

KOENIG EQUIPMENT, INC.  
STORM WATER OPERATION AND MAINTENACE MANUAL

Owner: KOENIG EQUIPMENT  
0 SLOAN DRIVE  
FRANKLIN, INDIANA 46131

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## **INSPECTION & MAINTENANCE**

The property owner will have the obligation to inspect and maintain the storm water management facilities as described below. City of Franklin will have the right to inspect the on-site storm water management facilities to confirm that they are functioning properly and being maintained. Should the City of Franklin notice an issue with the storm water management facility they should notify the property owner immediately.

The inspections shall be performed by the property owner or a qualified individual who is familiar with these types of facilities and their operations. It will be the responsibility of this person to complete the maintenance checklist (a copy can be found at the back of this manual) and be able to provide copies to the City of Franklin. This person shall also evaluate the effectiveness of the plan at least once per year and adjust the plan as needed. Inspection and maintenance of the storm water facilities should be performed at least four (4) times each year and after every major storm event consisting of 1 inch of rainfall or more. The purpose of the inspection is to identify operational conditions including conditions of berms, outlet structures and overall facility. Inspections are also to identify effectiveness of regularly scheduled preventative maintenance procedures and the associated timing and implementation of corrective measures.

It is recommended that all inspections be performed after all rain events have stopped and the basins have been drained back to the normal condition. No person should enter into a storm water facility while it is still draining. The inspector should look for clogging, excessive debris and sediment accumulation. If repairs to the system are to be made, a report shall first be submitted to the City of Franklin outlining the scope of the remediation work and the schedule with which the work will be done.

# KOENIG EQUIPMENT, INC.

## Stormwater Management Facilities

### Quarterly Report

**Check All That Apply**

Date: \_\_\_\_\_

All maintenance has been accomplished for this quarter according to the Maintenance Manual and as per plans.

Copy of the Stormwater Management Maintenance Checklist is attached.

Exceptions and Notes:

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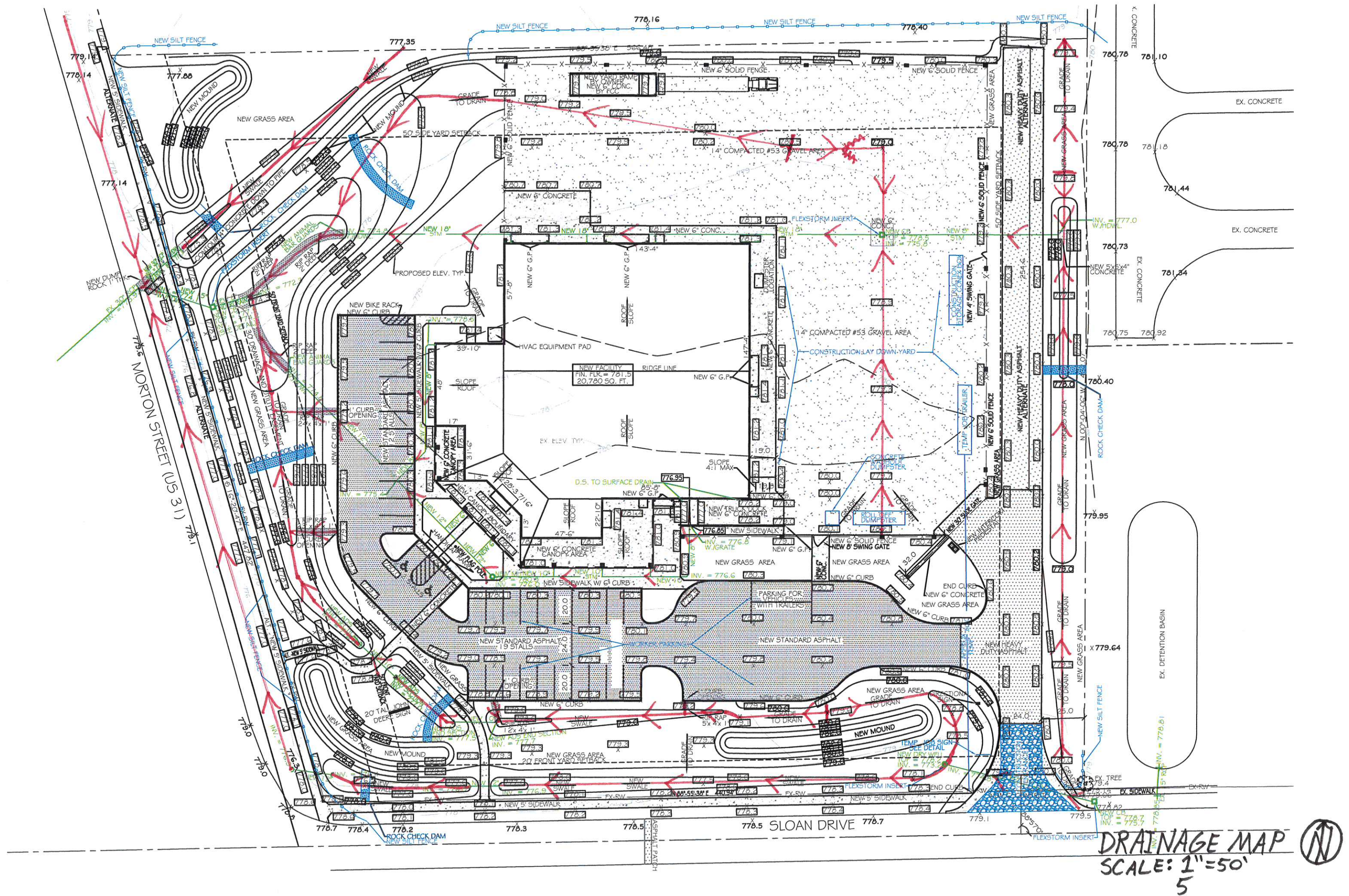
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\_\_\_\_\_  
**Signed**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Print Name**







## Stormwater System Inspection Checklist

Owner: Koenig Equipment Inc.

Inspector: .....

Date/Time .....

General Conditions	
Maintenance Item	Required Action
1. Encroachment into Stormwater System	Check area for unpermitted construction that affects system, contact owner to remedy situation
2. Complaints from Residents	Review and investigate complaints, take necessary actions, respond to resident
3. Public Hazards (describe below)	Identify any public hazards in and around the stormwater system, notify county engineer
4. Street Cleanliness	Determine date of last street cleaning, schedule cleaning if necessary
5. Condition of Vegetation	Check for damaged or dying plantings, check length of grass, schedule remedial actions if necessary

### Specific Comments

Comments	

## **Stormwater System (Cont.) Inspection Checklist**

<b>Catch Basins</b>	
<b>Maintenance Item</b>	<b>Required Action</b>
1. Presence of trash	Remove all trash
2. Presence of petroleum products	Remove petroleum products with absorbent material
3. Measurement of sediment	Measure sediment and record on inspection record, schedule cleaning if more than 50% full
4. Condition of catch basin	Check for cracks, missing concrete, and damage to structure
5. Condition of inlet and outlet pipes	Check for cracks, gaps, and damage to pipes

### **Specific Comments**

<b>Structure No.</b>	<b>Comments</b>
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	

## **Stormwater System (Cont.) Inspection Checklist**

<b>Manholes</b>	
<b>Maintenance Item</b>	<b>Required Action</b>
1. Presence of trash	Remove all trash, determine source and remedy cause
2. Presence of petroleum products	Remove petroleum products with absorbent material
3. Measurement of sediment	Schedule cleanout, determine source and remedy cause
4. Condition of catch basin	Check for cracks, missing concrete, and damage to structure
5. Condition of inlet and outlet pipes	Check for cracks, gaps, and damage to pipes

### **Specific Comments**

<b>Structure No.</b>	<b>Comments</b>
1	
2	
3	
4	
5	
6	
7	
8	
9	



## **Stormwater System (Cont.) Inspection Checklist**

<b>Outlet Pipe</b>	
<b>Maintenance Item</b>	<b>Required Action</b>
1. Presence of trash	Remove all trash, determine source and remedy cause
2. Presence of petroleum products	Remove petroleum products with absorbent material, determine source and remedy cause
3. Presence of sediment	Schedule cleanout, determine source and remedy cause
4. Condition of Manhole	Check for cracks, missing concrete, and damage to structure
5. Condition of embankment	Check Vegetation and riprap for erosion, schedule remedial action if necessary

### **Specific Comments**

<b>Structure No.</b>	<b>Comments</b>
1	
2	
3	
4	
5	
6	



## **FLEXSTORM™ Inlet Filter Specifications and Work Instructions**

**Product:** FLEXSTORM Inlet Filters

**Manufacturer:** Inlet & Pipe Protection, Inc [www.inletfilters.com](http://www.inletfilters.com)

*A subsidiary of Advanced Drainage Systems (ADS) [www.ads-pipe.com](http://www.ads-pipe.com)*

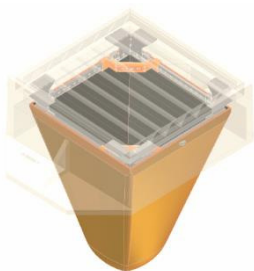
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### **1.0 Description of Work:**

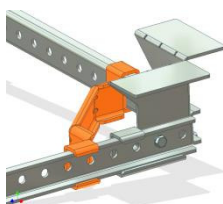
- 1.1 The work covered shall consist of supplying, installing, and maintaining/cleaning of the FLEXSTORM Inlet Filter assembly. The purpose of the FLEXSTORM Inlet Filter system is to collect silt and sediment from surface storm water runoff at drainage locations shown on the plans or as directed by the Engineer. FLEXSTORM PURE, permanent filters, are capable of removing small particles, hydrocarbons, and other contaminants from drainage “hot spots”.

### **2.0 Material:**

- 2.1 The FLEXSTORM Inlet Filter system is comprised of a corrosion resistant steel frame and a replaceable geotextile sediment bag attached to the frame with a stainless steel locking band. The sediment bag hangs suspended from the rigid frame at a distance below the grate that shall allow full water flow into the drainage structure if the bag is completely filled with sediment.



- 2.2 The FLEXSTORM Inlet Filter frame includes lifting handles in addition to the standard overflow feature. A FLEXSTORM Removal Tool engages the lifting bars or handles to allow manual removal of the assembly without machine assistance. The frame suspension system on most rectangular designs is adjustable in 1/2" increments up to 5" per side should the casting or drainage structure have imperfections.

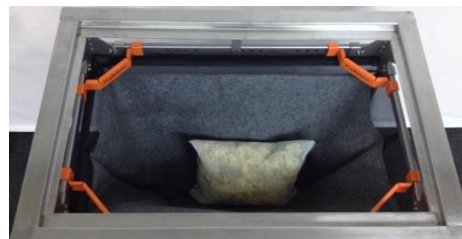




2.3 **FLEXSTORM CATCH-IT** Inlet Filters for temporary inlet protection: The FLEXSTORM CATCH-IT framing is galvanized or zinc plated for corrosion resistance. The “**FX**” Woven Polypropylene filter bag is the design standard, although the “**IL**” Nonwoven geotextile is also available if preferred by the engineer. These products are typically used for temporary inlet protection lasting 3 months (short term road work) to 5 years (residential developments).



2.4 **FLEXSTORM PURE** Inlet Filters for permanent inlet protection: The FLEXSTORM PURE framing is comprised of 304 stainless steel with a 25 year life rating. Multiple filter bags are available: **FX**, **FX+**, **PC**, **PC+**, **LL** and others. The Post Construction “**PC+**” is the design standard consisting of the “**FX**” Woven Polypropylene sediment bag lined with Adsorb-it filter fabric, which is made from recycled polyester fibers. The “**PC+**” includes a replaceable hydrocarbon skimmer pouch strapped to the bottom of the bag for advanced TPH removal.



### 3.0 Filter Bag Specifications and Capabilities:

3.1 Material Properties (taken from manufacturers average roll value):

FLEXSTORM FILTER BAGS	(22" depth)	(12" depth)	Clean Water Flow Rate (GPM/SqFt)	Min A.O.S. (US Sieve)
	STD Bag P/N	Short Bag P/N		
<b>FX: Standard Woven Bag</b>	<b>FX</b>	<b>FX-S</b>	200	40
<b>FX+: Woven w/ Oil Skimmer</b>	<b>FXP</b>	<b>FXP-S</b>	200	40
<b>FXO: Woven w/ Oil Boom</b>	<b>FXO</b>	<b>FXO-S</b>	200	40
<b>PC: Post Construction Bag</b>	<b>PC</b>	<b>PC-S</b>	137	140
<b>PC+: PC w/ Oil Skimmer</b>	<b>PCP</b>	<b>PCP-S</b>	137	140
<b>LL: Litter and Leaf Bag</b>	<b>LL</b>	<b>LL-S</b>	High	3.5
<b>IL: IDOT Non-Woven Bag</b>	<b>IL</b>	<b>IL-S</b>	145	70



3.2 Standard Bag Sizes and Capabilities: Bag Sizes are determined by clear opening dimensions of the drainage structure. Once frame design size is confirmed, Small - XL bag ratings can be confirmed to meet design criteria. Ratings below are for standard 22" deep bags.

Standard Bag Size <sup>6</sup>	Solids Storage Capacity (CuFt)	Filtered Flow Rate at 50% Max (CFS)			Oil Retention (Oz)	
		FX	PC	IL	PC*	PCP**
Small	1.6	1.2	0.8	0.9	66	155
Medium	2.1	1.8	1.2	1.3	96	185
Large	3.8	2.2	1.5	1.6	120	209
XL	4.2	3.6	2.4	2.6	192	370

4.0 **Tested Filtration Efficiency and Removal Rates:** Filtration Efficiency, TSS, and TPH testing performed under large scale, real world conditions at accredited third party erosion and sediment control testing laboratory. (See Full Test Reports at [www.inletfilters.com](http://www.inletfilters.com) )



Inside View of Hopper Agitator



Hopper With Outlet Pipe Leading To Area Inlet



Area Inlet Simulated Showing Influent Discharge From Pipe

4.1 **FLEXSTORM "FX" Filtration Efficiency Test Results:** All testing performed in general accordance with the ASTM D 7351, *Standard Test Method For Determination of Sediment Retention Device Effectiveness in Sheet Flow Application*, with flow diverted into an area inlet. Test Soil used as sediment had the following characteristics with a nominal 7% sediment to water concentration mix. This is representative of a heavy sediment load running off of a construction site.

Soil Characteristics	Test Method	Value	Filtration Efficiency of "FX" FLEXSTORM Bag  82%
% Gravel	ASTM D 422	2	
% Sand		60	
% Silt		24	
% Clay		14	
Liquid Limit, %	ASTM D 4318	34	
Plasticity Index, %		9	
Soil Classification	USDA	Sandy Loam	
Soil Classification	USCS	Silty Sand (SM)	



**4.2 FLEXSTORM “PC” and “PC+” Test Results:** TSS measured on effluent samples in accordance with SM 2540D and TPH in accordance with EPA 1664A.

Product Tested	110 micron Sediment Load	Ave Flow Rate GPM	% TSS Removal	Soil Retention Efficiency
FLEXSTORM PC Sediment Bag	1750 mg/L using OK-110 Silica Sand and Clean Water	23	<b>99.28%</b>	98.96%
		48	<b>99.32%</b>	99.25%
		70	<b>98.89%</b>	98.80%

Product Tested	Street Sweep Sediment Load	Particle Size of Sediment Load	% TSS Removal	Soil Retention Efficiency
FLEXSTORM PC Sediment Bag	2.5% = 100 lbs Sed / 4000 lbs water	.001 mm – 10.0 mm (median 200 micron)	<b>99.68%</b>	95.61%

Product Tested	Hydrocarbon Load	Ave Flow Rate GPM	% TPH Removal	Oil Retention Efficiency
FLEXSTORM PC+	243 mg/L using 750 mL (1.45 lb) used motor oil + lube oil and clean water	19	<b>99.04%</b>	97.22%
FLEXSTORM PC		20	<b>97.67%</b>	91.61%
FLEXSTORM PC+		92	<b>96.88%</b>	99.11%

**5.0 Identification of Drainage Structures to Determine FLEXSTORM Item Codes:**

5.1 The Installer (Contactor) shall inspect the plans and/or worksite to determine the quantity of each drainage structure casting type. The foundry casting number or the exact grate size and clear opening size will provide the information necessary to identify the required FLEXSTORM Inlet Filter part number. Inlet Filters are supplied to the field pre-configured to fit the specified drainage structure. Item Codes can be built using the FLEXSTORM Product Configurator at [www.inletfilters.com](http://www.inletfilters.com). Detailed Submittal / Specification drawings are linked to each Item Code and available for download by engineers and contractors to include on plans and/or verify field inlet requirements. An example of a typical drawing is shown below.





**FLEXSTORM P/Ns 62SHDFX & 62SHDFXP**  
HD4 INLET TYPE: SQUARE/RECT PRECAST OPENING WITH 4 SEAT GRATE SUPPORT

A: GRATE SIZE (LEFT TO RIGHT)  
B: CLEAR OPENING (FRONT TO BACK)  
C: GRATE SIZE (LEFT TO RIGHT)  
D: CLEAR OPENING (FRONT TO BACK)

Length from front of casting to front of grate (with concrete set)

Pure Frame with FX Bag		Field Inlet Dimensions		Flexstorm Framing Dims				Flexstorm Ratings (Flow at 50% Max)			Pure Frame with FX Bag	
ADS P/N	Flexstorm Item Code	Grate Size (A x C)	Clear Opening (B x D)	B1	D1	A1	C1	Bag Capacity (FY)	PC/PC+ Flow Rate (CFS)	Bypass (CFS)	ADS P/N	Flexstorm Item Code
62SHDFX	P-HD4-95-95-90-90-FX	9 1/2 X 9 1/2	8 X 8	6.0	5.0	9.5	9.3	0.2	0.6	1.2	62SHDFXP	P-HD4-95-95-90-90-FXP
62SHDFX	P-HD4-115-115-105-105-FX	11 5/8 X 11 5/8	10 5/8 X 10 5/8	8.0	7.5	11.5	11.3	0.4	0.7	1.7	62SHDFXP	P-HD4-115-115-105-105-FXP
62SHDFX	P-HD4-115-115-105-105-FX	11 7/8 X 11 7/8	10 5/8 X 10 5/8	8.0	7.5	11.5	11.3	0.4	0.7	1.7	62SHDFXP	P-HD4-115-115-105-105-FXP
62SHDFX	P-HD4-120-120-105-105-FX	12 X 12	10 5/8 X 10 5/8	8.5	7.5	12.0	11.8	0.4	0.7	1.7	62SHDFXP	P-HD4-120-120-105-105-FXP
62SHDFX	P-HD4-134-134-110-110-FX	13 3/8 X 13 3/8	11 5/8 X 11 5/8	9.5	8.5	13.0	13.1	0.5	0.8	1.9	62SHDFXP	P-HD4-134-134-110-110-FXP
62SHDFX	P-HD4-130-130-120-120-FX	13 X 13	12 X 12	9.5	9.0	13.0	12.8	0.5	0.8	2.0	62SHDFXP	P-HD4-130-130-120-120-FXP
62SHDFX	P-HD4-144-144-133-133-FX	14 3/8 X 14 3/8	13 3/8 X 13 3/8	10.5	10.5	14.0	14.1	0.7	0.9	2.3	62SHDFXP	P-HD4-144-144-133-133-FXP
62SHDFX	P-HD4-145-145-133-133-FX	14 5/8 X 14 5/8	13 3/8 X 13 3/8	11.0	10.5	14.5	14.3	0.7	0.9	2.3	62SHDFXP	P-HD4-145-145-133-133-FXP
62SHDFX	P-HD4-159-159-143-143-FX	15 7/8 X 15 7/8	14 3/8 X 14 3/8	12.0	11.5	15.5	15.6	0.9	1.0	2.5	62SHDFXP	P-HD4-159-159-143-143-FXP
62SHDFX	P-HD4-178-178-160-160-FX	17 7/8 X 17 7/8	16 X 16	14.0	13.0	17.5	17.5	1.2	1.1	2.9	62SHDFXP	P-HD4-178-178-160-160-FXP

**NOTES:**

- RATINGS SHOWN ARE FOR STANDARD 22" BAG DEPTH; "SHORT" 12" DEPTH BAGS ARE AVAILABLE WITH -S SUFFIX; RATINGS REDUCED BY ~50%.
- THE FOLLOWING REQUIRES ADDITIONAL REVIEW
  - GRATES WITH EXTENDED BOTTOMS
  - ANY OBSTRUCTED INLET OPENINGS

**FLEXSTORM INLET FILTERS PURE**

ALL PRODUCTS MANUFACTURED BY INLET & PIPE PROTECTION, INC. A DIVISION OF ADS, INC. WWW.INLETFILTERS.COM (866) 287-8655 PH (630) 355-3477 FX INFO@INLETFILTERS.COM

THE FRAME TYPE SHOWN IS HD4

SCALE: 1" = 1'-0"

SHEET 1 OF 1

## 6.0 Installation Into Standard Grated Drainage Structures:

- Remove the grate from the casting or concrete drainage structure. Clean the ledge (lip) of the casting frame or drainage structure to ensure it is free of stone and dirt. Drop in the FLEXSTORM Inlet Filter through the clear opening and be sure the suspension hangers rest firmly on the inside ledge (lip) of the casting. Replace the grate and confirm it is elevated no more than 1/8", which is the thickness of the steel hangers. For Curb Box Inlet Filters: Insert FLEXSTORM CATCH IT Inlet Filter as described above, pull the rear curb guard flap up and over the open curb box until tight, align magnets to ensure firm attachment to the top portion of the curb box casting. If the curb back opening is not magnetic, slide a typical rock sack or 2 x 4 through the 2-ply rear curb box flap to create a dam which will direct runoff into the sediment bag.





**7.0 Maintenance Guidelines:** The frequency of maintenance will vary depending on the application (during construction, post construction, or industrial use), the area of installation (relative to grade and runoff exposure), and the time of year relative to the geographic location (infrequent rain, year round rain, rain and snow conditions). The FLEXSTORM Operation & Maintenance Plan (as shown in 7.5) or other maintenance log should be kept on file.

- 7.1 Frequency of Inspections: Construction site inspection should occur following each  $\frac{1}{2}$ " or more rain event. Post Construction inspections should occur three times per year (every four months) in areas with year round rainfall and three times per year (every three months) in areas with rainy seasons before and after snowfall season. Industrial application site inspections (loading ramps, wash racks, maintenance facilities) should occur on a regularly scheduled basis no less than three times per year.
- 7.2 General Maintenance for standard sediment bags: Upon inspection, the FLEXSTORM Inlet Filter should be emptied if the sediment bag is more than half filled with sediment and debris, or as directed by the Engineer. Remove the grate, engage the lifting bars or handles with the FLEXSTORM Removal Tool, and lift the FLEXSTORM Inlet Filter from the drainage structure. Machine assistance is not required. Dispose of the sediment or debris as directed by the Engineer. As an alternative, an industrial vacuum may be used to collect the accumulated sediment if available. Remove any caked on silt from the sediment bag and reverse flush the bag for optimal filtration. Replace the bag if the geotextile is torn or punctured to  $\frac{1}{2}$ " diameter or greater on the lower half of the bag. If properly maintained, the Woven sediment bag will last a minimum of 4 years in the field.
- 7.3 Inspection and Handling of the FLEXSTORM PC / PC+ post construction sediment bag: The PC+ sediment bags will collect oil until saturated. Both the Adsorb-it filter liner and the skimmer pouch will retain oil. The volume of oils retained will depend on sediment bag size. Unlike other passive oil sorbent products, Adsorb-it filter fabric has the ability to remove hydrocarbons at high flow rates while retaining 10- 20 times its weight in oil (weight of fabric is 12.8 oz / sq yd). The average 2' x 2' PC Bag contains approx .8 sq yds, or 10 oz of fabric. At 50% saturation, the average Adsorb-it lined PC filter will retain approximately 75 oz (4.2 lbs) of oil. Once the bag has become saturated with oils, it can be centrifuged or passed through a wringer to recover the oils, and the fabric reused with 85% to 90% efficacy. If it is determined, per Maintenance Contracts or Engineering Instructions, that the saturated PC sediment bags will be completely replaced, it is the responsibility of the service technician to place the filter medium and associated debris in an approved container and dispose of in accordance with EPA regulations. Spent Adsorb-it can be recycled for its fuel value through waste to energy incineration with a higher BTU per pound value than coal. The oil skimmers start white in color and will gradually turn brown/black as they become saturated, indicating time for replacement. The average skimmer pouch will absorb approximately 62 oz (4 lbs) of oil before requiring replacement. To remove the pouch simply unclip it from the swivel strap sewn to the bottom of the bag. Dispose of all oil contaminated products in accordance to EPA guidelines. The ClearTec Rubberizer media used in the pouch, since a solidifier, will not leach under pressure and can be disposed of in most landfills, recycled for industrial applications, or burned as fuel.



- 7.4 Sediment Bag Replacement: When replacing a Sediment Bag, remove the bag by loosening or cutting off the clamping band. Take the new sediment bag, which is equipped with a stainless steel worm drive clamping band, and use a drill or screw driver to tighten the bag around the frame channel. Ensure the bag is secure and that there is no slack around the perimeter of the band. For Oil absorbent boom bags, simply replace the oil boom or pouch when saturated by sliding it through the mesh support sleeve.





## FLEXSTORM OPERATION AND MAINTENANCE PLAN



### Installation Instructions:

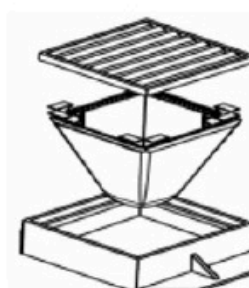
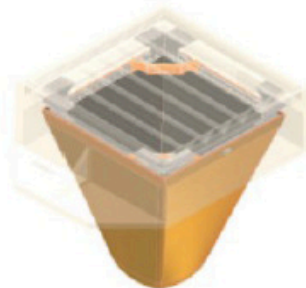
- Frequency of Inspections:**

- ### Maintenance Guidelines:

- ### Post Construction PC Bag Maintenance:

- Sediment Bag Replacement:**

1. Remove the bag by loosening or cutting off clamping bag.
2. Take new sediment bag and secure worm drive clamping band to the frame channel.
3. Ensure Bag is secure and there is no slack around perimeter.



**STRUCTURE ID#/LOCATION:**

[illegible]