other Infrastructure Components, visit nyc.gov/streetdesignmanual.

See Section 2-09 of Title 34 of the Rules of the City of New York for requirements related to sidewalk, curb, and roadway work.

**Maintenance Agreements**

Each treatment in this chapter has a statement indicating whether or not the material requires a maintenance agreement before being installed. This agreement typically requires that the adjacent property owner, installing entity, or some other entity will generally be responsible for maintaining that material and providing appropriate insurance.
Sidewalks

Sidewalks are paths for pedestrians alongside a road (see Glossary). The primary function of a sidewalk is to provide pedestrian movement and access to buildings, parks, and other destinations. Sidewalks also function as sites for loading and unloading vehicles, as public meeting and gathering spaces, as places for outdoor dining, and as venues for commerce or expression. Increasingly frequently, sidewalks can also serve as opportunities to beautify streets with vegetation.

See SIDEWALK (2.2.1) in the Geometry chapter for more information about sidewalks.

The furnishing zone is the area of the sidewalk usually immediately adjacent to the curb where street trees, signs, above-ground utilities, and street furniture are typically located (see Glossary). Furnishing zones provide a physical buffer and a visual transition between the vehicles in the roadway and the pedestrians on the sidewalk, while also affording a clear area for organizing the various elements of street furniture that might otherwise appear cluttered. This area is generally 5 feet wide, or as wide as the tree pits along the blockface.

Furnishing zones are most appropriate on streets with at least moderate levels of both pedestrian and vehicle traffic—usually commercial shopping streets. Furnishing zones are best used when applied to entire blocks or a series of blocks comprising a corridor, rather than to sidewalks in front of individual small properties which would create a “patchwork” effect. Some materials in this chapter are exclusively for use in furnishing zones; all sidewalk materials may be used in furnishing zones.

All materials listed in this section may be used in PLAZAS (2.1.4) as well.
Unpigmented Concrete

Usage: Standard

Benefits

- Provides durable sidewalk surface with high friction coefficient
- Widely available and cost-effective
- Provides solid footing for flush-mounted furniture anchors

Considerations

- Difficult to patch in sections where utility cuts or defects occur

Application

- Appropriate for sidewalks on all non-commercial and non-historic streets and select commercial streets unless otherwise specified
- Adjacent property owners are generally responsible for maintaining this material

Design

- Flag size: 5 feet by 5 feet
- Joint: “tooled joint” or simulated saw-cut joint-scoring patterns
- Typically requires 6-inch gravel base
- May require metal reinforcement bars as specified by DOT

Specification source: DOT Standard Specifications Section 2.02, 2.15, 2.22, 3.05, 4.13, item numbers 4.13 AAS (4-inch sidewalk) and 4.13 BAS (7-inch sidewalk)

Detail source: DOT Standard Details of Construction drawing # H-1045

Sustainability Opportunity: Supplementary cementitious materials (SCM)

Mixture comprised of cement(s), aggregate(s), water, and other chemical admixtures, smoothed and then allowed to harden, forming a solid sidewalk surface.
3.1.2a Pigmented Concrete: Dark

Usage: Standard*  

Benefits

See benefits of UNPIGMENTED CONCRETE (3.1.1)

Dark pigmenting visually enhances sidewalk and emphasizes urban character in areas with greatest commercial and retail density

Saw-cut joints provide cleaner look, simulating individually hewn blocks of stone

Considerations

See considerations for UNPIGMENTED CONCRETE (3.1.1)

Application

Standard in commercial districts C4-4 through C4-7, C5 and C6, as defined in the Zoning Resolution of the City of New York, per Section 2-09(f)(4) of Title 34 of the Rules of the City of New York

Adjacent property owners are generally responsible for maintaining this material

Design

See design guidance for UNPIGMENTED CONCRETE (3.1.1)

Specification source: DOT Standard Specifications Section 4.13, item numbers 4.1.3 CABS (4-inch sidewalk) and 4.1.3 CBBS (7-inch sidewalk)

Sustainability Opportunity: Supplementary cementitious materials (SCM)

Same mixture as UNPIGMENTED CONCRETE (3.1.1), but with an added pigment for use in high-density commercial districts. This is one of three kinds of pigmented concrete—see also PIGMENTED CONCRETE: BLUESTONE (3.1.2b) and PIGMENTED CONCRETE: GRANITE (3.1.2c).

* Standard only for commercial districts C4-4 through C4-7, C5, and C6, as defined in the Zoning Resolution of the City of New York, per Section 2-09(f)(4) of Title 34 of the Rules of the City of New York

Typical dark pigmented concrete sidewalk with simulated saw-cut joint scoring: Broadway at Exchange Place, Manhattan
Pigmented Concrete: Bluestone

Usage: Historic

Benefits

See benefits of UNPIGMENTED CONCRETE (3.1.1)

Reinforces historic character

Saw-cut joints provide cleaner look, simulating individually hewn blocks of stone add to the historic character of this treatment

Considerations

See considerations for UNPIGMENTED CONCRETE (3.1.1)

All sidewalk repair or replacement in historic districts requires written approval from LPC

Application

Appropriate, pending LPC review, in historic districts as replacement of bluestone that is beyond repair, per LPC guidelines

Appropriate, pending PDC review, in historic, non-landmarked neighborhoods as replacement of bluestone that is beyond repair, per PDC guidelines

Adjacent property owners are generally responsible for maintaining this material

Design

See design guidance for UNPIGMENTED CONCRETE (3.1.1)

Flag size and pigmenting to match existing bluestone flags per LPC or PDC guidelines

Specification source: DOT Standard Specifications Section 4.13, item numbers 4.13 ABS (4-inch sidewalk) and 4.13 BBS (7-inch sidewalk)

Sustainability Opportunity:

Supplementary cementitious materials (SCM)
Pigmented Concrete: Granite

Usage: Historic

Same mixture as UNPIGMENTED CONCRETE (3.1.1), but with an added pigment to simulate granite slabs in historic districts, per LPC guidelines, or in historic, non-landmarked neighborhoods, per PDC guidelines. This is one of three kinds of pigmented concrete — see also PIGMENTED CONCRETE: DARK (3.1.2a) and PIGMENTED CONCRETE: BLUESTONE (3.1.2b).

Benefits

See benefits of UNPIGMENTED CONCRETE (3.1.1)

Reinforces historic character

Saw-cut joints provide cleaner look, simulating individually hewn blocks of stone add to the historic character of this treatment

Considerations

See considerations for UNPIGMENTED CONCRETE (3.1.1)

All sidewalk repair or replacement in historic districts requires written approval from LPC

Application

Appropriate, pending LPC review, in historic districts as replacement of granite that is beyond repair, per LPC guidelines

Appropriate, pending PDC review, in historic, non-landmarked neighborhoods as replacement of granite that is beyond repair, per PDC guidelines

Adjacent property owners are generally responsible for maintaining this material

Design

See design guidance for UNPIGMENTED CONCRETE (3.1.1)

Flag size and pigmenting to match existing granite slabs per LPC or PDC guidelines

Specification source: DOT Standard Specifications Section 4.13, item numbers 4.13 ABS (4-inch sidewalk) and 4.13 BBS (7-inch sidewalk)

Sustainability Opportunity:
Supplementary cementitious materials (SCM)

Concrete pigmented to match adjacent granite: Greenwich Street at Barclay Street, Manhattan
Pigmented Concrete with Exposed Light-Colored Aggregate

Usage: Distinctive

Benefits

See benefits of PIGMENTED CONCRETE: DARK (3.1.2a)

Exposed aggregate creates a texture and more natural appearance

Exposed aggregate camouflages dirt and gum in high-traffic areas

Considerations

See considerations for PIGMENTED CONCRETE: DARK (3.1.2a)

Application

This material is recommended for commercial areas with high foot traffic

Because this is a Distinctive sidewalk treatment, it is best used when applied to entire blocks, rather than to the sidewalks of individual small properties which would create a “patchwork” effect

Use of this material generally requires a maintenance agreement

Same mixture as PIGMENTED CONCRETE: DARK (3.1.2a) for commercial districts, but with addition of exposed light-colored pebble-sized aggregate. Joints are scored to simulate saw-cutting.

Tinted concrete sidewalk with light-colored exposed aggregate (note: this example does not include the required “simulated saw-cut joint” scoring pattern): East 42nd Street at Grand Central Terminal, Manhattan

Design

See design guidance for PIGMENTED CONCRETE: DARK (3.1.2a)

Aggregate: pebble-sized, light in color

Aggregate specification source: DOT Standard Specifications
Section 4.13 E, item numbers 4.13 EAGG (4-inch sidewalk), 4.13 EBGG (7-inch sidewalk)

Sustainability Opportunity:
Supplementary cementitious materials (SCM)
3.1.2e Pigmented Concrete with Silicon Carbide Treatment

Pigmented Concrete with Silicon Carbide Treatment

Usage: Distinctive

Benefits
See benefits of PIGMENTED CONCRETE: DARK (3.1.2a)
Sparkle adds distinction and visual enhancement to pigmented concrete
Increases slip resistance of surface

Considerations
See considerations for PIGMENTED CONCRETE: DARK (3.1.2a)

Application
This material is appropriate for sidewalks in commercial districts
Because this is a Distinctive sidewalk treatment, it is best used when applied to entire blocks, rather than to the sidewalks of individual small properties which would create a "patchwork" effect
Use of this material generally requires a maintenance agreement

Design
See design guidance for PIGMENTED CONCRETE: DARK (3.1.2a)
Silicon carbide specification source: DOT Standard Specifications Section 4.13, item numbers 4.13 CSABS (4-inch sidewalk) and 4.13 CSBBS (7-inch sidewalk)
Sustainability Opportunity: Supplementary cementitious materials (SCM)

Same mixture as PIGMENTED CONCRETE: DARK (3.1.2a) for commercial districts, but treated with silicon carbide to add sparkle.
### Sand-Colored Concrete with Exposed Aggregate

**Usage:** Distinctive

#### Benefits

- See benefits of PIGMENTED CONCRETE WITH EXPOSED LIGHT-COLORED AGGREGATE (3.1.2d)
- Sand color reinforces natural character of open spaces

#### Considerations

- See considerations for PIGMENTED CONCRETE WITH EXPOSED LIGHT-COLORED AGGREGATE (3.1.2d)

#### Application

- This material is appropriate for sidewalks adjacent to waterfronts, parks, and other open spaces.
- Because this is a Distinctive sidewalk treatment, it is best used when applied to entire blocks, rather than to the sidewalks of individual small properties which would create a “patchwork” effect.
- Use of this material generally requires a maintenance agreement.

### Design

- Pigmenting: sand-colored
- Aggregate: pebble-sized, mixed-color river rock
- Specification source: DOT Standard Specifications Section 4.13, item number 4.13 ESA (4-inch sidewalk) and 4.13 ESB (7-inch sidewalk)

### Sustainability Opportunity:

- Supplementary cementitious materials (SCM)
Concrete with Exposed Glass Aggregate

**Usage:** Distinctive

**Benefits**
- Decorative glass adds distinction and visual enhancement to concrete
- Increases slip resistance of surface
- Precast pavers are relatively easy to reset or replace for utility access and other purposes

**Considerations**
- See considerations of UNPIGMENTED CONCRETE (3.1.1)
- Alkaline reaction can degrade structural integrity of the concrete
- Unit pavers can become loose over time and will require regular maintenance
- DOT requires testing of this material

**Application**
- Cast-in-place should not be used where frequent utility cuts are likely
- Use of this material generally requires a maintenance agreement

**Design**
- See design guidance for of UNPIGMENTED CONCRETE (3.1.1)
- Slip resistance: minimum 0.60 coefficient of friction wet
- Unlimited color and aggregate mix options available

**Cast in Place:**
- Joint: simulated saw-cut joint scoring
- When poured, may require metal reinforcement bars as specified by DOT

**Pavers:**
- Pavers should be sand-set for easier installation and greater permeability wherever impermeable installation generates stormwater runoff
- Pavers can be mortar set for stronger structural properties
- Paver size: 8 inches by 8 inches

**Specification source:** DOT Standard Specifications Section 4.13 EG, item numbers 4.13 EGA (4-inch sidewalk), 4.13 EGB (7-inch sidewalk), and 6.47 EGA8 (pavers)

**Sustainability Opportunity:**
- Supplementary cementitious materials (SCM)
- High-SRI coloring
- Recycled glass or reclaimed aggregates

Concrete into which select surface aggregates (such as colored glass or decorative pebbles) are embedded. Either cast in place or installed in the form of precast unit pavers. This treatment is for use exclusively in the furnishing zone.
Concrete with London Paver Scoring

Usage: Distinctive

Benefits

See benefits of UNPIGMENTED CONCRETE (3.1.1)

Reinforces civic character of an area

Less expensive than unit pavers

Considerations

Difficult to patch in sections where utility cuts or defects occur

Application

For sidewalks fronting on government buildings and other civic structures such as bridges and memorials

Because this is a Distinctive sidewalk treatment, it is best used when applied to entire blocks, rather than to the sidewalks of individual small properties which would create a “patchwork” effect

Use of this material generally requires a maintenance agreement

Design

Flag size: 18 inches by 36 inches

Requires concrete base

Specification source: DOT Standard Specifications Section 6.06 LP, item number 6.06 LP

Sustainability Opportunity: Supplementary cementitious materials (SCM)
### Hexagonal Asphalt Paver

**Usage:** Distinctive

### Benefits
- Commonly used paver for New York City public spaces conveys park-like character
- Interlocking hexagonal shape fits tightly together and resists shifting and buckling
- This material is widely available and cost-effective
- Dark color hides dirt and stains
- Hexagonal pavers are relatively easy to reset or replace, especially for utility access
- Asphalt pavers can be recycled

### Considerations
- Unit pavers can become loose over time and will require regular maintenance
- May contribute to heat-island effect

### Application
- Hexagonal asphalt pavers are appropriate for sidewalks adjacent to parks or plazas
- Use of this material generally requires a maintenance agreement—hexagonal asphalt pavers installed by DPR are an exception

### Design
- **Paver size:** 8 inches between parallel sides
- Can be sand-set for easier installation or mortar-set for stronger structural properties

### Specification source:
- DOT Standard Highway Specifications Section 3.04 and 6.60, item number 6.60 B

### Sustainability Opportunity:
- High recycled asphalt (RAP) content
## Bluestone Flag

**Usage:** Historic

### Benefits
- Reinforces historic character
- Adds distinction and visual enhancement to sidewalk
- Stone conveys connection to natural environment

### Considerations
- Vulnerable to breakage
  - Due to the possibility of pavers cracking or becoming uneven, application requires attentive maintenance
- All sidewalk repair or replacement in historic districts requires written approval from LPC
- Higher up-front cost than concrete

### Application
- This material is standard in historic districts or other areas with existing bluestone pavers where historic fabric remains intact, per the LPC guidelines
- In historic districts, adjacent property owners are generally responsible for maintaining this material
- Use of this material outside historic districts generally requires a maintenance agreement

### Design
- **Bluestone:** 2.25-inch thick New York State bluestone to match size and color of existing flags
- **Finish:** Natural cleft, with variation in smoothness not exceeding 1/8 inch
- **Joints:** Hand-tight

### Specification sources:
- LPC guidelines
- DOT Standard Specifications Section 6.07, item number 6.07 AB

### Sustainability Opportunity:
- Salvaged bluestone

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Historic stone unit paver with subtle variations in color, grain, and surface. The preservation and in-kind replacement of bluestone flags are normally required in new construction projects within historic districts; the installation of new bluestone flags is typically recommended in locations adjacent to existing bluestone.

**Bluestone flag sidewalk: Perry Street at Bleecker Street, Manhattan**
### 3.1.9 Granite Slabs

**Granite Slab**

**Usage:** Historic

**Benefits**
- Reinforces historic character
- Adds distinction and visual enhancement to sidewalk
- Stone conveys connection to natural environment

**Considerations**
- Not intended to support heavy vehicles when spanning underground vaults
- Difficult to repair or patch in sections
- All sidewalk repair or replacement in historic districts requires written approval from LPC
- Higher up-front cost than concrete

**Application**
- This material is standard in historic districts or other areas with existing granite pavers where historic fabric remains intact, per the LPC guidelines
- In historic districts, adjacent property owners are generally responsible for maintaining this material
- Use of this material outside historic districts generally requires a maintenance agreement

Historic stone paver, with varieties of color, texture, and veining. Can be cut to extremely large sizes to span underground vaults. The preservation and in-kind replacement of granite slabs are normally required in new construction projects within historic districts; the installation of new granite slabs is typically recommended in locations adjacent to existing granite.

**Design**
- Granite: to match size and color of existing flags, 3-inch minimum thickness
- Slip resistance: minimum 0.60 coefficient of friction wet

Specification sources: LPC guidelines, DOT Standard Specifications Section 6.04, item numbers 6.06 NG, 6.06 NGSM (mortar setting bed and joints), and 6.06 NGSS (sand setting bed and joints)

Sustainability Opportunity: Salvaged granite slabs

Granite slab sidewalk: West Broadway at Reade Street, Manhattan
### Granite Block

**Usage:** Distinctive

**Historic smooth-finish granite block unit pavers often referred to as “cobblestones,” commonly used throughout New York City in the nineteenth century. This treatment is for use exclusively in the furnishing zone.**

### Benefits
- Visually delineates separation of street uses
- Stones convey connection to natural environment
- Cobblestones are relatively easy to remove and reset, especially for utility access
- Reinforces historic character, where applicable

### Considerations
- Stones can become loose over time and will require regular maintenance
- Can be slippery when wet
- Uneven surface can hinder pedestrian and disabled persons’ mobility

### Application
- Furnishing zone and around tree beds
- Use of this material generally requires a maintenance agreement. Granite blocks installed by DPR around tree beds are an exception

### Design
- Should be sand-set for easier installation and greater permeability wherever impermeable installation generates stormwater runoff
- Can be mortar-set for stronger structural properties
- The area within 18 inches of the curb should be kept free of obstructions

### Specification source
- DOT Standard Specifications Section 2.06, 6.06

### Sustainability Opportunity:
- Salvaged cobbles
- Permeable installation
Precast Square Paver

Usage: Distinctive

Benefits
This material is widely available and cost-effective
Relatively easy to reset or replace, especially for utility access
Asphalt pavers can be recycled

Considerations
Unit pavers can become loose over time and will require regular maintenance

Application
Furnishing zone
Use of this material generally requires a maintenance agreement

Design
Paver size: 8 inches by 8 inches
Should be sand-set for easier installation and greater permeability wherever impermeable installation generates stormwater runoff
Can be mortar set for stronger structural properties
The area within 18 inches of the curb should be kept free of obstructions

Precast, square asphalt or concrete pavers. This treatment is for use exclusively in the furnishing zone.

Specification source: DOT Standard Specifications Section 6.06, item numbers 6.6 B (asphalt), 6.06 CSA (concrete with sand joints), 6.06 CSB (concrete with grouted joints), and 6.06 CSC (concrete with sand and grouted joints)

Sustainability Opportunity: High recycled asphalt (RAP) content
Sustainability Opportunity: High-SRI coloring

Square asphalt pavers in a furnishing zone: Willoughby Street at Duffield Street, Brooklyn
3.1.12 Permeable Interlocking Concrete Paver (PICP)

Permeable Interlocking Concrete Paver (PICP) have voids at the joints to allow water to pass through into an open-graded reservoir below.

*PICPs have been approved as standard for use on sidewalks at school locations in lieu of a planting strip. (See: Adopted Zoning Text Amendment 26-421, adopted April 30, 2012.) This treatment is Pilot at all other locations.

**Benefits**

- Reduces impermeable surface, thereby increasing water infiltration
- Reduces peak discharge during storm events
- Reduces likelihood of ponding and slick or icy conditions
- Helps reduce urban heat-island effect

**Considerations**

- Not recommended for use where there is water-sensitive subsurface infrastructure
- Only certain soil types are appropriate as sub-bases for infiltration
- Porosity of the pavers can convey harmful chemicals into the soil
- Requires regular maintenance
- Vegetative growth in joints will occur if there is no regular maintenance
- May require vacuuming of surface to restore permeability when joints become clogged
- Sand should not be applied to surface

**Application**

- Most effective on slopes less than 5%
- Must have adequate sub-surface conditions to detain stormwater and level bottom to allow for uniform infiltration
- Can be proposed for use in parking lane, gutter strip, sidewalk, or plaza area
- Avoid "stormwater hotspots"—sites where there is potential for soil and groundwater contamination
- Use of this material generally requires a maintenance agreement

**Design**

- ASTM No. 8, 89, or 9 stone is recommend to fill paver joints. Requires open graded stone infiltration bed
- Bottom of infiltration bed should be at least 2 feet above high water table and 2 feet above bedrock
- Sustainability Opportunity: Coat pavers with photocatalytic treatment or high-SRI surface
- Sustainability Opportunity: Manufacture pavers using color additives to increase the SRI or incorporating recycled materials
### Porous Concrete

**Usage:** Pilot

Concrete mixture using minimal cementitious paste to coat the aggregate, and using little or no sand or fine aggregate, leaving substantial void content. This allows water to pass through to an open-graded reservoir underneath.

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Application</th>
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<tbody>
<tr>
<td>See benefits of UNPIGMENTED CONCRETE (3.1.1)</td>
<td>Most effective on slopes less than 5%</td>
</tr>
<tr>
<td>Reduces impermeable surface, thereby increasing water infiltration</td>
<td>Must have adequate sub-surface conditions to detain stormwater and level bottom to allow for uniform infiltration</td>
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<tr>
<td>Reduces peak discharge during storm events</td>
<td>Can be used to pave an entire sidewalk or just hardscape between CONNECTED TREE BEDS (6.1.1b)</td>
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<tr>
<td>Reduces likelihood of ponding and slick or icy conditions</td>
<td>Avoid “stormwater hotspots”— sites where there is potential for soil and groundwater contamination</td>
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<tr>
<td>Helps reduce urban heat-island effect</td>
<td>Not recommended for implementation over significant underground utility corridors</td>
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<thead>
<tr>
<th>Considerations</th>
<th>Use of this material generally requires a maintenance agreement</th>
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<tbody>
<tr>
<td>See considerations for UNPIGMENTED CONCRETE (3.1.1)</td>
<td></td>
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<tr>
<td>Pervious concrete has reduced strength compared to conventional concrete applications</td>
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<tr>
<td>Not appropriate for use where there is water-sensitive sub-surface infrastructure</td>
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<tr>
<td>Porosity of the concrete can convey harmful chemicals into the soil</td>
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<td>Requires routine vacuuming of surface to restore permeability</td>
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<td>Sand should not be applied to surface</td>
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<tr>
<td>Contractors should be certified to install porous concrete</td>
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<td>Slump and air content tests are not applicable to pervious concrete</td>
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**Design**

See design guidance for UNPIGMENTED CONCRETE (3.1.1)

- Typically an 8- to 24-inch open graded stone infiltration bed is recommended

- Generally 4 - 8 inches thick

- Pervious concrete should maintain a 15 - 25% void content ratio

- Bottom of infiltration bed should be at least 2 feet above high water table and 2 feet above bedrock
Rubber Paver

**Usage:** Pilot

**Benefits**

- Easy to install and replace
- Pavers can be shaped to avoid trees or other objects
- Thinner than traditional sidewalk, allowing more room for roots to grow
- Permeability of the joints allows stormwater to filter through to tree roots
- Permeability helps to reduce the formation of the condensation commonly seen under traditional concrete flags which promotes the aggressive root growth that tends to cause fracturing and upheaval

**Considerations**

- Generates some stormwater runoff
- Unit pavers can become uneven over time and require regular maintenance

**Application**

- Appropriate for piloting on sidewalks or plazas with low pedestrian traffic where tree roots may cause the fracturing and upheaval of sidewalk paving
- Use of this material generally requires a maintenance agreement

**Design**

- Recycled rubber must be free of high-risk chemicals or otherwise sealed to prevent contamination of soil
- Paver size: 2 feet by 2.5 feet
- Various colors available
- Sustainability Opportunity: High-SRI coloring

Interlocking sidewalk pavers made of recycled rubber or a rubber/plastic mix.
Curbs

A curb is a step where the roadbed meets the sidewalk or other raised pathway (see Glossary). Curbs serve three functions: a visual and physical limit to the vehicular roadbed; a gutter to convey rainwater and detritus from the roadbed and sidewalks to the catch basins at the ends of the street; and aesthetically, curbs add a finished edge to sidewalks and roadbeds.
Unpigmented Concrete

Usage: Standard

Benefits
This material is widely available and cost effective
Can easily be cast on site to fit curved sidewalk profiles
Cast-in-place curbs are more resistant to displacement than stone alternatives

Considerations
Vulnerable to breakage or crumbling

Application
This material is standard for any street with UNPIGMENTED CONCRETE sidewalks (3.1.1)
DOT generally maintains this material

Design
Size: 6 inches wide on top, 8 inches wide on bottom, 18 inches deep; 7-inch reveal above roadway
Expansion joints of curb should line up with expansion joints of sidewalk
Steel facing should be used on streets where repeated mounting by heavy vehicles may cause damage.
May require metal reinforcement bars as specified by DOT

Concrete curb specification source: DOT Standard Specifications Section 4.08, 3.05
Steel-faced curb specification source: DOT Standard Specifications Section 2.13, 3.05, 4.09

Sustainability Opportunity:
Supplementary cementitious materials (SCM)
Sustainability Opportunity:
Salvaged or recycled steel facing

Mixture comprising cement(s), aggregate(s), water, and other chemical admixtures, smoothed and then allowed to harden, forming a solid curb.

ABOVE: Typical untinted concrete curb with steel facing: West 114th Street and Morningside Avenue, Manhattan
LEFT: Typical concrete curb: Beach 73rd Street, Queens
3.2.2 Pigmented Concrete

Usage: Standard

Benefits
See benefits of UNPIGMENTED CONCRETE (3.2.1)

Considerations
See considerations for UNPIGMENTED CONCRETE (3.2.1)

Application
See application guidance for PIGMENTED CONCRETE sidewalks (3.1.2a, 3.1.2b, and 3.1.2c)

DOT generally maintains this material

Design
See design guidance for UNPIGMENTED CONCRETE (3.2.1)

See design guidance and specification information for PIGMENTED CONCRETE sidewalks (3.1.2a, 3.1.2b, and 3.1.2c)

Sustainability Opportunity:
Supplementary cementitious materials (SCM)

Same mixture as UNPIGMENTED CONCRETE (3.2.1), but with a pigmented admixture to match the sidewalk. There are three types of pigmented concrete: PIGMENTED CONCRETE: DARK (3.1.2a), BLUESTONE (3.1.2b), and GRANITE (3.1.2c).

Typical pigmented concrete curb with steel facing: Beaver Street at Hanover Street, Manhattan
Integral Concrete Curb and Gutter

Usage: Distinctive

Benefits
Easier to install and maintain than cast-in-place alternatives
Can be removed and replaced as needed

Considerations
See considerations for UNPIGMENTED CONCRETE (3.2.1)

Application
Appropriate for residential areas with low volumes of heavy vehicles
Use of this material may require a maintenance agreement

Design
Specification source: DOT Standard Specifications Section 4.08, item number 4.08 CG
Sustainability Opportunity: Supplementary cementitious materials (SCM)
Sustainability Opportunity: Porous concrete where possible

Concrete curb and gutter precast as single pieces and installed in sections.
3.2.4 Granite

Granite cut to long sections and laid as curbing. Saw-finishing, achieved by cutting the granite with a stone saw and polishing out saw marks, provides a smooth, clean look. Split finishing, typically achieved by hand-chiseling, exposes the natural cleft of the stone, giving a rough-hewn texture.

**Usage:** Distinctive

**Benefits**
- Reinforces historic character (if applicable)
- Adds distinction and visual enhancement to sidewalk
- Stone conveys connection to natural environment
- Extremely durable and low-maintenance, resists cracking and discoloration
- Can be removed and replaced as needed

**Considerations**
- Difficult to patch and must therefore be replaced by section if severely damaged
- Much higher material cost than concrete

**Application**
- This material is appropriate for all streets, especially commercial districts, including use in combination with concrete sidewalk
- Granite curb is usually required in historic districts, adjacent to individual landmarks, or in areas with existing granite curb where the historic fabric remains intact
- DOT generally maintains this material

**Design**
- Size: 5 inches to 8 inches wide on top, 3 inches of minimum width on bottom, 16 inches deep
- Must have lip with batter and rounded edge
- Slip resistance at top of curb: minimum 0.60 coefficient of friction when wet

**Specification source:** DOT Standard Specifications Section 2.12, 4.07
- Saw-finish curb detail source: DOT Standard Detail drawing # H-1056
- Split-finish curb detail source: DOT Standard Detail drawing # H-1056A
- Sustainability Opportunity: Salvaged granite curb

**Sustainability Opportunity:** Salvaged granite curb
Crosswalks are areas of roadbed that are delineated to indicate where pedestrians are expected to cross (see Glossary). In certain instances, crosswalks may have patterns or be constructed from materials that further increase their visibility or add character to a neighborhood. This section is intended to include only surface materials approved for creating distinctive crosswalks. It does not include guidance on using standard thermoplastic markings to designate crosswalks for traffic control purposes. For this information, please refer to the most recent version of the federal Manual on Uniform Traffic Control Devices (MUTCD).

In addition to the materials listed in this section, all materials listed in the Roadways section (3.4) may also be used in crosswalks, according to the application guidance provided.
3.3.1 Granite Paver

Granite Paver

Stone unit pavers are known for durability and associated with high-quality traditional streets.

Usage: Historic

Benefits
Visually enhances crosswalk

Considerations
Due to the possibility of pavers cracking or becoming uneven, and asphalt shoving at the borders, application requires attentive maintenance

Significantly higher cost than a standard asphalt crosswalk

Application
Crosswalks on historic streets or where distinction is desired and there are low volumes of heavy vehicle traffic

Should not be used where frequent utility cuts are likely

Use of this material generally requires a maintenance agreement

Design
Crosswalks generally should comply with MUTCD standards

Paver size: minimum 4 inches for shortest dimension, maximum 30 inches for longest dimension, minimum 5-inch thickness for vehicular roadbed

Pavers that have a ratio of length to width greater than 2:1 should only be used when set in poured concrete because of the likelihood of breakage under heavy-vehicle traffic

Granite must have a textured surface that provides sufficient slip resistance to meet a minimum 0.60 coefficient of friction when wet

Specification source: DOT Standard Specifications Section 6.04

Sustainability Opportunity: Salvaged pavers

Granite pavers in a crosswalk. This treatment is appropriate for historic districts: Water Street, Brooklyn
Roadways

Roadways represent the paved central portion of the street that allows access to and movement through an area (see Glossary). Most roadways are primarily designed for motor vehicle use.
### Asphalitic Concrete

**Usage:** Standard

#### Benefits
- Provides smooth and durable road surface with high friction coefficient
- Material is widely available and cost-effective
- Impervious quality channels water to the curb on crowned roadways
- Dark color hides dirt and stains, creates background for high-contrast markings
- Easy to maintain and patch
- Can be pigmented or imprinted for varied purposes
- Asphalt can be recycled

#### Considerations
- Prone to rutting and shoving under high volumes of heavy vehicles
- Contributes to heat-island effect
- Sends runoff to catch basins, thereby contributing to combined-sewer overflows (CSOs) during large rainstorms

#### Design
- Minimum 3-inch-thick wearing course, typically
- Roadway should be crowned to drain stormwater from the road surface
- Typically requires concrete base

#### Specification source: DOT Standard Specifications Section 2.05, 3.01, 4.01, 4.02

#### Detail source: DOT Standard Details drawing H-1034 and related

#### Sustainability Opportunities:
- High recycled asphalt (RAP) content
- High-SRI asphalt
- Porous asphalt in parking lanes

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Mixture of asphalt binder and stone aggregate, usually laid on a concrete base and compacted by a roller to form a smooth and solid road surface.
### Porous Asphalt

**Usage:** Pilot

**Benefits**

- Reduces impermeable surface, thereby increasing water infiltration
- Exhibits structural properties similar to conventional asphalt
- Reduces peak discharge during storm events
- Reduces likelihood of ponding and slick or icy road conditions
- Helps reduce urban heat-island effect

**Considerations**

- Not recommended for use where there is water-sensitive sub-surface infrastructure
- Only certain soil types are appropriate as sub-bases for infiltration
- Porosity of pavement can convey harmful chemicals into the soil
- Requires vacuuming of surface to restore permeability when clogged
- Sand should not be applied to surface

**Application**

- Can be proposed for use in parking lanes, parking lots, and recreational paths
- Most effective on slopes less than 5%
- Must have adequate sub-surface conditions to detain stormwater
- Avoid “stormwater hotspots” — sites where there is high potential for soil and groundwater contamination
- Not recommended for implementation over significant underground utility corridors
- Use of this material generally requires a maintenance agreement

**Design**

- Minimum 3-inch-thick wearing course, typically
- Roadway should be crowned to drain stormwater from the road surface
- Aggregate should be no smaller than 600 μm, or the No. 30 sieve
- Asphaltic cement should be 5.75 – 6.75% bituminous asphalt content by weight
- Do not seal coat
- Typically, a 12 – 30-inch open graded stone infiltration bed is recommended.
- Bottom of infiltration bed should be at least 2 feet above high water table and 2 feet above bedrock

Asphaltic concrete in which the amount of fine particles is kept to a minimum and in which the binder content is low, allowing water to pass through into an open-graded reservoir.
Concrete

Usage: Standard

Benefits
- Provides durable road surface with high friction coefficient
- This material is widely available and cost effective
- Resists rutting and shoving that can occur with asphalt
- Compared to asphalt, reduces impact of vehicle travel vibrations on sub-surface features and neighboring structures

Considerations
- Difficult to replace or patch in sections where utility cuts or defects occur
- Noisier than asphalt

Application
- Appropriate for roads with high motor vehicle volumes and/or gross weight
- Should be used wherever engineering criteria dictates, such as bridges, vaulted roadways, or bus pads
- Should not be used where frequent utility cuts are likely
- Will be evaluated case-by-case based on engineer review of roadway structure
- DOT generally maintains this material

Design
- Must have joints to allow for expansion no more than 20 feet apart
- May require metal reinforcement bars as specified by DOT
- Specification source: DOT Standard Specifications Section 3.05, 4.05
- Detail source: DOT Standard Details drawing H-1050
- Detail source (bus pad): DOT Standard Details drawings H-1005, H-1005 A
- Sustainability Opportunity: Supplementary cementitious materials (SCM)
Granite Block

Usage: Historic

Historic smooth-finish granite block unit pavers often referred to as “cobblestones,” commonly used throughout New York City in the nineteenth century.

Benefits

- Reinforces historic character
- Calms vehicle traffic
- Can visually delineate separation of street uses or modal priorities
- Cobblestones are relatively easy to remove and reset, especially for utility access

Considerations

- Stones can become loose over time and require intensive, regular maintenance
- May generate significant noise from vehicle tires
- Uneven surface can hinder pedestrian, cyclist, and disabled persons' mobility
- Can be slippery when wet

Application

- Should be used wherever there is existing cobblestone in areas where the historic fabric remains intact
- Use of this material is subject to LPC review when used in historic districts with existing cobblestones
- May be used to provide visual delineation to separate bike lanes from vehicle lanes or vehicle lanes from pedestrian areas
- Can be used to designate areas of the roadbed not intended for regular vehicle travel, such as pedestrian streets or textured gutters, aprons, or medians

Design

- Can be sand-set for easier installation and maintenance and for greater permeability, or mortar-set for stronger structural properties
- May require concrete base
- Provision must be made for a smooth cycling surface, regardless of whether or not the roadway is part of a designated bike route. DOT and DDC are finalizing a new specification for achieving rideability that borrows from the GRANITE PAVER (3.3.1) specification for crosswalks

Sustainability Opportunity: Salvaged cobbles

Sustainability Opportunity: Permeable installation

Mock-up of new specification under development. It includes a smooth strip of granite pavers set among reused granite blocks