1.0 Planter Box

1.1 Description

Planter boxes are designed to capture and temporarily store storm water runoff. Planter Boxes are intended to be placed next to buildings or adjacent to roadways. Drainage areas to Planter Boxes will include building roofs and paved roadways or driveways. Drainage may be conveyed to the Planter Box with curb cuts/extensions or through non erosive roof downspouts.

The boxes are filled with gravel on the bottom, planting soil media, and vegetation. Runoff infiltrates into the soil where it is used by the plants, stored and filtered, if the runoff volume is large the water may pond on the surface for a limited period of time. Planter Boxes can be installed with underdrains with a pervious liner.

1.2 Requirements

1.2.1 General Requirements

The following general requirements will be met for all planter box installations:

- The contributing drainage area will be less than 15,000 square feet
- Groundwater levels will be at least 2 feet lower than the bottom of the planter box area.
- Box locations will have adequate relief between land surface and the stormwater conveyance system to allow percolation through the planting media and underdrain to the storm water conveyance system.
- Planter boxes will not be located in areas with excessive shade in order to avoid poor vegetative growth. For moderately shaded areas, shade tolerant plants will be used.
- Planter boxes will not be located near large trees that may drop leaves or needles.

1.2.2 Design Requirements

The following design requirements will be met for all planter box installations:

- Planter Boxes are sized to capture and treat the water quality volume, with a 12-inch maximum ponding depth.
- Planting mix depth is a minimum of 2 feet.
- Planter Boxes are designed to drain to below the planting soil depth in less than 48 hours.
- Perforated pipe underdrains may be used to increase flow capacity.

1.2.3 Underdrain System Requirements

Place an underdrain system beneath the filter media to increase flow capacity if native soils do not allow adequate infiltration. Provide an underdrain system that consists of perforated pipe underdrains with a minimum 4-inch diameter, an 8-inch minimum gravel filter layer, a nonwoven geotextile fabric to separate the gravel from the native soils and the gravel from the filter media.

Material	Specification	
No. 57 Aggregate	Use course aggregate No. 57 consisting of crushed slag or gravel.	
Pipe Underdrains	Use perforated pipe underdrains with a minimum diameter of 4-inches.	
Clean Out and Outlet Pipe	Use non-perforated pipe underdrains with a minimum diameter of 4-inches.	
Nonwoven Geotextile Fabric	Use Class 2 Type C non-woven geotextile fabric.	

1.2.4 Overflow Requirements

Planter boxes will bypass large flows with an overflow riser. Follow requirements below for planter box installations:

- An overflow device is required to be set at 4" below the top of the planter box.
- The overflow riser is designed to safely bypass the 10-yer 24-hour storm event.
- A vertical PVC pipe will be connected to the underdrain or stormwater conveyance system.
- The overflow riser will be 6 inches or greater in diameter, so it can be cleaned without damage to the pipe. The vertical pipe will provide access to cleaning the underdrains.

1.2.5 Filter Media

Ensure the filter media of the Planter Box is level to allow uniform ponding over the entire area. The maximum ponding depth above the filter media is 12-inches to allow the Planter Box to drain within a reasonable time and to prevent long periods of plant submergence. The filter media provides a medium for physical filtration for the stormwater runoff with enough organic matter content to support provide water and nutrients for plant life.

Provide a filter media with a minimum infiltration rate of 1.0 in/hour and a maximum rate of 6 in/hr.

The USDA textural classification of the filter media is Loamy Sand or Sandy Loam. The filter media is furnished, and on-site soils are not acceptable. Test the filter media to meet the following criteria:

ltem	Percent of Total Planting Mix by Weight	ASTM Sieve Size	Percent Passing by Weight
		3/8 in.	100
Sand*		No. 4	95-100
Clean, Washed, Well Graded,		No. 8	80-100
No Organic Material	9007 Mar	No. 16	50-85
Aggregate No . FA-10	80% Max	No. 30	25-60
ASTM C-33 Concrete Sand		No. 50	10-30
AASHTO M-6		No. 100	2-10
AASH10 M-45, No. 9 or No. 10		No. 200	0-3
		2 in.	100
Screened Topsoil Loamy Sand or Sandy Loam		1 in.	95-100
ASTM D5269	15% Max	No. 4	75-100
(imported or manufactured topsoil)	1370 WIAX.	No. 10	60-100
Max 5% clay content		No. 200	10-50
		0.002 mm	0-5
Organic Matter in the form of		3/8 in.	85-100
Compost, Leaf Compost, Peat Moss, or	5% Min	No. 8	50-80
Pinebark Nursery Mix**		No. 30	0-40

Table 2: Filter Media Material Specifications

*Do not use lime stone screenings.

** Potting grade pine bark with no particles larger than 1/2 inches.

Submit the source of the filter media and test results to the ENGINEER prior to the start of construction of Planter Boxes. Do not add material to a stockpile of filter media once a stockpile has been sampled. Allow sufficient time for testing. Utilize a filter media from a certified source or laboratory to reduce mobilization time and construction delays.

Use a filter media that is uniform, free of stones, stumps, roots or other similar objects larger than two inches excluding mulch. Do not mix or dump materials or substances within the Planter Box that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations.

Test the filter media to meet the criteria shown in Table 3:

Table 3: Filter	Media	Chemical	Analysis
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Item	Criteria	Test Method
Corrected pH	6.0 - 7.5	ASTM D4972
Magnesium	Minimum 32 ppm	*
P-Index	0-30	USDA Soil Test
Phosphorus (Phosphate - P_2O_5)	Not to exceed 69 ppm	*
Potassium (K ₂ O)	Minimum 78 ppm	*
Soluble Salts	Not to exceed 500 ppm	*

* Use authorized soil test procedures.

Should the filter media pH fall outside of the acceptable range, modify with lime (to raise pH) or iron sulfate plus sulfur (to lower pH). Uniformly mix lime or iron sulfate into the filter media prior to use in Planter Box areas.

Modify the filter media with magnesium sulfate if the filter media does not meet the minimum requirement for magnesium. Modify the filter media with potash if the filter media does not meet the minimum requirement for potassium. Uniformly mix magnesium sulfate and potash into the filter media prior to use in Planter Box.

A filter media that fails to meet the minimum requirements must be replaced.

1.2.6 Plantings

Use plantings that conform to the standards of the current edition of *American Standard for Nursery Stock* as approved by the American Standards Institute, Inc.

For Planter Box applications near roadways, consider site distances and other safety concerns when selecting plant heights.

Use plant materials that have normal, well developed stems or branches and a vigorous root system. Only use plantings that are healthy, free from physical defects, plant diseases, and insect pests. Symmetrically balance shade and flowering trees. Ensure major branches do not have V shaped crotches capable of causing structural weakness. Ensure trunks are free of unhealed branch removal wounds greater than a 1 in. diameter.

Use plant species that are tolerant to wide fluctuations in soil moisture content. Use plantings capable of tolerating saturated soil conditions for the length of time anticipated for the water quality volume, as well as anticipated runoff constituents.

Acceptable Planter Box plantings include:

- Turf Grass,
- Native Grasses and Perennials,
- Shrubs, and
- Trees.

1.2.7 Mulch Layer

Provide a uniform 3 inch layer of mulch on the surface of the Planter Box to enhance plant growth, enhance plant survival, suppresses weed growth, reduce erosion of the filter media, maintain soil moisture, trap fine sediments, promote the decomposition of organic matter, and pre-treat runoff before it reaches the filter media.

Provide shredded hardwood bark that consists of bark from hardwood trees milled and screened to a maximum 4 inch particle size, uniform in texture, free from sawdust and foreign materials, and free from any artificially introduced chemical compounds detrimental to plant life. Provide mulch that is well aged a minimum of 6-months.

Do not use pine needle, or pine bark mulch due to the ability of floatation.

Use alternative surface covers such as native groundcover, erosion control blankets, river rock, or pea gravel as directed by the ENGINEER. Use alternative surface covers based on function, cost and maintenance.

1.3 Installation

1.3.1 Underdrain System

Prior to placing the underdrain system, alleviated compaction native soils at the bottom of the Planter Box.

Remove any ponded water from the bottom of the Planter Box. Line the excavated area with a Class 2, Type C nonwoven geotextile fabric.

Place a layer of No. 57 Aggregate 3-foot wide, and minimum of 3-inches deep on top of the nonwoven filter fabric. Place the pipe underdrains on top of the underlying aggregate layer. Lay the underdrain pipe at a minimum 0.5 percent longitudinal slope. The perforated underdrain drain pipe may be connected to a stormwater conveyance system or stabilized outlet.

Place No. 57 Aggregate around the pipe underdrain system to a minimum depth of 8-inches. Place a Class 2, Type C nonwoven geotextile fabric between the boundary of the gravel and the filter media to prohibit the filter media from filtering down to the perforated pipe underdrain.

1.3.2 Filter Media

Install a permeable non-woven geotextile filter fabric between the filter media and the native soils or stone underdrain. Place the filter media in vertical layers with a thickness of 12 to 18 inches. Compact the filter media by saturating the entire Planter Box after each lift of filter media is placed until water flows from the underdrain system. Apply water for saturation by spraying or sprinkling. Perform saturation of each lift in the presence of the ENGINEER. Do not use equipment to compact the filter media. Use an appropriate sediment control BMP to treat any sediment-laden water discharged from the underdrain during the settling process.

Test the installed filter media to determine the actual infiltration rate after placement. Ensure the infiltration rate is within the range of 1 to 6 inches per hour.

1.3.3 Plantings

Plant all Planter Box grasses, native grasses, perennials, shrubs, trees, and other plant materials specified to applicable landscaping standards.

Ensure all plant materials are kept moist during transport and on-site storage. Plant the root ball so 1/8th of the ball is above final filter media surface. Ensure the diameter of the planting pit/hole is at least six inches larger than the diameter of the planting ball. Set and maintain the plant straight during the entire planting process. Thoroughly water all plantings after installation.

1.3 Maintenance

Planter Boxes require annual plant, soil, and mulch layer maintenance to ensure optimum infiltration, storage, and pollutant removal capabilities. In general, Planter Box maintenance requirements are typical of landscape care procedures and include:

- Watering: Plants will be selected to be drought tolerant and do not require watering after establishment (2 to 3 years). Watering may be required during prolonged dry periods after plants are established.
- Erosion control: Inspect flow entrances, ponding area, and surface overflow areas periodically, and replace soil, plant material, and/or mulch layer in areas if erosion has occurred. Properly designed facilities with appropriate flow velocities will not have erosion problems except in extreme events.
- Mulch: Replace mulch annually in planter boxes where heavy metal deposition is likely (e.g., contributing areas that include industrial, auto dealer/repair, parking lots, and roads). In residential lots or other areas where metal deposition is not a concern, replace or add mulch as needed to maintain a 3 inch depth at least once every two years.

1.4 References

City of Santa Barbara. Storm Water BMP Guidance Manual. Chapter 6 June 2008