SECTION (_____)
STORMFILTER® MEDIA CARTRIDGE FILTRATION SYSTEM
STORMWATER QUALITY – MEDIA CARTRIDGE FILTRATION SYSTEM STANDARD SPECIFICATION

1. GENERAL

1.1. The Contractor shall furnish and install the StormFilter, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents. The water quality treatment flow shall be as determined and approved by the Engineer of Record.

1.2. The StormFilter shall consist of an aboveground or underground precast concrete, steel or plastic structure that houses passive, radial flow, siphon-actuated, and rechargeable media filled filtration cartridge(s). The rechargeable media-filled filter cartridges shall incorporate a protective hood over the media cartridge and a siphon-actuated surface self-cleaning mechanism to increase the effective life of the filter media and to reduce the accumulation of material on the cartridge/media interface. Each radial-flow filter cartridge shall operate at a predetermined flow rate through the use of an integrated flow control orifice located within each filter cartridge outlet manifold. The media-filled cartridges shall trap particulates (TSS) and have the capability to adsorb pollutants such as dissolved metals, nutrients and hydrocarbons. The media cartridge filtration system shall consist of no less than 0.12 cubic feet of filter media for each 1-gallon per minute of water quality treatment flow.

1.3. The StormFilter shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering design and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the Engineer of Record and/or the approving Jurisdiction. The manufacturer of the StormFilter shall be, without exception:

Contech Engineered Solutions
9100 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.4. Submittals:

1.4.1. Manufacturer or supplier shall submit to the Contractor shop drawings for the StormFilter structure, filter cartridges and accessory equipment. Drawings shall include principal dimensions, filter placement, location of piping and unit foundation.

1.4.2. Manufacturer or supplier shall submit Installation Instructions to the Contractor.

1.4.3. Manufacturer or supplier shall submit an Operation and Maintenance Manual to the Contractor.

1.5. Substitution: Any proposed equal alternative product substitution to this specification must be submitted for review and approved by the Engineer of Record 10 days prior to bid opening. Review package should include third party reviewed performance data for both flow rate and pollutant removal. Pollutant data should follow TAPE protocols. The system must have a GULD approval for Basic treatment through the department of Ecology.

1.6. American Society for Testing and Materials (ASTM) Reference Specifications:

1.6.1. ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

1.6.2. ASTM C858: Standard Specification of Underground Precast Concrete Utility Structures

1.6.3. ASTM C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

1.6.4. ASTM C497: Standard Test Methods for Concrete Pipe, Manhole Sections or Tile

1.6.5. ASTM C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars

1.6.6. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

1.6.7. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

1.6.8. ASTM F628: Standard Specification for ABS Schedule 40 Plastic Drain, Waste and Vent Pipe with a Cellular Core

1.6.9. ASTM D1785: Standard Specification for PVC Plastic Pipe, Schedules 40, 80 & 120

1.6.10. ASTM D2466: Standard Specification for PVC Plastic Pipe Fittings, Schedule 40

1.6.11. ASTM A36: Standard Specification for Carbon Structural Steel

1.6.12. ASTM A48: Standard Specification for Gray Iron Castings

1.6.13. ASTM D4101: Standard Specification for Polypropylene Injection and Extrusion Materials

1.7. American Association of State Highway and Transportation Officials (AASHTO) Reference Specifications:

1.7.1. AASHTO M199: Standard Specification for Precast Reinforced Concrete Manhole Sections

2. MATERIALS

2.1. Internal Components:

2.1.1. All internal components including ABS and PVC manifold piping, filter cartridge(s), filter media (as specified on the plans in the StormFilter data block or by the Engineer of Record) shall be provided by Contech Engineered Solutions LLC. This includes sump covers, flow spreaders, energy dissipaters and outlet risers with scum baffles where appropriate.

2.1.2. ABS manifold pipe shall meet ASTM F628. PVC manifold pipe shall meet ASTM D1785 and PVC fittings shall meet ASTM D2466.

2.1.3. Filter cartridge bottom pan, inner ring, and hood shall be constructed from linear low-density polyethylene (LLDPE) or ABS. Filter cartridge screen shall consist of 1" x ½" welded wire fabric

(16 gauge minimum) with a bonded PVC coating. Internal parts shall consist of ABS or PVC material. Siphon-priming float shall be constructed from high-density polyethylene (HDPE). All miscellaneous nuts, bolts, screws, and other fasteners shall be stainless steel or aluminum.

2.1.4. An orifice plate shall be supplied with each cartridge to restrict flow rate to a maximum of 22.5 gpm at system design head or as specified on drawings.

2.1.5. If a sump cover/overflow, baffle/inlet, sump/outlet, sump/inlet, tower/outlet overflow is provided, they shall be constructed of ABS and sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or equal. Contractor to provide sealant material and installation unless completed prior to shipment.

2.1.6. Where an Underdrain Design is provided, the size of the underdrain will provide a minimum of 0.067 $in^2$ of underdrain cross sectional area per 1 gpm of design flow rate. (example: 105 gpm maximum design flow rate will require an underdrain with 7.035 $in^2$ of cross sectional area, which is equal to one 3" diameter pipe).

2.1.7. Filter media shall be provided by Contech or an approved alternate source. Filter media shall consist of one or more of the following, as specified in the StormFilter data block, or by the Engineer:

2.1.7.1. Perlite Media: Perlite media shall be made of natural siliceous volcanic rock free of any debris or foreign matter. The perlite media shall have a bulk density ranging from 6.5 to 8.5 $lb/ft^3$ and particle sizes ranging from that passing through a 0.50 inch screen and retained on a U.S. Standard #8 sieve.

2.1.7.2. CSF Media: CSF media shall be made exclusively of composted fallen deciduous leaves. Filter media shall be granular. Media shall be dry at the time of installation. The CSF leaf media shall have a bulk density ranging from 40 to 50 $lb/ft^3$ and particle sizes ranging from that passing through a 0.50 inch screen to that retained on a U.S. Standard #8 sieve.

2.1.7.3. Metal Rx Media: Metal Rx media shall be made exclusively of composted fallen deciduous leaves. Filter media shall be granular. Media shall be dry at the time of installation. The Metal Rx media shall have a bulk density ranging from 40 to 50 $lb/ft^3$ and particle sizes ranging from that passing through a U.S. Standard #8 sieve to that retained on a U.S. Standard #14 sieve.

2.1.7.4. Zeolite Media: Zeolite media shall be made of naturally occurring clinoptilolite, which has a geological structure of potassium-calcium-sodium aluminosilicate. The zeolite media shall have a bulk density ranging from 44 to 48 $lb/ft^3$, particle sizes ranging from that passing through a U.S. Standard #4 sieve to that retained on a U.S. Standard #6 sieve, and a cation exchange capacity ranging from 1.0 to 2.2 meq/g.

2.1.7.5. Granular Activated Carbon: Granular activated carbon (GAC) shall be made of lignite coal that has been steam activated. The GAC media shall have a bulk density ranging from 28 to 31 $lb/ft^3$ and particle sizes ranging from that passing through a U.S. Standard #4 sieve to that retained on a U.S. Standard #8 sieve.

2.1.7.6. Zeolite-Perlite-Granular Activated Carbon (ZPG): ZPG is a mixed media that shall be composed of a 1.3 $ft^3$ outer layer of 100% Perlite (see above) and a 1.3 $ft^3$ inner layer consisting of a mixture of 90% Zeolite (see above) and 10% Granular Activated Carbon (see above).

2.1.7.7. Zeolite-Perlite (Zeo/Perl): Zeo/Perl is a mixed media that shall be composed of a 1.3 $ft^3$ outer layer of 100% Perlite (see above) and a 1.3 $ft^3$ inner layer consisting of 100% Zeolite.

2.1.7.8. CSF Leaf Media – Granular Activated Carbon (CSF/GAC): CSF/GAC is a mixed media that shall be composed of a 1.3 $ft^3$ outer layer of 100% CSF media (see above) and a 1.3 $ft^3$ inner layer consisting of 100% Granular Activated Carbon (see above).

2.1.7.9. Perlite – Metal Rx : Perlite/Metal Rx is a mixed media that shall be composed of a 1.3 $ft^3$ outer layer of 100% Perlite (see above) and a 1.3 $ft^3$ inner layer consisting of 100% Metal Rx (see above).

2.1.7.10. PhosphoSorb: PhosphoSorb media shall be made from Perlite pellets with activated alumina bound to the surface. The PhosphoSorb media pellets shall be granular and have a bulk density from 18 to 25 $lb/ft^3$. The pellet size should range from that passing through a U.S. Standard ¼ inch sieve and retained on a #8 sieve.

2.1.8. Overflow Assembly (Where Provided):

2.1.8.1. Flow spreader shall be constructed of Linear Low-Density Polyethylene (LLDPE). Contractor to provide sealant material and installation unless completed prior to shipment.

2.1.8.2. Energy dissipater shall be constructed of polyolefins. Contractor to provide sealant material and installation unless completed prior to shipment.

2.1.8.3. Outlet riser with scum baffle shall be constructed of HDPE. Outlet riser shall have an outlet stub outside dimension (O.D.) of 12-inch diameter PVC, SDR 26 and a secondary outlet stub O.D. of 8-inch diameter PVC, SDR 26.

2.2. Steel Catch Basin & Roof Drain Components:

2.2.1. Basin shall be all welded steel construction, fabricated from ASTM A36 ¼-inch steel and shall be designed to withstand AASHTO H-20 wheel loads when placed below ground in a location that could receive direct loading.

2.2.2. Basin Grate: Grating shall be ductile iron construction and shall meet AASHTO H-20 loading requirements, and shall be provided according to ASTM A48.

2.2.3. Basin Solid Lid (below ground system design): Solid lid shall be gray cast iron, treated with non-slip surfacing, and shall meet AASHTO H-20 loading requirements, and shall be provided according to ASTM A48.

2.2.4. Basin Solid Lid (above ground system design): Solid lids shall be PVC plate with pick holes. Covers to be cut as required for top inlet roof drain pipes.

2.3. Precast Concrete Structure Components:

2.3.1. Precast concrete vault shall be provided according to ASTM C857 and C858. Precast concrete manhole shall be provided according to ASTM C478.

2.3.2. Vault and manhole joint sealant shall be Conseal CS-101 or approved equal.

2.3.3. If interior concrete baffle walls are provided, baffle walls shall be sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or equal. Contractor to provide sealant material and installation unless completed prior to shipment.

2.3.4. Frames and covers shall be gray cast iron and shall meet AASHTO H-20 loading requirements, and shall be provided according to ASTM A48.

2.3.5. Doors shall have hot-dipped galvanized frame and covers. Covers shall have diamond plate finish. Each door to be equipped with a recessed lift handle. Doors shall meet H-20 loading requirements for incidental traffic, at a minimum, or per project specific traffic loading requirements.

2.3.6. Steps shall be constructed of copolymer polypropylene conforming to ASTM D4101. Steps shall be driven into preformed or drilled holes once concrete is cured. Steps shall meet the requirements of ASTM C478 and AASHTO M199. The ½" Grade 60 deformed reinforcing bar shall meet ASTM A615, where required.

2.3.7. Ladders shall be constructed of aluminum and steel reinforced copolymer polypropylene conforming to ASTM D4101. Ladder shall bolt in place. Ladder shall meet all ASTM C497 load requirements. Ladders provided upon request or where required, and shall not conflict with the operation and accessibility to perform maintenance of the StormFilter.

2.4. Contractor Provided Components (below ground installation):

2.4.1. All contractor-provided components shall meet the requirements of this section, the plans specifications and contract documents. In the case of conflict, the more stringent specification shall apply.

2.4.2. Sub-base: Crushed rock base material shall be six-inch minimum layer of ¾-inch minus rock. Compact undisturbed sub-grade materials to 95% of maximum density at +/-2% of optimum moisture content. Unsuitable material below sub-grade shall be replaced to engineer's approval.

2.4.3. In-situ concrete, if required, shall have an unconfined compressive strength at 28 days of at least 3000 psi, with ¾-inch round rock, a 4-inch slump maximum, and shall be placed within 90 minutes of initial mixing.

2.4.4. Silicone Sealant shall be pure RTV silicone conforming to Federal Specification Number TT S001543A or TT S00230C or Engineer approved.

2.4.5. Grout shall be non-shrink grout meeting the requirements of Corps of Engineers CRD-C588. Specimens molded, cured and tested in accordance with ASTM C109 shall have minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

2.4.6. For manhole systems, Contractor shall connect to 12-inch or 8-inch diameter outlet riser with Fernco flexible coupling, or approved equal.

2.4.7. Rebar used on applicable Catch Basin & Roof Drain systems shall meet ASTM A615M Grade 420 (60 ksi) or as otherwise specified in the general technical specifications.

2.4.8. Backfill material shall be ¾-inch minus crushed rock, or approved equal.

3. PERFORMANCE

3.1. Cartridge Operation: Each StormFilter shall contain one or more siphon actuated media filter cartridges that maintain a uniform pressure profile across the face of the filter during operation. At the design flow rate the maximum filter hydraulic loading rate is not to exceed 2.1 gallons per minute per square foot of filter surface area. Stormwater shall enter the filter cartridges through sides and shall flow through the filter media radially from the outer perimeter to the inner cartridge lumen and shall have an average contact time no less than 38 seconds. These media filter cartridges will incorporate a self-cleaning mechanism to remove accumulated material from the cartridge media surface that is activated when the siphon breaks.

3.2. Documentation of Sediment Removal: The StormFilter system shall have the State of Washington Department of Ecology, General Use Level Designation (GULD) Certification and current approval status from the New Jersey Department of Environmental Protection (NJDEP).

3.3. Cartridge Sediment Loading: Filter cartridges shall be of a design that has demonstrated a minimum sediment retention capacity of 22 pounds of silty loam per cartridge in laboratory tests without a reduction in hydraulic capacity. Laboratory data shall be corroborated with field observations/data demonstrating equivalent or improved longevity without impacting normal hydraulic performance of the StormFilter. All laboratory and field tests submitted in support of this specification must have undergone peer review by outside entity other than Contech.

3.4. Overflow:

3.4.1. Vault Configuration: StormFilter shall have a baffled, non-siphoning internal overflow with a minimum capacity of 1.8 cfs.

3.4.2. Manhole Configuration: The filter system will have a baffled, non-siphoning internal overflow with a minimum of 1.0 cfs capacity.

3.4.3. Peak Diversion Configuration: Each StormFilter shall include an internal, offline overflow bypass. Water first enters an inlet bay that is separate from the cartridge bay and separate from the outlet bay. Low flows travel from the inlet bay, through a transfer opening and into the cartridge bay. High flows enter the outlet bay by topping a weir separating the inlet and outlet bay. Flow rates beyond the treatment design flow shall bypass, and not enter the cartridge bay.

3.4.4. Catch Basin Configuration: Each StormFilter shall include an internal, offline overflow bypass.

Water enters through the grate into the inlet bay that is separate from the cartridge bay and separate from the outlet bay. Low flows travel from the inlet bay, through a transfer opening and into the cartridge bay. High flows enter the outlet bay by topping the baffled weir separating the inlet and outlet bay. Flow rates beyond the design flow (overflow) will not enter the cartridge bay. Minimum of 0.5 cfs overflow capacity.

3.4.5. Roof Drain Configuration: Minimum of 1 cfs overflow capacity.

3.4.6. Infiltration Manhole Configuration: The filter system will have a baffled, non-siphoning internal overflow with a minimum of 1.0 cfs capacity.

3.5. Linear Grate Configuration Vault Access: All portions of the vault, inlet bay, outlet bay and filtration bay shall be directly accessible from the surface through removable grated openings or solid covers.

4. EXECUTION

4.1. Precast Concrete Structure:

4.1.1. Set precast structure on crushed rock base material that has been placed in maximum 6-inch lifts, loose thickness, and compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor compaction test, ASTM D698, at moisture content of +/-2% of optimum water content.

4.1.2. Structure floor shall slope 1/4 inch maximum across the width and slope downstream 1 inch per 12 foot of length. For manholes "Length" is defined by a line running from the invert of the outlet through the center of the manhole and "width" is the perpendicular to the "length". Structure top finish grade shall be even with surrounding finish grade surface unless otherwise noted on plans.

4.1.3. Inlet and outlet pipes shall be stubbed in and connected to precast concrete structure according to Engineer's requirements and specifications. All connections to be sealed to minimize water intrusion. If grout is used, Contractor to grout all inlet and outlet pipes flush with or protruding up to 2 inches into interior of structure.

4.1.4. When required, ballast shall be placed to the dimensions specified by the engineer and noted on the data block. Ballast shall not encase the inlet and/or outlet piping. Provide 12" clearance from outside diameter of pipes.

4.2. Steel Catch Basin:

4.2.1. Catch basin floor shall slope 1/4 inch maximum across the width and slope downstream 1 inch per 12 foot of length. Catch basin top finish grade shall be even with surrounding finish grade surface unless otherwise noted on plans.

4.2.2. Contractor shall prevent sediment and debris from entering the filter unit during construction.

4.2.3. If necessary, the inlet chamber may be filled with clean water to assist in preventing flotation during construction until the structure is backfilled and the concrete collar is poured.

4.2.4. Catch basin outlet shall be connected to downstream (and upstream, if applicable) piping using a flexible-type coupling.

4.2.5. Concrete perimeter slab shall be constructed 1 foot wide and 6 inches thick. Slab shall include two #4 rebar hoops with minimum 6-inch overlap at closure. Allow 2-inch vertical spacing between hoops and minimum 2-inch clearance from concrete surfaces, or as directed by the engineer.

4.3. Clean Up:

4.3.1. Remove all excess materials, rocks, roots, or foreign material, leaving the site in a clean, complete condition approved by the engineer. The project site shall be clean and free of dirt and debris and the inlet/outlet chamber(s) and filter chamber(s) shall be free of construction debris and sediment before the allowing runoff to enter and place the system in operation. All filter components shall be free of any foreign materials including concrete and excess sealant.

4.3.2. Where applicable, Contractor shall remove the temporary filter fabric around the inlet grate to place the system in operation.

4.3.3. Where required, the 4-inch cleanout plug in the overflow weir wall shall remain in place for proper operation of the system.

4.4. Filter Cartridges:

4.4.1. Filter cartridges shall be delivered installed in the structure, unless otherwise agreed upon with Contech. Contractor shall take appropriate action to protect the cartridges from sediment and other debris during construction. The method ultimately selected shall be at Contractor's discretion and Contractor's risk. Some methods for protecting the cartridges include, but are not limited to:

4.4.1.1. Remove cartridges from the structure and store appropriately. Cartridges shall be reinstalled to operate according to 4.4.2 (see below).

4.4.1.2. If structure is equipped with underdrain bypass piping, Contractor may leave cartridges in the vault and allow stormwater entering collection system to bypass filter bay through underdrain bypass piping.

4.4.1.3. Leave cartridges in the structure and plug inlet and outlet pipe to prevent stormwater from entering the vault, and provide means for stormwater to bypass the StormFilter.

4.4.2. Filter cartridges shall not be placed in operation until the structure is clean and the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the StormFilter. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediments. Contact Contech to assist with system activation and/or inspect the system for proper installation once site is clean and stabilized.

4.5. Contractor to install filter cartridges. Specifications for alternate cartridge installation methods available by contacting Contech directly.

4.5.1. Filter Cartridges with ¼-Turn Connector Fittings: Tape shall be cleanly and completely removed from manifold fitting openings. ¼-turn connects shall be glued and inserted into all manifold fittings to be equipped with a filter cartridge. Filter cartridges shall be turned onto the connector until they reach the hard stop on the connector – approximately ¼ revolution, with care to not "over turn" the cartridge, or turn with such force to damage the hard stop mechanism. Plugs shall be inserted without glue in all manifold fittings not equipped with a filter cartridge.

5. INSPECTION AND MAINTENANCE

5.1. Maintenance and Inspection shall be in performed in accordance with Contech's recommendations for maintenance and inspection.

5.2. Maintenance and inspection intervals shall be per Contech's recommendations, or per the approving/local jurisdiction/agency requirements; whichever is more frequent.

5.3. Surface access for personnel and equipment for inspection and maintenance activities shall be provided.

END OF SECTION