



STREET PLANTING MANUAL





CITY OF STAMFORD STREET TREE PLANTING MANUAL

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The City of Stamford Street Tree Planting Manual is available online on the Zoning Board website.

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Benefits of Street Trees

Trees are valuable assets that provide a spectrum of environmental and other benefits including:

Trees protect pedestrians from vehicular traffic, help calm traffic, and lower ambient noise.

Trees remove particulate matter from the air.

Trees remove harmful gases such as carbon dioxide, carbon monoxide, sulfur dioxide, and ozone.

Trees produce oxygen.

Soil and tree roots capture stormwater runoff.

Leaves attenuate/slow stormwater runoff.

Trees provide habitat for wildlife.

Trees can either shade a building or protect it from winter winds, reducing energy costs up to 20%.

Trees provide privacy.

Trees screen unsightly areas.

Trees increase property values.

Trees beautify Stamford.

Spacing Requirements (see Appendix A)

The following requirements shall be followed when planting trees along sidewalks. These requirements are design and tree species dependent. However, the requirements generally follow regulations of City agencies with jurisdiction over infrastructure on the right-of-way. The Americans with Disabilities Act (ADA) guidelines must also be followed. In the State of Connecticut, it is the law to contact Call Before You Dig (CBYD) prior to any excavation involving mechanized or powered equipment to locate utility pipes and cables in the area of the proposed work site.

Distance between Street Trees (trunk to trunk) based on Tree Size

Tree size	Distance between trees
Small trees Mature height = less than 35'	1 tree for every 20 feet of street frontage
Medium - Large trees Mature height = 35' to 50'+	1 tree for every 30 feet of street frontage

Spacing Requirements (cont'd.)

1. Do not plant in front of building entrances in order to permit easy access by the Fire Department.
2. Do not plant within bus stops, but trees may be set back in sidewalk if approved by Transportation Bureau (see spacing diagram – Appendix A).
3. Do not plant within No Standing zones or Fire Lanes.
4. Minimum distance between trees (trunk to trunk) shall be 20 feet to 30 feet, depending upon the tree size/ species and other local conditions.
5. Minimum distance from a cobra head streetlight or utility pole to the tree trunk is 25 feet (this may vary with tree species) as determined by the Engineering Bureau. For all other streetlights, the minimum distance may be less as determined by the Engineering Bureau.
6. Minimum distance from a stop sign to a tree trunk is 30 feet as determined by the Transportation Bureau.
7. Minimum distance from the face of *No Parking* and other curbside regulation signs to a tree trunk is 6 feet as determined by the Transportation Bureau.
8. Street trees shall be planted in between parking spaces so as not to interfere with parking operations. Tree locations on metered streets to be reviewed and approved by the Transportation Bureau.
9. Minimum horizontal distance from a water main to a tree trunk is 12 feet as determined by the Engineering Bureau.
10. Minimum distance from a gas or water valve to the edge of a tree pit is 2 feet as determined by the Engineering Bureau.

Spacing Requirements (cont'd.)

11. Minimum distance from an oil fill pipe to the edge of a tree pit is 4 feet as determined by the Engineering Bureau.
12. Minimum distance from a fire hydrant to the edge of the pit is 6 feet.
13. If there are underground conduits between streetlights, running parallel to the street from one street light to another (usually 6" to 18" from the curb line), review tree pit spacing with Engineering Bureau, Energy/Utility Manager.
14. Do not plant in front of vaults.
15. Do not plant new trees under overhead canopy of adjacent trees.
16. Minimum distance from a curb cut or driveway to the edge of the tree pit is 2 feet and to the tree trunk is 10 feet as determined by the Transportation Bureau.
17. Minimum distance from the corner of a street intersection to the tree trunk is 30 feet as determined by the Transportation Bureau.
18. Distance from the edge of a tree pit to any opposite obstruction (building wall, stoop, railing, property line etc.) is 5 feet unless otherwise provided by the Zoning Regulations.
19. All tree pits must be contiguous to the street curb (except with the permission of the Transportation Bureau).
20. Trees may be planted on either side of sidewalks in lawn areas where there is sufficient room between the property line and the street curb.

Tree Pit Dimensions

Tree pits should be as large as possible to allow for ample growing space for the tree's roots and to reduce the likelihood of future sidewalk lifting. The standard street tree pit size is 4 feet by 10 feet. The overall width of a sidewalk can limit the size of a tree pit. Where a 4 feet by 10 feet tree pit is not possible, alternate dimensions must be approved by the Transportation Bureau. The installation of continuous tree pits is encouraged whenever possible, and design proposals that call for continuous tree pits may be given more flexible spacing requirements.

Bioswales / Green Infrastructure

Bioswales installed on the right-of-way help collect and manage storm water runoff from streets and sidewalks by directing storm water to engineered systems that typically feature soils, stones, and vegetation.

Species Selection (see Appendix B)

Species selection should take into account site conditions, design goals, and diversity goals. In choosing a species, the mature height and spread shall be considered to ensure that it will not interfere with existing or proposed structures and overhead utilities. The City of Stamford will not allow large trees to be planted under primary wires.

The City of Stamford provides a list of approved species for planting in the right-of-way (*City of Stamford Street Tree List* - Appendix B). Alternate species not found on the approved list may be considered on a case by case basis by the Tree Warden, or designee. Within the Architectural Review Design District, however, the Downtown Special Services District (Stamford Downtown) will review and approve species selection.

Tree Pit Surface Treatments (see Appendix C)

Tree pits shall be paved with permeable pavers or other permeable material that allows water to get to the tree. When Flexi-Pave or equivalent is used, the standard color is "chestnut," unless otherwise specified.

Tree pit guards: Where tree pit guards are appropriate and space allows, the specifications in Appendix C shall apply. A tree pit guard is usually a cast-iron fence or wrought iron wickets, 18" height, installed around a tree pit for protection. The tree guard posts shall be solid steel or reinforced aluminum. Tree guards must be three sided leaving the street side open and should not be embedded into concrete. This will protect the tree from dogs and pedestrians and give it enough space to grow.

Tree grates are not to be used.

Impermeable pavers are not to be used.

Within the Architectural Review Design District, the Stamford Downtown will review and approve tree pit surface treatments.

Plant Material

Digging: All trees shall be dug immediately before moving unless otherwise specified. All trees shall be dug to retain as many fibrous roots as possible. Balled and burlapped trees shall have a solid ball of earth of the minimum specified size (32 inches), securely held in place by untreated burlap and stout rope (nylon rope is NOT acceptable). Oversize or exceptionally heavy trees are acceptable if the size of the ball or spread of roots is proportionally increased. Loose, broken, or manufactured balls are unacceptable.

Form and structure: All trees shall be typical of their species or cultivar. They shall have normal, well developed branches and a fibrous root system. They shall be sound, healthy, vigorous trees, free from defects, disfiguring knots, sunscald, injuries, abrasions of the bark, plant diseases, insect eggs, borers and all forms of infestations. All trees shall have a single, straight trunk, with leader intact (not all species have a leader but one must be present in those that do) and be branched at least five feet from the ground unless otherwise specified or approved by the Tree Warden, or designee.

Provenance and tree size: All trees shall be nursery grown in a USDA hardiness zone of 7B or lower (material collected from the wild is unacceptable). Tree size shall be at least 2.5 inch caliper measured at 6 inches from the ground, unless otherwise authorized by the Tree Warden, or designee.

Species Selection: Species shall be selected from *City of Stamford Street Tree List - Appendix B*.

Planting Backfill

Material shall consist of natural loam topsoil with the addition of humus only, and shall not exceed the percentages below for rock, sand, silt or clay. Topsoil must be free from subsoil, obtained from an area which has never been stripped. It shall be removed to a depth of one foot or less if subsoil is encountered. Topsoil shall be of uniform quality, free from hard clods, stiff clay, hardpan, sods, particularly disintegrated stone, lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, sticks or any other undesirable material. Topsoil shall meet the following requirements:

- a. Organic Matter. Backfill shall contain between 5%-9% organic matter.
- b. The pH shall be in the range of 6.0 to 7.5 inclusive, unless otherwise approved or specified by the Tree Warden, or designee.
- c. Soil Textural Analysis. Topsoil shall consist of the following percentages of sand, silt and clay.

Rocks, Stone and Gravel (>2.0 mm)	<25%
Sand (0.05-2 mm)	40%-70%
Silt (0.002-0.05 mm)	10%-50%
Clay (<0.002 mm)	20% maximum

Any soil that does not meet the above requirements will be rejected and removed from the site.

- d. When the topsoil complies with the requirements but shows a deficiency of not more than one percent in organic matter, it may be incorporated when and as permitted by the Tree Warden, or designee.
- e. Electrical conductivity shall be a maximum of 1.0. mmhos/cm. A higher level would indicate that the salt content is too high to be acceptable, and the soil must be removed from the site by the permit holder.

Planting Backfill (con'td.)

The City reserves the right to take soil samples and perform tests (at the contractor's expense) as it deems necessary to ensure that these specifications are met. The City of Stamford may require that soil be changed at the expense of the applicant if the soil does not meet the City's specifications. The applicant may also provide a report from an approved lab showing a passing soil sample if they wish to verify that their soil meets the City's specifications. The soil should be tested for the following nutrients: pH, soluble salt level, organic matter content, percentages of sand/silt/clay, soil textural class, gravel content, + extra sieve $\frac{1}{4}$. The choice of lab must be approved in advance by the City of Stamford, and soil samples must be taken by the City of Stamford Tree Warden, or designee, for delivery to an approved soil testing company. Only a passing sample acceptable to the City of Stamford will exempt the applicant from having to replace the soil.

Planting Specifications

Planting shall consist of excavating all tree pits, planting, and maintaining new trees of the type and size designated on the *City of Stamford Street Tree List - Appendix B*.

Site characteristics, such as overhead power lines, existing vegetation, and infrastructure items, such as curbs and sidewalks, shall be considered. Trees that grow taller than 25 feet should not be planted directly under power lines. When possible the tree leader shall be offset from power lines.

Where subsurface obstructions (vaults, utilities, sprinklers) are encountered during excavation and restrict the planting of a tree, the applicant shall restore the disturbed area to its original condition. If damage is done to an underground obstruction, it is the responsibility of the applicant to restore the site to its original condition. A new planting location will be designated if conditions permit.

Trees shall be transported and handled with utmost care to ensure adequate protection against injury and desiccation. When transported in closed vehicles, plants shall receive adequate ventilation to prevent sweating. When transported in open vehicles, plants shall be protected by tarpaulins or other suitable cover material. Balled and burlapped trees shall be set on the ground and balls covered with soil. Until planted, all materials shall be properly maintained and kept adequately watered. Applicants are liable for any damage to property caused by planting operations and related work. All disturbed areas shall be restored to their original condition.

Planting Seasons

Trees may be planted in the fall from October 1 through December 15, and in the spring from March 1 through May 15. No planting is permitted in the summer.

Installation (see Appendix D)

Remove all materials from the tree pit for the full length and width of the tree pit to the depth of the tree's root ball. For excavation of a lawn strip, excavate an area at least three times the diameter of the root ball in length by the width of the lawn strip (up to 3 times the diameter of the root ball). Extreme care shall be taken to avoid excavation to a depth greater than required. The subgrade below the root ball shall be tamped slightly to prevent settlement. All ropes, stones, etc. shall be removed from the planting site before backfilling. All excavated materials shall be removed from the site and disposed of in an acceptable manner.

Place balled and burlapped material in the prepared planting pit by lifting and carrying it by the root ball so that the ball will not be loosened. Set the tree straight and in the center of the pit. All trees shall sit, after settlement, with the base of the trunk and the beginning of the roots, known as the "trunk flare", level with the sidewalk grade. If the top of the root ball is higher or lower than the sidewalk grade, the depth of the planting site should be adjusted by adding or removing soil below the root ball to make the trunk flare level with the sidewalk grade. Cut and remove rope and wire from the top 2/3 of the root ball. At least 2/3 of the burlap shall be removed from the tree pit. The remaining wires should be pulled back and the burlap adjusted to prevent the formation of air pockets. Backfilling mixture shall be loose and friable and not frozen.

Soil shall be firmed at 6 to 8 inch intervals. All tree pits are to be filled with topsoil and made level with existing conditions. Cultivate and rake over finished planting areas leaving them in an orderly condition. At no time should topsoil be mounded to cover the trunk of the tree. The trunk flare shall always be visible. Final soil level shall be flush with the surrounding sidewalk grade to prevent potential tripping hazard.

Topsoil shall be rounded into 4" to 6" wide saucer around the perimeter of the rootball.

Tree Wrap

No tree trunks shall be wrapped. Remove all nursery tags and protective wrapping.

Staking

All staking shall be done during the planting operation and shall be maintained throughout the first year of the 3 year guarantee period. After the first year, the stakes must be removed.

Stakes shall be of white cedar with bark attached and shall show no sign of cracking or decay. They shall have a maximum allowable deflection of ten percent (10%). Stakes shall be cut even so they are the same height. All trees shall be supported by two (2) eight-foot stakes, having a diameter or width at the middle of not less than 2 inches nor more than 2 ³/₄ inches and a diameter or width at the butt not exceeding 3 inches. Stakes shall be placed outside of the rootball, driven 30 inches into the ground, and shall be fastened to the tree with a suitable length of ³/₄" wide, flat, woven polypropylene material such as Arbortie™ as manufactured by DeepRoot®, San Francisco, CA or approved equal that is knotted around the tree stakes (Appendix D).

Unless otherwise directed, trees shall be staked as shown on the plans and in accordance with these specifications. Stakes shall be set parallel to curbs. Trees shall stand plumb after staking.

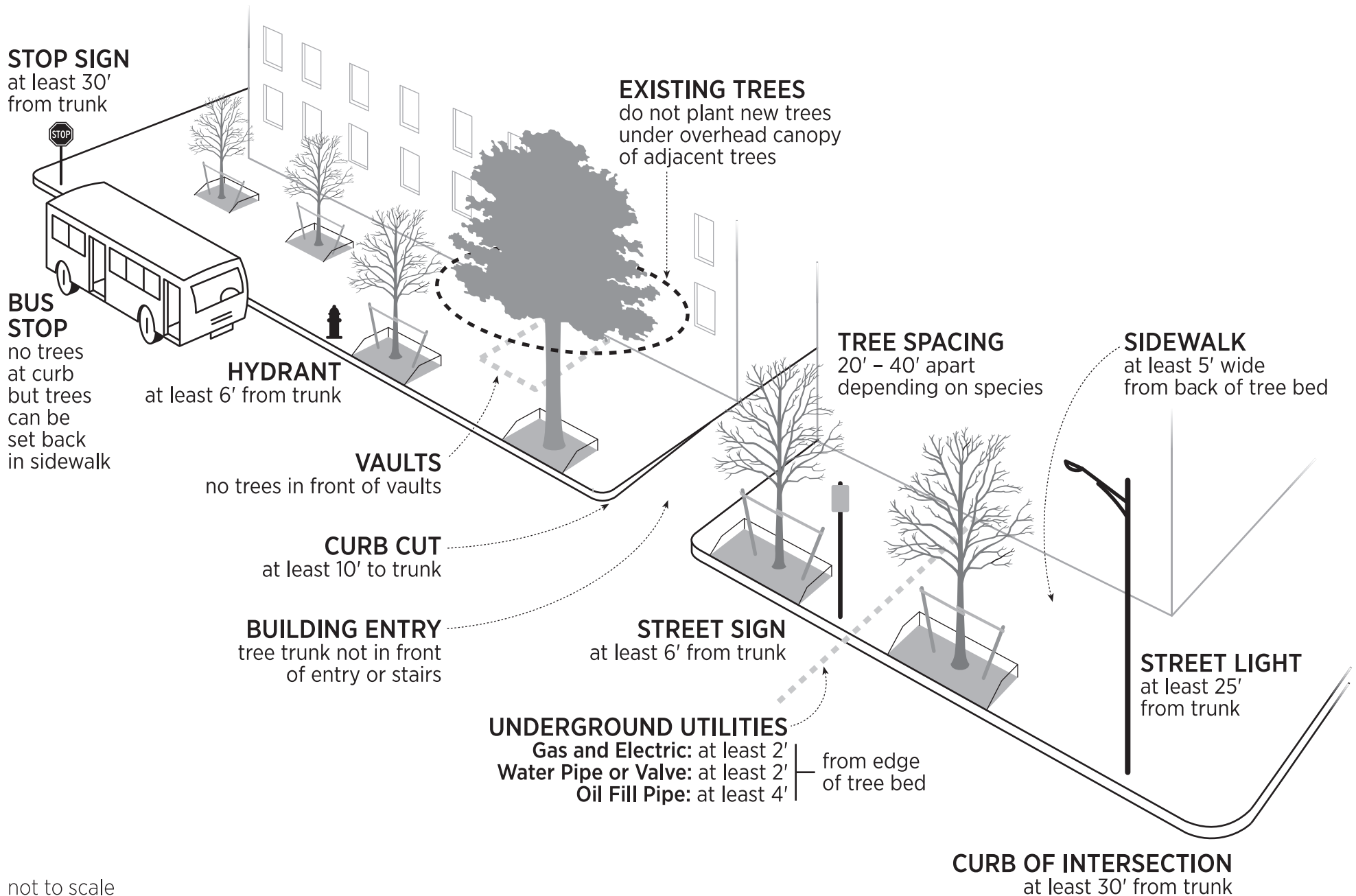
Stakes and Arbortie™ shall be removed at the end of the first year of the 3 year guarantee period, unless directed otherwise by the Tree Warden, or designee.

Guarantee Period

All trees must be guaranteed to remain healthy for three (3) full planting seasons per City of Stamford Zoning Regulations. The following are characteristics of an unhealthy, dead or dying tree: when scraped with a sharp knife or pruning shears, the tree twigs are brown and brittle instead of moist and green; the bark on the trunk is peeling, cracked, and/or split; the canopy has hanging branches and missing leaves. The Tree Warden or designee will make the final determination of whether the tree is in good health or not.

Appendix A

Street tree planting guidelines



not to scale

Appendix B

City of Stamford Street Tree List

Tree Warden – 203 977 4536

The following is a list of tree species recommended by the City of Stamford Tree Warden. Trees were chosen for their ability to withstand drought, compacted soil, pollution, and other urban stresses. All are cold hardy to USDA Zone 5. Other species or cultivars may be substituted subject to the Tree Warden's approval, unless contained in the Prohibited Trees List. [Please note: Tree species native to Connecticut are shaded grey.]

LARGE TREES: Mature height greater than 50 feet tall						
TREE SPECIES		SHAPE	VISUAL INTEREST	ENVIRONMENTAL TOLERANCES	ENVIRONMENTAL SENSITIVITIES	COMMENTS
Scientific Name	Common Name					
<i>Acer rubrum</i>	Red Maple	Rounded	Red fall color	Wet soils	Salt / Compaction	
<i>Acer saccharum</i>	Sugar Maple	Rounded	Orange fall color	Shade	Salt / Compaction	For large lawn areas
<i>Betula nigra</i> 'Heritage'	River Birch	Pyramidal	Brown peeling bark	Wet soils		Heritage® is best
<i>Celtis occidentalis</i>	Hackberry	Rounded		Wet or dry soils / wide pH		Does well in the shore area
<i>Ginkgo biloba</i>	Ginkgo	Upright	Yellow fall color	Drought / salt / wide pH	Permanently wet soils	Male only – does not bear fruit
<i>Gleditsia triacanthos inermis</i>	Honey locust	Irregular	Yellow fall color	Wet or dry soils / salt / wide pH	Shade	
<i>Gymnocladus dioicus</i>	Kentucky coffeetree	Rounded	Double compound leaf	Drought/salt	Needs space	For large lawn areas
<i>Liquidambar styraciflua</i>	Sweetgum	Pyramidal	Yellow / maroon fall color	Wet or dry soils	Shade	Plant spring only / messy fruit
<i>Liriodendron tulipifera</i>	Tulip Tree	Pyramidal	Green/orange flowers		Drought / needs space	For
<i>Metasequoia glyptostroboides</i>	Dawn Redwood	Pyramidal		Wet or dry soils / wide pH	Needs space	Deciduous conifer
<i>Platanus x acerifolia</i>	London Planetree	Rounded		Wet or dry soils / wide pH	Needs space	Leaf fungus defoliates in spring
<i>Quercus bicolor</i>	Swamp White Oak	Rounded		Wet or dry soils	High pH	Plant spring only / flaking bark
<i>Quercus imbricaria</i>	Shingle Oak	Rounded	Russet fall color		Needs space	Plant spring only / slow recovery
<i>Quercus palustris</i>	Pin Oak	Pyramidal		Wet or dry soils / compaction	Needs space / high pH	
<i>Quercus phellos</i>	Willow Oak	Rounded	Russet fall color	Wet or dry soils	High pH	Plant spring only / unlobed leaves
<i>Quercus robur</i>	English Oak	Rounded		Dry soils		Plant spring only
<i>Quercus rubra</i>	Red Oak	Rounded	Russet fall color	Dry soils / compaction	Needs space	Plant spring only
<i>Styphnolobium japonicum</i>	Sophora	Rounded	July flowers, fall seed pods	Dry soils / salt / compaction	Shade	Northern hardiness limit
<i>Taxodium distichum</i>	Baldcypress	Pyramidal		Wet or dry soils / salt	Shade / needs space	Deciduous conifer / hardiness limit
<i>Tilia Americana</i> 'Redmond'	American Linden	Rounded	Yellow fall color	Compaction / wide pH	Salt / foliage insects	Fragrant flowers / basal suckering
<i>Tilia cordata</i>	Littleleaf Linden	Pyramidal	Yellow fall color	Wide pH	Salt	Fragrant flowers
<i>Tilia tomentosa</i>	Silver Linden	Rounded		Dry soils / compaction / wide pH		Fragrant flowers
<i>Ulmus</i> 'Homestead'	Homestead Elm	Oval		Wet or dry soils / salt / wide pH	Shade	Fast growth
<i>Ulmus americana</i>	American Elm	Vase-like	Yellow fall color	Wet or dry soils / salt / wide pH	Shade	Only DED resistant cultivars
<i>Ulmus parvifolia</i>	Chinese Elm	Rounded	Yellow fall color	Wet or dry soils / salt / wide pH		Ornamental bark
<i>Zelkova serrata</i>	Japanese Zelkova	Vase-like	Bronze fall color	Dry soils / salt / wide pH	Shade	Structural prune when young



MEDIUM TREES: Mature height between 35 and 50 feet tall

TREE SPECIES		SHAPE	VISUAL INTEREST	ENVIRONMENTAL TOLERANCES	ENVIRONMENTAL SENSITIVITIES	COMMENTS
Scientific Name	Common Name					
<i>Aesculus x carnea</i>	Red Horsechestnut	Rounded	Pink / red flowers	Wide pH	Dry soils	
<i>Carpinus betulus</i>	European hornbeam	Oval	Yellow fall color	Wide pH	Salt	
<i>Cercidiphyllum japonicum</i>	Katsura Tree	Pyramidal	Yellow fall color	Wide pH	Dry soils	Lawn areas only
<i>Cladrastis kentukea</i>	Yellowwood	Rounded	Yellow fall color	Wide pH	Dry soils	Lawn areas only
<i>Corylus colurna</i>	Turkish Filbert	Rounded		Wide pH	Dry soils	
<i>Eucommia ulmoides</i>	Hardy rubber tree	Rounded		Dry soils / wide pH		Slow growth
<i>Koelreuteria paniculata</i>	Golden Raintree	Rounded	Papery seed capsules	Dry soils / salt / wide pH		
<i>Nyssa sylvatica</i>	Black Tupelo	Oval	Purple / scarlet fall colors	Wet soils / salt		Plant spring only, small / difficult
<i>Ostrya virginiana</i>	Hophornbeam	Rounded	Yellow fall color	Wide pH	Dry soils	Plant spring only, small / difficult
<i>Quercus acutissima</i>	Sawtooth Oak	Rounded	Yellow fall color	Salt		Plant spring only

SMALL TREES: Mature height less than 35 tall (suitable for planting beneath utility wires)

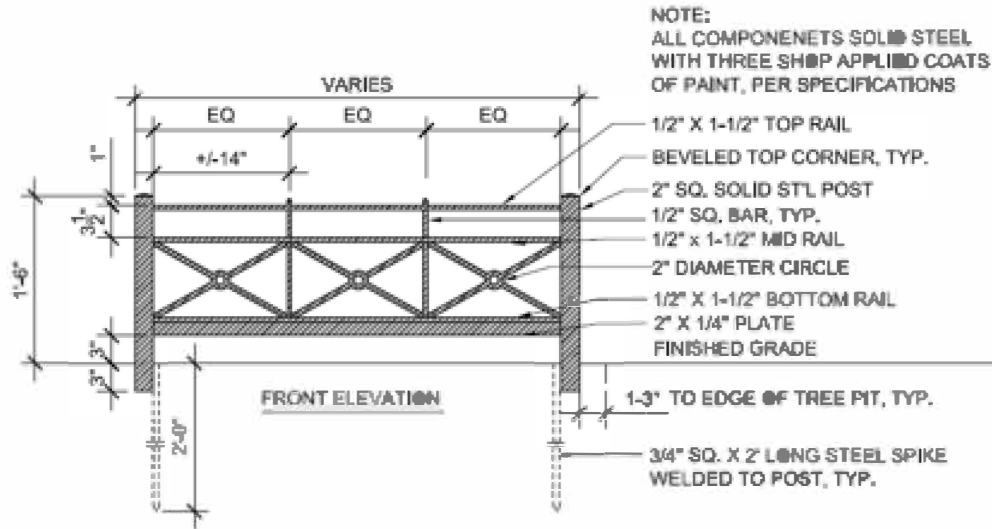
TREE SPECIES		SHAPE	VISUAL INTEREST	ENVIRONMENTAL TOLERANCES	ENVIRONMENTAL SENSITIVITIES	COMMENTS
Scientific Name	Common Name					
<i>Acer campestre</i>	Hedge maple	Rounded	Yellow fall color	Dry soils / salt / wide pH		
<i>Acer ginnala</i>	Amur maple	Rounded		Dry soils / salt / wide pH		
<i>Acer truncatum</i>	Shantung Maple	Rounded		Dry soils / wide pH		
<i>Amelanchier spp.</i>	Serviceberry	Rounded	Spring flowers / fall colors		Salt / dry soils	For lawn areas only
<i>Crataegus crus-galli inermis</i>	Thornless Hawthorn	Rounded	Spring flowers / fall color	Dry soils / salt / wide pH	Foliar diseases	
<i>Maackia amurensis</i>	Amur Maackia	Rounded	June flowers	Wide pH	Compacted soils	For lawn areas only
<i>Prunus cerasifera</i>	Flowering Plum	Vase-like	Early spring flowers	Wide pH		Low branching / short-lived
<i>Prunus sargentii</i>	Sargent Cherry	Vase-like	Spring flowers / fall colors	Salt	Dry soil	For lawn areas only
<i>Prunus serrulata 'Kwanzan'</i>	Kwanzan Cherry	Vase-like	Spring flowers			Double flower
<i>Prunus virginiana 'Schubert'</i>	Schubert Cherry	Oval	Maroon leaves			Leaves first green, then maroon
<i>Prunus x yedoensis</i>	Yoshino Cherry	Rounded	Spring flowers			
<i>Syringa reticulata</i>	Japanese Tree Lilac	Oval	White flowers	Dry soils / salt / wide pH		Flowers showy / fragrant

UNAUTHORIZED TREES

Scientific Name	Common Name	Reason
<i>Acer platanoides</i>	Norway Maple	Invasive exotic / over-planted
<i>Acer pseudoplatanus</i>	Sycamore Maple	Invasive exotic
<i>Aesculus hippocastanum</i>	Horsechestnut	Very weak structure
<i>Ailanthus altissima</i>	Tree of Heaven	Invasive exotic
<i>Albizia julibrissin</i>	Mimosa	Invasive exotic
<i>Morus spp.</i>	Mulberry	Invasive exotic / hazard, poor structure
<i>Phellodendron amurense</i>	Amur Corktree	Invasive exotic
<i>Pyrus calleryana 'Aristocrat'</i>	Callery Pear	Invasive exotic / poor structure / over-planted
<i>Pyrus calleryana 'Bradford'</i>	Bradford Pear	Invasive exotic / poor structure / over-planted

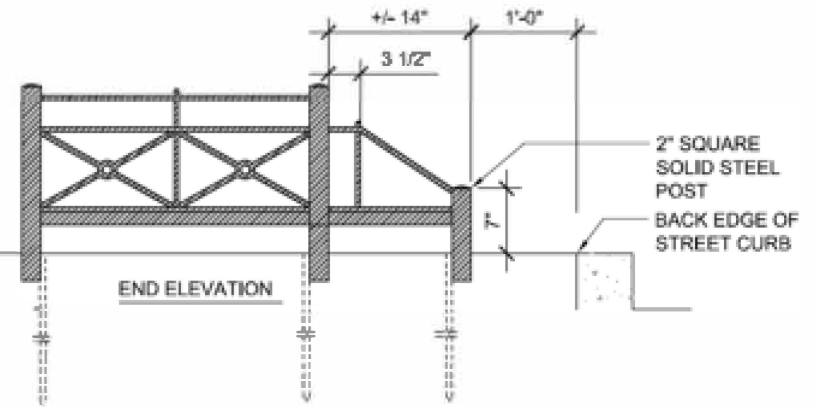


Appendix C



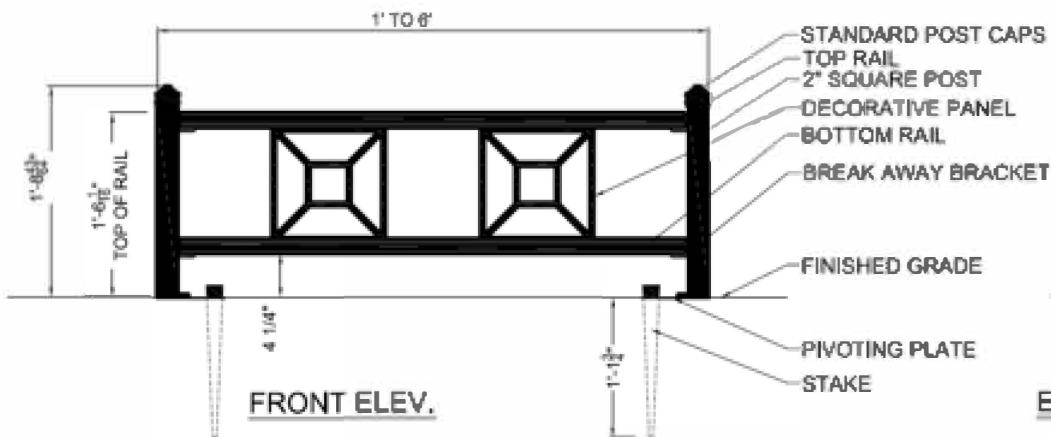
TREE PIT GUARD TYPE 'B'

NOT TO SCALE



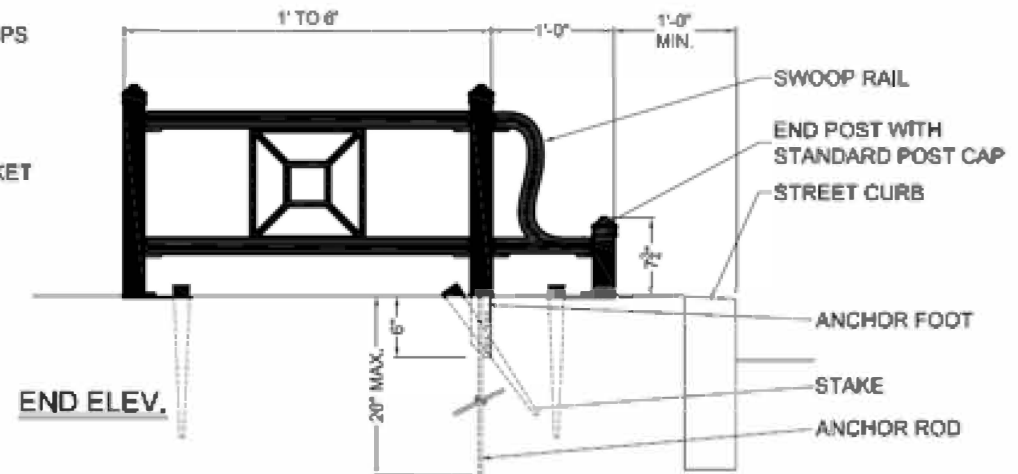
TYPE 'B' THREE-SIDED DESIGN

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TREE PIT GUARD TYPE 'C'

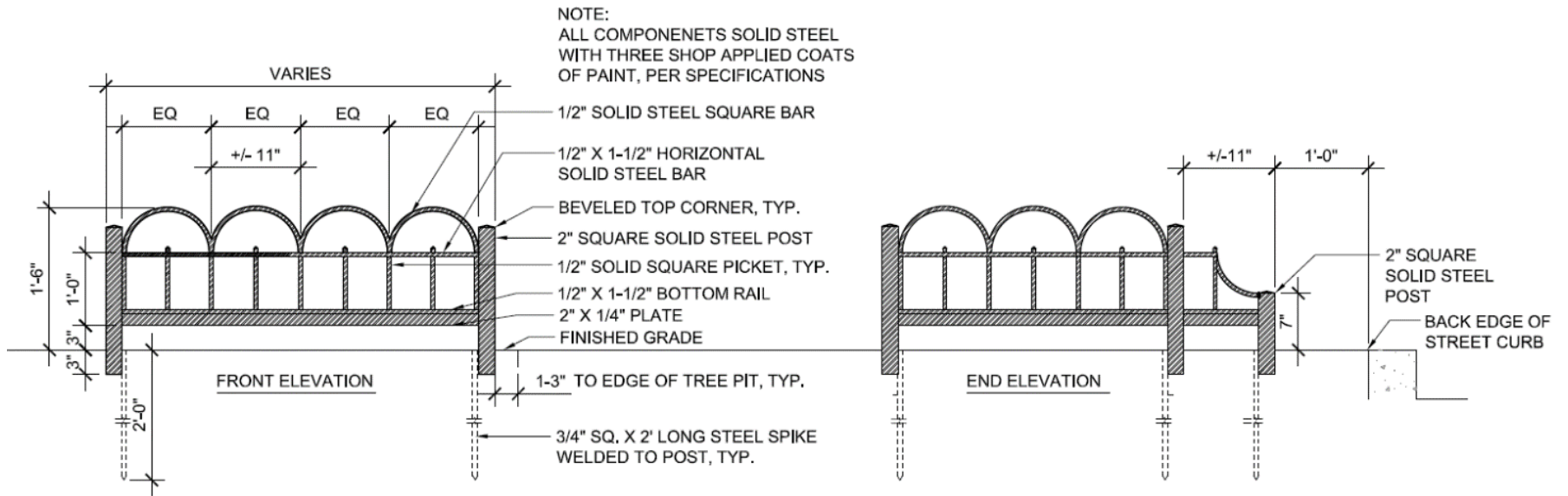
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TYPE 'C' THREE-SIDED DESIGN

Appendix C

TREE GUARD EXAMPLES



TREE PIT GUARD TYPE 'A'

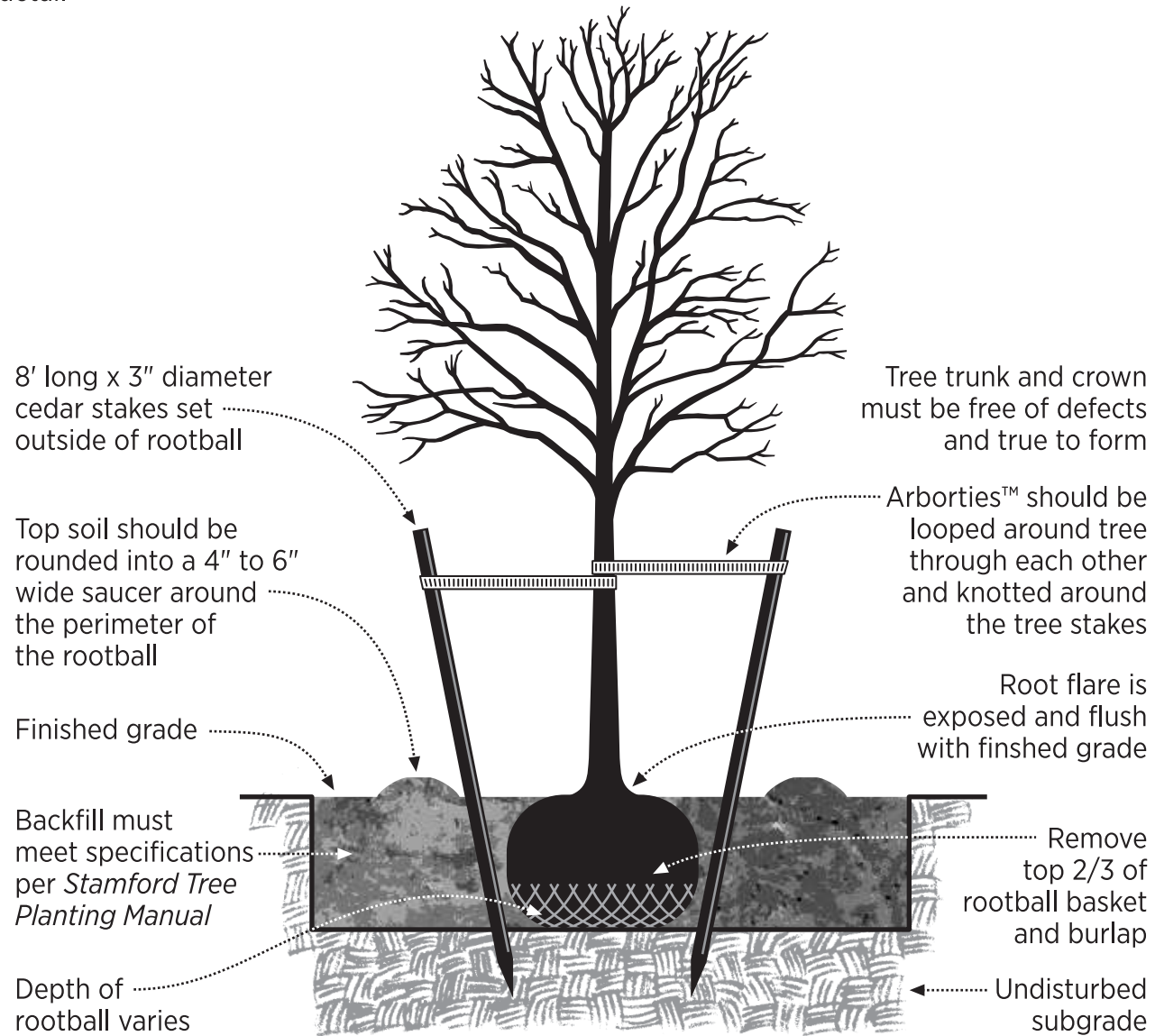
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TYPE 'A' THREE-SIDED DESIGN

NOT TO SCALE

Appendix D

Tree planting and stake detail



Appendix E – Green Infrastructure

Green infrastructure is an approach to stormwater management that protects, restores, or mimics the natural water cycle. Strategies include the installation of **pervious surfaces**, **street trees** and **bioswale rain gardens**.

These techniques filter contaminants, preventing them from entering Long Island Sound, while also reducing hardscape and impervious surfaces and mitigating stormwater flow. In addition to fostering environmental resilience and sustainability, green infrastructure helps create a welcome setting for public interaction and improves the visual and pedestrian experience on our Stamford streets.



Pervious Tree Bed Treatment Pilot Project – Summer Street, Stamford, CT Summer 2019
Photo Courtesy of Stamford DSSD



Sample Bioswale Rain Gardens –
Photo(s) Courtesy of Yale School of the Environment Urban Resources Initiative

Bioswale Rain Gardens

As described by Yale University's *Urban Resources Initiative*, a bioswale is an engineered planted area designed to collect runoff from the street and sidewalk. The bioswale retains and filters this water through natural processes and plant uptake. This water is then stored in the aquifer instead of draining into Long Island Sound.

As water flows down the street following a storm or snowmelt event, it enters the bioswale through a curb cut. The tub-like shape of the bioswale causes this water to pool, allowing some to be absorbed by surrounding plants. The rest of the water moves down through the soil and is filtered, eventually reaching the water table and joining the groundwater supply.

The diagram below illustrates several key features that allow bioswales to perform these functions effectively.

Sample Bioswale Rain Gardens –
Photo(s) Courtesy of Yale School of the Environment *Urban Resources Initiative*

The **inlet** is where the stormwater runoff enters the bioswale. A raised bump on the splashpad minimizes how much water runs past.

Plants are a mixture of shrubs and perennials suited to withstand an urban environment. **Peastone** protects against erosion and prevent weed establishment.



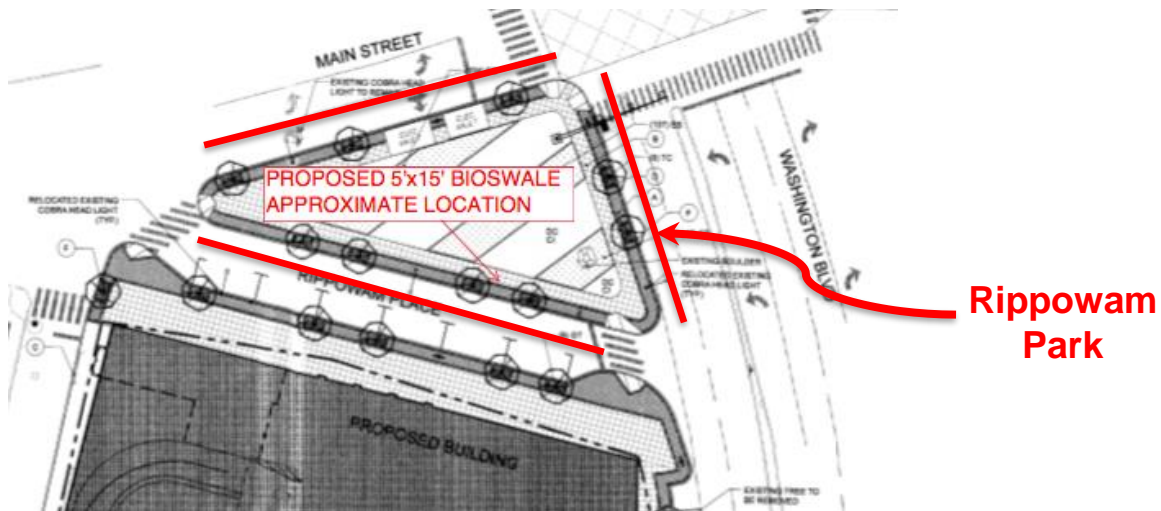
Each bioswale is **graded** to have a U-shaped interior, where soil in the center is lower than soil at the edges. This helps water pool and properly drain.

The **gabion** serves as a quick-release mechanism, allowing water to rapidly drain into a layer of buried gravel.

Edging installed along the sides of a bioswale provides visual interest and can help prevent the unintended growth of grass and weeds.

Bioswale Rain Gardens

The City of Stamford installed a bioswale pilot project at Rippowam Park on Washington Boulevard in 2019, utilizing design specifications created by the Nature Conservancy. The City will utilize these specifications for future bioswale projects (included below). Bioswales function optimally with dimensions of 5' X 20'. They must not impose on underground utility infrastructure nor interfere with curb cuts. The City may alter the dimensions of a bioswale to accommodate sidewalk conditions, including a 5-foot minimum sidewalk width for foot traffic.



**Rippowam
Park**

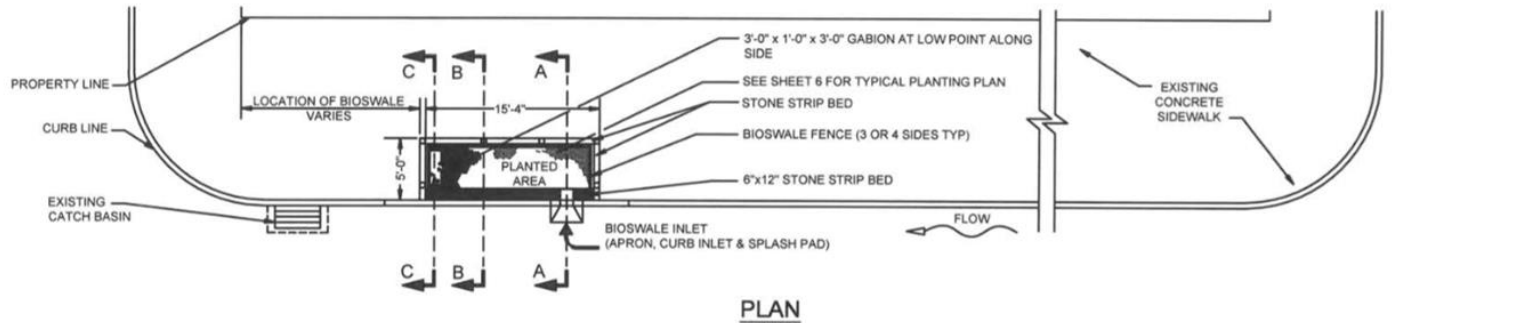


Bioswale Rain Gardens

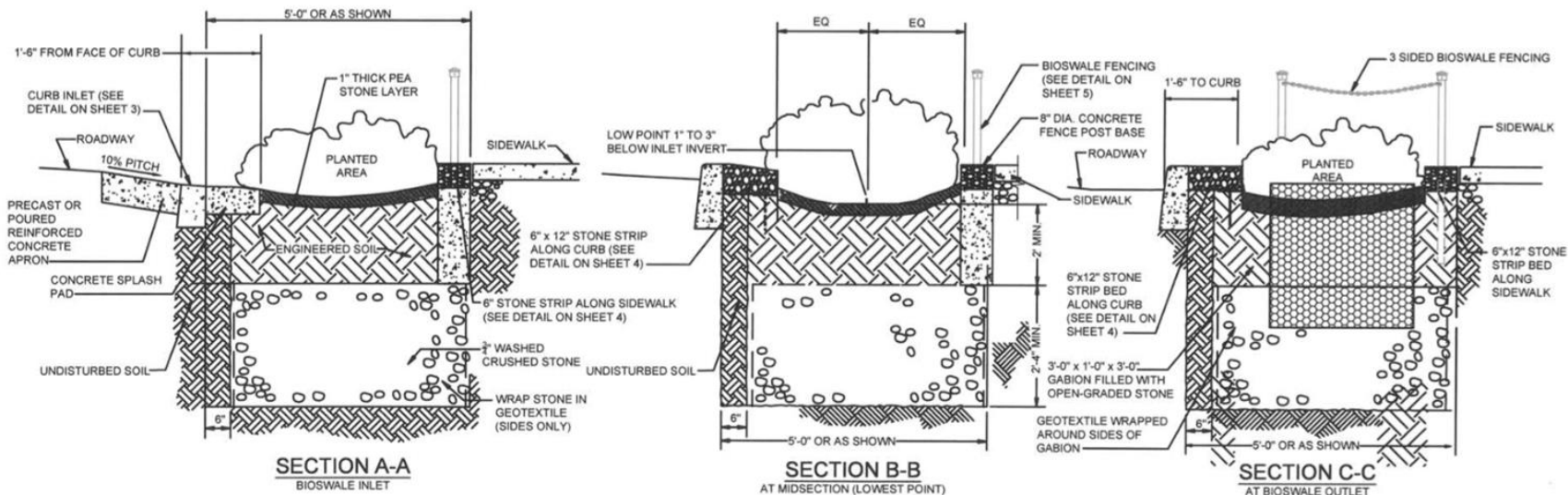
Bioswale specification for Stone Strip and Fencing

NOTES:

1. BOTTOM OF BIOSWALE IS TO BE LEVEL, UNCOMPACTED (SCARIFY) PRIOR TO FILLING WITH STONE.
2. NO COMPACTION OF STONE OR SOIL LAYERS.



PLAN



SECTION A-A
BIOSWALE INLET

SECTION B-B
AT MIDSECTION (LOWEST POINT)

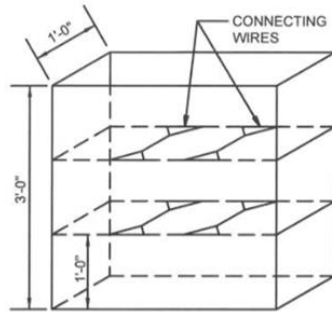
SECTION C-C
AT BIOSWALE OUTLET

CROSS SECTIONS
STANDARD FOR 15' x 5' BIOSWALE - STONE
STRIP AND FENCING

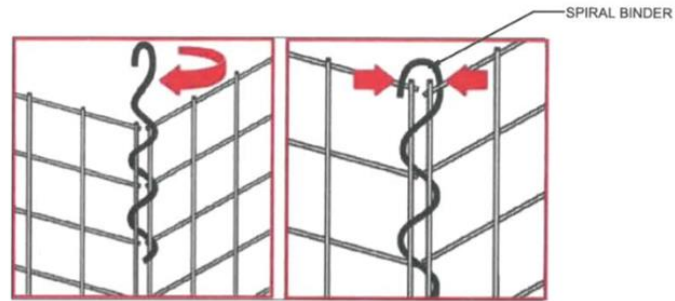
NOT TO SCALE

Bioswale Rain Gardens

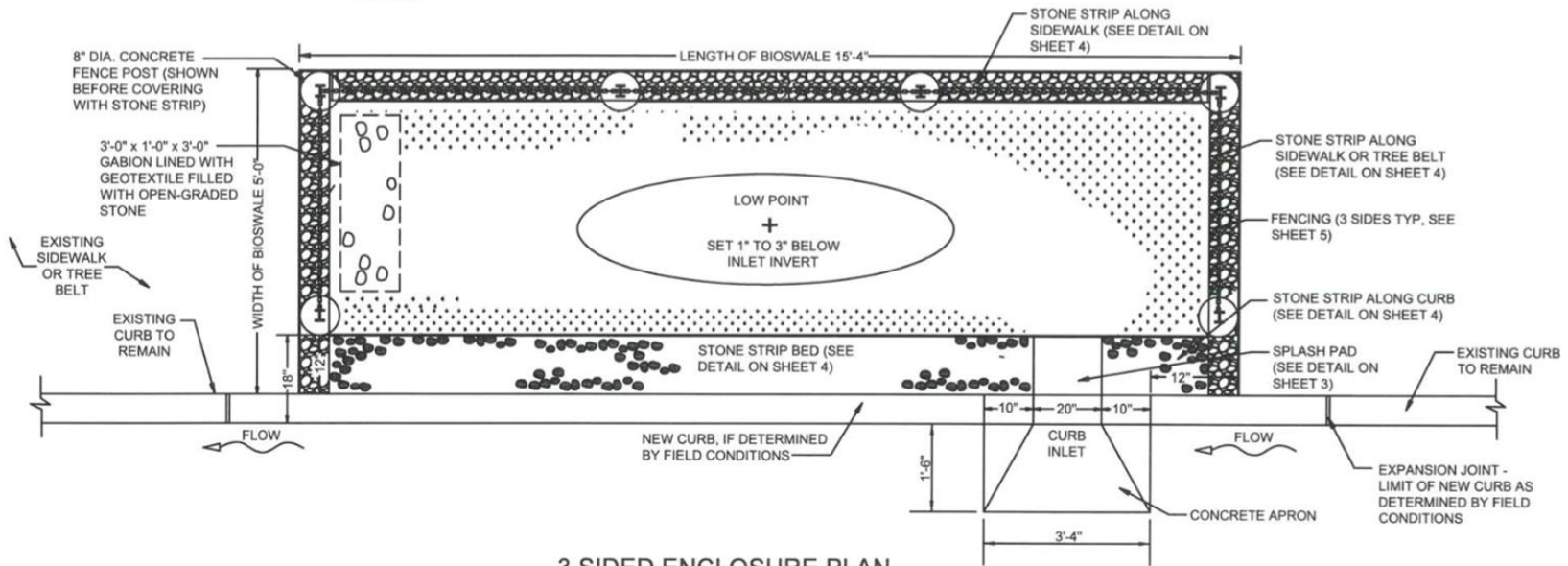
Bioswale specification for Gabion



GABION DETAIL
NOT TO SCALE



GABION ASSEMBLY DETAIL
NOT TO SCALE



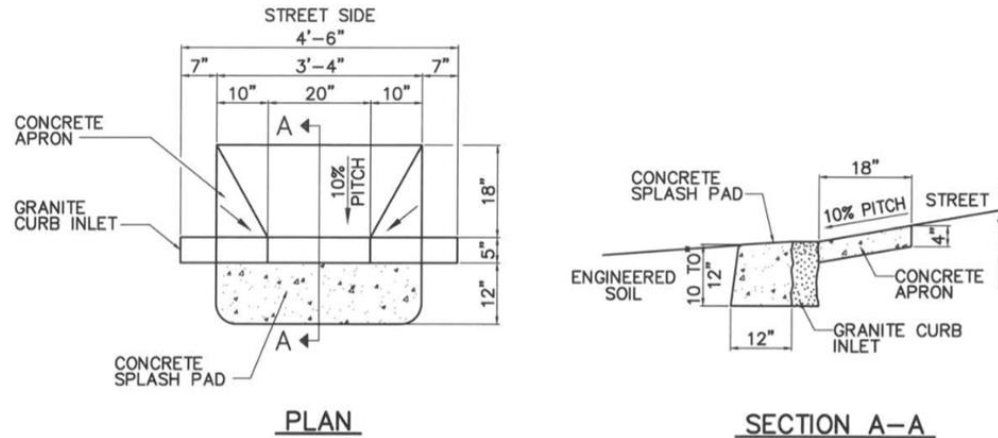
**3 SIDED ENCLOSURE PLAN
STANDARD FOR 15' x 5' BIOSWALE
WITH GABION**
NOT TO SCALE

NOTES:

1. NO BIOSWALES SHALL BE INSTALLED IN THE CITY RIGHT-OF-WAY WITHOUT THE EXPRESS PERMISSION OF THE CITY ENGINEER.
2. SOIL LEVEL AT GABION MUST BE AT THE SAME ELEVATION AS THE INVERT OF THE BIOSWALE INLET.
3. GRADING AND GABION LOCATIONS ARE SPECIFIC TO INLET ORIENTATION SHOWN. IF THE INLET ORIENTATION IS MOVED TO THE OTHER SIDE, THE GRADING AND GABION LOCATIONS MUST BE MIRRORED.
4. CONTRACTOR SHALL NOT BE PERMITTED TO STOCKPILE, STORE, OR LAY DOWN ANY CONSTRUCTION MATERIAL WITHIN ANY EXISTING TREE PIT OR BIOSWALE.

Bioswale Rain Gardens

Bioswale specification for Inlet

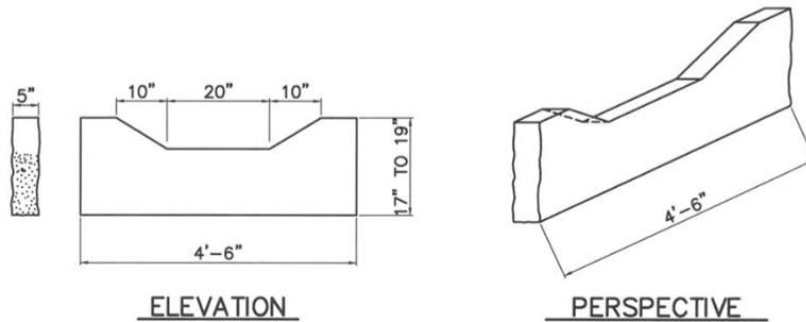


BIOSWALE INLET DETAIL

SCALE: $\frac{1}{2}"=1'-0"$

NOTES:

1. CURB HEIGHTS VARY. CONCRETE SPLASH PAD TO BE Poured FROM STREET LEVEL TO THE BOTTOM OF THE CURB. NO EXCESS CONCRETE TO BE PLACED IN BIOSWALE FOOTPRINT.
2. TRANSITION FROM CONCRETE APRON TO CURB INLET TO SPLASH PAD IS TO BE FLUSH.
3. IF CURB IS MADE OF BLUESTONE, CONCRETE OR ANY OTHER MATERIAL OUTSIDE OF GRANITE, A PRE-CUT SECTION OF GRANITE CURB MUST BE INSTALLED TO CREATE BIOSWALE INLET.



GRANITE CURB INLET DETAIL

SCALE: $\frac{1}{2}"=1'-0"$

NOTE:

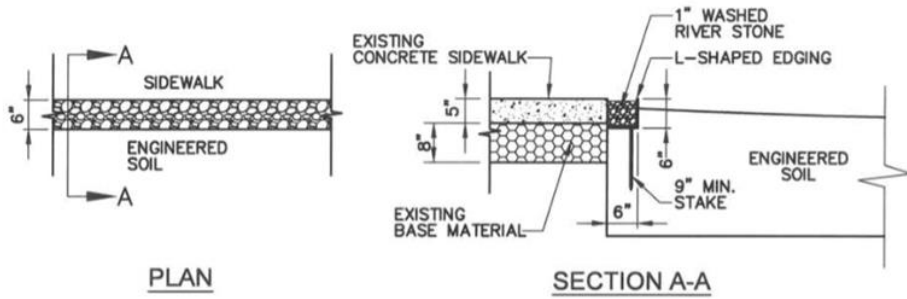
GRANITE CURB INLET CAN BE CUT IN PLACE OR INSTALLED AS A PRE-CUT SECTION OF GRANITE CURB. PRE-CUT SECTIONS MUST BE A SINGLE LENGTH OF GRANITE CURB.

BIOSWALE INLET DETAILS

SCALE: AS NOTED

Bioswale Rain Gardens

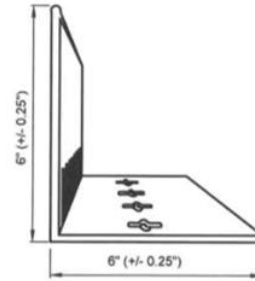
Bioswale specification for Stone Strip



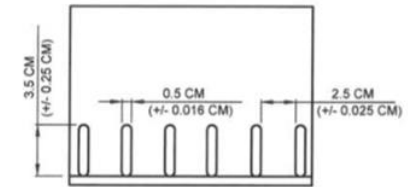
PLAN

SECTION A-A

**STONE STRIP DETAIL
ALONG SIDEWALK EDGES**

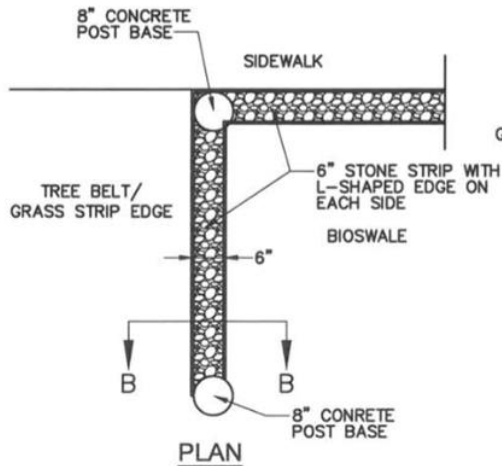


SIDE ELEVATION

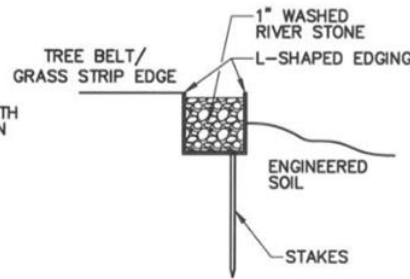


FRONT ELEVATION

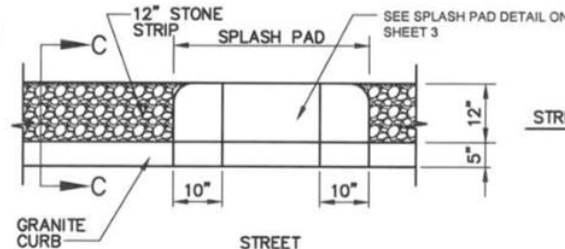
L-SHAPED EDGING



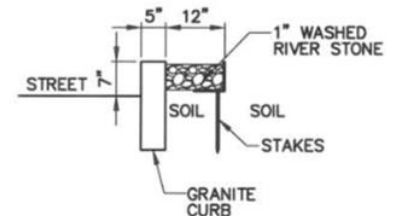
PLAN



SECTION B-B



STREET PLAN



SECTION C-C

STONE STRIP DETAIL ALONG CURBING

**STONE STRIP DETAIL ALONG TREE BELT/
GRASS STRIP EDGE**

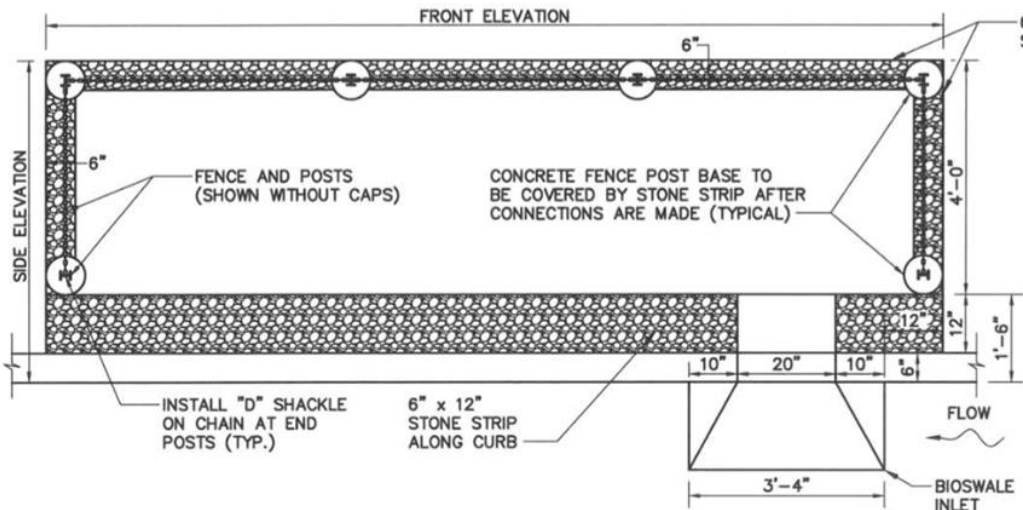
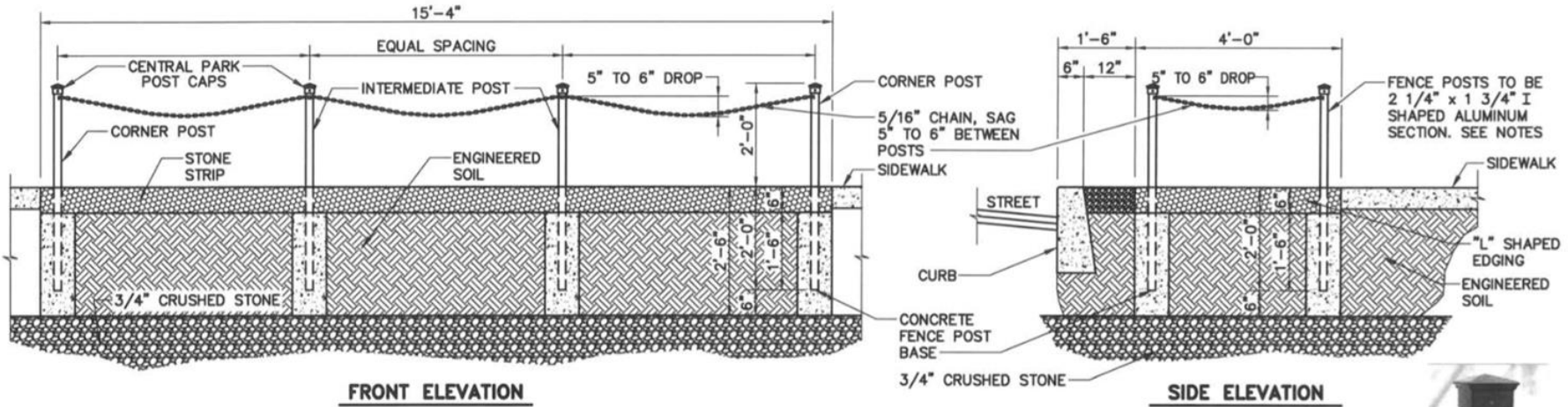
STONE STRIP DETAILS

NOT TO SCALE

NOTES:
COMPACT SOIL BELOW EDGING/STONE STRIP.

Bioswale Rain Gardens

Bioswale specification for Fencing with Stone Strip



FENCING DETAILS WITH STONE STRIP

NOT TO SCALE

NOTES:

FENCE SHALL BE ALUMINUM POST AND CAP WITH STEEL CHAIN AS FURTHER SPECIFIED BELOW:

1. FENCE POSTS SHALL BE HEAVY ALUMINUM EXTRUDED I BEAM SHAPED. POSTS SHALL BE A MINIMUM OF 4'-0" LONG. THEY SHALL BE 2 1/4" DEPTH AND 1 3/4" FLANGES. THE WEB OF THE POST SHALL BE 3/16" THICK AND NOTCHED TO ACCEPT THE CHAIN, PRIOR TO APPLYING THE FINISH. FLANGES SHALL BE 1/4" THICK. FINISH SHALL BE BLACK POLYESTER POWDER COATING. TOP OF CAP 2" ABOVE SIDEWALK, EMBEDDED MIN. 18" INTO CONCRETE BASE.
2. FENCE CAPS SHALL BE CAST ALUMINUM, SIZED TO FIT THE POST, WITH A SLOPED TOP, KNOWN AS A CENTRAL PARK CAP. THE CAP SHALL EXTEND ONTO THE POST COVERING THE END AND SHALL HAVE SET SCREWS TO SECURE THE CAP TO THE POST. THE FINISH SHALL BE BLACK POLYESTER POWDER COATING.
3. CHAIN SHALL BE 5/16" STEEL CHAIN, HOT DIP GALVANIZED, MEETING AIS REQUIREMENTS. CHAIN SHALL FIT OVER TOP OF POSTS. ENDS OF CHAIN SHALL BE FITTED WITH GALVANIZED "D" SHACKLES. THE CHAIN SHALL UNDERGO AN ELECTROPHORETIC PROCESS (E-COAT). THE FINISH SHALL BE BLACK POLYESTER POWDER COATING MATCHING THE POSTS AND CAPS.
4. FENCE SHALL BE AS SUPPLIED BY SNUG COTTAGE HARDWARE, THE HOOVER FENCE CO., OR APPROVED EQUAL.

