**SECTION 32 91 13.50**

**STORMWATER BIOINFILTRATION**

###### Based On DFD Master Specification Dated 01/06/2023

***This section has been written to cover typical situations that contractors will encounter. The Division of Facilities Development expects changes to this document to account for project specific conditions and design requirements. Use “Track Changes” when editing and providing Preliminary Review submittals***.

***Note to the designer: It is the A/E’s responsibility to evaluate the proposed site to determine the suitability for infiltration. The A/E shall utilize WDNR Technical Standard 1002 – Site Evaluation for Stormwater Infiltration.***

***It is expected that that the A/E will also provide plan sections/details of proposed infiltration basins.***

**PART 1 - GENERAL**

**SCOPE**

The work under this section shall consist of providing all work, materials, labor, equipment and supervision necessary to construct Stormwater Bioinfiltration Devices. Included are the following topics:

PART 1 - General

Related Work

Reference Standards

Submittals

Quality Assurance

PART 2 - PRODUCTs

Geotextile Fabric

Pipe

Aggregates

Sand

Compost

Engineered Soil

Planting Bed Vegetation

Mulch

Erosion Mat

PART 3 - Execution

Protection Measures

Temporary Erosion and Sediment Controls

Excavation

Storage Layer

Underdrain Pipe

Pea Gravel

Geotextile Fabric

Engineered Soil

Erosion Mat

Planting

# RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

***The designer must determine if this work will impact other related work and should only include the following sections that apply to the project.***

Section 30 05 00 – Common Work Results for All Exterior Improvements

Section 31 20 00 – Earthmoving

Section 31 25 00 – Erosion Control

Section 32 91 13 – Soil Preparation

Section 32 92 00 – Plants

Section 32 92 20 – Native Seeding

Section 33 40 00 – Storm Drainage Utilities

Section 00 00 00 – (Section Title)

**REFERENCE STANDARDS**

WisDNR Standard 1002 Site Evaluation for Stormwater Infiltration

WisDNR Standard 1004 Bioretention for Infiltration

WisDNR S100 Compost Specification

WisDOT PAL Wisconsin Erosion Control Product Acceptability List (PAL)

WisDOT SSHSC Standard Specifications for Highway and Structure Construction

# SUBMITTALS

Provide copies of all quality assurance testing reports and certifications:

Field Infiltration Testing: for bioinfiltration device rough-graded areas

Organic Compost Certification

Engineered Soil Certification

Provide product data for the following products:

Pipe

Geotextile Fabrics

Erosion Mat

# QUALITY ASSURANCE

Field Infiltration Testing

Immediately after rough grading of bioinfiltration devices, conduct field infiltration testing by a third-party testing agency to verify infiltration rates for all bioinfiltration devices. Field tests shall be conducted using a double-ring infiltrometer per ASTM D3385. Calculate infiltration rates in accordance with WisDNR Site Evaluation for Stormwater Infiltration, Standard 1002. Tests shall be conducted for each 5000 square feet of surface area of the bioinfiltration device or one test per device minimum measured at the design high water level.

Furnish a report of the test results to Architect/Engineer for approval prior to placement of additional interface or storage layer materials in the bioinfiltration device.

Organic Compost Certification

Contractor shall submit, in writing to DFD Project Representative, a certification from compost supplier that organic compost used on the project is in compliance with the requirements outlined in WisDNR Specification S100.

Engineered Soil Certification

Contractor shall submit, in writing to DFD Project Representative, a certification from the engineered soil supplier that engineered soil product supplied for the project is in compliance with the requirements outlined in WisDNR Standard 1004 Bioretention for Infiltration.

**PART 2 - PRODUCTS**

***Note to the designer: This specification section must be closely coordinated with other project designers to ensure there are no unintended conflicts with other related site work specification sections. At a minimum, there should be close coordination with section 32 92 20, Native Seeding, section 32 92 00 Plants, and with section 33 40 00, Storm Drainage Utilities.***

##### pipe

***Note to the designer: Determine the need for flexible or rigid pipe. Consider whether the use of roll stock HDPE is appropriate for your project because of the difficulties of achieving specific slopes and grades with this product.***

Underdrain Pipe

Underdrain pipe shall be corrugated HDPE or PVC, Schedule 40, minimum diameter of 6-inches, with perforations, in accordance with WisDNR Standard 1004.

The pipe shall be covered with a filter fabric if the bioinfiltration devise storage layer is gravel, or with filter fabric sock if the storage layer is sand. The filter fabric shall conform to the product requirements for geotextile fabric.

Cleanout Pipe

Cleanout pipe shall be rigid, non-perforated PVC, covered with a watertight cap as shown in the Drawings.

##### GEOTEXTILE FABRIC

Filter fabric as required for underdrain pipe protection that meets the requirements of the WisDOT SSHSC Section 645.2.2.4, Geotextile Type DF, Schedule B Test.

Filter sock fabric as required for underdrain pipe protection that has openings that are small enough to prevent sand particles from entering the underdrain pipe. The fabric shall meet the requirements of WisDOT SSHSC Section 612.2.8 Geotextile.

##### Gravel

All gravel aggregates used in the construction of bioinfiltration devices shall be double washed, and free of organic material and fines.

Gravel used within the storage layer shall meet the following gradation requirements:

Sieve Size Percent Passing by Weight

2-inch 100

1 ½-inch 90-100

1-inch 20-55

3/4 –inch 0-15

3/8 – inch 0-5

***Note to the designer: Determine the depth of the storage layer to comply with WisDNR Standard 1004. The total thickness of the storage layer should be that which results in a total device drain time of 72 hour but shall not exceed 48-inches in thickness.***

Pea Gravel

Pea gravel in accordance with WisDNR Standard 1004, to cover the underdrain pipe, graded from 3/8” to 1/4”.

***Note to the designer: Verify the availability of materials with local quarries and adjust the specification as necessary. Selected materials must be of greater diameter than the pipe perforation openings.***

**SAND**

Particles of natural rock, free of clay and silt particles, that meet one of the following gradation requirements:

USDA coarse sand

ASTM C33, fine aggregate concrete sand

WisDOT SSHSC Section 501.2.5.3.4, fine aggregate concrete sand

The preferred sand product consists of mostly silica, but sand consisting of dolomite or calcium carbonate may also be used. Manufactured sand or stone dust are not allowed.

**Organic COMPOST**

Well-composted, stable, and weed-free organic matter meeting the requirements of WisDNR S100 Organic Compost Specification.

##### engineered soil

A mixture of 70-80% sand and 15-30% organic compost based on volume, free of rocks, stones, roots, brush, or other material over 1” in diameter, in compliance with WisDNR Standard 1004.

***Note to the designer: Special attention should be given to plant selection when the percentage of sand exceeds 75%, per WisDNR Standard 1004.***

Engineered soil mix shall have a pH between 5.5 and 8.0.

**PLANTING BED VEGETATION**

Rootstock and plugs shall be used in establishment of trees, shrubs, and herbaceous perennial plants in the bioinfiltration device.

Plant selections shall be native to the area and adapted to the hydric zones of the bioinfiltration device and shall be salt tolerant.

Turf grass shall not be used to vegetate the bioinfiltration basin, although may be used in pretreatment areas.

**MULCH**

Shredded hardwood mulch or chips per WisDNR Standard 1004.

**EROSION MAT**

Erosion mats shall comply with WisDOT SSHSC PAL, for Urban, Class 1, Type B. Erosion mat shall be American Excelsior-Curlex Net-Free, Erosion Control Blanket-S32BD, Western Excelsior-Excel SS-2 All Natural, Ero-Guard EG-25 (NN), Erosion Tech ETRS2BN or approved equal.

**PART 3 - EXECUTION**

**PROTECTION MEASURES**

Pre-Installation Meeting

Prior to the installation of the bioinfiltration device, the Architect/Engineer, DFD Construction representative, and the contractor shall conduct a pre-installation meeting to ensure compliance with WisDNR Standard 1004 for all construction and planting procedures.

Stabilization

Construction of the bioinfiltration device shall not begin until after the contributing drainage area has been stabilized with vegetation and/or hardscapes. Construction site runoff from disturbed areas shall not be allowed to enter the bioinfiltration device.

Weather

Construction shall be suspended during periods of rainfall or snowmelt. Construction shall remain suspended if ponded water is present or if residual soil moisture contributes significantly to the potential for soil smearing, clumping, or other forms of compaction.

Delays resultant from weather shall not serve as a basis for a change order.

Compaction Avoidance

Compaction and smearing of the soils beneath the floor and side slopes of the bioinfiltration device area, and compaction of the soils used for backfill shall be minimized.

During construction, the area dedicated to the bioinfiltration device shall be cordoned off to prevent access by heavy equipment.

Acceptable equipment for constructing the bioinfiltration device includes excavation hoes, light equipment with turf type tires, marsh equipment, or wide-track loaders.

Compaction Remediation

If compaction occurs at the base of the bioinfiltration device, the soil shall be refractured to a depth of at least 12-inches.

If smearing occurs the smeared areas shall be corrected by raking or rototilling.

Compaction and smearing remediation shall be conducted by the contractor at no additional cost to the Owner.

**TEMPORARY EROSION AND SEDIMENT CONTROLS**

Prior to beginning construction, the Contractor shall install temporary erosion and sediment controls around the perimeter of the bioinfiltration device area, to protect from siltation or contamination from adjacent landscape or paved surfaces and construction activities.

Leave erosion control in place until plant establishment and construction activities are complete.

**EXCAVATION**

Excavation equipment shall work from the upper edges of the bioinfiltration devices to excavate the areas to the depths and dimensions as shown on the Drawings. Excavation equipment shall have adequate reach such that it does not need to be located within the footprint of the bioinfiltration device to remove material.

***Note to the designer: If existing soil conditions do not have adequate infiltration, add the following paragraph noting the depth of the permeable sub-layer. The depth noted below should be determined by the designer based on site investigations.***

Upon excavation to the depth indicated in the drawings, the Contractor shall fracture the swale or basin bottom soils to a depth of [xx] inches to promote greater infiltration or to reach a permeable sub layer.

**INTERFACE LAYER**

If required, install sand interface layer above native soil and mix with the top 2-4” of native soil per WisDNR Standard 1004.

**STORAGE LAYER**

Place the storage layer materials to the depth as indicated in the Drawings on top of native soil or interface layer sand in accordance with WisDNR Standard 1004.

**UNDERDRAIN PIPE**

Install underdrain pipe as shown in the Drawings. Pipe shall be installed with a minimum slope of 0.005 ft/ft. Pipe joints shall be made in accordance with the manufacturer’s recommendation. Standard pipe fittings shall be used.

Install cleanouts where shown in the Drawings. Cleanouts shall be installed with a watertight cap located flush with the surface of the bioinfiltration device.

Connect underdrain pipe to a stormwater drainage system structure, such that it will discharge outside the bioinfiltration device area, as indicated in the Drawings.

**GEOTEXTILE FABRIC**

Install filter fabric around underdrain pipe shown in the Drawings in accordance with WisDNR Standard 1004.

**ENGINEERED SOIL**

Verify moisture condition of Engineered Soil is low enough to prevent clumping and compaction during placement. Engineered Soil shall not be placed unless it meets these conditions.

Do not amend engineered soil mix with fertilizer.

Thoroughly blend engineered soil off-site before delivering to site.

Engineered soil shall be stored on plastic sheeting.

***Note to the designer: Min. depth of Engineered Soil is 24”, unless use of a pea gravel lens is required per WisDNR Standard 1004. Verify this before editing the depth requirement below and indicate this depth in the Drawings.***

Engineered soil layer shall be 24” depth minimum, unless otherwise indicated in the Drawings.

Place engineered soil in lifts not to exceed 12 inches in depth until the desired elevation of the bioinfiltration device is achieved.

Re-examine the surface within 48 to 72 hours following placement of engineered soil. Place additional engineered soil until desired elevation of the bioinfiltration device is achieved. Contractor is responsible to pay for additional engineered soil as needed to achieve final elevations shown in the Drawings.

Steps may be taken to induce mild settling of the engineered soil as needed to prepare a stable planting medium and to stabilize the ponding depth. Vibrating plate style compactors shall not be used to induce settling.

**MULCH AND EROSION MAT**

Provide mulch at minimum depth of 3” around entire area of the bioinfiltration device in accordance with WisDNR Standard 1004. The entire planting bed shall be mulched prior to planting to prevent compaction during planting. Mulch shall be pushed aside for the installation of each plant.

Install Erosion Mat between newly planted plugs to keep mulch from floating as required per WisDNR Standard 1004.

***Note to the designer: Delete or edit the following paragraphs if using sections 32 92 00 Plants or 32 92 20 Native Seeding, to call-out infiltration basin plantings.***

**PLANTING**

Install herbaceous plant plugs at 12” on center minimum spacing, and trees and shrubs as shown in the Drawings, in accordance with WisDNR Standard 1004.

Contractor shall follow the applicable planting requirements for Plants, Section 32 92 00, unless in conflict with requirements of this Stormwater Bioinfiltration Section.

#### END OF SECTION