

ATTACHMENT A

BIORETENTION SOIL SPECIFICATION

1.00 BIORETENTION SOIL

Bioretention soil shall achieve an initial infiltration rate of at least 8-inch per hour nor more than 20 inches per hour “in situ” and a long-term, in-place infiltration rate of at least 5 inches per hour. Bioretention soil shall also support vigorous plant growth. Bioretention Soil shall be a mixture of fine sand, and compost, measured on a volume basis:

65% Sand
20% Sandy Loam
15% Compost

A. SUBMITTALS

Product Data: Submit manufacturer's product data and installation instructions. Include required substrate preparation, list of materials, application rate/testing and percolation rates.

Certifications: Manufacturer shall submit a letter of certification that the products meet or exceeds all physical property, endurance, performance and packaging requirements.

Submittals for Bioretention Soil: Tests must be conducted within 120 days prior to the delivery date of the bioretention soil to the project site.

Batch-specific test results and certification will be required for projects installing more than 100 cubic yards of bioretention soil.

The contractor must submit the following for approval:

1. A sample of mixed bioretention soil.
2. Grain size analysis results of the sand component performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils.
3. Grain size analysis results of the sandy loam component performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils.
4. Grain size analysis results of compost component performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils.
5. Agricultural soil analysis of results for the Bioretention Soil as specified in Section 2.03 E
6. Provide the following information about the testing laboratory(ies) name of laboratory(ies) including:
 - a) contact person(s)
 - b) address(es)
 - c) phone contact(s)

- d) e-mail address(es)
- e) qualifications of laboratory(ies), and including use of ASTM and USDA method of standards.

B. Sand shall be free of wood, waste, coating such as clay, stone dust, carbonate, etc., or any other deleterious material. All aggregate passing the No. 200 sieve size shall be non-plastic.

Sand for Bioretention Soil shall be analyzed by an accredited lab using #200, #100, #40, #30, #16, #8, #4, and 3/8 inch sieves (ASTM D 422 or as approved by municipality), and meet the following gradation:

Sieve Size	Percent Passing (by weight)
3/8 inch	100
No. 4	90-100
No. 8	70-100
No. 16	40-95
No. 30	15-70
No. 40	5-55
No. 100	0-15
No. 200	0-5

Note: all sands shall consist of natural sand, manufactured sand, or a combination thereof.

C. Sandy loam for Bioretention Soil shall be free of wood, waste, coating such as stone dust, carbonate, etc., or any other deleterious material. All aggregate passing the No. 200 sieve size shall be non-plastic.

Sandy loam soil should comply with the following specifications on USDA soil textural classification scheme by weight:

- Sand: 50-74%
- Silt: 11-48%
- Clay: 2-15%

Note: all sandy loam shall consist of natural sand, manufactured sand or a combination thereof.

D. Compost for Bioretention Soil shall be a well decomposed, stable, weed free organic matter source derived from waste materials including yard debris, wood wastes or other organic materials. Compost shall have a dark brown color and a soil like odor. Compost exhibiting a sour or putrid smell, containing recognizable grass or leaves, or is hot (120F) upon delivery or rewetting is not acceptable. Compost shall be produced at a facility inspected and regulated by the Local Enforcement Agency for CalRecycle.

The past 3 inspection reports shall be submitted verifying compliance with Title14 requirements of the Process to Further Reduce Pathogens (PFRP), Fecal coliform and Salmonella testing and pathogen and EPA, 40 CFR 503 regulations.

Composite Quality Analysis:

Property	Method	Requirement
pH, Units	Saturation Paste	6 to 8.5
EC, dS/m	Saturation Extract	0 to 10
Boron, ppm	Saturation Extract	less than 2.5
Moisture content, %	Gravimetric	30 to 60
Bulk Density, lbs/cubic yard		500 to 1100
Organic Matter, % of Dry Weight	Loss on Ignition	35% to 75%
Carbon to Nitrogen Ratio		15:1 to 25:1
Maturity	Solvita	5 or above
Stability	Solvita	5 or above
Particle Size	Sieve Analysis	
Pass 1/2 inch sieve		≥80%
Pass #200 sieve		max 5%
503C Metals	Title 14	
Arsenic (As)		20
Cadmium (Cd)		15
Chromium (Cr)		100
Copper (Cu)		150
Lead (Pb)		300
Mercury (Hg)		10
Nickel (Ni)		100
Selenium (Se)		30
Zinc (Zn)		300
Pathogen		
Salmonella	Title 14	< 3 MPN per 4 gms
Fecal Coliform		<1000 MPN per 1 gm
Physical contaminants		
Plastic Metal and Glass, % > 4mm	% by Weight	< 1
Sharps, % > 4mm	% by Weight	0

- E. Bioretention Soil shall be free of roots, clods, and/or stones larger than 1-inch in the greatest dimension, pockets of coarse sand, noxious weeds, sticks, lumber, brush and other litter. It shall not be infested with nematodes, or undesirable disease-causing organisms such as insects and plant pathogens. Bioretention soil mix shall be friable and have sufficient structure in order to give good tilth and aeration to the soil.

Gradation limits – The definition of the soil should be the following USDA classification scheme by weight:

- Sand 85-92%
- Silt 14% maximum
- Clay 5% maximum

Permeability Rate - Hydraulic conductivity rate shall be not less the 8 inch per hour nor more than 20 inches per hour when tested in accordance with USDA Handbook Number 60, method 34b or other approved methods.

Analysis for pH, salinity and nutrient levels shall be submitted for approval prior to acceptance. Nutrient tests should include the testing laboratory recommendations for supplemental additions to the soil as calculated by the amount of material to be added per volume of soil for the type of plants to be grown in the soil.

Property	Method	Requirement
pH, Units	Saturation Paste	6.0 to 8.0
EC, dS/m	Saturation Extract	0.5 to 2.5
Boron, ppm	Saturation Extract	less than 2.5
Chloride, ppm	Saturation Extract	less than 150
Sodium Adsorption Ratio		less than 3.0
Carbon to Nitrogen Ratio		10 to 20
Organic Matter, % of Dry Weight	Loss on Ignition	2 to 5
Extractable Nutrients, dry weight basis	Ammonium Bicarbonate / DPTA Extraction	
phosphorus, ppm		10 to 40
potassium, ppm		100 to 200
iron, ppm		24 to 35
manganese, ppm		0.6 to 6
zinc, ppm		1 to 8
copper, ppm		0.3 to 5
magnesium, ppm		50 to 150
sodium, ppm		0 to 100
sulfur, ppm		25 to 500
molybdenum, ppm		0.1 to 2
aluminum, ppm		less than 3.0

Bioretention Soil shall be analyzed by an accredited lab using #200, 1/4 inch, 1/2 inch, and 1 inch sieves (ASTM D 422 or as approved by municipality), and meet the following gradation:

Sieve Size	Percent Passing (by weight)
1 inch	99-100
½ inch	90-100
¼ inch	40-90
No. 200	Less than 5%

2.00 BIORETENTION SOIL PLACEMENT

- A. Imported backfill material for the bioretention zones should be placed in a relatively loose condition, no rolling or other heavy equipment, to promote the planned infiltration of water, through the bioretention soil mix layer.
- B. Bioretention soil shall be installed in six (6) to twelve (12) inch lifts and lightly watered to provide settlement and natural compaction. No mechanical compaction is allowed. After natural compaction has been completed, add, if needed, additional bioretention soil to proposed finish grade as indicated on the plans.
- C. Rake bioretention soil as needed to level out.
- D. Vehicular traffic, construction equipment shall not drive-on, move onto, or disturb the bioretention soil once placed and water compacted.
- E. The geotechnical engineer shall perform at least one percolation test in accordance with the County of San Diego Department of Environment Health Percolation Testing Criteria or other approved methods “in situ” prior to planting the Bioretention area (the engineer of work may require more than one in situ test depending on size of bioretention area). “In situ” percolation test(s) shall have an initial rate of at least 8-10 inches per hour to insure a long term infiltration rate of at least 5 inches per hour. If the percolation rate does not meet at least 8-10 inches per hour, the contractor shall provide and submit corrective action to the geotechnical engineer for approval, such as rototilling or hand cultivation to improve the percolation rate. Once the approved corrections are determined, the contractor will perform the required corrective action to improve the percolation rate and re-test at his expense.
- F. Erosion and Sediment Control practices during construction shall be employed to protect the long-term functionality of the bioretention basin/swale. The following practices shall be followed for this reason:
 - 1. Provide erosion control in the contributing drainage areas to the facility and stabilize upslope areas.

2. Facilities should not be used as sediment control facilities, unless installation of all bioretention-related materials are withheld towards the end of construction allowing the temporary use of the location as a sediment control facility, and appropriate excavation of sediment is provided prior to installation of bioretention materials.
-
- G. A two inch layer of bark mulch per Section 02900 Landscape Planting shall be installed on the surface of the bioretention soil if planting of container stock and no hydroseeding is to be installed to prevent foot compaction of the bioretention soil.
 - H. If hydroseeding is to be installed on the surface of the bioretention soil, no stabilized matrix shall be used in the hydroseed components or mix.