



# Aqua-Filter™ Specifications

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## **I. GENERAL**

This specification shall govern the performance, materials and fabrication of the Stormwater Filtration Systems.

## **II. SCOPE OF WORK**

The Stormwater Filtration System shall be provided by AquaShield™, Inc. 2733 Kanasita Drive, Chattanooga, TN 37343 (423-870-8888) and shall adhere to the following material and performance specifications at the specified design flows, and storage capacities.

## **III. MATERIALS**

A. The Stormwater Filtration System shall be made from high-density polyethylene (HDPE) resins meeting the following requirements:

- 1) HDPE Material – The HDPE material supplied under this specification shall be high density, high molecular weight as supplied by manufacturer. The HDPE material shall conform to ASTM D3350-02 with minimum cell classification values of 345464C.
- 2) PHYSICAL PROPERTIES OF HDPE COMPOUND
  - a) Density - the density shall be no less than 0.955 g/cm<sup>3</sup> as referenced in ASTM D 1505.
  - b) Melt Index - the melt index shall be no greater than 0.15 g/10 minutes when tested in accordance with ASTM D 1238- Condition 190/2.16.
  - c) Flex Modulus - flexural modulus shall be 110,000 to less than 160,000 psi as referenced in ASTM D 790.
  - d) Tensile Strength at Yield - tensile strength shall be 3,000 to less than 3,500 psi as referenced in ASTM D 638.
  - e) Slow Crack Growth Resistance shall be greater than 100 hours (PENT Test) as referenced in ASTM F 1473 or greater than 5000 hours (ESCR) as referenced in ASTM D 1693 (condition C).

f) Hydrostatic Design Basis shall be 1,600 psi at 23 degrees C when tested in accordance with ASTM D 2837.

- Color – black with minimum 2% carbon black.

B. REJECTION - The Stormwater Filtration System may be rejected for failure to meet any of the requirements of this specification.

#### **IV. PERFORMANCE**

- A. The Stormwater Filtration System shall include a \_\_\_\_\_ - foot inner diameter circular Swirl Concentrator™ to pre-treat the incoming water. A tangential inlet shall be provided to induce a swirling flow pattern that will cause settleable solids to accumulate in the bottom center of the chamber in such a way as to prevent re-suspension of captured particles. An arched baffle wall shall be provided in such a way as to prevent floatable liquids and solids from exiting the Swirl Concentrator™.
- B. The Stormwater Filtration System shall include a \_\_\_\_\_ - foot inner diameter Filtration Chamber with a filter bed no less than \_\_\_\_\_ - feet long and \_\_\_\_\_ -feet in diameter containing \_\_\_\_\_ -filter containers. A distribution system shall be provided in such a way as to evenly distribute low flows across the filter containers. An overflow bypass shall be provided in such a way as to allow flows larger than the filter bed's design capacity to bypass the filter bed and exit the Filtration Chamber. The filter media shall be manufactured from natural materials as provided by AquaShield™ Inc. and be capable of removing up to 80% total suspended solids, and 95% total petroleum hydrocarbons, and 80% phosphorus, and 90% zinc on a net annual basis.
- C. The Stormwater Filtration System shall have a sediment storage capacity of \_\_\_\_ cubic feet and be capable of capturing \_\_\_\_ gallons of petroleum hydrocarbons. The system shall have a peak hydraulic flow capacity of \_\_\_\_ cubic feet per second (cfs) and a water quality filtration flow rate of \_\_\_\_ cfs.
- D. Maintenance access to the treatment system shall be provided via 30-inch (ID) man-way(s) and one (1) 40-inch (ID) man-way with ladder (reduced to 30-inch at grade) such that all maintenance areas are accessible.

## **V. SWIRL CONCENTRATOR CONSTRUCTION**

- A. The Swirl Concentrator shall be constructed of solid wall high-density polyethylene (HDPE) ASTM F 714 cell class 345464 c. For sizes above 63-inches, the treatment chamber shall be constructed from profile wall HDPE ASTM F 894 RSC 250 or solid wall pipe.
- B. The bottom thickness of the Swirl Concentrator will be determined in accordance with ASTM D 1759. Calculations must be provided to justify the thickness of the bottom.
- C. The inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice.
- D. All Swirl Concentrator inlet connections larger than 4-inch nominal OD pipe shall be butt fusion welded, electro-fusion welded or flange connected. For 4-inch OD pipe and smaller threaded transition fittings can also be used as well as the acceptable connections listed.
- E. Top of the Swirl Concentrator shall be built to the requirements of the drawings. If air testing is required, flanged tops or man-ways will be required.
- F. Reinforced concrete pads spanning the Swirl Concentrator will be required when the Stormwater Filtration System is used in traffic areas. A traffic rated frame and cover will be required. A professional engineer shall approve the design of the concrete pad. Their calculations must be included in the submittal.
- G. The manufacturer upon request can supply typical anti-flotation/buoyancy calculations. In addition, typical drawings of the AquaShield™ Stormwater Treatment System with concrete anti-flotation structures can also be provided. Anti-flotation structure design and approval are ultimately the responsibility of the specifying engineer. The contractor shall provide the anti-flotation structure.

## **VI. FILTRATION CHAMBER CONSTRUCTION**

- A. The Filtration Chamber shall be constructed from profile wall HDPE ASTM F 894 RSC 250 pipe or solid wall pipe.
- B. The inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice.

- C. All Filtration Chamber outlet connections larger than 4-inch nominal OD pipe shall be butt fusion welded, electro-fusion welded or flange connected. For 4-inch OD pipe and smaller threaded transition fittings can also be used as well as the acceptable connections listed.
- D. Ends of the Filtration Chamber shall be built to the requirements of the drawings. If air testing is required, flanged tops or man-ways will be required.
- E. Reinforced concrete pads spanning the Filtration Chamber should be used in traffic loading situations when required by Specifying Engineer. A traffic rated frame and cover will be required for each man-way. A professional engineer shall approve the design of the concrete pad. The Engineer's calculations must be included in the submittal.
- F. Contractor, if required, shall provide anti-floatation and/or anti-settling anchors, with appropriate straps and/or connection devices.

## **VII. INSTALLATION**

### **A. Excavation and Bedding**

The trench and trench bottom shall be constructed in accordance with ASTM D-2321, Section 6, Trench Excavation, and Section 7, Installation. The HDPE Stormwater Filtration System shall be installed on a stable base consisting of 12-inches of Class I stone materials (angular, crushed stone or rock, crushed gravel; large void content, containing little or no fines) as defined by ASTM D2321, Section 5, Materials, and compacted to 95% proctor density. Additional bedding shall be tamped uniformly under the lower portion of the filtration chamber up to the spring-line to provide adequate support. All required safety precautions for the Stormwater Filtration System installation are the responsibility of the Contractor.

### **B. Backfill Requirements**

Backfill materials shall be Class I or II stone materials, (well graded gravels, gravelly sands; containing little or no fines) as defined by ASTM D2321, Section 5, Materials and compacted to 90% proctor density. Class I materials are preferred. Backfill and bedding materials shall be free of debris. Backfilling shall be done to conform to ASTM 1759, Section 4.2, "Design Assumptions" Backfill shall extend at least 2 feet beyond the edge of the Stormwater Filtration System and for the full height to sub-grade and extend laterally to undisturbed soils.

### **C. Pipe Couplings**

Couplings to and from the Stormwater Treatment System shall be Fernco<sup>®</sup> or Mission<sup>™</sup> type flexible boot with stainless steel tension bands. A metal sheer guard should be used when available.

## **VIII. DIVISION OF RESPONSIBILITY**

### **A. Stormwater /System Manufacturer**

The Manufacturer shall be responsible for delivering the Stormwater Filtration System to the site. The system includes the Swirl Concentrator<sup>™</sup> with all internal components and service access riser to surface, the Filtration Chamber with all internal components, service access risers to surface, filter media, pipe coupling between the Swirl Concentrator<sup>™</sup> and Filter Chamber, and manhole frames and covers.

### **B. Contractor**

The Contractor shall be responsible for preparing the site for the system installation including, but not limited to, temporary shoring, excavation, cutting and removing pipe, new pipe, bedding, and compaction. The Contractor shall be responsible for furnishing the means to lift the system components off the delivery trucks. The Contractor shall be responsible for providing any concrete anti-floatation/anti-creep restraints, anchors, collars, etc. with any straps or connection devices required. The Contractor shall be responsible for field cutting, if necessary, HDPE service access risers to grade. The Contractor shall be responsible for sealing the pipe connections to the Stormwater Filtration System, backfilling and furnishing all labor, tools, and materials needed.

## **IX. SUBMITTALS**

The Contractor shall be provided with dimensional drawings and, when specified, utilize these drawings as the basis for preparation of shop drawings showing details for construction and reinforcing. Shop drawings shall be annotated to indicate all materials to be used and all applicable standards for materials, required tests of materials and design assumptions for structural analysis. Shop drawings shall be prepared at a scale of not less than 1/4 inch per foot. Three (3) hard copies of said shop drawings shall be submitted to the Specifying Engineer for review and approval.

## **X. QUALITY CONTROL INSPECTION**

### **A. Materials**

The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places. The sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections, which have been damaged beyond repair during delivery, will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the Contractor's expense.

### **B. Inspection**

All sections shall be inspected for general appearance, dimensions, soundness, etc.

### **C. Defects**

Structural defects may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs will be made. The Specifying Engineer before final acceptance shall carefully inspect repairs.