

# STANDARD SPECIFICATION STORMWATER QUALITY FILTER TREATMENT DEVICE

## PART 1 – GENERAL

### 1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality filter treatment device that separates pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

### 1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures  
ASTM D 4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks  
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections  
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets  
ASTM D 4101: Specification for Copolymer steps construction

### 1.3 SHOP DRAWINGS

Shop drawings are to be submitted with each order to the contractor then forwarded to the consulting engineer. Shop drawings are to detail the precast concrete and/or fiberglass (FRP) components required and the sequence for installation.

### 1.4 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

## PART 2 – PRODUCTS

### 2.1 GENERAL

2.1.1 The device shall be circular or rectangular and constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications. Alternatively, the device shall be constructed of fiberglass (FRP), installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.1.2 Fiberglass Insert (Cartridge Deck) The concrete device shall include a fiberglass insert bolted and sealed watertight inside the concrete chamber. Alternatively, the fiberglass device shall include a fiberglass insert bolted and/or chemically welded watertight inside the fiberglass chamber. The fiberglass insert shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges; (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be eleven 2.75-inch diameter elements, and alternatively ninety-one 0.75-inch diameter elements. The length of each filter element

shall be a minimum 18 inches and a maximum 54 inches. The dry weight of each cartridge shall not exceed 25 pounds, and shall allow for manual installation. Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck, Each cartridge shall be held fast by a lid that is threaded onto the receptacle. The maximum treatment flow rate of a cartridge shall be controlled by an orifice in the lid. The maximum treatment flow rate per cartridge shall be 50 gpm for a standard cartridge and 25 gpm for a draindown cartridge.

2.1.4 Backwashing Cartridges Filter cartridges shall allow for use of a manual backwashing or rinsing procedure to restore flow and sediment capacity and extend cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants A vertical pipe (maintenance access pipe) or weir structure shall contain a large opening through the cartridge deck and thereby provide access for removal of accumulated floatable pollutants and sediment.

2.1.6 Internal Bypass and Pressure Relief The FRP insert shall be fitted with one or two pressure relief pipes. For devices that are installed off-line, the pressure relief pipe shall have adequate hydraulic capacity to convey the water quality treatment flow rate in case of full occlusion of filter cartridges. For devices that are installed in-line, the pressure relief pipe(s) shall have adequate hydraulic capacity to convey the bypass flow rate as specified by the design engineer.

2.1.7 Bend Structure The device shall be able to be used as a bend structure in the stormwater conveyance system

2.1.8 Double-Wall Containment of Hydrocarbons The precast concrete device shall provide double-wall containment for hydrocarbon storage by means of an inner wall of fiberglass, to a minimum depth of 12 inches below the cartridge deck. Alternatively, a fiberglass (FRP) device does not require double-wall containment as fiberglass is resistant to hydrocarbons.

2.1.9 Separator Skirt The device shall provide a separator skirt that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The separator skirt shall serve as a baffle to protect the membrane filter elements from contamination by floatables and coarse sediment.

2.1.10 Sump The device shall provide a minimum 2 feet of sump below the bottom of the membrane filter elements for sediment accumulation, unless otherwise specified by the design engineer.

2.2 PRECAST CONCRETE SECTIONS. All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications.

2.3 GASKETS. All gaskets used for the concrete joints shall be manufactured using neoprene or nitrile rubber gaskets, to prevent deterioration from presence of captured petroleum hydrocarbons. Mastic sealants or butyl tape are not an acceptable alternative as they are prone to leakage of petroleum hydrocarbons.

2.4 FRAME AND COVER. Frame and covers shall be manufactured from cast-iron and embossed with the name of the device manufacturer or the device brand name.

2.5 CONCRETE. All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.6 FIBERGLASS. The fiberglass portion of the water treatment device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.7 STEPS. Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured.

2.8 INSPECTION. All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

#### **3.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE**

The installation of a precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes. Selected sections of a general specification that are applicable are summarized below.

3.1.1.1 The precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber section(s)
- transition slab (if required)
- bypass section
- connect inlet and outlet pipes
- riser section and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

3.1.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

3.1.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the stormwater quality treatment device has been constructed, any lift holes must be plugged with mortar.

3.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight.

3.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant

recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

**3.2.1 Fiberglass (FRP) Device Construction Sequence** The installation of the FRP device should conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices. Selected sections of a general specification that are applicable are summarized below.

**3.2.1.1 Structural** Proposed installation details shall conform with all federal, provincial, state, municipal or other local specifications as may be applicable, including all building code requirements.

**3.2.1.2 Water Quality Device Construction Sequence** The water quality FRP is installed in the following sequence:

- Water quality device as delivered to site placed on prepared bedding or slab using spreader bars to avoid lifting chains from contacting sides of tank. Do not drop, roll or slide vessel.
- Backfill using approved back fill material
- Pour anti-buoyancy slab
- Connect inlet and outlet pipes
- Riser sections and/or transitions (if required and if shipped separately)
- Frame and access cover

**3.2.1.3 Frame and Cover Installation** No direct structural connection shall be permitted to any FRP maintenance access surface riser pipe. No vertical structural connection shall be permitted to any FRP component under any circumstances unless approved by the manufacturer.

A minimum 1-inch (25 mm) gap shall be left around and above any required FRP maintenance access surface risers (i.e. not a buried installation), with this gap filled with pea gravel or approved fill material against the surrounding structure that must support the frame and cover in its entirety.

### **3.3 MAINTENANCE ACCESS PIPE AND PRESSURE RELIEF PIPE INSTALLATION**

In some instances the maintenance access pipe (or weir) and pressure relief pipes will require attachment to the cartridge deck at the job site, rather than at the precast or fiberglass fabrication facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

**3.4 FILTER CARTRIDGE INSTALLATION** Filter cartridges shall be installed in the cartridge deck after the site has stabilize, unless otherwise specified by the design engineer.

## **PART 4 – QUALITY ASSURANCE**

### **4.1 INSPECTION AND MAINTENANCE**

4.1.1 The manufacture shall include an Owners Manual upon request.

4.1.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines.

**4.2 REPLACEMENT FILTER CARTRIDGES** When replacement filter cartridges are required, only cartridges approved by the manufacturer for use with the stormwater quality filter device shall be installed.