

Storm Water Membrane Filtration Device

PART 1 – GENERAL

01.01.00 Purpose

The purpose of this specification is to establish generally acceptable criteria for Storm Water Membrane Filtration Devices (SWMFD) that treat storm water runoff including dry weather flows and other contaminated water sources. It is intended to serve as a guide to promote understanding regarding materials, manufacture and installation; and to identify devices complying with this specification.

01.02.00 Description

The SWMFD is used for filtering stormwater runoff including dry weather flows. The SWMFD is a pre-engineered water treatment system composed of a pretreatment chamber, one or more filtration chambers containing a plurality of vertically extending membrane filter cartridges, an underdrain system, and a discharge chamber.

01.03.00 Manufacturer

The manufacturer of the SWMFD shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the SWMFD(s) shall be a device manufactured by Bio Clean Environmental Services, Inc., or assigned distributors or licensees. Bio Clean Environmental Services, Inc. can be reached at:

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398 Via El Centro
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01.04.00 Submittals

- 01.04.01 Submittal drawings are to be provided with each order to the contractor and consulting engineer.
- 01.04.02 Submittal drawings are to detail the SWMFD and all components required and the sequence for installation, including:
- System configuration with primary dimensions
 - Interior components
 - Any accessory equipment called out on submittal drawings
- 01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

- 01.05.01 Specification requirements for installation of SWMFD.
- 01.05.02 Manufacturer to supply components of the SWMFD(s):
- Concrete structure (chambers)
 - Internal components
 - Risers, hatches, and manholes optional

01.06.00 Reference Standards

ASTM C 891	Specifies for installation of underground precast concrete utility structures
ASTM C 478	Specification for precast reinforced concrete manhole sections
ASTM C 443	Specification for joints for concrete pipe and manholes, using rubber sealants and gaskets
ASTM D 4101	Specification for copolymer steps construction
ASTM A 615	Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A 706	Standard Specifications for Deformed and Plain Low Alloy Steel Bars for Concrete Reinforcement

PART 2 – COMPONENTS

The Storm Water Membrane Filtration Device (SWMFD) and all of its components shall be self-contained within a concrete structure constructed with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615 or ASTM A 706, Grade 60, and supports a minimum H-20 loading as indicated by AASHTO. All seams and connection points shall be sealed water tight with non-shrink grout in accordance with manufactures recommendations and project specifications.

02.01.00 Pretreatment Chamber

- 02.01.01 Baffle Walls shall be constructed of concrete or fiberglass. Concrete baffles shall have a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615 or ASTM A 706, Grade 60. Fiberglass baffle walls constructed of marine grade and be a minimum of ¼” thick.
- 02.01.02 Pretreatment Chamber is designed to remove floatables, oils, coarser sediments and other suspended particulates that may cause premature filter clogging.

02.03.00 Membrane Filter Cartridge

Filter cartridges shall be comprised of cylindrical membrane filter elements pressure fitted to a filter coupling. The diameter of each cartridge is approximately 8”, consisting of a 3” core surrounded by 2.5” pleated membranes to maximize surface area. The length of each filter element shall be a minimum of 9.62”, with a maximum length of 30.75”. The maximum flux rate determined by the maximum treatment flow rate per unit of filtration membrane surface area shall be 0.05 gpm/ft². The filter cartridges shall be located below the access hatches to allow access for maintenance. The filter cartridges shall have removable handles to facilitate ease of maintenance. The filter cartridges shall be removable and installed by hand.

<u>Cartridge Length</u> <u>(in)</u>	<u>Pleated Media Area</u> <u>(ft²)</u>	<u>Design Treatment Flow Rate (gpm)</u> <u>(1 filter)</u>
9.62	40	2
19.5	90	4.5
30.75	170	8.5

- 02.03.01 Underdrain Assembly shall be constructed of aluminum grade 6061-T6 or 5052 rectangular tubing, the width of the tubing being wider than the O.D. of the membrane filter cartridges. Connection point between tubing and cartridge couplers to be water tight. The underdrain assembly shall be open on the effluent end located inside the discharge chamber.

- 02.03.02 Riser Tube – A PVC riser will be installed inside each cartridge to control the flow rate and evenly distribute sediment loading along the full height of the cartridge. One in every eight cartridges will include a riser with a drain down orifice at the bottom of the riser.

PART 3 – PERFORMANCE

The membrane media filter shall only meet performance specification listed on the submittal drawings.

03.01.00 General

3.01.01 Function

The storm water quality filter treatment device functions to remove pollutants by the following unit treatment processes; sedimentation, floatation and membrane filtration.

3.01.02 Pollutants

The stormwater quality filter treatment device removes oil, debris, trash, sediment, sediment-bound pollutants, metals and nutrients from stormwater during frequent wet weather events.

3.01.04 Treatment Flux Rate

The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum treatment flux rate across the membrane filter cartridges of 0.05 gpm/ft² (0.034 lps/m²).

03.02.00 Test Performance

At a minimum, the SWMFD must meet all of these testing performance standards and have a Manufactures Performance Certification per Section 05.02.00:

- 03.02.01 Independent Third Party Testing:
The SWMFD must be tested under a nationally recognized lab protocol and verified independently by a third party public agency;
- Must capable of removing greater than 80% TSS
 - Verified by NJCAT and approved by NJDEP
 - Must use a particle size distribution with d₅₀ of 52 microns
 - Approval must be current and not expired.
- 3.02.02 Suspended Solids Removal
The SWMFD shall have demonstrated a minimum median TSS removal efficiency of greater than 80%.
- 03.02.03 Sediment Loading
The SWMFD must be proven to have the ability to load 27 lbs/cartridge and/or 37 lbs/sf of effective treatment/sedimentation area, while still maintaining an overall 89% removal efficiency.
- 03.02.04 Online Use
The SWMFD shall be approved for online use by NJDEP, able to internally bypass higher flows without scouring.

PART 4 - EXECUTION

04.01.00 General

The installation of the SWMFD shall conform to all applicable national, state, state highway, municipal and local specifications.

04.02.00 Installation

The Contractor shall furnish all labor, equipment, materials and incidentals required to install the SWMFD device(s) and appurtenances in accordance with the drawings and these specifications.

- 04.02.01 Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and excavation. Soil conditions shall be tested in accordance with the governing agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.
- 04.02.02 Compaction – All soil shall be compacted per registered professional soils engineer's recommendations and per governing agencies standards, prior to installation of SWMFD unit(s).
- 04.02.03 Backfill shall be placed according to a registered professional soils engineer's recommendations and per governing agencies standards, and with a minimum of 6" of gravel under all concrete structures.
- 04.02.04 Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.

04.03.00 Shipping, Storage and Handling

- 04.03.01 Shipping – The SWMFD unit(s) shall be shipped to the contractor's address or job site. The contractor is responsible for offloading and placing the units(s) in the exact site of installation.
- 04.03.02 Storage and Handling – The contractor shall exercise care in the storage and handling of the SWMFD and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the contractor. The SWMFD(s) and all components shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The SWMFD shall always be handled with caution and lifted according to OSHA and NIOSA lifting recommendations and/or the contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

- 04.04.01 Inspection – After installation, the contractor shall demonstrate that the SWMFD has been properly installed at the correct location(s), elevations, and with appropriate components. All components associated with the SWMFD and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the SWMFD has been installed per the manufacturer's specifications and recommendations. All components shall be inspected by a qualified

- professional once a year and results of inspection shall be kept in an inspection log.
- 04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal. The maintenance shall be performed by a qualified professional. A maintenance manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the SWMFD. A maintenance/inspection record shall be kept by the maintenance operator. The record shall include any maintenance activities performed, amount and description of debris collected.
- 04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the SWMFD shall be transported and disposed of at an approved facility for disposal site in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic materials.

PART 5 – QUALITY ASSURANCE

05.01.00 Warranty

The Manufacturer shall guarantee the SWMFD against all manufacturing defects in materials and workmanship for a period of (1) year from the date of delivery to the customer. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The SWMFD is limited to recommended application for which it was designed.

05.02.00 Performance Certification

The SWMFD manufacturer shall submit to the Engineer of Record a “Manufacturer’s Performance Certificate” certifying the SWMFD is capable of achieving the specified removal efficiency for suspended solids as typically found in storm water runoff. The SWMFD manufacture shall also provide a copy of their latest NJ CAT verification and NJDEP approval letter certifying it will remove a minimum of 80% of total suspended solids (of the size fractions typical for urban runoff or as required by local regulations) from the design flow rate. Devices without these performance certifications will not be accepted.

END OF SECTION