



ADS-FLEXSTORM
24137 111th Street
Naperville, IL 60564



November 30, 2017

Mr. Jaime Favila
California State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA, 95812-100

**Re: Trash Treatment Control Device Application for
ADS-FLEXSTORM Full Trash Capture (FTC) Inserts**

Dear Mr. Favila,

Thank you for the opportunity to submit our application for the FLEXSTORM FTC inserts. Information is presented and organized in accordance with the Trash Treatment Control Device Application Requirements. Per the application guidelines the following document is broken into 7 sections and an appendix:

1. Cover Letter
 2. Table of Contents
 3. Physical Description
 4. Installation Information
 5. Operation and Maintenance Information
 6. Reliability Information
 7. Field/Lab Testing Information and Analysis
- Appendix

Thank you for reviewing this application, if any additional information is required please contact us as needed.

A handwritten signature in black ink, appearing to read "Jamie Ringenbach". The signature is written in a cursive style and is positioned above a horizontal line.

Jamie Ringenbach, General Manger
Advanced Drainage Systems, Inc
FLEXSTORM division



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Naperville, IL 60564



1. COVER LETTER

1.A. General description of the device.

The FLEXSTORM FTC INSERT is an engineered, custom manufactured catch basin insert. It is placed directly under a catch basin drainage grate or suspended below a catch basin curb opening in order to collect trash and debris from surface storm water runoff as part of a TMDL program, or as directed by the Engineer.

1.B. The applicant's contact information and location.

California based contact:
Mike Reardan 303-532-7490 mike.reardan@ads-pipe.com
Allied Product Manager
32086 Calle Navelda
Temecula, CA, 92592

FLEXSTORM's contact at the manufacturing facility:
Jamie Ringenbach 630-355-3288 jamie.ringenbach@ads-pipe.com
General Manager, ADS FLEXSTORM
24137 111th Street, unit A
Naperville, IL, 60564

1.C. The device's manufacturing location.

FLEXSTORM Inlet filters are designed and manufactured at our facility in Naperville, IL. They are stocked locally at 5 ADS locations in CA and at any number of over 5,000 distributors nationwide.

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Naperville, IL, 60564

1.D. A brief summary of any field/lab testing results that demonstrate Device's functions as described within the application.

FLEXSTORM FTC inserts are field tested at several sites as part of a trial program with Orange County, Florida. Over the course of 8 months monthly, inspections and cleanings were performed on the FTC inserts. Over 2 years one device was recorded to remove ~700 lbs. of debris and sediment with a ratio of roughly 2:1 by weight. A write-up of that pilot program can be found in Appendix A.

1.E. A brief summary of Device limitations, and operational, sizing, and maintenance considerations.

The FLEXSTORM Full Trash Capture (FTC) Inserts are designed for both below the grate installations and in wall mount applications suspended under an open throat curb opening. The drop inserts are designed to fit the CA market for all standard catch basin concrete openings and grate sizes with adjustable side flanges to take up gaps potentially larger than 5 mm. Rear bolt on deflectors are used for combination inlets to prevent trash from bypassing the filter resting below the grate. FLEXSTORM also builds for custom sizes or unique

situations with completed field dimensional forms. For curb inlet wall mount filters, the insert is dropped through the 20" dia. manhole opening, 2 mounting brackets are secured to the catch basin wall beneath the curb opening, and the filter is lifted onto the brackets with quick release features. Drop inserts usually take 2-5 minutes to install, while wall mount inserts will take approximately 10 minutes per 4' length. Maintenance is typically performed using an industrial vacuum with 3" hose or vacuum truck when the baskets are half full, or every 4 months, depending on location loading and storage capacity. Alternatively, the filters may be completely lifted from the drainage structure and dumped into a receptacle, rinsed and replaced.

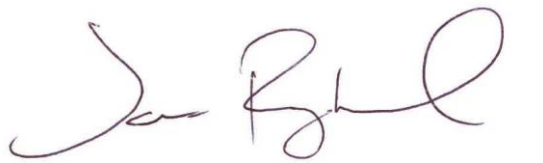
1.F. Description or list of locations, if any, where Device has been installed.

ADS-FLEXSTORM has sold the FTC stainless steel baskets into various markets including PA, CA, and FL with excellent results. The inserts are being specified in CA where CPS installations are not possible- most recently in Contra Costa, Newark, and Camarillo. A large number of inserts may be found in areas of Lancaster, PA with extreme amounts of trash entering their 2 x 4 catch basins. ADS-FLEXSTORM also has FL installations in Orange County where they have been actively monitoring performance and have approved FLEXSTORM for use in their storm water insert program. A write-up of this Orange County pilot program can be found in Appendix A.

FLEXSTORM has provided Inlet Filters targeting various levels of particle size and pollutant removal since 2004 with well over 150,000 installations throughout the country. When ADS acquired FLEXSTORM in 2012, efforts to develop trash capture devices for the CA market began. The 5 mm 14GA perforated stainless steel became a stock item used for connector pipe screens CPS, an approved FTC device. FLEXSTORM naturally transitioned this perforated steel into drop inserts replacing the traditional filter bags on the PURE framing where larger trash, not sediment, was targeted. The field results have been successful in capturing cigarette butts, leaves and trash without resuspension given the baskets high storage capacity. The large screen openings allow ample flow through and will not blind from sand and sediment loading off streets and parking lots.

1.G. Certification Clause.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Jamie Ringenbach, General Manger
Advanced Drainage Systems, Inc
FLEXSTORM division

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3. Physical Description

3.A. Design drawings for all standard Device sizes including dimensions, and alternative configurations.

Refer to APPENDIX B for design drawings

3.B. Description of how the Device works to trap all particles that are 5mm or greater in size and how it is sized for varying flow volumes.

The ADS-FLEXSTORM FTC filter ensures that all particles greater than or equal to 5mm are captured by constructing the filtering body of the filter from uniformly punched stainless steel with 4.8mm openings. This ensures that no particles larger than 4.8mm can pass by the filter.

FTC inserts are sized to fit the catch-basin they are being inserted into. As a result their size is directly related to the size of the catch-basin and performance characteristics generally scale with the increase flow through a larger frame and grate.

ADS-FLEXSTORM has established a catalog of common sized inserts based on the standard drainage structures found throughout California. The Installer (Contractor) shall inspect the plans and/or worksite to determine the quantity of each drainage structure casting type. The catch basin design, casting number, or the exact grate and clear opening size will provide the information necessary to identify the required FLEXSTORM FTC insert part number. Inserts are supplied to the field pre-configured to fit the specified drainage structure.

3.C. Device maximum trash capture capacity.

See Tables 1 & 2 for the trash capacity of each FTC insert.

| FLEXSTORM Performance Specifications - Full Trash Capture | | | | | | |
|---|------------|--------------|----------------------------------|-----------------------------------|-----------------------------|--------------------------------|
| ADS-FLEXSTORM P/N | Basin Size | Basket Depth | Ultimate Bypass Flow Rate (CFS)* | Storage Volume (ft ³) | Flow Rate when Empty (CFS)* | Flow Rate when 50% Full (CFS)* |
| 62HD12FTC | 12 x 12 | 12" | 0.5 | 0.7 | 6.8 | 3.0 |
| 62HD18FTC | 18 x 18 | 12" | 1.8 | 1.7 | 12.2 | 4.5 |
| 62HD24FTC | 24 x 24 | 12" | 3.0 | 3.1 | 18.6 | 6.3 |
| 62HD3618FTC | 36 x 18 | 12" | 4.0 | 3.5 | 20.8 | 7.3 |
| 62HD3624FTC | 36 x 24 | 12" | 4.5 | 5.0 | 25.1 | 8.3 |
| 62HD36FTC | 36 x 36** | 12" | 8.0 | 7.1 | 41.6 | 14.6 |

* Calculated with 4" head pressure above 2" grate

** Two 36 x 18 filter baskets placed side by side

Table 1: Part #s, Basin IDs, and performance specifications for standard FLEXSTORM FTC Catch Basin drop inserts

| Product Selection of Wall Mounted Inserts for Standard Curb Inlets FLEXSTORM Performance Specifications - Full Trash Capture | | | | | |
|--|-------------------------|--------------|-----------------------------------|-----------------------------|--------------------------------|
| ADS-FLEXSTORM P/N | Curb Opening Width (in) | Basket Depth | Storage Volume (ft ³) | Flow Rate when Empty (CFS)* | Flow Rate when 50% Full (CFS)* |
| 62HDWM36FTC | 36 | 12" | 2.7 | 17.8 | 6.7 |
| 62HDWM42FTC | 42 | 12" | 3.1 | 20.3 | 7.6 |
| 62HDWM48FTC | 48 | 12" | 3.6 | 22.8 | 8.5 |
| 62HDWM60FTC** | 60 | 12" | 4.5 | 27.9 | 10.3 |
| 62HDWM72FTC** | 72 | 12" | 5.4 | 33 | 12.1 |
| 62HDWM84FTC** | 84 | 12" | 6.3 | 37.6 | 13.7 |
| 62HDWM96FTC** | 96 | 12" | 7.2 | 42.7 | 15.5 |
| 62HDWM120FTC** | 120 | 12" | 8.9 | 52.4 | 18.9 |

* Calculated with 6" head pressure above Filter

** Multiple filters of the same length placed side by side

Table 2: Part #s, Curb Opening Widths, and performance specifications for selected FTC Wall Mounted inserts for Open Throat Basins

3.D. The Device hydraulic capacity (flow in cfs) at its maximum trash capture capacity for all standard Device sizes.

Refer to Tables 1 & 2 for hydraulic capacity of FTC inserts, hydraulic calculations for 36 x 18 FTC insert are found in Appendix C.

3.E. Conditions under which the device re-introduces previously trapped trash.

The FLEXSTORM trash retention screen and storage basket will not reintroduce previously trapped trash unless there is a backflow in the storm conveyance system. If water is entering the filter normally through the drainage grate the previously trapped trash will continually compact into the basket.

3.F. Each material and material grade used to construct the Device.

The FLEXSTORM FTC frame is primarily constructed from 304 stainless steel of varying gauge. The framing includes lifting handles to facilitate installation and removal of the basket into and out of the drainage structure. The top support flanges are 13GA 304 stainless steel and the long span adjustable side flanges are 14GA or 16GA 304 stainless steel. These side flanges are used to funnel all flow into the basket with the ultimate bypass beneath them. The ultimate bypass in the frame is designed to exceed that of the design flow into the drainage structure.

The remaining FLEXSTORM FTC framing is comprised of 11GA 304 stainless steel corner brackets and 12GA 304 stainless steel U-channels. The active filtering component is 14GA perforated stainless steel. The steel basket is uniformly punched with 3/16" dia. holes (4.8 mm) in such a pattern that the basket has 50% open area and retains any particles 5 mm or larger. The center main body panel is a one piece formation stretching across of the longest span making up the front, bottom, and rear of the basket. This *single* formation provides exceptional strength and stability of the basket. The two side panels are then secured to the main body panel with either spot welds or 316 stainless rivets. The basket is secured to the U-channel framing system with 5/16" diameter 316 stainless steel bolts.

3.G. Estimated design life of the Device.

The FTC inserts have a 25 year minimum design life when used in storm water applications exposed to moderate levels of salt and other naturally occurring roadway contaminants. The fabrication or bending may stress or expose certain surfaces slightly but not significantly reduce the design life of the stainless steel. The loading for each sized insert is considered and the support materials have been tested with considerable safety factor based on 125 lbs. per cubic ft. storage capacity.

3.H. Engineering plans/diagrams for a typical installation.

Written instructions and diagrams for a typical installation can be found on the technical drawings in Appendix B.

3.I. Photographs, if any, of pre-and post-installation examples

See appendix D (Photo 1,2,3,4)

3.J. If the Device is designed with an internal bypass, explain how the bypass only operates for volumes greater than the design storm.

The bypass region of the FLEXSTORM FTC Insert is located above the perforated filter media. It only becomes active should the basket become completely filled with storm water, trash, and debris. In these cases the water spills over the side of the perforated baskets and is deemed to have entered bypass mode. Hydraulic calculations for the bypass region of the FTC inserts can be found in Appendix E.

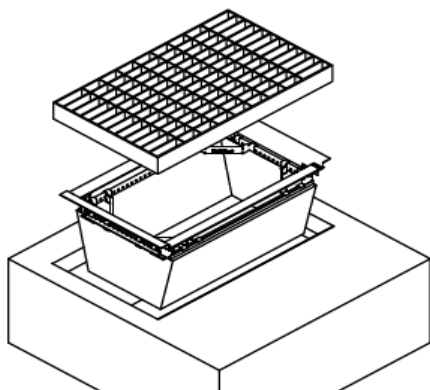
The engineer is responsible for confirming the ultimate bypass capacity of the FTC insert exceeds the design flow to the catch basin for a chosen rain event.

4. Installation

4.A. Device installation procedures and considerations.

Installation into Standard Grated Drainage Structures:

Remove the grate from the casting or concrete drainage structure using a grate removal tool. Clean the ledge (lip) of the casting frame or drainage structure to ensure it is free of stone and dirt. Lower the FLEXSTORM insert through the clear opening and be sure the suspension hangers rest firmly on the support ledge of the structure. Replace the grate and confirm it is elevated no more than 1/8", which is the thickness of the steel hangers. If there are gaps along the length of the concrete opening greater than 5 mm, loosen the adjustable flange bolt and slide the flange flush with the concrete wall. Replace the grate.



Installation into Curb Inlets:

For curb inlet wall mount inserts, the basket profile size is 12" x 12" with lengths up to 48". Lower the basket into the catch basin through the manhole opening. Mark the wall mount support bracket locations on the basin wall beneath the street/curb opening. Using a hammer drill install the provided wedge anchor bolts into the concrete wall and secure the support brackets. Lift the FTC basket and engage the support brackets allowing the basket to hang cantilevered off the wall for quick installation and removal. For multiple lengths on longer curb openings, simply use the dual support brackets securing the baskets side by side to cover the entire curb span. See Appendix B Design Drawings for more wall mount installation detail.

4.B. Methods for diagnosing and correcting installation errors.

ADS-FLEXSTORM offers standard sized configurations however there are instances where the catch basin drainage structure has been customized or varies from typical designs. This is not an issue as long as the dimensions are documented. ADS-FLEXSTORM can build FTC inserts for any catch basin Configuration. Simply submit the proper field dimensional form: <http://inletfilters.com/field-dimensional-order-forms>

5. Operation and Maintenance Information

5.A. Device inspection procedures and inspection frequency considerations.

Upon inspection, the FLEXSTORM FTC insert should be emptied if the steel basket is more than half filled with trash and debris, or as directed by the engineer, city, or municipal contract. Remove the grate and use a vacuum truck or industrial vacuum to remove the trash and debris that has collected in the filter. Alternatively, the basket may be lifted out of the drainage structure and trash emptied into a receptacle to be hauled away. Remove any caked on trash and debris from the steel basket to ensure proper flow. When the basket is cleaned the grate should be replaced onto the basin and maintenance logged.

5.B. Maintenance procedures, including a description of necessary equipment and materials.

FLEXSTORM FTC inspections should occur three times per year (every four months) in areas with year round rainfall. Alternatively, maintenance guidelines per the awarded contract should be followed.

5.C. Maintenance frequency considerations, including effects of delay.

As with all storm water BMPs, inspection and maintenance must occur on a regular basis or the filtering mechanism will be overloaded and rendered useless. In such a case, the filter baskets may become completely filled with trash and debris until reaching the ultimate bypass which would still allow full water flow but without filtration. Any trash entering the drainage structure may possibly escape directly into the sewer system. Examples of overflowing trash in wall mounted curb inlets that were not maintained for several years can be found in appendix D (photo 5, 6)

5.D. Device maintenance and vector control accessibility.

The FLEXSTORM FTC Inserts provide a bypass area with a minimum 2" opening to allow for vector control insertion of mosquito pellets into the catch basin without requiring removal of the drop insert. The wall mounted inserts provide little if any interference with vector control procedures for abatement in curb inlets. Furthermore, the large 5 mm dia. openings in the filter screen will not accumulate standing water in the baskets, which will discourage mosquito breeding.

6.0 Reliability Information:

6.A. Device sensitivity to loadings other than trash (ie leaves, sediment).

The FLEXSTORM FTC system is a very durable and robust frame and basket assembly that will not corrode or break down even when subjected to heavy loading conditions, exposure to salt or chemicals, or during extreme temperature conditions. The perforated steel basket is designed to remove and filter larger trash and debris and is not recommended in areas where there is concern over capturing smaller particles or other contaminants, such as hydrocarbons, nutrients, or heavy metals. FLEXSTORM offers media inserts to line the inside and geotextile filters on the outside of the perforated steel baskets if higher removal rates for targeted pollutants are required. The perforated screen openings will not prematurely blind like other geotextile filter elements so it is preferred where larger trash is targeted.

6.B. Warranty information.

The 304 stainless steel framing and basket materials along with product construction are warranted for a period of 5 years from the date of installation. Replacement parts will be supplied at no charge to the end user provided the inserts were installed properly for their intended use as a full trash capture device.

6.C. Applicant's customer support.

ADS has a nationwide support team with local field representatives and product managers. The CA Product Manager is Mike Reardan and he can be reached at 303 532-7490 or mike.reardan@ads-pipe.com FLEXSTORM headquarters can address any engineering and design questions at 630 355-3288 or info@inletfilters.com.

ADS website: www.ads-pipe.com/en

FLEXSTORM website: www.inletfilters.com

7. Field/Lab Testing Information and Analysis

7.A. Provide available field or lab testing information that demonstrates Device functionality and performance.

Appendix A reviews the pilot study performed by Orange County, FL. Additional data regarding performance values for the catch basin inserts can be found in Appendix C and E.

Appendix A: Summary of Orange County Florida pilot program

Round FLEXSTORM FTC insert installed in the **Town of Windemere, FL** in 2015 targeting trash and palm leaves in a high traffic area. The ultimate bypass prevents ponding should the basket become completely filled prevented maximum flow through the perforated steel basket.



Round FLEXSTORM FTC insert in an open throat application in **Orange County, FL** installed in June 2015. Inserts located in residential areas with minimal trash but a lot of tree and sediment runoff; organic loading. Volume of inserts was 1.5 ft³. Orange County maintenance records are shown below over two years.



Orange County, FL Maintenance Log of ADS-FLEXSTORM FTC Inserts:

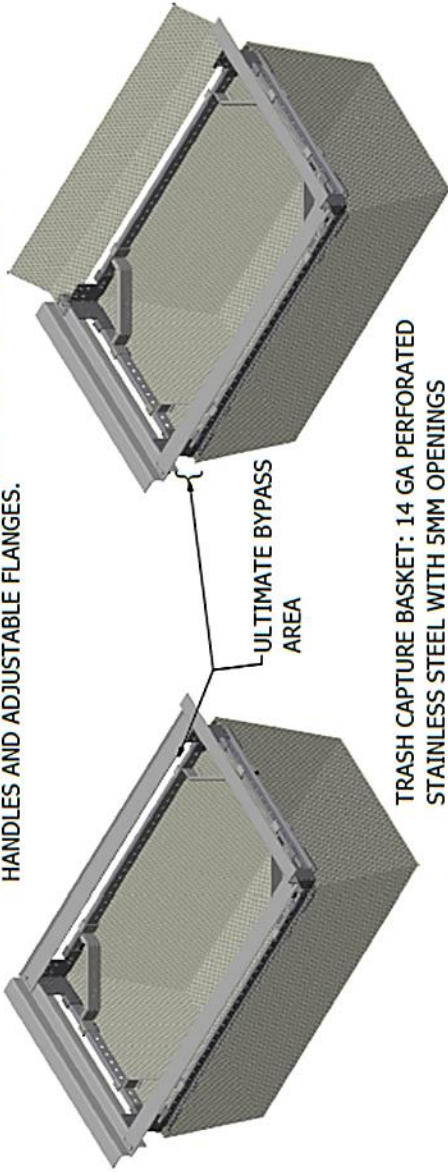
| Street | Basket # | Date of Maintenance | Large Particle % | Small Particle % | % Full | Debris Weight (LBS) |
|----------------------|----------|---------------------|------------------|------------------|--------|---------------------|
| 9220 South Bay Dr | 92 | 11/6/2015 | 70% | 30% | 100% | 57.6 |
| 9220 South Bay Dr | 92 | 11/25/2015 | 70% | 30% | 100% | 67.9 |
| 9220 South Bay Dr | 92 | 1/11/2016 | 50% | 50% | 100% | 63.9 |
| 9220 South Bay Dr | 92 | 2/3/2016 | 70% | 30% | 100% | 39.4 |
| 9220 South Bay Dr | 92 | 2/29/2016 | 90% | 10% | 100% | 39.4 |
| 9220 South Bay Dr | 92 | 3/28/2016 | 70% | 30% | 100% | 41.1 |
| 9220 South Bay Dr | 92 | 5/25/2016 | 50% | 50% | 70% | 48.6 |
| 9220 South Bay Dr | 92 | 8/26/2016 | 70% | 30% | 60% | 18.2 |
| 9220 South Bay Dr | 92 | 9/27/2016 | 60% | 40% | 100% | 28.1 |
| 9220 South Bay Dr | 92 | 12/1/2016 | | | 70% | 24.1 |
| 9220 South Bay Dr | 92 | 1/30/2017 | 90% | 10% | 100% | 42.9 |
| 9220 South Bay Dr | 92 | 3/27/2017 | 100% | 0% | 100% | 33.3 |
| 9220 South Bay Dr | 92 | 4/27/2017 | 70% | 30% | 100% | 25.3 |
| 9220 South Bay Dr | 92 | 6/5/2017 | 50% | 30% | 100% | 43.4 |
| 9220 South Bay Dr | 92 | 6/30/2017 | 30% | 70% | 100% | 33.9 |
| 9220 South Bay Dr | 92 | 7/26/2017 | 0% | 100% | 100% | 53.6 |
| 9220 South Bay Dr | 92 | 9/27/2017 | 80% | 20% | 90% | 43.4 |
| 9361 Cypress Cove Dr | 91 | 11/6/2015 | 50% | 50% | 100% | 95.4 |
| 9361 Cypress Cove Dr | 91 | 11/25/2015 | 50% | 50% | 100% | 73.1 |
| 9361 Cypress Cove Dr | 91 | 1/11/2016 | 40% | 10% | 100% | 54.1 |
| 9361 Cypress Cove Dr | 91 | 2/3/2016 | 50% | 50% | 100% | 24 |
| 9361 Cypress Cove Dr | 91 | 2/29/2016 | 100% | 0% | 100% | 46.9 |
| 9361 Cypress Cove Dr | 91 | 3/28/2016 | 100% | 0% | 100% | 32.7 |
| 9361 Cypress Cove Dr | 91 | 5/25/2016 | 70% | 30% | 50% | 34.9 |
| 9361 Cypress Cove Dr | 91 | 8/26/2016 | 80% | 20% | 50% | 16.4 |
| 9361 Cypress Cove Dr | 91 | 9/27/2016 | 50% | 50% | 100% | 37.4 |
| 9361 Cypress Cove Dr | 91 | 12/1/2016 | | | 100% | 41.6 |
| 9361 Cypress Cove Dr | 91 | 1/30/2017 | 90% | 10% | 100% | 45.6 |
| 9361 Cypress Cove Dr | 91 | 3/27/2017 | 100% | 0% | 100% | 22.9 |
| 9361 Cypress Cove Dr | 91 | 4/27/2017 | 90% | 10% | 100% | 13.6 |
| 9361 Cypress Cove Dr | 91 | 6/5/2017 | 70% | 30% | 100% | 27.6 |
| 9361 Cypress Cove Dr | 91 | 6/30/2017 | 0% | 100% | 100% | 41.5 |
| 9361 Cypress Cove Dr | 91 | 7/26/2017 | 30% | 70% | 100% | 37.5 |
| 9361 Cypress Cove Dr | 91 | 9/27/2017 | 70% | 30% | 100% | 65.5 |

Analysis: Average weight of debris for each service period was 41 lbs with 65% large particles > 1" dia. The relatively small storage capacity of 1.5 ft³ required more frequent maintenance intervals. Average weight of debris is 27 lbs./ft³. Our design criteria are based on 125 lbs/ft³ resulting in a loading design safety factor of 4.6.

Appendix B: Design Drawings

ADS-FLEXSTORM Full Trash Capture Inserts for Grated Catch Basins

SUPPORT FRAMING: 12 GA 304 STAINLESS STEEL FRAMING W/LIFT HANDLES AND ADJUSTABLE FLANGES.



FLEXSTORM FILTER FOR SQUARE/RECTANGULAR GRATES

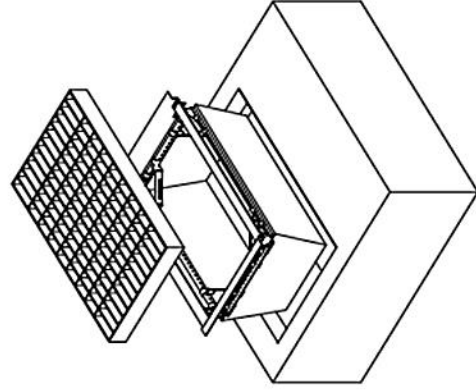
FLEXSTORM FILTER W/BOLT ON DEFLECTOR FOR CURB OPENINGS



FLEXSTORM FILTER FOR ROUND GRATES

Installation Instructions:

1. Remove grate from the drainage structure
2. Clean stone and dirt from the grate support ledge (lip)
3. Drop the FLEXSTORM inlet filter through the clear opening such that the flanges rest firmly on the lip of the catch basin
4. Replace the grate on top of the filter framing



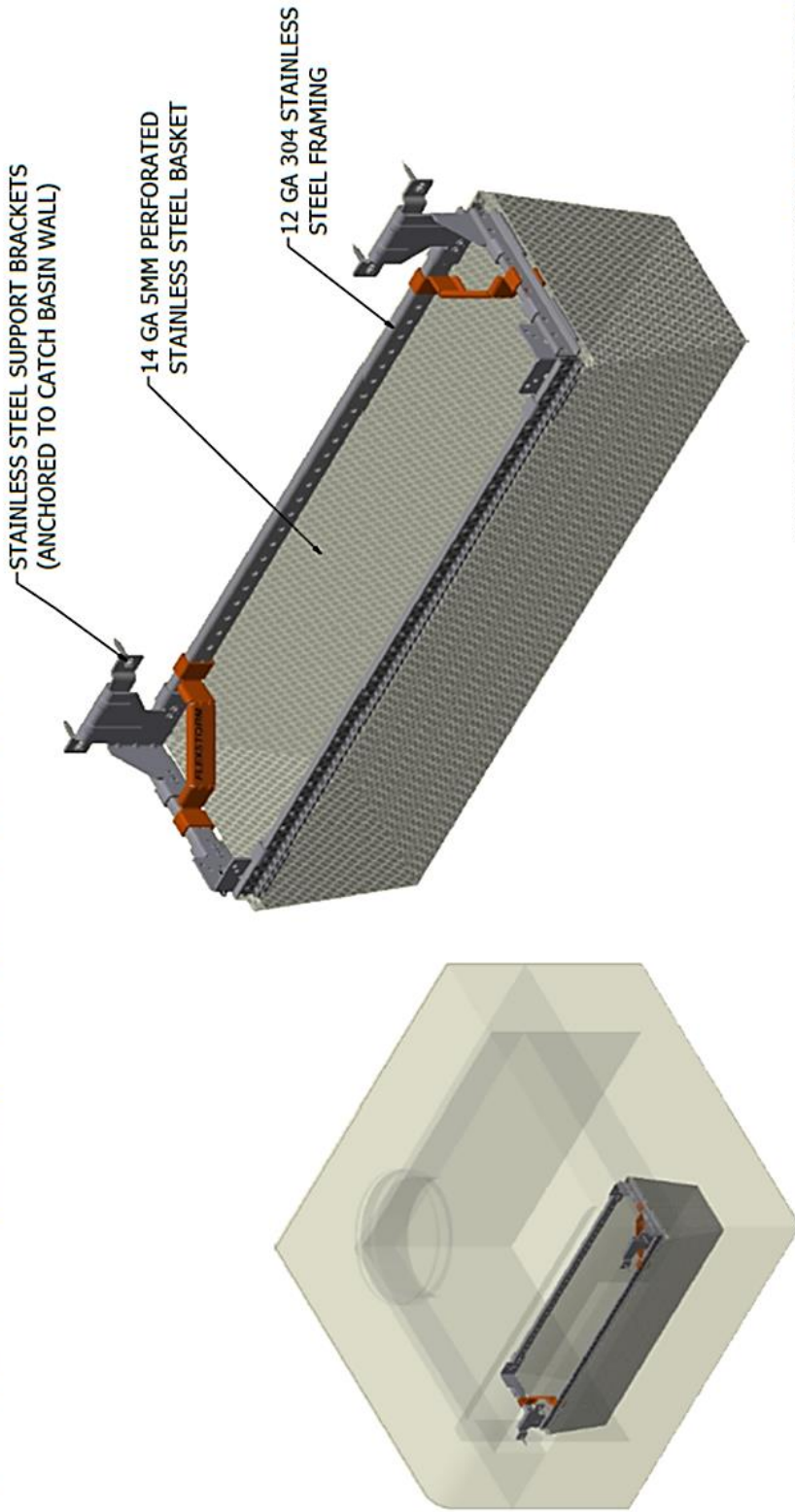
| FLEXSTORM Performance Specifications - Full Trash Capture | | | | | | |
|---|------------|--------------|-----------------------------|-----------------------------------|-----------------------------|--------------------------------|
| ADS P/N | Basin Size | Basket Depth | Ultimate Bypass Cap. (CFS)* | Storage Volume (ft ³) | Flow Rate when Empty (CFS)* | Flow Rate when 50% Full (CFS)* |
| 62HD12FTC | 12 x 12 | 12" | 0.5 | 0.7 | 6.8 | 3.0 |
| 62HD18FTC | 18 x 18 | 12" | 1.8 | 1.7 | 12.2 | 4.5 |
| 62HD24FTC | 24 x 24 | 12" | 3.0 | 3.1 | 18.6 | 6.3 |
| 62HD3618FTC | 36 x 18 | 12" | 4.0 | 3.5 | 20.8 | 7.3 |
| 62HD3624FTC | 36 x 24 | 12" | 4.5 | 5.0 | 25.1 | 8.3 |
| 62HD3636FTC | 36 x 36** | 12" | 8.0 | 7.1 | 41.6 | 14.6 |

* Calculated with .5' flowing water above centroid of ultimate bypass area

** Two 36 x 18 filter baskets placed side by side

| | | | | | |
|---------------|--|----------------------------|--|-------|--|
| TITLE | | DWG NO | | REV | |
| ADS-FLEXSTORM | | Full Trash Capture Inserts | | SCALE | |

ADS-FLEXSTORM Full Trash Capture Inserts for Curb Inlets



INSTALLATION AND MAINTENANCE INSTRUCTIONS

1. ENTER MANHOLE OPENING WITH INLET FILTER AND MOUNTING HARDWARE
2. ALIGN FILTER FRAME WITH CURB OPENING AND MARK CENTERLINE OF EACH FRAME HANGER BRACKET
3. USING SUPPLIED WALL MOUNT BRACKETS, MARK LOCATION OF BRACKET SCREW HOLES SPACED 1" DOWN FROM TOP LEDGE OF CONCRETE.
4. USING HAMMER DRILL, DRILL HOLE TO RECOMMENDED DEPTH OF SPECIFIED FASTENER.
5. SECURE THE WALL MOUNT BRACKETS USING CONCRETE FASTENERS AND HANG THE FLEXSTORM INLET ASSEMBLY.
6. FOR MAINTENANCE SERVICE WITH TRUCK MOUNTED VACUUM.

| ADS P/N | FLEXSTORM Performance Specifications - Full Trash Capture | | | | |
|----------------|---|--------------|-----------------------------------|-----------------------------|--------------------------------|
| | Curb Opening Width (in) | Basket Depth | Storage Volume (ft ³) | Flow Rate when Empty (CFS)* | Flow Rate when 50% Full (CFS)* |
| 62HDWM36FTC | 36 | 12" | 2.7 | 17.8 | 6.7 |
| 62HDWM42FTC | 42 | 12" | 3.1 | 20.3 | 7.6 |
| 62HDWM48FTC | 48 | 12" | 3.6 | 22.8 | 8.5 |
| 62HDWM60FTC** | 60 | 12" | 4.5 | 27.9 | 10.3 |
| 62HDWM72FTC** | 72 | 12" | 5.4 | 33.0 | 12.1 |
| 62HDWM84FTC** | 84 | 12" | 6.3 | 37.6 | 13.7 |
| 62HDWM96FTC** | 96 | 12" | 7.2 | 42.7 | 15.5 |
| 62HDWM120FTC** | 120 | 12" | 8.9 | 52.4 | 18.9 |

* Calculated with .5' flowing water above centroid of ultimate bypass area
 **Multiple filters of the same length placed side by side

TITLE ADS-FLEXSTORM FULL TRASH CAPTURE FOR OPEN THROAT INLETS

SIZE DWG NO SCALE REF

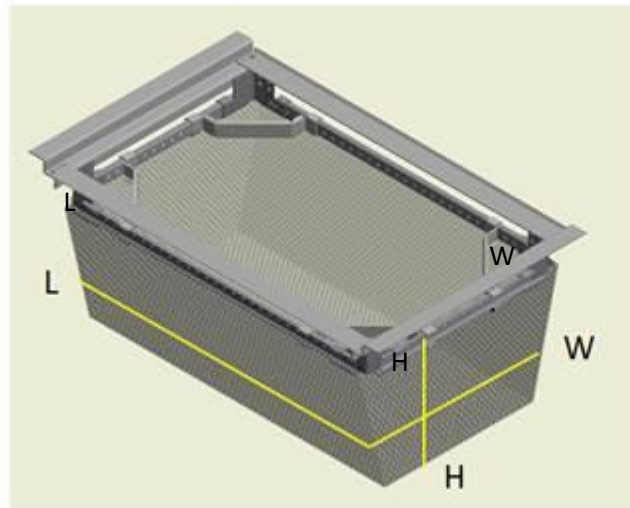
Appendix C: Hydraulic Calculations of Perforated Stainless Steel Basket

Example Flow Through calculation for 36 x 18 Stainless Steel Basket (62HD3618FTC):

Method for determining flow rate through 5mm perforated stainless steel baskets

In order to determine the flow rate through a perforated basket we first determine the total number of 5 mm holes in the perforated steel basket. Then we determine a pressure difference in the water between the top of the basket and the perforated holes. Then that pressure difference is used to calculate the flow rate of water through a single 5 mm opening. That flow rate is multiplied by the total # of holes to give a flow rate for the entire basket.

1. Determine the # of holes in a 36 x 18 perforated steel basket (62HD3618FTC)



The equation for the surface area of a rectangular prism with one open side:

$$L=33", W=15.5", H=12"$$

$$SA = 2 * L * H + 2 * H * W + L * W = 1675.5 \text{ in}^2$$

From physical measurements it was determined that there are 18 holes/ in^2 in the perforated material. Therefore:

$$1675.5 \text{ in}^2 * 18 \frac{\text{holes}}{\text{in}^2} = 30159 \text{ holes in the 62HD3618FTC basket}$$

2. Determine the flow rate of water through a 5 mm orifice:

To determine the flow rate through a 5 mm opening we first Determine the pressure difference of water before and after it flow through the orifice. It is assumed that once the water exits the perforated opening it has a pressure equal to sea level (101.325 kPa). Before exiting the orifice it is assumed the water has a pressure equal to depth of the basket opening beneath the curb line (102.857 kPa). Using the formula shown below we are able to convert that pressure difference into a flow rate.

Equation(s)

$$p_1 - p_2 < FL^2 \cdot (p_1 - FF \cdot P) \rightarrow$$

$$Q_w = 0.0865 \cdot C \cdot \left(\frac{d_o}{4.654}\right)^2 \cdot \sqrt{\frac{p_1 - p_2}{SG}}$$

$$p_1 - p_2 \geq FL^2 \cdot (p_1 - FF \cdot P) \rightarrow$$

$$Q_w = 0.0865 \cdot C \cdot \left(\frac{d_o}{4.654}\right)^2 \cdot FL \cdot \sqrt{\frac{p_1 - FF \cdot P}{SG}}$$



p1 : Primary Pressure (kPa abs)

p2 : Secondary Pressure (kPa abs)

d_o : Diameter of Orifice (mm)

C : Discharge Coefficient

Q_w: Water Flow Rate (m³/h)

FL : Pressure recovery factor (=0.9)

FF : Critical pressure ratio factor

P : Absolute vapor pressure of the water at inlet temperature (kPa abs)

SG : Specific Gravity

Plugging those values into the formula yields a water flow rate per opening of .313648 GPM or .0006988 CFS/hole.

Finally, we multiply the total # of holes in the 62HD3618FTC basket by the flow rate of water per hole:

$$.0006988 \text{ CFS/hole} \cdot 30159 \text{ holes} = \mathbf{20.8 \text{ CFS}}$$
 through the basket when empty.

To determine the flow through of the basket when it is 50% full with material we make a change to the surface area calculation. Since it is assumed that 50% of the side walls and the bottom of the basket is blocked with debris the surface area equation becomes:

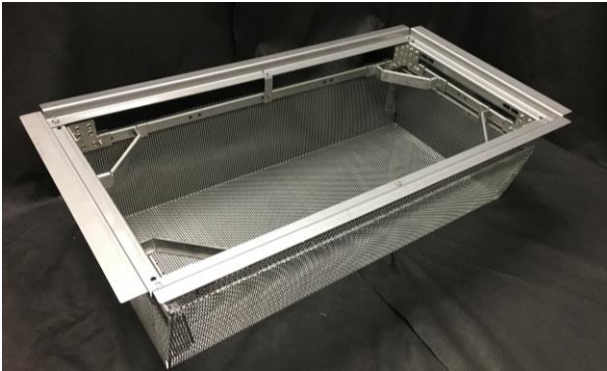
$$SA = 2 * L * H/2 + 2 * H/2 * W = 588 \text{ in}^2$$

Multiplying that surface area by the # of openings per square inch and the flow rate through each hole yields:

$$588 \text{ in}^2 * 18 \frac{\text{holes}}{\text{in}^2} * .0006988 \frac{\text{CFS}}{\text{hole}} = 7.3 \text{ CFS}$$

Therefore, when 50% filled or blocked with debris the 62HD3618FTC is expected to have a water flow through rate of 7.3 CFS.

Appendix D: Photo Gallery



Photos 1,2: FTC inserts shown before installation into a catch basin



Photos 3,4: FTC inserts shown during installation into a catch basin



Photo 6: Improperly maintained Open Throat Curb Inlet Filter in Pueblo, Colorado.



Photo 5: Philadelphia Water Dept. Wall Mount Filter where service was overdue

Appendix E: Hydraulic Calculations of Ultimate Bypass Region

Example Bypass calculation for 36 x 18 Stainless Steel Basket (62HD3618FTC):

Flow through the Ultimate Bypass Area is calculated with the same equations as flow through an orifice.

$$Q_i = C * A * V$$

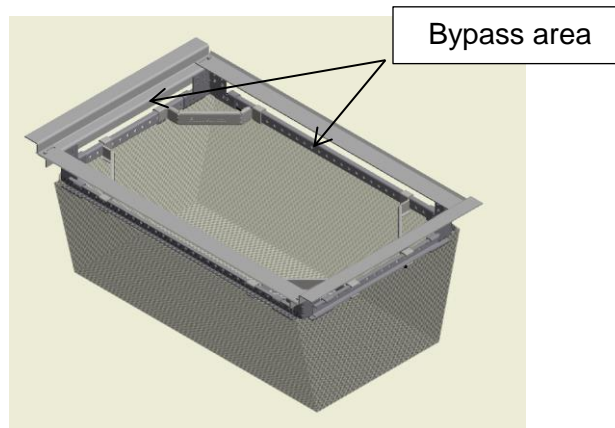
Q =Flow through an orifice in $\frac{ft^3}{s}$, C=Coefficient of discharge from opening (assumed to be .67 for bypass area),
A= Area of the orifice (ft^2), and V=Velocity of water as it passes through the orifice (ft/s).

$$\text{Velocity can be expanded: } V = \sqrt{2 * g * h}$$

g=acceleration due to gravity ($32.2ft/s^2$), h=height of water above centroid of orifice's opening (ft) (6")

Therefore, flow through the bypass area can be written as $Q = CA\sqrt{2gh}$

Calculate Square Area of ultimate Bypass Area:



$$A = 2(H_1 * L_1) + 2(H_2 * L_2)$$

Where H is the height of the bypass opening and L is the Length of the Bypass Opening. For the 62HD3624FTC: $H_1 = 2"$, $L_1 = 32"$, $H_2 = 1"$, $L_2 = 12"$.

$$A = 2*(2*34) + 2*(1.5*16) = 152 \text{ in}^2 \Rightarrow 1.06 \text{ ft}^2$$

Calculate velocity of flow as it passes through the bypass area:

$$V = C\sqrt{2gh} = .67 \sqrt{2 * 32.2 \frac{ft}{s^2} * .5 \text{ ft}} = 3.8 \text{ ft/s} \quad \text{Therefore,}$$

$$Q = CA\sqrt{2gh} = 1.06 \text{ ft}^2 * 3.8 \frac{ft}{s} = 4.0 \text{ CFS} \quad \text{Ultimate Bypass Capacity}$$

Based on the above calculation it can be shown that with .33ft of water over the grate a 62HD3624FTC will bypass 4.0 CFS of water through the ultimate bypass framing.