4.6

INFRASTRUCTURE & LANDSCAPE DESIGN ELEMENTS

Street Lighting ............................................................... 224
Street Trees ................................................................. 228
Stormwater Management .............................................. 236
Lawn Extensions .......................................................... 240
Landscape Planters ...................................................... 244
Site Utilities ................................................................. 248
DESCRIPTION & INTENT

Lighting is an essential element of street design, safety, and security. Street lighting is used to illuminate the street, sidewalks, and bike facilities. Street lighting is critically important at intersections and crosswalks.

Lighting levels are important. Lighting should be sufficient for people to see comfortably and correctly distinguish persons and objects in the street, but lighting should not be so great as to create deep shadows or pronounced areas of light and dark.

Street lighting should be efficient in both energy use and direction of light. Consistent with Ann Arbor’s endorsement of the Dark Skies Initiative, street lights should minimize sky glow (casting or reflecting light up into the night sky).

Street lights are important elements of street character during daytime hours as well. The verticality of light poles helps to distinguish the curb line of the street and establishes a particular rhythm to the street edge. The spacing of light poles often dictates the spacing of other street elements as well, notably street trees.

There are two broad categories of street lights used in downtown:

- **Roadway lighting** is mounted higher (18 to 24 feet above the roadway) and poles have an arm that extends the streetlight over the travel way.

- **Pedestrian-scale lighting** is typically mounted lower (12 to 16 feet above the sidewalk) and primarily used to illuminate the Walking Zone, although on the narrow streets of Ann Arbor, ambient light from pedestrian lighting is often sufficient to serve as both roadway and pedestrian lighting.

USE & APPLICATION

Location

- Street lighting is required on all street types although the type and intensity of lighting may vary.

- Pedestrian-scale lighting is generally desired in areas with more intense pedestrian activity in Destination Commercial, Commercial, and Civic & University frontages.

- Typical roadway lighting may be sufficient and desirable for both Roadway and the Walking Zone in the Near Neighborhood context, as light is focused towards the roadway and causes less light to enter homes.

<table>
<thead>
<tr>
<th>Frontage Context</th>
<th>Preferred Lighting Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination Commercial</td>
<td>Pedestrian-scaled, with roadway lighting at intersections as needed</td>
</tr>
<tr>
<td>Commercial</td>
<td>Pedestrian-scaled, with roadway lighting at intersections as needed</td>
</tr>
<tr>
<td>Mixed</td>
<td>Pedestrian-scaled, with roadway lighting at intersections as needed</td>
</tr>
<tr>
<td>Civic &amp; University</td>
<td>Pedestrian-scaled, with roadway lighting at intersections as needed</td>
</tr>
<tr>
<td>Near Neighborhood</td>
<td>Roadway lighting</td>
</tr>
</tbody>
</table>
DESIGN & OPERATIONS

Design Requirements

A Light Levels: Street lighting shall be used to provide sufficient illumination, particularly at crosswalks and intersections. Lighting shall be placed to provide consistent lighting levels.

» In downtown, horizontal light levels along a street should generally be between 0.4 to 1.7 foot-candles (fc).¹ Lighting levels at intersections and crosswalks should be between 1.5 and 3.4 fc. There are few consistent standards for pedestrian lighting levels, although a minimum luminance of 0.5 fc is generally recommended.

» Higher levels of lighting may be desired at transit stops, bike share stations, or other areas of concentrated pedestrian activity. Lighting may be provided by sources other than street lights.

B Placement: Light poles shall be placed in the Amenity Zone of the street approximately 2 feet on center from the face of curb.

» Where bumpouts are present, light placement should typically be consistent with the curb line outside of the bumpouts.

C Spacing: Lighting placement and levels should be sufficient for personal safety and security permitting recognition of people and objects while avoiding the creation of excessive shadows.

» Where pedestrian-scaled lighting is used, pedestrian-scale street lights shall be 40 to 60 feet apart.

» Where roadway lights are used, they shall be spaced approximately 190 feet apart

Energy Efficiency: Ann Arbor pioneered the use of LED light fixtures as a means to reduce energy consumption and costs. Effective, high efficiency lighting is required.

Additional Design Considerations

• Light Fixture Style: A variety of light fixtures are found throughout downtown.

» Ornamental “globe” and “cobra head” lights are most common for pedestrian and roadway lighting respectively, however Ann Arbor does not have a single light standard for either lighting type.

» Consistent light fixtures within a character district will reinforce the image of the place and facilitate maintenance.

¹ Foot candles (abbreviated “fc”) are the standard unit of lighting levels. Foot candles are the approximate distance that is illuminated away from the source of light, measured in lumens per foot.
• **Arrangement**: The type and arrangement of light fixtures can reflect the character and hierarchy of the street. Light poles may be arranged in an “alternate” or “opposite” configuration. Opposite configurations are typically associated with a more formal, higher order streetscape although, such a configuration may result in uneven lighting levels and more lights and light poles than are necessary to meet target lighting standards.

• **Accessory Functions:**
  » Brackets for banners, hanging baskets, or other ornamentation may be affixed or integrated into the light pole.
  » Light poles may provide electrical outlets to support downtown activities or seasonal displays.
  » Street signage, bicycle parking and/or single space parking meters may be integrated into light poles to reduce sidewalk clutter.

**Sustainability Considerations**

• LEDs are the preferred lighting source in Ann Arbor given their low energy use.

• Solar-powered or other emerging technology lights offer additional alternatives to consider.

• Lighter street surfaces and/or higher levels of reflectivity may lower lighting requirements and associated costs.

**Design References**

• The Illuminating Engineering Society of North America (IES) authors the nationally recognized “Recommended Practice for Roadway Lighting” – the standard for roadway, pedestrian and bicycle facilities approved by the American National Standards Institute (ANSI).

• The City of Ann Arbor Public Services Standard Specifications provides installation and construction specifications for street lighting.

• FHWA Lighting Design for Mid-block Crosswalks (2008) provides guidance on lighting and visibility considerations at crosswalks to improve pedestrian safety.

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**MAINTENANCE & MANAGEMENT**

**General Maintenance**

• The majority of street lights in Ann Arbor are owned and maintained by DTE with operation paid for by the City of Ann Arbor. The balance of street lights are city-owned and maintained by the Field Services Unit.

**Seasonal Use & Maintenance**

• **Snow Removal**: There are no special requirements for snow removal associated with street lighting.

**Reviews & Approvals**

• Street lighting should be coordinated through the Public Services Area but may involve multiple other city units and Detroit Edison (DTE).

• It may also be necessary to engage Washtenaw County and the Michigan Department of Transportation (MDOT) in certain circumstances.

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2 RP-8-14 is the most current report issued October 2014 and available at www.ies.org/store.

3 http://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

4.6 INFRASTRUCTURE DESIGN ELEMENTS

[STREET LIGHTING]
STREET TREES

DESCRIPTION & INTENT

Street trees are critical component of the downtown environment and part of the City’s overall green infrastructure system. Street trees provide a broad range of benefits, such as managing stormwater volumes, providing shade for pedestrians, making streets safer and more appealing, enhancing the aesthetic character of the street, and reducing the urban heat island effect. Maintaining healthy street trees is a challenge in dense urbanized environments, but proper consideration of the growing environment yields large and healthy street trees that provide maximum benefit.

USE & APPLICATION

Location

- Street trees are required on all streets in the downtown environment unless an exception is granted due to technical in-feasibility of planting trees. See Minimum Planting Area in Design Guidelines Below.
- Trees are especially important to locate near seating, bus stops, and other locations where pedestrians may be sitting, resting, or waiting and can take advantage of the shade trees provide.

Street trees can be planted in one of three different conditions:

1. **Within an Open Landscape Planters**: Landscape planters are curbed or raised planting beds with exposed soil/mulch within the Amenity Zone. See Landscape Planter Design Element for More Information.
   - Open landscape planters are the preferred method for accommodating trees downtown as they provide more soil surface for water and air to access to tree roots.

2. **Within a Covered Tree Trench**: Tree trenches use a combination of grates and covered soil areas within the Amenity Zone to provide an area for root growth beneath a hardscape surface.
   - Covered Tree Trenches are best-used in locations where significant foot traffic – such as high on-street parking turnover, loading/unloading zones, bus stops, taxi stands, and other intense uses compete for limited space, such as in Destination Commercial, Commercial, and some Civic & University frontage areas.

3. **Within a Lawn Extension**: Lawn extensions are on-grade, typically lawn, planting areas in the Amenity Zone used primarily in Near Neighborhood zones. See Lawn Extension Design Element for More Information.

Requirements and graphic representations for each condition are provided in the Design Guidelines below.
Tree Species Selection and Application

- **Street Character**: Selecting the right tree for a given street type is important and must consider the overall Frontage Context of street as well as specific conditions, space, and growing environment for the planting itself. Trees play a critical role in defining the street character, as such congruency with the street Frontage Context is critical.
  
  » Table 4.6.1 describes intended character goals for street tree plantings depending on the street’s Frontage Context.

- **Site Selection**: Trees grow in many different sizes and forms, and not all trees are appropriate to all types of streets. Proper selection of tree species for a given site shall consider:
  
  » Size of available growing areas and growing medium (soil and drainage).
  
  » Width and height of the tree relative to the distance between trees (tree spacing) and between trees and adjacent building faces.
  
  » Presence of other street elements that would adversely impact trees or be adversely impacted by trees, such as signs, light posts, and overhead or underground utilities.

- **Tree Sizes**: Table 4.6.2 provides tree sizes and placement recommendations.
  
  » These recommendations should be utilized in a flexible manner, recognizing that specific design conditions and constraint may require deviation (with approval of Ann Arbor Urban Forestry & Natural Resources staff) in order to accommodate street tree planting. For example, parking meters, street signs, utility vaults/connections, building entrances, and other fixed street elements may require adjusting street tree placement and spacing.

### Table 4.6.1 - Street Tree Character Goals

<table>
<thead>
<tr>
<th>Frontage Context</th>
<th>Street Tree Character Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination Commercial</td>
<td>Street trees are important for providing shade for shoppers, outdoor dining/retail and making an attractive pedestrian environment. However, it is also important that street trees minimize obstructions to business signage wherever possible. Larger street trees should be used, with larger initial plantings, to more quickly provide bigger and taller canopy coverage. Healthy tree pruning and maintenance is critical in high use areas.</td>
</tr>
<tr>
<td>Commercial</td>
<td>As with Destination Commercial streets, Commercial streets also benefit from larger street tree plantings where trees can provide shade while minimizing obstructions to business signage.</td>
</tr>
<tr>
<td>Mixed</td>
<td>Mixed streets afford greater flexibility in street tree plantings due to generally lower pedestrian volumes and less retail/storefront visibility concerns. While larger trees and a larger canopy is generally preferred wherever possible, small trees and ornamental species may also be incorporated into the street tree planting, especially when selected species can provide attractive foliage or flowering to enhance the visual quality of mixed streets. Many mixed streets also include service access to building (utilities, loading docks, etc.) and street trees can be used to screen less visually appealing features.</td>
</tr>
<tr>
<td>Civic &amp; University</td>
<td>Civic &amp; University streets generally have minimal commercial activity yet provide a high quality pedestrian experience for people accessing institutional uses. Street tree plantings should complement the scale and articulation of Civic &amp; University buildings create a more cohesive streetscape character. Larger groupings of species should be considered to create a stronger “promenade” feel. Both larger canopy trees and ornamentals can be appropriate, and should be placed to provide shade for seating nodes or plaza spaces along the Civic &amp; University streets.</td>
</tr>
<tr>
<td>Near Neighborhood</td>
<td>Near Neighborhood streets are primarily residential in nature, and larger canopy trees should be utilized whenever possible over smaller tree types. The tree canopy is important for shading smaller scale residential buildings and providing a more calm residential street feeling.</td>
</tr>
</tbody>
</table>

### Table 4.6.2 - Street Tree Size and Placement

<table>
<thead>
<tr>
<th></th>
<th>Small Trees</th>
<th>Medium Trees</th>
<th>Large Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-center spacing</td>
<td>20’</td>
<td>25’</td>
<td>30’</td>
</tr>
<tr>
<td>Minimum distance from curbs or clear Walking Zone</td>
<td>2’</td>
<td>2.5’</td>
<td>3’</td>
</tr>
<tr>
<td>Distance from light poles</td>
<td>10’</td>
<td>12’</td>
<td>15’</td>
</tr>
<tr>
<td>Distance from driveways/fire hydrants</td>
<td>10’</td>
<td>10’</td>
<td>10’</td>
</tr>
<tr>
<td>Minimum distance from intersections</td>
<td>20’</td>
<td>20’</td>
<td>20’</td>
</tr>
</tbody>
</table>
**Species Selection:** The tables below list approved street trees by size class. Prior to planting, verify that the selected species is listed on the most up-to-date tree species list.

<table>
<thead>
<tr>
<th>Species List – Small Trees (under 30 foot/10 foot diameter canopy) (from approved City street tree list)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trident Maple</td>
</tr>
<tr>
<td>Paperbark Maple</td>
</tr>
<tr>
<td>Striped Maple</td>
</tr>
<tr>
<td>Tatarian Maple</td>
</tr>
<tr>
<td>Downy Serviceberry</td>
</tr>
<tr>
<td>Allegheny Serviceberry</td>
</tr>
<tr>
<td>Autumn B Serviceberry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medium Trees (25-40 foot/15 foot diameter canopy) (from approved City street tree list)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miyabei Maple</td>
</tr>
<tr>
<td>Shantung Maple</td>
</tr>
<tr>
<td>River Birch</td>
</tr>
<tr>
<td>European Hornbeam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Large Trees (40+ foot/20+ foot diameter canopy) (from approved City street tree list)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Maple</td>
</tr>
<tr>
<td>Sugar Maple</td>
</tr>
<tr>
<td>Yellow Buckeye</td>
</tr>
<tr>
<td>Hackberry</td>
</tr>
<tr>
<td>Katsura Tree</td>
</tr>
<tr>
<td>Turkish Filbert</td>
</tr>
<tr>
<td>Hardy Rubber Tree</td>
</tr>
<tr>
<td>Ginkgo</td>
</tr>
<tr>
<td>Honeylocust</td>
</tr>
<tr>
<td>Kentucky Coffeetree</td>
</tr>
<tr>
<td>Sweetgum</td>
</tr>
<tr>
<td>Tuliptree</td>
</tr>
</tbody>
</table>

**Planting Design:** Trees should be planted in a sequence of two to three of the same species in a row to provide a consistent character for a given segment of the street. Where conditions allow, planting trees for symmetry across the street should be considered (e.g. the same sequence of two to three trees repeats on the opposite side of the street).

Street tree planting downtown should coordinate with any specific tree plantings identified in street tree master plans that are part of the Urban and Community Forestry Management Plan.

**Soil Volumes:** Trees typically need 2 cubic feet of growing soil for every square foot of canopy area for healthy growth (see: Urban, Jim. Up By Roots, Healthy Soils and Trees in the Built Environment. International Society of Arboriculture, Champaign Illinois. 2008). In the downtown environment, the following approximate canopy sizes are anticipated for street trees:

- **Small Trees** = 10 foot diameter canopy (approx. 150 cubic feet of soil)
- **Medium Trees** = 15 foot diameter canopy (approx. 350 cubic feet of soil)
- **Large Trees** = 20 foot diameter canopy (approx. 600 cubic feet of soil)
DESIGN & OPERATIONS

Design Requirements – Open Landscape Planters and Landscape Strips

Landscape planters are areas within the streetscape with exposed soils and mulches for trees and other vegetation to be planted and contained within a curbed perimeter and/or raised seating walls. While not always feasible, curbing provides added protection against salt and other damaging elements. See Landscape Planters Design Element for additional guidance on the design, layout, and construction details for landscape planters.

Minimum Soil Surface: Trees planted within a landscape planter shall have a minimum soil surface area of 5 feet wide by 6 feet long (30 square feet) or 4 feet wide by 7 feet long (28 square feet) allocated to an individual tree and be free from other woody or deep rooting vegetation.

Total soil volume of the landscape planter must be 240 cubic feet of soil per tree in larger contiguous planters containing multiple trees (equivalent to 6 feet wide x 10 feet long by 4 deep) or 350 cubic feet of soil for planters with only one tree (equivalent to 6 feet wide by 15 feet long by 4 feet deep). Trees should be planted in the middle of their allocated soil volume.

Depth of the soil is based on the size of the root ball, with the top of the root ball flush with the finished grade of the planter (absent of mulch cover) and accounting for a 6 to 12 inches of compacted planting soil below the root ball. Do not place root ball directly on undisturbed grade.

For trees up to 3 inches in caliper, a minimum of 12 inches of new planting soil mix must surround the root ball (e.g. 2 foot diameter root ball requires a minimum 4 foot diameter area of planting soil). For trees 3 inches in caliper or larger, 18 inches of planting soil mix must surround the root ball. These minimums may determine the minimum possible width for the planter based on the specific size of the root balls for specified plant materials. See Planting Detail Below for Additional Information.

- Drainage: Provide subsurface drain lines connected to the stormwater system in areas with poorly drained surrounding soils.
- Raised Planters: If the landscape planter is a raised planter design, open and connect planter to sub-grade soils to allow root growth into adjacent areas.

Trees in Landscape Planters

Tree Spacing Varies by tree size (20’ to 30’ on center)

Min Area 4’ x 7’ or 5’ x 6’

Total Soil Volume
240 c.f. in multi-tree planter
350 c.f. in single-tree planter
Design Requirements – Covered Tree Trenches

Covered tree trenches provide a method for growing trees in the higher intensity urban environments. Covered tree trenches combine a primary planting area of soil covered by a grate and an extended soil zone comprised of additional grate-covered planting soil and/or structural soils below paved surfaces.

**Primary Planting Area:** Primary planting area shall be sized as follows:

» For trees up to 3 inches in caliper, a minimum of 12 inches of new planting soil mix shall surround the root ball (e.g. this yields a 5 foot by 5 foot area for a 3 foot diameter root ball). For trees 3 inches in caliper or larger, 18 inches of planting soil mix shall surround the root ball.

**Tree Grates:** The primary planting area shall be covered by a tree grate with the following characteristics:

» Tree grates shall be constructed out of solid steel or cast iron and able to meet the load bearing capacity and requirements of the surrounding sidewalk area.

» Tree grates shall provide a 2 foot diameter circular or 2 foot by 2 foot rectangular opening around the tree truck to allow for tree growth. The grate system shall be able to be removed and replaced with a larger opening grate in the event the tree trunk grows too large for the opening.

» Tree grates shall be able to be locked in place to prevent vandalism, but still removable in order to provide maintenance access below the tree grate.

» Tree grates shall provide openings within the tree grate to allow air and water to enter the planting soil. These other openings should not allow an object greater than 1 inch in diameter to pass through (e.g. a chair leg).

» The distance between the finished soil grade and the top of the tree grate may not be no more than 6 inches in height.

**Drainage:** Provide a 4 inch wrapped, perforated drain pipe running vertical from the finished grade to the bottom of the planting area inside of the primary planting area to provide air infiltration into the soil.

» Provide subsurface drain lines connected to the stormwater system in areas with poorly drained surrounding soils.

Trees in Covered Tree Trenches

- **Tree Spacing:** Varies by tree size (20’ to 30’ on center)
- **Total Soil Volume:**
  - 240 c.f. in multi-tree planter
  - 350 c.f. in single-tree planter
- **Primary Planting Area:**
  - 2’ diameter circle or 2’x2’ rectangle
  - Other openings diameter of tree grate should be less than 1”
Extended Soil Zone shall contain, in conjunction with the primary planting area, a total soil volume of 350 cubic feet for single trees or 250 cubic feet per tree for interconnected soil zones where multiple trees are being planted. The extended soil zone must be constructed in one of the following ways:

» Grated Surface: Use additional grated area with normal planting soil. Grates must meet the same requirements as those listed above for the primary planting area – with the exception of the opening for the tree trunk.

OR

» Geo-Engineering: Use structural soils and/or other geo-engineering solutions (e.g. Silva Cells) to provide a load bearing sub-grade suitable for root growth and supporting the surface pavings. Consider using porous surface pavement material such as porous concrete or pavers (see sidewalks) for areas above structural soils.

Use of structured soils or other geo-engineering solutions is a non-standard treatment and requires special permission of the City of Ann Arbor Urban Forestry and Natural Resources Coordinator and Engineering Unit.

Design Requirements – Tree Installation

- Where street trees are placed within landscape planters with curbs or seat-walls, the undisturbed ground may be concrete or other hard surfaces forming the planting pit area.

- Planted street trees must be approved with a two-year warranty period and maintenance contract providing tree care (watering, etc.) for the first two years following installation.

- At least 20-gallons of water should be provided to each tree immediately following planting.

Additional Design Considerations

- Hybrid designs containing part open landscape planters and part covered tree trenches may be utilized with approval of the City’s Urban Forestry & Natural Resources Coordinator.

- The sides of landscape planters and covered tree trenches should be open to existing sub-grade wherever possible to provide for additional root zone space. Expanded use of structural soils or other treatments around tree plantings is highly desirable.

- Provide water connection spigots in close proximity to tree planting areas.

Utility Considerations

- Do not plant trees directly on top of major utilities, utility leads, vaults, access panels, or other utility infrastructure that are within the soil growth zone.

Sustainability Considerations

- Explore opportunities for using structural soils below existing paved Sidewalk and Amenity Zone areas when they can be connected to the growing zone of tree roots.

- Use permeable pavements to encourage infiltration of stormwater into the root zone around trees.

Design References

- City of Ann Arbor Urban & Community Forest Management Plan.

- Boston Complete Streets.

- City of New York Department of Parks and Recreation Street Tree Planting Standards (2014).
MAINTENANCE & MANAGEMENT

General Maintenance

- For the first two years following tree installation, trees must be maintained as required by a tree maintenance agreement.
  - Trees must be watered throughout the growing season (May 15th to October 31st) at two-week intervals. Each watering must provide at least 20-gallons of water for each tree. Watering frequency may be adjusted based on drought or excessive rainfall conditions.
  - Weeding, trash removal, and mulching must be maintained to keep the tree area free from weeds, trash, and other debris.
- After the first two years following tree installation, the City oversees tree maintenance responsibilities. The City and DDA are collaborating to create programs to engage citizens and businesses in tree care, including volunteer and business outreach programs. These maintenance activities include:
  - Tree pruning and disease/pest management. Tree pruning in Destination Commercial and Commercial areas for storefront and signage visibility is important.
  - Regular watering, especially during drought conditions

- Use of Gator Bags for tree watering should refer to Ann Arbor Urban Forestry & Natural Resources staff for current practices.

Seasonal Use & Maintenance

- Snow Removal: Snow should be cleared from landscape planters and grated tree areas as soon as possible to minimize salt and other pollutant loading from entering exposed soil areas. Snow should not be stored on top of landscape planters and grated tree areas.

Reviews & Approvals

- Public street trees are reviewed by the Ann Arbor Urban Forestry & Natural Resources Planning Coordinator.
- Private projects planting new public street trees must have their plans and planting details reviewed and approved by the Ann Arbor Urban Forestry & Natural Resources Planning Coordinator.
4.6 INFRASTRUCTURE DESIGN ELEMENTS

[STREET TREES]
STORMWATER MANAGEMENT

DESCRIPTION & INTENT

Managing stormwater in the urban environment is critical for protecting water quality and reducing the volume of stormwater entering rivers and other water bodies. In Ann Arbor, managing stormwater within the right-of-way is guided by the City’s Municipal Separate Storm Sewer System (MS4) Permit and the City’s Green Streets Policy (“Stormwater Management Guidelines for Public Street Construction and Reconstruction”). All on-site stormwater must be managed on-site, out of the public ROW, and is regulated separately from this Manual.

Stormwater management techniques, often referred to as Green Infrastructure, include many different types of facilities designed to infiltrate, store, and filter runoff. Within the downtown environment, a variety of stormwater management techniques may be applied in order to achieve the management targets identified in the Green Streets Policy. Typically, these techniques will include infiltration planters and underground infiltration and/or storage systems.

USE & APPLICATION

Location

• All public street construction and re-construction projects are subject to the Green Streets Policy, with maintenance and street resurfacing projects exempt. Regardless, any projects which impact a significant portion of the street environment should still consider stormwater management improvements.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balanced</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The Green Street Policy establishes specific infiltration management goals:

<table>
<thead>
<tr>
<th>Site Conditions</th>
<th>Infiltration Standard management goal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First 1 inch</td>
</tr>
<tr>
<td>Within the floodplain, or</td>
<td></td>
</tr>
<tr>
<td>Slopes &gt; 20%, or</td>
<td></td>
</tr>
<tr>
<td>Soil infiltration &lt; 0.6in/hr</td>
<td></td>
</tr>
<tr>
<td>Not in the floodplain, and</td>
<td></td>
</tr>
<tr>
<td>Slopes &lt; 20%, and</td>
<td></td>
</tr>
<tr>
<td>Soil infiltration rate between 0.6in/hr and 2.0 in/hr</td>
<td></td>
</tr>
<tr>
<td>Not in the floodplain, and</td>
<td></td>
</tr>
<tr>
<td>Slopes &lt; 20%, and</td>
<td></td>
</tr>
<tr>
<td>Soil infiltration rate &gt;2.0in/hr</td>
<td></td>
</tr>
<tr>
<td>50% annual change, 24 hour event (2.35 inches)</td>
<td></td>
</tr>
<tr>
<td>10% annual chance, 24 hour event (3.26 inches)</td>
<td></td>
</tr>
</tbody>
</table>

- Stormwater management facilities in the right-of-way can use a variety of Stormwater Best Management Practices (BMP) to reach the management goals. The Southeast Michigan Council of Governments (SEMCOG) “Low Impact Development Manual for Michigan” identifies a number of structural BMPs to consider within urban environments.

<table>
<thead>
<tr>
<th>Stormwater BMP</th>
<th>Typical Location</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infiltration Planters</td>
<td>Amenity Zone, Curbside Zone</td>
<td>Bioswales, rain gardens, bioretention</td>
</tr>
<tr>
<td>Subsurface Infiltration</td>
<td>Underground: Amenity/ Curbside Zones, Roadway Zone</td>
<td>Infiltration or storage vaults, infiltration trenches</td>
</tr>
</tbody>
</table>

- Multiple stormwater BMPs can be used in an integrated system to accomplish the management goals. Any proposed BMP must be approved by the City to ensure sustained maintenance.
• Private or University of Michigan development projects that result in construction or reconstruction of a public street are subject to the Green Streets Policy.

• Coordinating private development projects and public street projects should be explored to provide as much stormwater management as possible. Managing additional stormwater runoff from private property, such as buildings or parking lots, with BMPs located within the public right-of-way may be allowed provided that the minimum management targets for private and public land areas are both met appropriately.

4.6 INFRASTRUCTURE DESIGN ELEMENTS

[STORMWATER MANAGEMENT]

DESIGN & OPERATIONS

Design Requirements – Infiltration Planters

Infiltration planters are open landscaped areas typically in the Amenity Zone of the street. They may also be located in other zones depending on the overall design of the street. Infiltration planters are designed to capture runoff from the roadway and other impervious areas of the street. Captured water is filtered through plants and soil and infiltrated completely through the planter or into an overflow under-drain and can be treated in a secondary stormwater system.

• Management Volume: Infiltration Planters shall be designed, in conjunction with other stormwater systems to infiltrate the required stormwater quantities per the Green Streets Policy.

A Length: Stormwater planters may line the entire street length, however where on-street parking is provided, breaks shall be provided at least every 40 feet (approximately two car lengths) to allow access from parked cars to the sidewalk.
Inlets: When water runoff is captured from the street, it must be brought into the infiltration planter through a covered flow inlet structure that does not break the top surface of the curb or walkable pavement surfaces.

Curbing: Infiltration planters must be curbed with a minimum of 6 inches wide and 4 inches high curb when adjacent to Sidewalk and Amenity Zone areas. When adjacent to the road curb, this additional curbing is not required along that side of the infiltration planter.

Soil Surface: The finished soil height must be recessed at least 4 inches but not more than 12 inches below the grade of the surrounding Sidewalk and Amenity Zone areas.

- Soil Mix: Soil mix must be specified to infiltrate stormwater and have sufficient depth to store and infiltrate the targeted water volume.

- Drainage: Infiltration planters must include a positive overflow drain to divert water accumulation in excess of the infiltration rate of the planter to another treatment system such that areas adjacent to the landscape planter do not get flooded or eroded.
  
  » For infiltration planters unable to drain collected water within 12 hours of the end of rain event, under-drains must be provided to drain excess water into the storm sewers.

- Plant Materials: Plant materials must be tolerant of salt and other common runoff pollutants.

Design Requirements – Subsurface Infiltration

Subsurface infiltration can take a number of forms, including underground infiltration vaults, infiltration trenches, and dry wells. These systems can be used to provide stormwater infiltration and constrained urban areas with limited surface area available for landscape planters and/or in conjunction with surface treatments to add additional storage and infiltration capacity.

- Management Volume: Subsurface infiltration systems must be designed, in conjunction with other stormwater systems to infiltrate the required stormwater quantities per the Green Streets Policy.

- Load Bearing: Subsurface infiltration system must be designed to accommodate the load bearing requirements of the roadway or other accessible surfaces above the infiltration system.

- Conveyance: Water shall be conveyed to the subsurface infiltration systems through piping and conventional curb and gutters and/or through a grated inlet channel system.

- Pre-treatment: Water being conveyed into a subsurface infiltration system shall be pre-treated through a sump, stormwater flow-through planter, or comparable facility to remove large debris and materials.
Additional Design Considerations

- Locate pre-treatment material, such as cobble and stone, to capture debris just inside the inlet point and provide easy access to clean out.

- Incorporate appropriate trees into the infiltration planter to enhance the stormwater benefits. Trees must be approved by the Ann Arbor Water Quality Manager.

- Incorporate stormwater planters with traditional landscape planters, and integrate seat-walls and other vegetation into the design.

- Consider locating special signage along the street at key locations to tell people there is an underground stormwater management facility present and educate them about their operation and benefits.

Utility Considerations

- Consider the location and condition of existing utility infrastructure and access points.

- Ensure overflows into existing stormwater pipe infrastructure do not result in additional flooding or bottlenecking.

- Install water proof vault covers or other utility access points if located within an infiltration planter.

Design References

  - See: Planter Boxes, Native Vegetation, Constructed Filters, and Bioretention sections for more specific design guidance.
  - See: Infiltration Practices, Constructed Filters

MAINTENANCE & MANAGEMENT

General Maintenance

- Regularly (quarterly, at a minimum) remove excess sediment, litter, and debris, particularly within any pre-treatment facilities, to maintain a clean appearance and preserve effective functioning.

- Quarterly inspection of inlets, sumps and outlet points to ensure there are no blockages or impediments to designed water flows (including sediment buildup and excess debris).

- Sumps or pre-treatment areas should be cleaned out at least once per year unless excess debris and sediment build up occurs requiring more frequent service.

- Regular landscape maintenance, such as deadheading, weeding, and leaf removal is important to maintaining the health and attractiveness of infiltration planters.

Seasonal Use & Maintenance

- Winter Conditions: Inspect inlet and outlet points more frequently in winter to ensure they are clear of excess snow and ice and remain open, particularly positive overflow drains.

Reviews & Approvals

- Ann Arbor Water Quality Manager.
- Site Plan Review for private projects.
- Ann Arbor Engineering Unit.
LAWN EXTENSIONS

DESCRIPTION & INTENT

Lawn extensions are panels of grass lawn in the Amenity Zone between the sidewalk and street curb. Lawn extensions are characteristic of detached housing residential areas where pedestrian volumes are generally low and a desire for more greenery to soften the street edge experience exist. Lawn extensions are not generally suited to highly urban environments, such as Ann Arbor’s downtown, since heavy pedestrian traffic can quickly wear down and erode lawn surfaces. In addition, lawn extensions require regular maintenance (watering, mowing, weed control) that is more suited for private residential landowners to maintain. Nevertheless, in many downtown locations lawn extensions are a viable street design element.

USE & APPLICATION

Location

- Lawn extensions are restricted in all areas of downtown outside of a Near Neighborhood Frontage Context areas.
- In Near Neighborhood locations, lawn extensions shall only be used in situations where the fronting property owners or occupants acknowledge responsibility for proper care and maintenance.
- In addition, lawn extensions should be a minimum of 3 feet wide in order to provide sufficient room for lawn to establish. Narrower lawn extensions are more susceptible to erosion and wear.
- Lawn extensions should occur along the majority of the block side where they are being used to provide a cleaner and more consistent look for that portion of the street.

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Design & Operations

Design Requirements

A Width: Lawn extensions shall be a minimum width of 3 feet between the back of the street curb and edge of the sidewalk.

- Lawn Seeding: Lawn areas shall be seeded or sodded with a species mix suitable for Ann Arbor’s climate region and consistent with the sun/shade availability of the specific planting site.
  - When installing lawn extensions with seeding, a straw cover shall be used to minimize soil runoff and pedestrian traffic.

- Soil: Lawn areas shall contain at least 4 inches of topsoil and the topsoil or soil surface for sod applications must be flush to the edge of the sidewalk and back of curb. Lawn extensions shall be smooth and not result in water pooling or ponding on their surface or on the surface of adjacent sidewalk areas.

Additional Design Considerations

- Plantings: Lawn extensions may be planted with perennials beds or ground covers in addition to or complimenting lawn areas. These plantings shall not be in excess of 36 inches above the adjacent road surface, or as permitted by Ann Arbor City Code. Shrubs or other low woody plants may not be used.
  - Where perennials and ground covers are used, periodic clear zones or pathways connecting from the street edge to the sidewalk are important where on-street parking occurs to minimize foot traffic impacts on ornamental plantings. Gaps should be provided at least every 40 feet.
  - Where perennials and ground covers are used, at least 1 inch of biodegradable mulch should be applied to cover and protect exposed soil areas. Stone, cobble, pea gravels, and other hard mulches should not be used as mulching materials.

- Street Trees: Larger lawn extensions are ideal locations for planting street trees. Street trees are required on all streets. See Street Tree Design Element for more Information on Street Tree Plantings.
**Utility Considerations**

- Lawn extensions may be located on top of most utilities. Identify and avoid placing soil and lawn planting on top of water valves or other utility access panels that may be found in the utility zone.

**Sustainability Considerations**

- Pursue use of “no mow” plant species as an alternative to traditional lawn turf species can be pursued. Such alternatives should be selected based on their ability to withstand foot traffic when used as a lawn substitute.

- Use xeriscaping and other low water need plants to conserve water compared to typical lawn plantings.

- Avoid the use of synthetic fertilizers and herbicides to avoid impact on water quality and pollutant exposure to people touching lawn areas. City Code prohibits the use of phosphorous fertilizers.

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**MAINTENANCE & MANAGEMENT**

**General Maintenance**

- **Plant Care**: Lawn extensions and any plantings within that zone must be maintained by the fronting property owners. Regular maintenance includes mowing to maintain lawn areas, watering, weeding, and maintaining mulch.

  » Lawn extensions covered in turf grass must be maintained with an average height not in excess of 12 inches.

- **Street Trees**: Street trees are maintained by the City Field Operations.

**Reviews & Approvals**

- Installation of lawn extensions in areas that were not previously lawn extensions is discouraged unless part of a comprehensive street reconstruction or design process. Outside of this context, lawn extensions for public and private projects can only be created with approval of the DDA, Street Design Team, and the Ann Arbor Urban Forestry & Natural Resources Planning Coordinator.
4.6 INFRASTRUCTURE DESIGN ELEMENTS
[LAWN EXTENSIONS]
DESCRIPTION & INTENT

Landscape planters are curbed or raised soil areas designed to accommodate decorative plantings in a clean and clearly maintained fashion within the streetscape. Landscape planters soften the urban environment and provide foliage and flowers to make the street environment more appealing and engaging for all types of users.

Landscape planters typically contain a variety of suitable and tolerant perennial plant species and may be used to accommodate street tree plantings. Annual plants can be suitable for landscape planters provided that arrangements for their maintenance and replacement have been made.

Landscape planters are either curbed or raised in order to deter pedestrian traffic from moving through the landscaped area and harming or impacting plant materials. Curbing landscape planters provides a strong edge for the planter, improves soil and mulch containment, and discourages pedestrians from cutting through the planting beds. Raised planter designs provide an opportunity to incorporate informal seating areas into the streetscape design.

The use and abundance of landscape planters within the Amenity Zone must be carefully considered alongside other competing uses.

USE & APPLICATION

Location

- Landscape planters are well suited to the downtown environment and are recommended on all types of streets. Near neighborhood streets often utilize lawn extensions as an alternative to landscape planters, as they may better fit a residential character.

- Landscape planters occur primarily within the Amenity Zone between the sidewalk and the curb.

- Where buildings are setback from the sidewalk, landscape planters are also appropriate in the Frontage Zone, and can be incorporated into building facades.

Related Design Elements

- **Amenity Zone Uses**: Locate landscape planters in coordination with street lighting, signs, parking meters, and other elements within the Amenity Zone that may need to be present. In destination commercial areas, café dining, outdoor retailing, and other uses in the Amenity Zone competes for space with landscape planters. Street design in these areas should accommodate both elements by utilizing planters that support commercial activity, such as raised seatwall planters.

- **Public Seating**: Incorporate landscape planters within seat-walls. Seat-walls are especially beneficial at intersections and when used in conjunction with bulb outs at the corner or in a mid-block location to provide a seating zone close to intersections.
**DESIGN & OPERATIONS**

**Design Requirements**

- **Planter Type:** Design landscape planters as either a curbed planting bed, a raised planter, or a hybrid design.

  **Curbed Landscape Planters:** For a curbed planting bed, edge the planter box with a 6 inch to 10 inch wide and 4 inch to 6 inch high concrete curb with chamfered edges following the grade of the Sidewalk and Amenity Zone.

  **Raised Landscape Planters:** For a raised planter, surround the planter box by a 12 inch to 16 inch wide and 15 inch to 22 inch (18 inches preferred) tall concrete seat-wall with chamfered edges. Design seat-walls to provide a level surface for seating.

  **Hybrid Landscape Planters:** Design hybrid planters as a curbed planter except with one, two, or three sides of the landscape planter designed with seat-walls.

- **Width:** The width of landscape planters must provide at least a 2 foot 6 inch wide zone for soil and plantings, not accounting for the width of curbing or seat-walls.

  - Street trees require a minimum soil area width of 4 feet. Refer to the Street Tree design element for additional information.

- **Curb Strip:** Provide at least 8” of paved surface, and preferably 18”, between the back of the street curb and the nearest face of the landscape planters where on-street parking exists. This paved zone provides a place for people to walk around the planter and/or for parking meters and other signage to be installed outside of the planting bed itself.

- **Planting Mulch:** Provide a minimum a 1 inch thick mulch surface for all exposed planting soils.

  - Keep mulch surfaces for planting between 2 inches and 6 inches below the edge of and curbs or seat-walls to prevent mulches from spilling outside of the landscape planter.

- **Plantings:** Planters use a combination of herbaceous plants and street trees.

  - Select perennial species suited to specific site conditions, including sun/shade, water availability, and salt tolerance for plantings within landscape planters.

  - Suitable herbaceous annuals may be planted by private entities but only with a maintenance agreement and approval of the Urban Forestry and Natural Resources Coordinator.

  - Street Trees are required on all streets and can be incorporated into landscape planters. Refer to the Street Tree design element for more information.
Additional Design Considerations

- **Seat-walls**: Raised landscape planters with seat-walls, if space is available, should be setback at least 1’ from the through sidewalk areas so that people sitting on the seat-wall minimize impacts to the flow of pedestrian traffic.

- **Special Character Districts**: In historic or other character districts, the concert curb or seat-wall design may use other materials appropriate to that character areas. In all cases, use materials that are ridged, mortared together, and set in a concrete base to create a solid curb or seat-wall unit.

- **Street Trees**: Consider locating street trees in landscape planters. See Street Tree Design Element Section for Additional Detail.

Utility Considerations

- Landscape planters should not be located in areas where utility access panels, vaults, or other regular utility maintenance and access occurs.

- Street lights may be set within curbed landscape planters when the width of the landscape planter is at least three times the needed width of the street light base and footing to still provide sufficient soil volume and planter width.

Sustainability Considerations

- Consider drought tolerant plant materials that do not require extensive watering outside of their establishment period (typically two years).

- Design landscape planters into stormwater infiltration planters. Lower the soil surface elevation to below the sidewalk and/or street grade and provide a break in the curb or seat-wall with an inlet structure to divert stormwater into the planter. Design the planter to handle anticipated rainfall and water quantity volumes. See Stormwater Management Design Element Section for Additional Guidance.
MAINTENANCE & MANAGEMENT

General Maintenance

- **Plant Care**: Plant materials shall be maintained in accordance with a maintenance agreement established as part of the planter design and construction process. As with lawn extensions, plantings in adjacent landscape planters (except for street trees) should be maintained and cared for by the adjacent property owner.

  » Maintaining at least a 1 inch mulch cover over the landscape planter.

  » Weeding, removing litter, and maintaining plants (deadheading, cutting, et.)

  » Clearing, sweeping, and removing mulch and other materials that spill outside of the landscape planter.

  » Regular watering, especially during dry periods.

- **Establishment Period**: Following new landscape planter construction, water new plant materials regularly during the growing season for the first two-years during plant establishment.

Reviews & Approvals

- For private projects, the Ann Arbor Urban Forestry & Natural Resources Planning Coordinator is responsible for reviewing and approving plant materials used in landscape planters.

- For public projects, the Ann Arbor Urban Forestry & Natural Resources Planning Coordinator and the Street Design Team are responsible for reviewing and approving landscape planter designs and plant materials.
SITE UTILITIES

DESCRIPTION & INTENT
The public right-of-way is home to the utilities that serve the buildings and uses of downtown, and their presence is typically unremarkable to the average downtown visitor. The location and design of public utilities in the streets of downtown is regulated through the City of Ann Arbor Public Services Standard Specifications. The intent of this section is to supplement the Orange Book standards and provide guidance for locating private and public utility services, particularly as they relate to the pedestrian environment.

USE & APPLICATION

Location
Almost all public streets projects impact utilities mains and services in some way. A few examples include:

- Sidewalk reconstruction and streetscape improvements which impact utility service lines, hand holes and valves, and catch basin inlets.
- Utility main replacement and subsequent service line adjustments.
- Utility repairs to mains and service lines.
- Street resurfacing, which may impact manholes and catch basin inlets.

Private Development
Private development projects that impact the street right-of-way or require reconstruction of portions of the public right-of-way will typically impact public and private utilities in the following ways:

- Installation of new water and sanitary service leads from existing mains.
- Connection to the stormwater system.
- Replacement or up-sizing utility mains to provide for the new development’s needs.
- Streetscape reconstruction, which may include new lighting.
- Electrical and communication service connections.
Design Requirements – Manhole, Valves, and Hand Holes

Access to utility service junctions through manholes, hand holes and water service valves are critical to the maintenance, emergency management, and safety of the utility systems. The cover of these access points are typically flush with adjacent pavement.

- Hand holes are used for electrical and communications cable junctions and have specific design requirements. Constructed hand holes should be polymer concrete rated for light duty traffic.

- Size hand holes to be as small as necessary for the number of wires passing through and junctions being made.

- Locate hand holes as follows:
  - Locate within landscape beds if used in design. Conduits should sweep into the hand holes such that they are located at least 12 inches from the planting soils of the beds and trees.
  - In streetscapes without planting beds locate sidewalks to limit conflicts with conduits running through the urban street tree soil treatment.
  - Avoid placing hand holes on barrier-free ramps or at grade breaks in the sidewalks, as the long rectangular shape of most hand holes makes it difficult to pour the concrete in these situations without grade issues.
  - Place the top of the conduits at least 12 inches below the base of the sub-grade.

- Where electrical junctions occur in vehicular traffic areas use precast concrete structures and cast iron frames and lids designed to carry heavy traffic loads, in lieu of hand holes.

- Locate manholes and water main valves within vehicular travel lanes, where new main construction allows.

Design Requirements – Storm Inlets

The placement of stormwater inlets/catch basins at crosswalks and intersections is important for efficient storm drainage as well as providing an accessible street environment. Of particular concern is ensuring universal access, avoiding the puddling of water at the base of curb ramps and on sidewalks during the snow season, and providing for maintenance of the drains, inlets, and catch basins.

- Place Inlets/catch basins at the point of curvature (spring point) of each intersection, thus requiring two inlets/catch basins for each corner.

- Adjust the location of inlets/catch basins so that they are:
  - Not within the travel lane of curb ramps.
  - Placed on the higher elevation side and directly adjacent to curb ramps so that ice and snow are less likely to block drainage to the inlets and to catch water before crossing a curb ramp.

- Locate inlets/catch basins directly adjacent to mid-block crossing curb ramps on the higher elevation side of the curb line from the curb ramp.

- If inlets/catch basins must be placed in the travel lane of curb ramps, design the cast grate of the structure to accommodate universal access.

- Trench Drains: The use of trench drains is highly discouraged and they should not be used unless there is no adequate storm drainage alternative. While the use of trench drains and sidewalk inlets should be avoided, where they are deemed necessary they should meet the following design requirements:
  - The accessible body of all trench drains and sidewalk drains must be a minimum of 8 inches wide for maintenance purposes.
  - Trench drains and sidewalk drains must be rated for light duty traffic. Non-metal drain grates are not allowed.
  - The grate of the structures must accommodate universal access.
  - Lateral pipes draining the trench drains and sidewalk inlets must be a minimum of 8 inches in diameter, and be no longer than 40 feet before tapping into a City standard inlet/catch basin or manhole.
Design Requirements – Fire Hydrants

Providing for fire safety is critical to protecting historic architectural resources and providing for new development and growth. Providing adequate number and spacing of fire hydrants is an important element in ensuring for adequate fire protection. Given that the typical block length on downtown Ann Arbor is less than 300 foot long, hydrant spacing standards are generally met with hydrants located at each intersection; however, downtown corners are often crowded with lights, pedestrian amenities, cross walks, bicycle parking and other elements, which may impede access to the hydrants.

- The City of Ann Arbor Public Services Standard Specifications requires a clear 20 foot access path to each hydrant and no parking within 15 feet of a hydrant. The center line of hydrants must be at least 4, but not more than 10, feet back from the curb.

- The typical pattern found in downtown is for two hydrants per intersection, located on opposite corners across the diagonal of the intersection.

- Hydrants located closer to the short end of the range allowed from the curb will allow more flexibility in the design and use of the intersection, and will typically place the hydrants outside of the Sidewalk Zone, and in the Amenity Zone.

- Ann Arbor’s Orange Book requires a hydrant with 100 feet of a Fire Department Connection to a commercial building’s fire suppression system.

Design Requirements – Above Ground Utility Appurtenances

New building construction and electrical and communications services often require above grade utility boxes, panels and transformers.

While these appurtenances provide for important private utility service, they can hamper the pedestrian use of downtown streets and sidewalks.

- Where such appurtenances are required for a specific private development, they should be located on private property.

- If appurtenances are serving public amenities and/or multiple properties and private buildings, they should still be located on private land, alleys, or parking lots. If this is not technically feasible, as determined by the Ann Arbor Planning and Development staff during the site plan review process, they should be located in the Amenity Zone and out of the primary pedestrian flow.

- Co-locate surface mounted utilities and share boxes or pedestals wherever possible.

Additional Design Considerations

- City of Ann Arbor Public Services Standard Specifications

- City of Ann Arbor Approved Materials List for Utilities and Roadways.

- City of Ann Arbor Code of Ordinances Chapter 47-Streets and Chapter 49-Sidewalks.

Sustainability Considerations

- Coordination of utility main upgrade and the need for street or streetscape reconstruction is itself a technique of sustainability as it minimizes the use (and expenditure for) construction materials and the energy and resources used to install them.

- The City of Ann Arbor currently coordinates the need for utility upgrades with street and streetscape improvements through the Capital Improvement Process and collaboration with the DDA, and this approach should be continued and streamlined as needed.
MAINTENANCE & MANAGEMENT

General Maintenance

• Complete inspection of the condition of hand hole and valve covers annually, particularly after the winter snow removal season, to assess any damage or impact to the walkability of the sidewalk surfaces.

Reviews & Approvals

• Michigan Department of Environmental Quality (MDEQ)
• Site Plan Review for private projects
• Ann Arbor Engineering Unit