

## Section [ \_\_\_\_\_ ] Stormwater Quality In-Line Downspout Filtration Device

### **PART 1 – GENERAL**

#### 01.01.00 Purpose

The purpose of this specification is to establish generally acceptable criteria for in-line devices used for filtration of stormwater runoff in structure downspouts. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

#### 01.02.00 Description

Stormwater In-Line Downspout Filter (SWIDF) units are used for filtration of stormwater runoff in structure downspouts. The SWIDF is a cylindrical filter system composed of an external housing and internal cylindrical filter insert which is wrapped with various filter screens. The SWIDF is to be used for vertical flowing runoff only. Runoff enters the SWIDF from the top and flows into the area between the housing and internal cylinder. It then flows horizontally through the filter screen to the center bypass area and flow vertically down out of the housing. The SWIDF also utilizes a hydrocarbon boom wrapped around the bottom of the filter insert which absorbs hydrocarbons during low flows. The SWIDF has an internal bypass feature located in the center of the internal cylinder; when water flow exceeds the capacity of the filter screen or filter media it rises to a level where it enters large orifices at the top of the inner cylinder and bypasses directly out the bottom of the housing .

#### 01.03.00 Manufacturer

The manufacturer of the SWIDF device 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 (5) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the SWIDF(s) shall be a filter device manufactured by Bio Clean Environmental Services, Inc., or assigned distributors or licensees. Bio Clean Environmental Services Inc. can be reached at:

Corporate Headquarters:  
398 Via El Centro  
Oceanside, CA 92058  
Phone: (760) 433-7640  
Fax: (760) 433-3176  
[www.biocleanenvironmental.net](http://www.biocleanenvironmental.net)

#### 01.04.00 Submittals

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

## 01.05.00 Work Included

- 01.05.01 Specification requirements for installation of SWIDF.
- 01.05.02 Manufacturer to supply completely assembled SWIDF(s):
- Exterior filter housing
  - Interior filter cylinder insert
  - Filter screen
  - Hydrocarbon filter boom
- 01.05.03 Standard flexible adapters with clamps will be supplied with each filter unit, but it is the responsibility of the contractor to install the correct type of gaskets and couplings per local regulations. Note: standard adapters provided not acceptable in all jurisdictions. Please reference local regulations.

## 01.06.00 Reference Standards

ASTM A 240	Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM D 3789	Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
ASTM D 4491	Water Permeability Geotextiles by Permittivity
ASTM D 4632	Grab Breaking Load and Elongation of Geotextiles
ASTM D 4833	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 5919	Determination of Adsorptive Capacity of Activated Carbon by Micor-Isotherm Technique for Absorbents at ppb Concentrations
ASTM F 716	Testing Sorbent Performance of Absorbents
ASTM F 726	Sorbent Performance of Absorbents

## **PART 2 – COMPONENTS**

### 02.01.00 Internal Filter Components

- 02.01.01 Filter Cylinder shall be manufactured using only Stainless Steel components with a minimum type 304 complying with the requirements of ASTM A 240, with a top and bottom thickness of 14 gauge (0.078”) and a wall thickness of 20 gauge (0.038”).
- 02.01.02 Mesh Screen shall be manufactured using only Stainless Steel wire mesh with a minimum type 304 complying with the requirements of ASTM A 240, with a wire diameter of 0.01mm and with a number 40 sieve size (420µm).

- 02.01.03 Hydrocarbon Filter Boom
- Filter media shall be made up of granulated oil absorbing polymers that have been tested in accordance with section 11.2 of ASTM F 716.07. Filter media must be proven to absorb 180% of its weight within a 300 second contact time, and at this absorption percentage the physical increase in the size of the granules is not more than 50%.
  - Filter netting shall be 100% Polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- 02.01.04 Stainless Steel - All metal components shall be Stainless Steel. No galvanized or other zinc or copper containing treatments or alloys should be used.

## 02.02.00 External Filter Components

- 02.02.01 Filter Housing shall be manufactured using only Stainless Steel components with a minimum type 304 complying with the requirements of ASTM A 240, with a wall thickness of 1/8" (0.125") and a bottom ring of housing thickness of 10 gauge (0.134")
- 02.02.02 Handles shall be manufactured using 1/2" round Stainless Steel components with a minimum type 304 complying with the requirements of ASTM A 240.
- 02.02.03 Adapters
- Flexible Adapters/Couplings shall be made of an elastomeric compound that meets the requirements of ASTM D5926, C1173 and applicable portions of ASTM C443, C425, C564, CSA B602 and D1869, and must be leak-proof, root-proof and resistant to chemicals, ultraviolet rays and fungus growth. Specific jurisdictions may require a shielded or alternate type of adapter.
  - Stainless Steel clamps must be corrosion-resistant and rust-proof.
- 02.02.04 Finishes shall consist of thermoplastic coating powder that meets standards in Table 1;

**Table 1**

Recommended Coating Thickness		300-750 $\mu$
Appearance		Smooth/Glossy
Gloss	ISO 2813	70
Impact Strength	Gardner (drop weight) ISO 6272 Direct 23°C (3mm plate) Indirect 0°C (3mm plate)  Gardner (drop weight) ISO 6272 Direct 23°C (0.7mm plate) Indirect 0°C (0.7mm plate)	2.7 Joules 18.0 Joules  > 27 Joules > 27 Joules
Abrasion	Taber ASTM D4060/84 H18, 500g load, 1000 cycles	60 mg weight loss
Salt Spray	ISO 7253 Steel - Scribed  - Unscribed Aluminium - Scribed - Unscribed	Results after 1000 hours Loss of adhesion less than 10mm from scribe. Under film corrosion 2-3mm No loss of adhesion No loss of adhesion No loss of adhesion
Chemical Resistance*	- Dilute Acids 60°C - Dilute Alkali 60°C - Salts (except peroxides) 60°C - Solvents 23°C	Good Good Good Poor
Adhesion	PSL, TM 19	A-1
Weathering	QUV ASTM G53-77  Florida 45° facing South	2000 hrs - No significant change in color or loss of gloss.  3 years - No significant change in color or loss of gloss.
<u>Burning Characteristics</u>		
Ignitability	BS476: Pt5: 1979 500 micron coating	P - not easily ignitable
Surface spread of flame	BS476: Pt7: 1979 500 micron coating	Class 1
Fire Propagation	BS476: Pt6: 1989 500 micron coating	I = 0.2
Flammability	UL94	V <sub>0</sub> (see also Properties of Material)
Safe Working Temperature	(Continuous in air)	60°C max

## **PART 3 – PERFORMANCE**

### 03.01.00 General

- 03.01.01 Function - The SWIDF has no moving internal components and functions based on gravity flow, unless otherwise specified. The SWIDF is composed of an inner and outer cylinder. The outer cylinder is housing for the inner cylinder, which is perforated and wrapped with a filter screen. The bottom of the cylinder is wrapped with a hydrocarbon media boom to remove oils during low flows. The top of the inner cylinder is capped, which forces inflowing water towards the area between the inner and outer cylinders. Water entering this space is forced through the filter screens and /or hydrocarbon filter boom material. As water passes through the filter screens and/or hydrocarbon filter boom, particulate matter is captured and stored within the treatment area between the inner and outer cylinders. The upper part of the inner cylinder contains a plurality of multiple, larger openings which are not wrapped to allow water flows greater than the peak treatment flow rate to flow through the apparatus unimpeded, as a high flow bypass. Coverage of the SWIDF is to provide full treatment of influent stormwater, at rated flows.
- 03.01.02 Pollutants - The SWIDF will remove and retain debris, sediments, metals and hydrocarbons entering the filter during frequent storm events and specified flow rates.
- 03.01.03 Treatment Flow Rate and Bypass - The SWIDF operates in-line. The device has an internal bypass that is capable of directing flows in excess of the treatment flow rate. The SWIDF will treat 100% of the required water quality treatment flow based on Minimum Filtration Capacities listed in Table 2. The SWIDF will bypass any flow rate greater than the Filtration Capacity Requirements. The minimum bypass capacities are listed in Table 2.
- 03.01.04 Pollutant Load – The SWIDF must be designed to have minimum storage capacity of 0.23 cubic feet of solids and 1.62 pounds of hydrocarbons.
- 03.01.05 Performance Protocol and Results - The test setup and procedure shall be in accordance with IAMPO standards, except the bypass shall remain open and unplugged. A quantity of 20 mesh sand, equivalent in volume to the unit housing capacity, and randomly containing four halved 12 ounce paper cups shall be prepared. The mixture shall be gradually added to the system upstream of the filter at a rate resulting in the feed sand concentration approximately 150mg/L at a flow rate equivalent to 25% of the maximum Filtered Flow Capacity listed for the appropriate downspout model number in Table 2. The system shall be run at this flow rate for 20 minutes following the addition of the solids without having the water level backup as noted in the view port. The filter shall be capable of capturing a minimum of 60% of the sand.

### 03.02.00 Lab Test Performance

At a minimum, the SWIDF shall meet the performance standards in Table 2.

**Table 2**

MODEL NUMBER	INLET INSIDE DIAMETER		FILTER OUTSIDE DIAMETER		STORAGE CAPACITY		FILTERED FLOW		BYPASS FLOW	
	in.	cm.	in.	cm.	cf	L	gpm	lps	gpm	lps
BC-DF4	4	10.16	6.625	16.828	0.09	2.55	249	15.709	566	35.709
BC-DF6	6	15.24	8.625	21.908	0.21	5.95	509	32.113	1006	63.469
BC-DF8	8	20.32	8.625	21.908	0.21	5.95	509	32.113	1006	63.469
BC-DF10	10	25.40	12.750	32.385	0.77	21.80	1145	72.238	2264	142.84
BC-DF12	12	30.48	12.750	32.385	0.77	21.80	1145	72.238	2264	142.84

## **PART 4 - EXECUTION**

### 04.01.00 General

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

### 04.02.00 Installation

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

- 04.02.01 The SWIDF will be securely installed inline with existing piping, with contact surfaces sufficiently joined together. The filter is connected to downspout piping with the use of 4", 6", or 8" approved couplers or adapters, secured with metal bands. The SWIDF shall be installed in a vertical position, pursuant to the manufacturer's recommendations and the details, shop drawings, and these specifications.
- A. Remove couplers or adapters from both ends of the SWIDF.
  - B. Measure the exact height of the SWIDF, approximately 18"
  - C. Cut the existing piping ¼" longer than the exact height of the SWIDF.
  - D. Place the couplers or adapters on the top and bottom of the existing pipe, sliding them all the way up and down, even with the pipe.
  - E. Using the handles, place the filter in line with the existing pipe. Slide the couplers or adapters back in place over the filter and tighten the clamps securely.

#### 04.03.00 Shipping, Storage and Handling

- 04.03.01 Shipping – SWIDF shall be shipped to the contractor’s address and is the responsibility of the contractor to transport the unit(s) to the exact site of installation.
- 04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the SWIDF 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 SWIDF(s) shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The SWIDF shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor’s workplace safety professional recommendations.

#### 04.04.00 Maintenance and Inspection

- 04.04.01 Inspection – After installation, the contractor or plumber shall demonstrate that the SWIDF has been properly installed at the correct location(s), elevations, and with appropriate seals and gaskets. All components associated with the SWIDF and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the SWIDF has been installed per the manufacturer’s specifications and recommendations.
- 04.04.02 Maintenance – The manufacturer recommends cleaning and maintenance a minimum of twice a year and replacement of the Hydrocarbon Filter Boom one per year. The cleaning and maintenance shall be performed by a company engaged in stormwater filtration maintenance for a minimum of 5 years. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the SWIDF. 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, and the condition of the filter.
- 04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the SWQIDF shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.



## **PART 5 – QUALITY ASSURANCE**

### **05.01.00 Warranty**

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

### **05.02.00 Performance Certification**

The SWIDF manufacturer shall submit to the Engineer of Record a “Manufacturer’s Performance Certificate” certifying the SWIDF is capable of achieving the specified removal efficiency for suspended solids as set by the International Association of Plumbing and Mechanical Officials (IAMPO) guide criteria for in-line devices for downspout filtration – IAMPO IGC 214-2008 as revised October, 2008. Devices without suspended solids testing done by an IAMPO approved company and/or approved by the IAMPO will not be accepted.