Bio Clean
A Forterra Company

October 21, 2021

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

Re: Amended Application for Trash Treatment Control Device - Bio Clean® Grate Inlet and Curb Inlet Filters

Dear Mr. Cosentini,

Bio Clean® is pleased to re-submit this application for the Grate Inlet and Curb Inlet Filters for Certification as a Full Capture System - Trash Treatment Control Device. The Bio Clean® Grate Inlet and Curb Inlet Filters have been approved since February 2021 when originally submitted to the California State Water Resources Control Board. Recently, additional configurations have been added to the device. We've also removed our smallest size filter to remain compliant with MVCAC vector control regulation. Additional configuration sizes, concept drawings, photos, and hydraulic calculations have been added to the end of this amended application and are all included in Appendix I. Documentation for this application is being submitted in accordance with the California State Water Resources Control Board *Trash Treatment Control Device Application Requirements* document that includes the following minimum requisite sections:

1. Cover Letter
2. Table of Contents
3. Physical Description
4. Installation Guidance
5. Operation and Maintenance Information
6. Vector Control Accessibility
7. Reliability Information
8. Field/Lab Testing Information and Analysis

Please contact me with any questions or should additional information be required. Thank you for your consideration of this application.

Regards,

Jacob Forst
Product Research and Development Technician
Bio Clean®, A Forterra Company

1.0 COVER LETTER

1.A. Device product name and general description;

The Bio Clean® Grate Inlet and Curb Inlet Filters are designed to capture trash and debris. The Grate Inlet and Curb Inlet Filters are passive, gravity flow devices and can be installed as a new construction BMP or retrofit BMP into standard storm drain inlets to treat flows after interception but prior to conveyance. The design incorporates a non-blocking screen that has an aperture less than 5mm ensuring capture of all particles 5mm in size or larger. Each device also incorporates an integrated internal bypass feature ensuring captured pollutants to not impede interception or conveyance of peak storm water runoff.

These Devices are fabricated from rigid, durable materials such as stainless steel and marine grade fiberglass. Installation is quick and easy with the design requiring minimal to no mounting hardware. Routine maintenance is required to remove pollutants and is site and pollutant loading dependent. Maintenance is facilitated by the unique design of the device allowing for direct access of the Filters through the manhole access and/or grate.

1.B. The name of the Device owner;

California Contact:

Sean Hasan
Western Region Director
Bio Clean®, A Forterra Company
398 Via El Centro
Oceanside, California 92058
(760) 283-7188
Sean.Hasan@forterrabp.com

Corporate Contact:

Stephen Hides
VP & General Manager
Bio Clean®, A Forterra Company
511 East John Carpenter Freeway
Irving, Texas 75062
(760) 517-9030
Stephen.Hides@forterrabp.com

1.C. The owner or manufacturer's website where the Device can be found on the internet;

The Bio Clean® Grate Inlet and Curb Inlet Filters can be found on the Bio Clean® website: www.biocleanenvironmental.com/catch-basin-inlet-filters

1.D. The location of the Device manufacturing site;

The Bio Clean® stormwater division is supported through manufacturing by its parent company Forterra Building Products. Forterra Building Products currently has 88 manufacturing locations throughout the country. Three facilities currently provide support for the California market and are listed below:

Forterra Building Products
Drainage Pipe and Products Division
7020 Tokay Avenue
Sacramento, California 95828

Forterra Building Products
Drainage Pipe and Products Division
26380 Palomar Road
Menifee, California 92585

Forterra Building Products
Bio Clean® Stormwater Management Systems
398 Via El Centro
Oceanside, California 92058

1.E. A brief summary of any field/lab testing results that demonstrates the device functions as described within the application;

Bio Clean® conducted laboratory testing on the proprietary non-blocking screen material utilized in the Grate Inlet and Curb Inlet Filters. Bio Clean® conducted this testing to empirically determine unique properties of the screen including the Effective Open Area (EOA), the Coefficient of Discharge (C_d), and the flow capacity and characteristics. The results of the testing provided a clear relationship between discharge (Q) and head (h) acting on the screen. The results of the testing have been incorporated into the design of the Filters to determine both the treatment and peak flow rates for the Filters.

The test report has been included in the Application as Appendix F for review by the SWRCB and interested parties.

1.F. A brief summary of the device limitations, and operational sizing, and maintenance considerations;

The Bio Clean® Grate Inlet and Curb Inlet Filters are pre-engineered filtration systems designed to meet site-specific water quality treatment requirements. Conformance with the Engineer's Plans and Specifications and the Manufacturer's recommendations is essential to ensure proper operation and function of the Device.

Bio Clean® manufactures the Grate Inlet and Curb Inlet Filters using stainless steel and marine grade fiberglass components. The materials selected serve a wide variety of applications and are the most durable materials available for these type devices. Adherence to installation recommendations are required to ensure the design service life of the Device is maintained.

Bio Clean® Grate Inlet and Curb Inlet Filters should be sized to meet site and region specific water quality objectives and requirements. Systems that are not designed and installed in conformance within the maximum treatment flow rate and maximum bypass flow rate limits can cause adverse hydraulic conditions. Additionally, non-conformance with the Device design limits may cause non-compliance with the Trash Provisions.

All structural, post-construction Best Management Practices require routine and scheduled inspection and maintenance. Inspection and maintenance is facilitated by the design of the Device. The design of the Device allows for placement of the Filters directly beneath the grate and/or manhole access allowing direct, unimpeded access to the storage baskets for quick and easy removal with no confined space entry required. Design considerations for maintenance frequency should be a consideration.

1.G. A description or list of locations, if any, where the device has been installed. Include the name and contact information of as many as three municipality(s) purchasing the Device; and

Installations of the Trash Capture version of this device are pending SWRCB Certification.

1.H. The application shall be signed by the owner or authorized representative (not the technical or sales representative) and include the following certification:

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.

Stephen Hides

Stephen Hides, Vice President and General Manager

3-5-2021

Date

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2.0 TABLE OF CONTENTS

Contents

3.0 PHYSICAL DESCRIPTION

3.A. Trash Capture: Describe how the Device traps all trash particles 5 mm or greater in size;

The Bio Clean® Grate Inlet and Curb Inlet Filters are passive, gravity flow, stormwater treatment systems utilizing screening, sedimentation, and absorption to capture trash, floating and neutrally buoyant debris, suspended sediments and hydrocarbons. The non-blocking screening system is suspended from either the grate or at the curb inlet opening and retains the captured pollutants above the bottom of the catch basin allowing the captured trash and debris to be stored in a dry state that prevents further contamination of the stormwater and minimizes maintenance requirements. Design flows are directly routed through a basket made from non-blocking, stainless steel screen that has an aperture not greater than 4.7 mm ensuring capture of all particles 5mm in size or larger.

The Bio Clean® Grate and Curb Inlet Filters incorporate the following features to achieve full capture of all particles larger than 5mm. These features additionally ensure no re-suspension of previously captured pollutants.

- The pollutant capture basket sidewall is manufactured from a proprietary, non-blocking louver-expanded stainless steel screen. The openings of the screen are made by a process that angles the opening in one direction so that when water and debris encounter the screen a wiping action occurs which pushes both water and debris across the opening rather than through the opening. This perpetual, deflective shielding action minimizes blockages and penetration of debris through the screen opening.
- The proprietary, non-blocking screens are made from 20-gauge, type 304 stainless steel with an aperture not greater than 4.7mm. The open area is not less than 37%.
- The pollutant capture basket bottom screen is manufactured from 14-gauge, type 304 stainless steel with an aperture not greater than 5.0mm. The open area is not less than 51%.
- Bypass features are incorporated in all Devices and are located above the treatment water level in the basket ensuring retention of all trash and debris for flows conforming to full capture requirements.

3.B. Peak Flows/Trash Volumes: Explain how the device is sized for varying peak flow rates and trash capture volumes;

<u>Grate Inlet Filter Operation & Sizing</u>

Stormwater flowing from parking lots and roads begin their entrance into the catch basin through the grated inlet. Prior to entering the catch basin, the flows must first pass through the Grate Inlet

Filter. The Grate Inlet Filter installs directly beneath the grate of the catch basin and all flow that enters the catch basin are first directed through the Filter (*See Figure 2 – Grate Inlet Filter Operation)*.

The Inlet Filter is straightforward in design, but special consideration was given to the configuration and capacities to ensure maximum possible treatment and adequate bypass without re-suspension of previously removed pollutants (*See Figure 1 – Grate Inlet Filter Features).* The sidewall of the filter basket is constructed from a proprietary, non-blocking, louver-expanded stainless steel screen. The openings of the screen are made by a process that angles the opening in one direction so that when water and debris encounter the screen, a wiping action occurs which pushes both water and debris across the opening rather than through the opening. This perpetual, deflective shielding action minimizes blockages and penetration of debris through the screen opening. Once flows are filtered, the stormwater enters the catch basin and is allowed to freely exit through the lateral pipe.

During peak flow events, the Inlet filter continues to treat, however water levels in the filter basket may rise to the point of overflow, at which point the Inlet Filter is considered to be operating in bypass mode. Bypass occurs through a circumferential opening (or window) at the top of the basket just above the filter screen but beneath the grate. During smaller peak flow events, the bypass window operates as a weir allowing these flows to exit through the bottom of the window. A significant amount of flow continues to be filtered, and this continued flow forces previously retained pollutants to remain in the filter basket. During larger peak flow events, the water level will rise above the bypass window changing the window to act like an orifice. Peak flows are discharged through the window with the orifice controlling flow.

The Engineer should make note of the treatment flow capacity, the bypass flow capacity, as well as the grate inlet flow capacity and determine which of the three may be a limitation of the flow capacity for this component of the storm drain system.

A sizing chart for the Grate Inlet Filter is shown in Table 1. The nomenclature for models lists the Width x Length x Height of the grate and filter basket. The characteristics and capacity Table lists the maximum treatment capacity for Full Capture trash removal. The Table additionally lists the maximum storage capacity (for trash and sediment). These capacities are considerate of both re=suspension of removed pollutants and screen blocking. A safety factor has been applied to the storage capacity, treatment capacity, and bypass capacity. The Table lists the most commonly utilized standard sizes available. Other standard sizes are available as well as custom configurations. Characteristics and capacities will be determined on an as needed basis following the same guidelines and using the same empirically determined data for sizing of the custom configurations.

Grate Inlet Filter Features

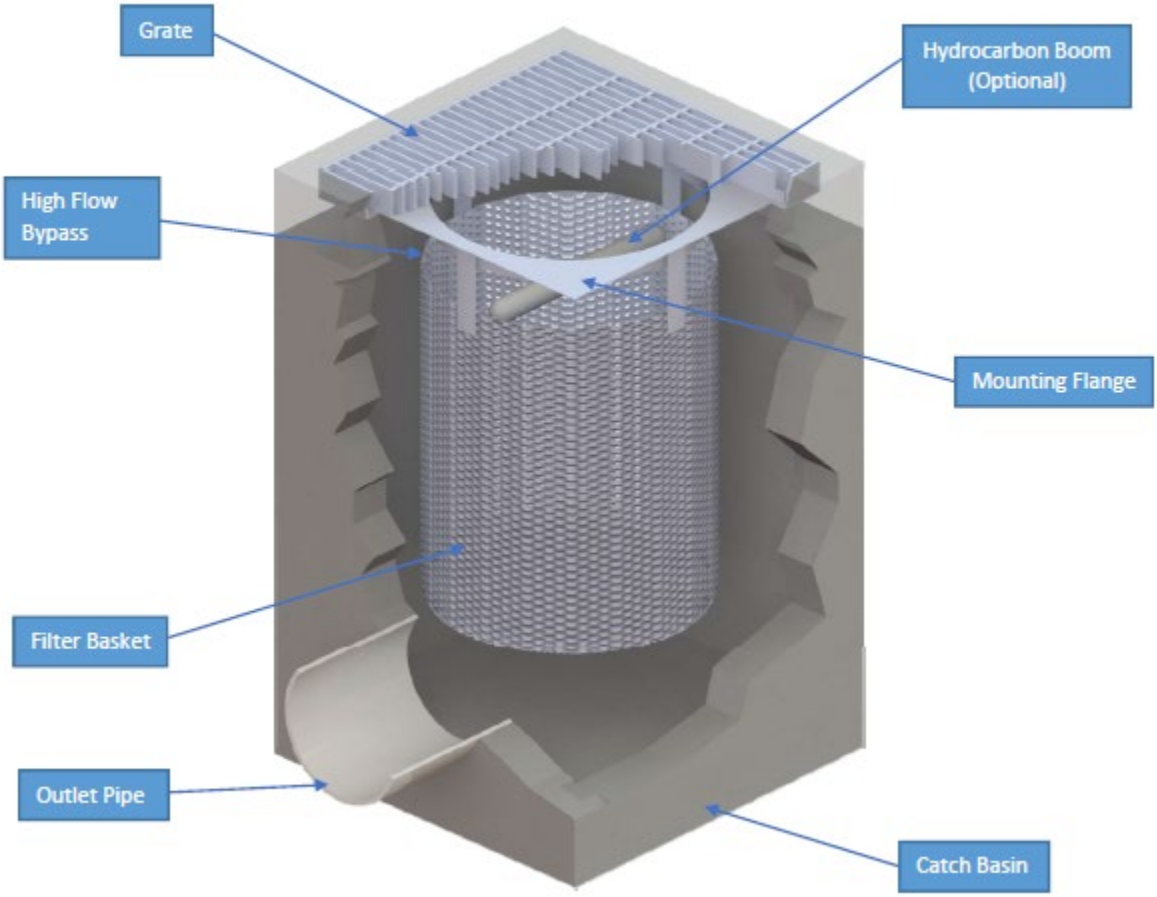


Figure 1 - Grate Inlet Filter Features

Grate Inlet Filter Operation - Diagram

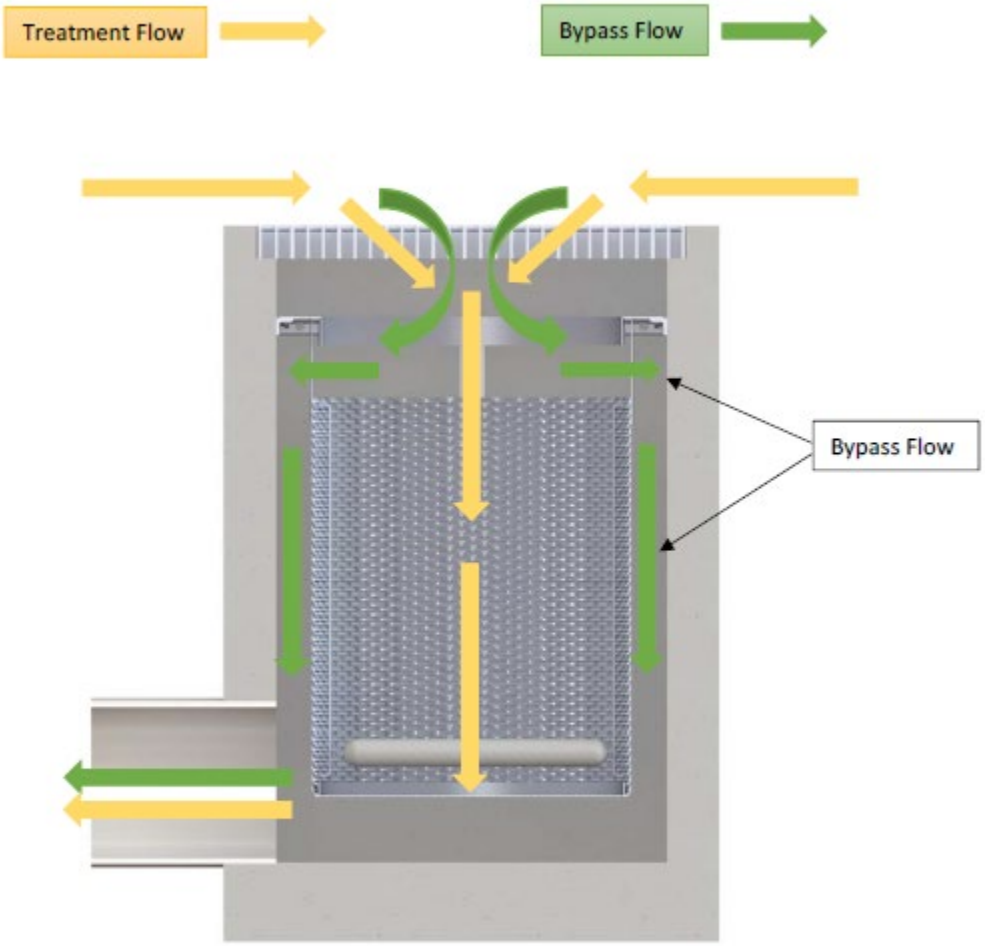


Figure 2 - Grate Inlet Filter Operation

Bio Clean® Grate Inlet Filter Characteristics and Capacity Table
California Full Capture Certified Capacities

TABLE 1

Model No.[1]	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity[2] (ft^3)	Treatment Capacity[3,5] (ft^3/s)	Bypass Capacity[4,6] (ft^3/s)
BC-G-18-18-18	16	18	1.05	4.32	3.68
BC-G-24-24-24	21	24	2.41	7.67	4.83
BC-G-30-30-24	27	24	3.98	12.97	6.21
BC-G-25-38-24	33 x 21	24	4.16	13.53	6.59
BC-G-36-36-24	33	24	5.94	19.64	7.60
BC-G-48-48-18	44	18	7.92	25.59	10.13

1. Other standard and custom model sizes available. Contact Bio Clean® for more information.
2. Storage Capacity based on the basket half full.
3. Considers a Safety Factor of 2.0 for side discharge and a Safety Factor of 3.0 for bottom discharge.
4. Considers a local depression ponding depth of 6-inches and a grate thickness of 3.5-inches.
5. In some cases, the filtered flow capacity has been reduced to the maximum possible inflow to the filter.
6. In some cases, the bypass capacity has been reduced to the maximum possible inflow to the filter.

Curb Inlet Filter Operation & Sizing

The Curb Inlet version of the Device functions very similarly to the Grate Inlet version in terms of physical filtration. Both Devices utilize the same cylindrical basket for physical filtration of the stormwater. The two Devices differ in how stormwater flow is received and conveyed to the filter and how peak flows bypass the filter (*See Figure 3 – Curb Inlet Filter Features).*

Stormwater flowing from parking lots and roads begin their entrance into the catch basin through a curb opening. The opening may be as short as two feet long or as long as 28 feet long. In a typical curb inlet, these flows would be allowed to drop to the bottom of the catch basin and freely exit the basin. To treat for Trash Full Capture, the inlet is outfitted with a trough made from marine grade fiberglass. The trough is mounted directly beneath the curb opening and spans the entire length of the opening. The trough collects all low flows entering the catch basin and conveys and directs the water to the filter. The filter is connected to the trough by a square tray system. The tray provides a physical and hydraulic connection between the trough and the filter. Additionally, the tray positions the filter back away from the curb opening. This position is an adequate distance away from the curb opening to remove the filter from the influence of peak flows. Furthermore, the tray positions the filter basket directly beneath the manhole access cover to provide for quick and easy removal of trash, debris and sediment without the need to enter the catch basin.

The filter basket is similarly constructed to the Grate Inlet Filter with the exception of the bypass window. The filter basket operates the same during filtration of the stormwater. The bypass window is omitted from the filter basket of the Curb Inlet Filter and bypass occurs upstream in

the trough system. The trough is designed such that the height of the trough is less than the height of the filter tray system. The trough height has adequate capacity to collect and convey treatment flows to the filter. Peak flows exceed the capacity of the trough system and overtop the height of the trough. Because bypass occurs upstream of the filter, peak flows are kept separate from the treatment area and re-suspension of pollutants does not occur. Because the Curb Inlet Filter bypass operation is the same as the standard curb inlet operation, the bypass capacity of the filter is the same as the standard inlet capacity of the curb opening (*See Figure 4 – Curb Inlet Filter Operation*).

A sizing chart for the Curb Inlet Filter is shown in Table 2. The treatment basket diameter is the same for all models. The variable dimension between models is the filter basket height and this is noted n the nomenclature for the models with the last digits of the model number. The characteristics and capacity Table lists the maximum treatment capacity for Full Capture Trash removal. The Table additionally lists the maximum storage capacity (for trash and sediment). These capacities are considerate of both re-suspension of removed pollutants and screen blocking. A safety factor has been applied to the storage capacity and treatment capacity. The Table includes the most commonly utilized standard sizes available. Other standard sizes are available as well as custom configurations. Characteristics and capacities will be determined on an as needed basis following the same guidelines and using the same empirically determined data for sizing of the custom configurations.

Curb Inlet Filter Features

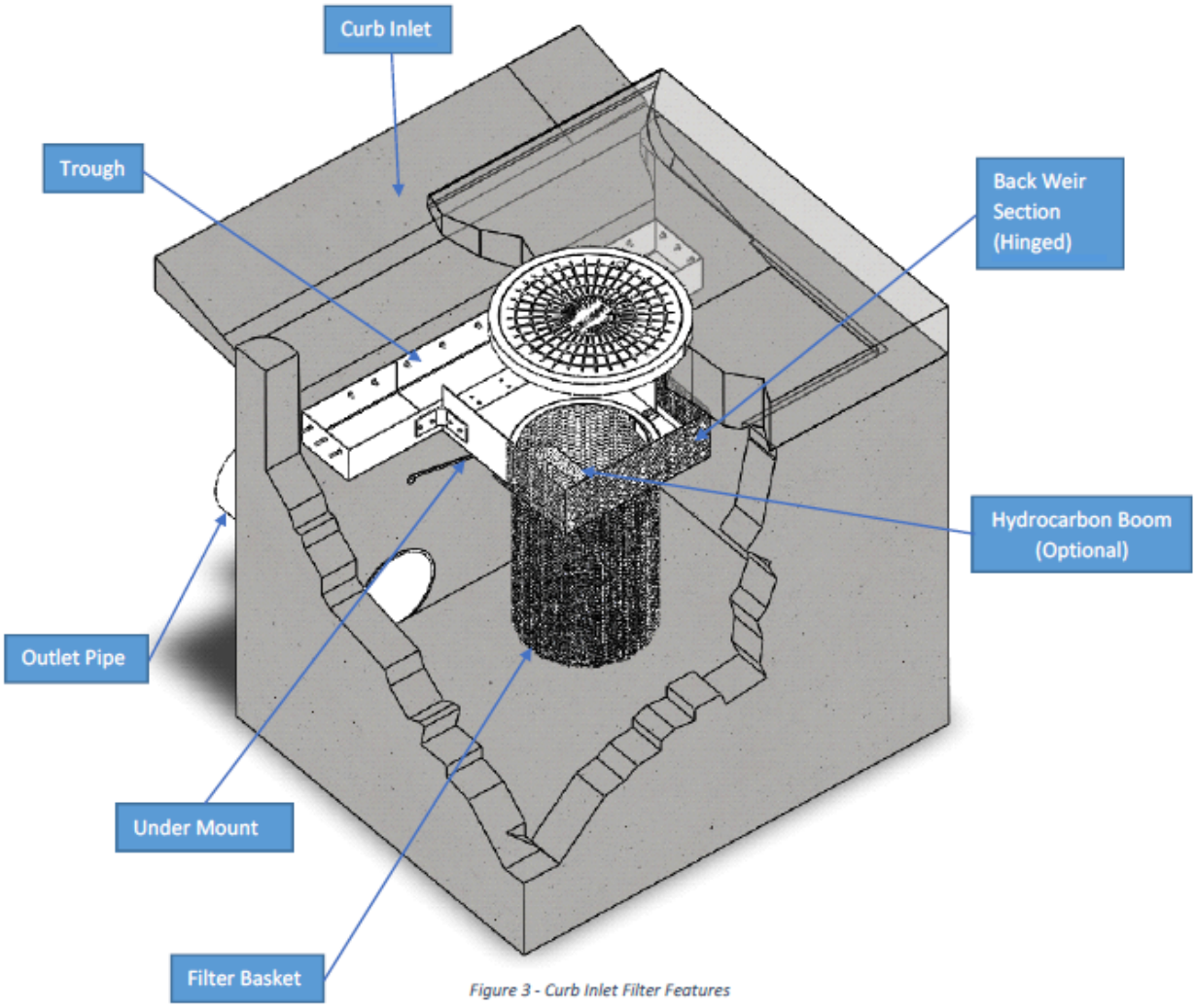


Figure 3 - Curb Inlet Filter Features

Curb Inlet Filter Operation - Diagram

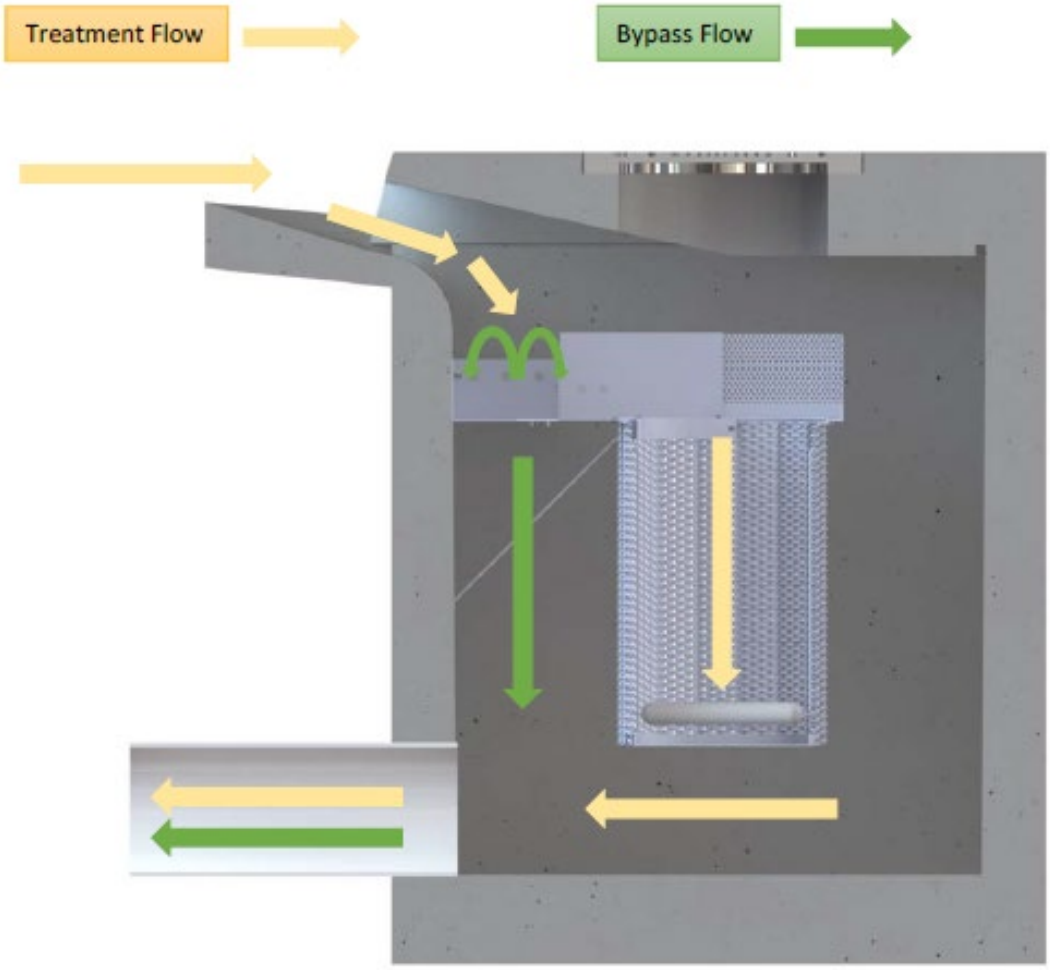


Figure 4 - Curb Inlet Filter in Bypass Operation

Bio Clean® Curb Inlet Filter Characteristics and Capacity Table
California Full Capture Certified Capacities

TABLE 2

Model No.[1]	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity[2] (ft^3)	Treatment Capacity[3,4] (ft^3/s)
BC-CURB-30	18	30	2.21	2.85
BC-CURB-24	18	24	1.77	2.85
BC-CURB-18	18	18	1.33	2.85
BC-CURB-12	18	12	0.88	2.85

1. Other standard and custom model sizes available. Contact Bio Clean® for more information.
2. Storage Capacity based on the basket half full.
3. Considers a Safety Factor of 2.0 for side discharge and a Safety Factor of 3.0 for bottom discharge.
4. In some cases the filtered flow capacity has been reduced to the maximum possible inflow to the filter.

3.C. Hydraulic Capacity: For all standard sizes, provide a table of the hydraulic capacity (flow rate) when the Device is empty and at several intervals of trash capture volumes up to the Device's recommended maximum trash capture volume;

Table 1 and Table 2 above list the trash capture volume (ft^3) retained by each Inlet Filter model. The trash capture volumes listed are maximum volumes that can be removed without a reduction in treatment performance and considers full retention of trash with no re-entrainment under peak flow conditions. Table 3 and Table 4 list the hydraulic capacities of each Device at various levels of trash capture volume. Sample calculations for the hydraulic flow for the Curb and Grate Inlet Filters can be found in Appendix H.

Bio Clean® Grate Inlet Filter Hydraulic Capacities at Various levels of trash capture volumes

TABLE 3

GRATED INLETS						
Model[1]	Filtered Flow Capacity[4]	Filtered Flow Capacity[4] 25% Clogging Factor	Filtered Flow Capacity[4] 50% Clogging Factor	Filtered Flow Capacity[4] 75% Clogging Factor	Bypass Flow Capacity[5] 100% Clogged	Solids Storage Capacity[6]
	(ft^3/s)	(ft^3/s)	(ft^3/s)	(ft^3/s)	(ft^3/s)	(ft^3)
BC-G-18-18-18	4.32	4.32	2.91	1.39	3.68	1.05
BC-G-24-24-24	7.67	7.67	5.84	2.78	4.83	2.41
BC-G-30-30-24	12.97	12.97	8.26	4.11	6.21	3.98
BC-G-36-36-24	19.64	17.14	11.01	5.67	7.60	5.94
BC-G-48-48-18	25.59	18.99	12.91	7.30	10.13	7.92
BC-G-25-38-24	13.53	13.53	12.08	6.71	6.59	4.16

1. Other standard and custom model sizes available. Contact Bio Clean® for more information.
2. Based on 37% Open Area.
3. Based on 51% Open Area.
4. Considers a Safety Factor of 2.0 for side discharge and a Safety Factor of 3.0 for bottom discharge.
5. Considers a local depression ponding depth of 6-inches and a grate thickness of 3.5-inches.
6. Storage Capacity based on the basket half full.
7. In some cases the filtered flow capacity has been reduced to the maximum possible inflow to the filter.
8. In some cases the bypass capacity has been reduced to the maximum possible inflow to the filter.

Bio Clean® Curb Inlet Filter Hydraulic Capacities at Various Levels of Trash Capture Volumes

TABLE 4

CURB INLETS					
Model[1]	Filtered Flow Capacity[4]	Filtered Flow Capacity[4] 25% Clogging Factor	Filtered Flow Capacity[4] 50% Clogging Factor	Filtered Flow Capacity[4] 75% Clogging Factor	Solids Storage Capacity[6]
	(ft^3/s)	(ft^3/s)	(ft^3/s)	(ft^3/s)	(ft^3)
BC-CURB-24	2.85	2.85	2.85	2.85	1.40
BC-CURB-18	2.85	2.85	2.85	2.85	1.05
BC-CURB-12	2.85	2.85	2.85	2.85	0.70

1. Other standard and custom model sizes available. Contact Bio Clean® for more information.
2. Based on 37% Open Area.
3. Based on 51% Open Area.
4. Considers a Safety Factor of 2.0 for side discharge and a Safety Factor of 3.0 for bottom discharge.
5. Storage capacity based on the basket half full.
6. In some cases the filtered flow capacity has been reduced to the maximum possible inflow to the filter.

3.D. Comparison Table: For all standard sizes, provide a table that includes the peak flow rates, and recommended maximum trash capture volume;

Maximum trash capture volume and hydraulic capacities are listed in Table 1 and Table 3 for Grate Inlet Filters, as well as Table 2 and Table 4 for Curb Inlet Filters.

3.E. Design Drawings: Provide design drawings for all standard Device sizes and, if any, alternate configurations;

Design drawings for all standard devices and configurations are included in Appendix A.

3.F. Alternative Configurations: If the Device includes alternative configurations, explain the purpose of each configuration and mandatory installation conditions;

As of this amended application, there is an alternative configuration to the Grate Inlet Filter. The filter basket itself is going from cylindrical in shape to a tapered square shape so that these baskets can be nested into each other during shipping. The top flange and bypass components remain the same, and the system operates the same as the standard configuration, from the treatment flow path to the bypass flow path. This alternative configuration is also installed in the same way as the standard configuration. Additional concept drawings, photos, and hydraulic calcs for this alternative configuration have been added to the end of this application in Appendix I.

3.G. Internal Bypass: If the Device has an internal bypass, explain how the bypass functions to only allow a bypass of flows exceeding the peak flow rate;

The Grate Inlet and Curb Inlet Filters are designed to capture target pollutants of concern but the Devices have also been designed to not impede normal hydraulic operation of the catch basins they are installed in. This is accomplished by way of an internal bypass feature of the basket for the Grate Inlet Filter and the weir tray for the Curb Inlet Filter. These bypass features are incorporated into the Device before the retained trash and treatment area and therefore do not release previously retained pollutants.

Grate Inlet Filter Bypass Operation

During peak flow events, the Grate Inlet Filter continues to treat, however water levels in the filter basket may rise to the point of overflow at which point the Inlet Filter is considered to be operating in bypass mode. Bypass occurs through a circumferential opening (or window) at the top of the basket just above the filter screen but beneath the grate (*See Figure 5*). During smaller peak flow events, the bypass window operates as a weir allowing these flows to exit through the bottom of the window. A significant amount of flow continues to be filtered and this continued flow forces previously retained pollutants to remain in the filter basket. During larger peak flow events, the water level will rise above the bypass window changing the window to act like an orifice. Peak flows are discharged through the window with the orifice controlling the flow.

The bypass flows continue to convey between the exterior of the filter basket and the interior of the catch basin. The bypass flow and treated flow rejoin prior to exiting the catch basin. Adequate annular space is required for these bypass flows to continue unimpeded and at a capacity not less than originally intended for the catch basin. The bypass flow rates for each filter basket configuration has been pre-determined and are published in Table 1. This bypass flow rate should be noted and compared to the original design capacity of the catch basin. A safety factor has been applied to the bypass capacity.

Section 3.G. (Continued)

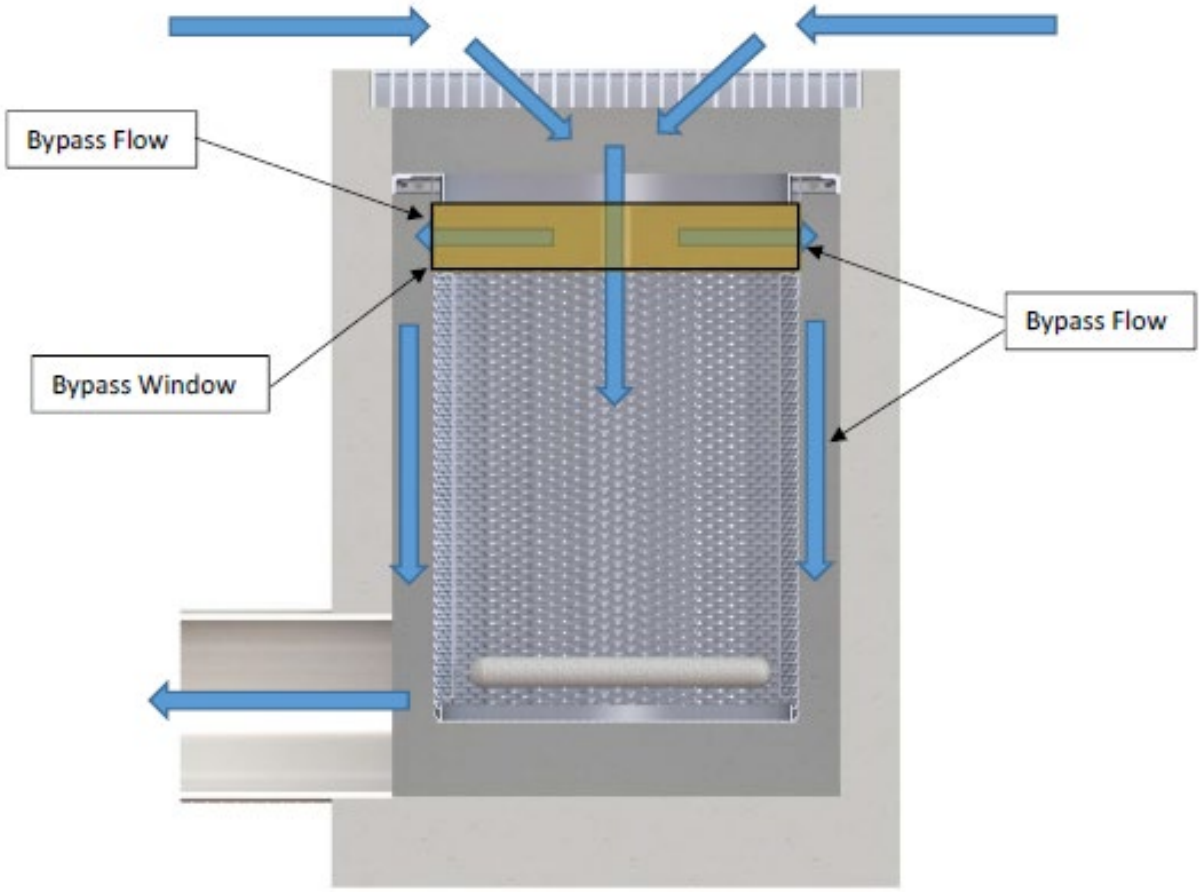


Figure 5 - Grate Inlet Filter in Bypass Operation

Curb Inlet Filter Bypass Operation

The filter basket for the Curb Inlet is similarly constructed to the Grate Inlet Filter basket with the exception of the bypass window. Both filter baskets operate the same during filtration of stormwater. The bypass window is omitted from the filter basket of the Curb Inlet Filter and bypass occurs upstream in the trough system (*See Figure 6*). The trough is designed such that the height of the trough is less than the height of the filter tray system. The trough height has adequate capacity to collect and convey treatment flows to the filter basket. Peak flows exceed the capacity of the trough system and overtop the height of the trough. Because bypass occurs upstream of the filter, peak flows are kept separate from the treatment area and re-suspension of pollutants does not occur. Because the filter bypass operation is the same as the standard curb inlet operation, the bypass capacity of the filter is the same as the standard inlet capacity of the curb opening.

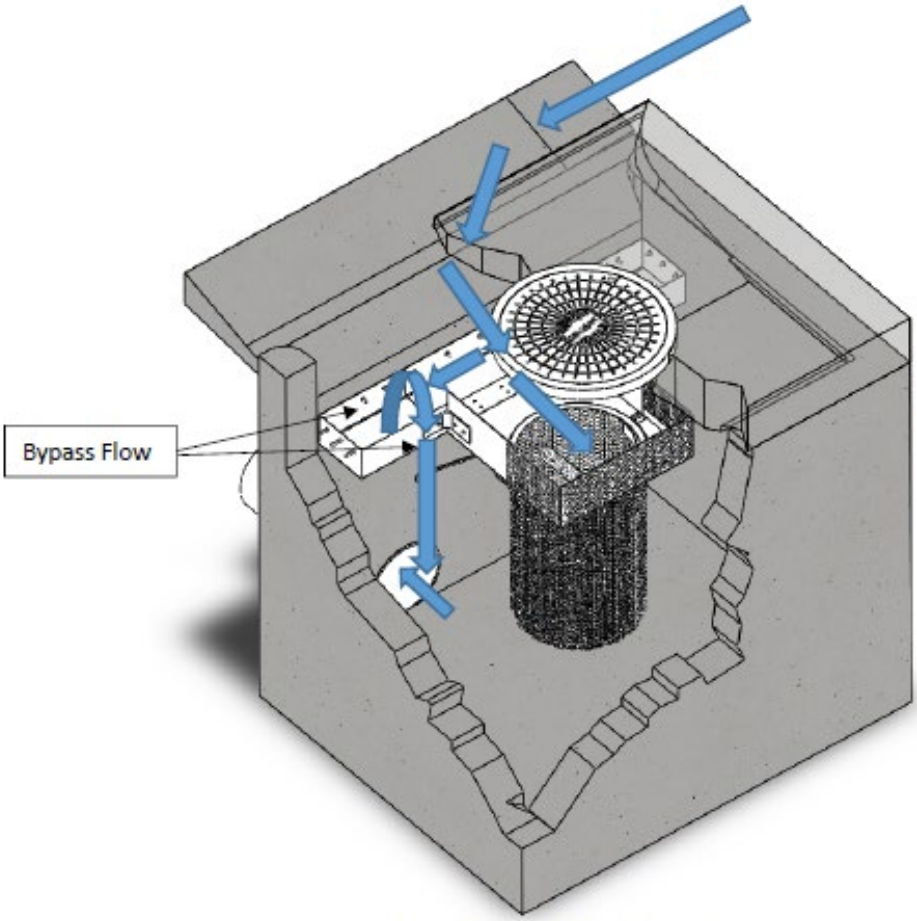


Figure 6 - Curb Inlet Filter in Bypass Operation

3.H. Previously Trapped Trash: Explain the condition(s) under which the Device re-introduces previously trapped trash (e.g., via the internal bypass);

The Grate Inlet and Curb Inlet Filters have been designed to remove and permanently retain all trash and debris that is 5mm in size or larger. Conditions under which either configuration of the Device re-introduce previously trapped trash are listed below:

- If the Device is not properly maintained and trash and debris are allowed to accumulate beyond the prescribed maximum allowable level in the trash containment compartments, conditions will be present that could cause a re-introduction of trash into the effluent of the Device.
- Broken or damaged screens, baskets or troughs can cause an adverse condition that would allow re-introduction of trash and debris into the effluent.
- Missing or un-replaced components after a maintenance service can cause an adverse condition that could re-introduce trash and debris into the effluent of the Device.

3.I. Calibration Feature: If the Device includes an adjustable calibration feature, describe how the calibration feature functions;

The Grate Inlet and Curb Inlet Filters do not have any adjustable calibration features.

3.J. Photos: If any, provide device installation photographs;

Figure 7 - Grate Inlet Filter (no access window) Prior to Installation.

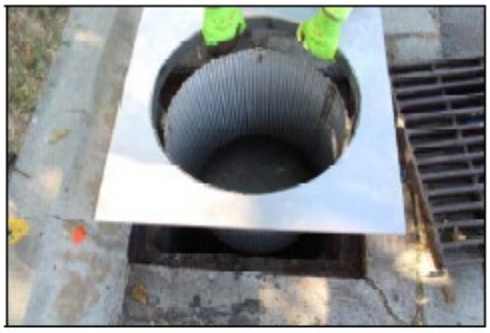


Figure 8 - Grate Inlet Filter (no access window) Being Installed.

Figure 9 - Grate Inlet Filter (no access window) Being Installed.

Figure 10 - Grate Inlet Filter (no access window) Being Installed.

Figure 11 - Grate Inlet Filter (no access window) Installed.

Figure 12 - Grate Inlet Filter (no access window) Prior to Maintenance.

Section 3.J. (Continued)

Figure 13 - Grate Inlet Filter (no access window) Prior to Maintenance.

Figure 14 - Grate Inlet Filter (no access window)Installed After Maintenance.

Figure 15 - Grate Inlet Filter (no access window) Installed After Maintenance.

Figure 16 - Curb Inlet Filter Basket Being Installed.

Figure 17 - Curb Inlet Filter Basket Being Installed.

Figure 18 - Curb Inlet Filter Basket Being Installed.

Section 3.J. (Continued)

Figure 19 - Curb Inlet Filter Basket Installed In Tray System.

Figure 20 - Curb Inlet Filter Basket Installed In Tray System.

Figure 21 - Curb Inlet Filter Basket Installed In Tray System.

3.K. Material Type: Provide each material and material grade used to construct the Device (e.g., stainless steel, plastic, etc.); and

The Grate Inlet and Curb Inlet Filters are constructed of high strength, durable materials and components that ensure a long design and service life for the Device. Appendix B of this submittal includes a detailed Specification for the Grate Inlet and Curb Inlet Filters which includes material Specifications. Key materials and components are additionally listed below:

- Filter Housing – The Filter Housing is manufactured from Type 304 Stainless Steel.
- Side Screens – The Side Screen is manufactured from Type 304 Stainless Steel, louver-expanded metal with openings equal to or less than 4.7mm in size.
- Bottom Screens – The Bottom Screens are manufactured from Type 304 Stainless Steel, perforated mesh, with round openings equal to or less than 5mm in size.
- Media Filtration Booms (Optional) – The Media Booms are made from granulated oil absorbing polymers tested in accordance with ASTM F 716.07
- Trough – The Trough is manufactured from marine grade fiberglass and Type 304 Stainless Steel.
- Weir – The weir box is manufactured from Type 304 Stainless Steel.

3.L. Design Life: Provide the estimated design life.

The estimated design life for the Grate Inlet and Curb Inlet systems is 25 to 50 years. The design life is dependent on the materials is utilized as well as the proper application of those materials.

4.0 INSTALLATION GUIDANCE

4.A. Standard device installation procedures including calibration instructions if applicable;

Installation requirements and procedures for the Grate Inlet Filter and Curb Inlet Filter are detailed in the *Grate Inlet Filter Installation Manual* and *Curb Inlet Filter Installation Manual* which have been included in Appendix C of this submittal. The guidelines include requirements and procedures for:

- Delivery
- Inspection
- Cath Basin Preparation
- Installation
- Installation Diagrams

Grate Inlet Filter Installation

The Grate Inlet Filter requires minimal tools and effort for a successful installation. The most critical part of the installation is measurement of the catch basin and grate dimensions. Proper measurements ensures proper manufacture of the Inlet Filter and provides an opportunity to check the Device will function properly with no adverse effects to the existing storm drain system. Measurement charts for the Grate Inlet Filter are included as part of this submittal at the end of Appendix C.

Once the measurements have been completed, the Inlet Filter is manufactured and delivered for installation. Most installations require only removing the catch basin grate, cleaning the catch basin, lowering the Inlet Filter into position, and then replacing the grate. Some versions of the Inlet Filter require installation of a secondary support structure within the catch basin. Details of this type of installation and the standard installation can be found in Appendix C.

Curb Inlet Filter Installation

The Curb Inlet Filter system utilizes several components in addition to the filter basket and requires mounting some of the components to the inside walls of the catch basin. As with the

Grate Inlet Filter, the most critical part of the installation is measurement of the catch basin. Proper measurement ensures proper manufacture of the Inlet Filter and provides an opportunity to check the Device will function properly with no adverse effects to the existing storm drain system. Measurement charts for the Curb inlet Filter are included as part of this submittal at the end of Appendix C.

Additionally, confined space entry of the catch basin is likely required for the primary installation of the Curb Inlet Filter system. It is imperative the installer adhere to all jurisdictional and/or OSHA safety recommendations and requirements.

Post installation inspection of the Inlet Filters is strongly advised. A representative from Bio Clean® is available for on-site inspection as support for the Owner. Inspection should determine if the Inlet Filter was installed properly as well as provided in a clean condition with no defects as a result of the installation.

Installation for Trash Capture in association with Full Capture programs, Trash TMDLs, or the Statewide Trash Amendment are often retrofit type installations. Care should be taken to document existing and as-built conditions to determine if the Inlet Filters must be supplied in a unique configuration to meet the retrofit conditions. Consideration must be given to any unique configurations for flow, treatment, and installation.

4.B. Description of device installation limitations and/or non-standard device installation procedures; and

Aside from confined space requirements and/or other OSHA safety recommendations, there are no additional limitations on the installation of the Grate Inlet and Curb Inlet Filters.

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

Bio Clean® has a process for design and manufacturer that includes checks and balances to minimize and eliminate errors in the design and manufacturing processes for the Grate Inlet and Curb Inlet systems. This process involves a formal submittal and review of the design and fabrication details for each unit. The owner has and should take this opportunity to review the proposed device prior to installation. This process helps to reduce or eliminate errors during installation. In the event an installation error does occur, the error should be documented and reviewed with the Bio Clean® and the Contractor immediately upon determination of the error.

After completion of installation, a checklist should be reviewed to ensure proper installation of the Inlet Filter system. The checklist should include key criteria for determination of proper installation. This checklist should be reviewed in its entirety at the completion of the installation and kept as documentation of proper installation. If during the checklist review an error is determined, the documented error should be reported to Bio Clean® as well as the Owner and Engineer. The checklist includes key criteria such as:

- The catch basin is clean and free of trash and debris.
- The grate is properly seated in the frame and does not protrude above the frame.
- The grate is properly oriented to receive storm drain flow (ensure the veins of the grate are positioned in the direction of water flow).
- The filter basket has been properly sealed.
- Inlet/Outlet pipes to/from the catch basin are not blocked or impeded as a result of the filter installation.
- Inlet Filter and Inlet Filter components are not bent, broken, or damaged.
- All debris from installation has been cleaned and removed.
- All components are free of sharp corners and edges.
- Optional hydrocarbon absorbent booms are installed and free to float within the filter basket.

Additionally the Grate Inlet and Curb Inlet Filters can be inspected after commencement of operation to determine proper operation.

5.0 OPERATION AND MAINTENANCE INFORMATION

5.A. Inspection procedures and frequency considerations;

The Grate Inlet Filter *Operation and Maintenance Manual* and Curb Inlet Filter *Operation and Maintenance Manual* are included with this submittal as Appendix D. These manuals include detailed requirements and recommendations for operation and maintenance of the Inlet Filters when used as Full Capture Trash Treatment Control Devices. A summary of requirements and recommendations are listed below:

Maintenance Summary

- Clean filter basket. Typical service interval occurs once every 12 months (≈ 10 minute service time).
- Replace optional hydrocarbon media booms. Typical replacement occurs once every 12 months (≈ 5 minute service time).

Notes:

- Maintenance cycles are dependent on site-specific pollutant loading.
- Maintenance operations should be planned to occur just prior to start of the rainy season and at the termination of the rainy season for the most effective system operation.

Inspection Procedures

- Following the installation of a Grate Inlet Filter or Curb Inlet Filter, the unit will require periodic and scheduled maintenance. Bio Clean® or a Bio Clean® approved contractor can provide inspection and maintenance services.
- Inspection of the Inlet Filters should be quick and require no entry into the catch basins or extensive use of equipment. The inspection should provide a general assessment of the condition and operation of the Inlet Filter and an estimate as to the need or timing for maintenance.
    - The primary observation during inspection is the condition of the filter basket. The filter basket should be in good, working condition and should be free from obstructions or blockages. Accumulated trash levels should be documented and if maximum capacity levels are exceeded, maintenance should occur.

5.B. Description of maintenance frequency considerations related to the Device's hydraulic capacity at various levels of trash capture volumes;

Standardized maintenance frequencies that are suitable for most sites are detailed in Section 5.A. Maintenance frequency is very site specific depending on pollutant loading. Records from inspections and prior maintenances should be periodically reviewed to assess the appropriateness of the prescribed maintenance frequency. Table 3 and Table 4 in Section 3.c. list the hydraulic capacities at various levels of trash capture volumes for the Grate Inlet and Curb Inlet Filters respectively.

5.C. Maintenance procedures, including procedures to clean the trash capture screen;

A full description of the maintenance procedures is located in the Grate Inlet *Operation and Maintenance Manual* and Curb Inlet *Operation and Maintenance Manual* included with this submittal as Appendix D. A summary of the key components of the procedures is listed below:

Maintenance Procedures

It is recommended that maintenance occur at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the Device while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Grate Inlet and Curb Inlet Filter can be performed from finished surface without entry into catch basin utilizing a vacuum truck. Some unique and custom configurations may create conditions that would require entry for some or all of the maintenance procedures. Once all safety measures have been set up, cleaning of the Grate Inlet and Curb Inlet Filter can proceed as follows:

- Remove all manhole cover or access hatches (traffic control and safety measures to be completed prior).

- Using an extension on a vacuum truck, position the hose over the opened manhole, hatch or grate opening. Insert the vacuum hose down into the filter basket and suck out trash, foliage, and sediment. A pressure washer is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. For the Curb Inlet filter, if the filter basket is overly full, trash, sediment, and debris can accumulate inside the trough and weir sections of the system. Once the filter basket is clean, power wash the weir and trough pushing the debris into the filter basket (leave the vacuum hose in the filter basket during this process so entering debris will be sucked out). Power wash off the trough, weir, debris screen, and filter basket sides and bottom.
- Next, remove the optional hydrocarbon boom (if installed) that is attached to the inside of the filter basket. They hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the color chart guide. If replacement is required, install and fasten in place a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- The last step is to close up and replace the manhole or hatch and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas, the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer.

Record Keeping Maintenance Procedures

- Following maintenance and/or inspection, the maintenance operator shall prepare a maintenance/inspection record. The record shall include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
- The owner shall retain the maintenance/inspection record for a minimum of five years from the date of maintenance. These records shall be made available to the governing municipality for inspection upon request at any time.

5.D. Essential equipment and materials for proper maintenance activities;

The following equipment is helpful when conducting Grate Inlet Filter and Curb Inlet Filter inspections and maintenance:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar

- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Confined space entry equipment (if necessary)
- Vacuum truck
- Pressure washer
- Replacement absorbent booms

5.E. Description of the effects of deferred maintenance on device structural integrity, performance, odors, etc.; and

Delayed or deferred maintenance can cause diminished pollutant removal, re-entrainment of pollutants in catch basin and upstream hydraulic impacts, and impacts to water quality.

5.F. Repair Procedures for the Device's structural and screening components.

In the case that damage is done to any part of the Bio Clean® Grate Inlet and Curb Inlet Filter, there are two approaches to repairing the damaged baskets. For minor damage, Bio Clean® can send out a field welder to fix the basket on the spot. In cases where the damage is more extensive, Bio Clean® recommends removing the damaged basket and replacing it with a new one to ensure that all installed devices adhere to full capture requirements. In most cases regarding damage, Bio Clean® recommends replacing the entire basket.

6.0 VECTOR CONTROL ACCESSIBILITY

6.A. The date the Device application was submitted for vector control accessibility design verification via email to the Mosquito Vector Control Association of California (MVCAC) (Trashtreatment@mvcac.org);

An application was originally submitted to the Mosquito Vector Control Association of California (MVCAC) via email on January 4, 2021, with approval received on January 27, 2021. With the addition of the alternative configuration, a new application was submitted to MVCAC via email on September 29, 2021 and a revised verification letter was received on October 20, 2021. It is attached as Appendix G.

6.B. Description and/or video that demonstrates how mosquito vector control personnel can readily access the bottom of the storm water vault and/or Device for visual observation and mosquito treatment; and

Bio Clean® designed the Grate Inlet and Curb Inlet Filter with access that facilitates maintenance. Filter baskets are located directly beneath the grate of the catch basin for the Grate Inlet version of the Filter. Filter baskets are located directly beneath the manhole access covers and/or hatches for the Curb Inlet basket of the Filter. Filter baskets are easily removed providing direct, unimpeded access to the catch basin.

While in operation, the Grate Inlet and Curb Inlet Filters are designed to be free of standing or constant pools of water in both the Filters and the catch basins. In addition, filter baskets are suspended above the catch basin bottoms allowing the contents to dry between storm events. Because of the absence of any standing water and because prolonged wet conditions are not anticipated, vector are not anticipated as a result of the installation and operation of the Filters.

It should be noted that some catch basins may be inadequately constructed and may be prone to retaining water even small amounts, which can be problematic for mosquito breeding. The preferred course of action is to repair any deficiencies that may cause standing water in a catch basin prior to installation of a Full Capture Device, it is critical that the deficient areas be visible and accessible by Vector/Mosquito Control personnel.

To accommodate visibility and accessibility by Vector/Mosquito Control personnel, the Bio Clean® Grate Inlet Filter features a viewing/access port built into the top flange of the basket. This viewing port is located at the corner of the top flange and varies in size; as the flange and basket get larger, the viewing port gets larger. The viewing port is made as large as possible to give maximum visibility to Vector/Mosquito Control personnel. This viewing port has an access cover attached via a pivot point with a tab at the end so that the viewing port can easily be rotated opened without removing the grate. *Figure 22* illustrates the viewing port in a catch basin, and *Figure 23* is a sample drawing of this viewing port. The example drawing in *Figure 23* is based on a 20-inch x 20-inch top flange. The 5-inch diameter viewing port will be the minimum size, and as the top flange grows, the access hole will grow with it. This applies to both standard and additional configuration baskets.

The Bio Clean® Curb Inlet Filter is located directly beneath the manhole opening for easier cleaning. The location of the filter does not impede Vector/Mosquito control activities however. The filter is located at an elevation that allows an acute angle view and access on the sides of the filter. *Figure 24, Figure 25,* and *Figure 26* illustrates this view for an installed filter in a typical catch basin. Visibility and access beneath the filter is facilitated by a design feature on the filter. In the case of larger catch basins, extra precautions are put into place during the filter installation to ensure visibility and accessibility by Vector/Mosquito Control personnel. In these instances, the Back Weir Section of the filter will be no larger than 8-inches tall, and the filter will be installed 12-inches lower than normal. The limits placed on the back weir and the additional 12-inch of clearance create adequate visibility and accessibility in even the largest of vaults, as illustrated in *Figure 27* and *Figure 28*.

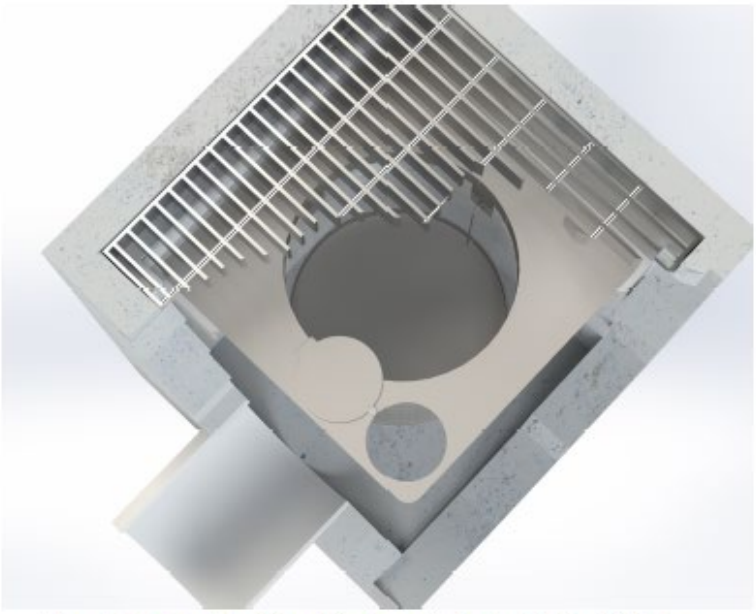


Figure 22 - Top View Rendering of viewing port in Bio Clean® Grate Inlet Filter

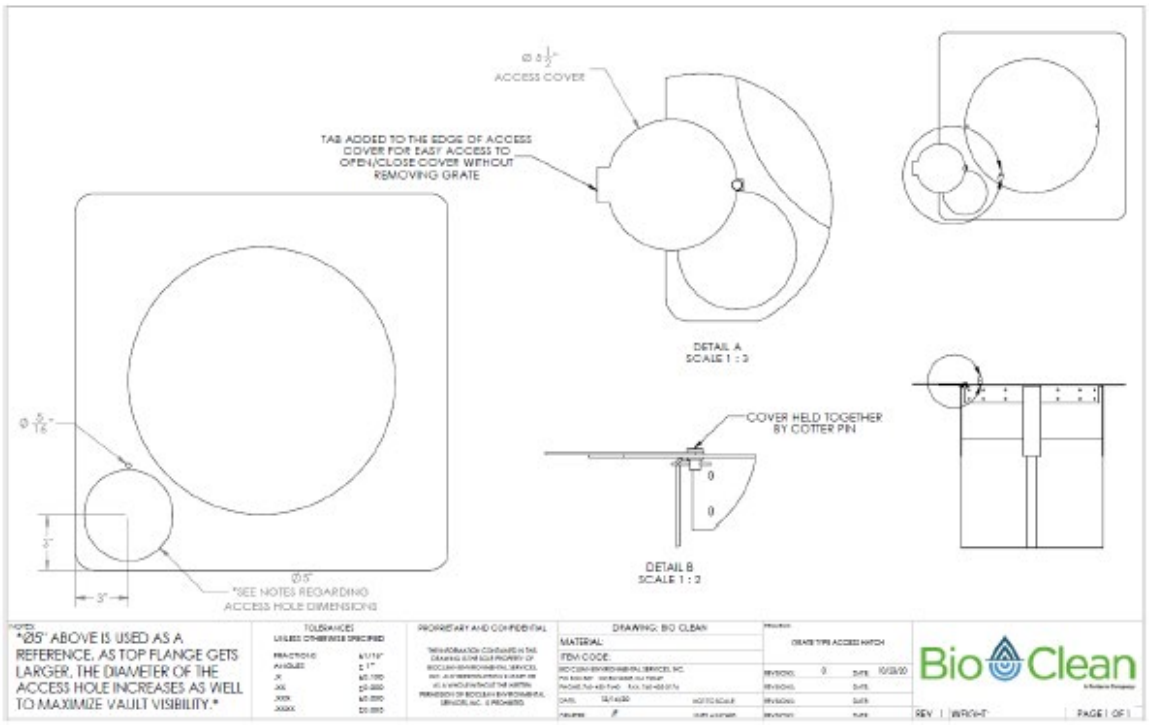


Figure 23 - Sample drawings of Bio Clean® Grate Inlet Filter viewing port

Figure 24 - View 1 of Catch Basin Bottom with Bio Clean® Curb Inlet Filter Installed

Figure 25 - View 2 of Catch Basin Bottom with Bio Clean® Curb Inlet Filter Installed

Figure 26 - View 3 of Catch Basin Bottom with Bio Clean® Curb Inlet Filter Installed

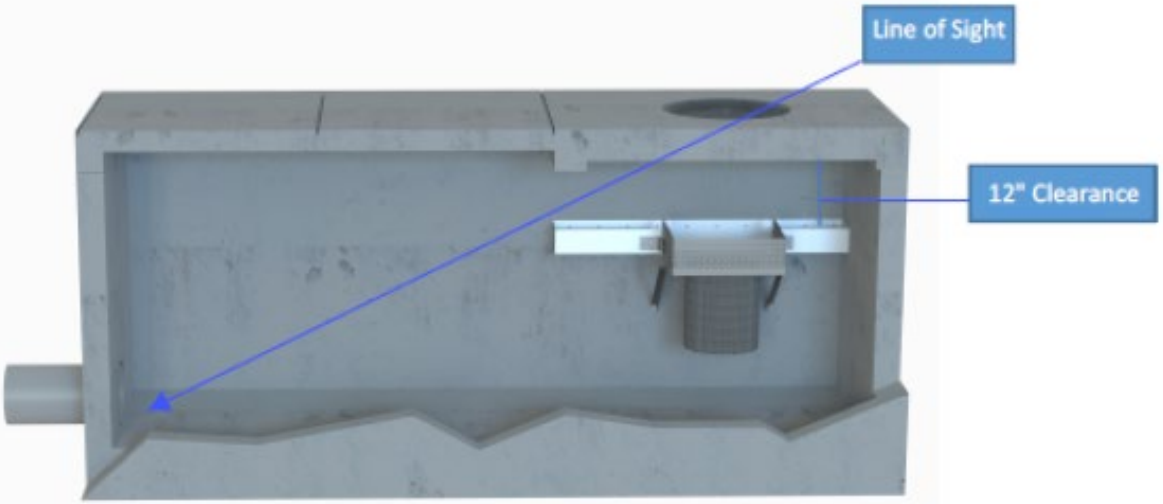


Figure 27 - Bio Clean® Curb Inlet Filter installed lower to increase visibility in larger vaults. Back Side View

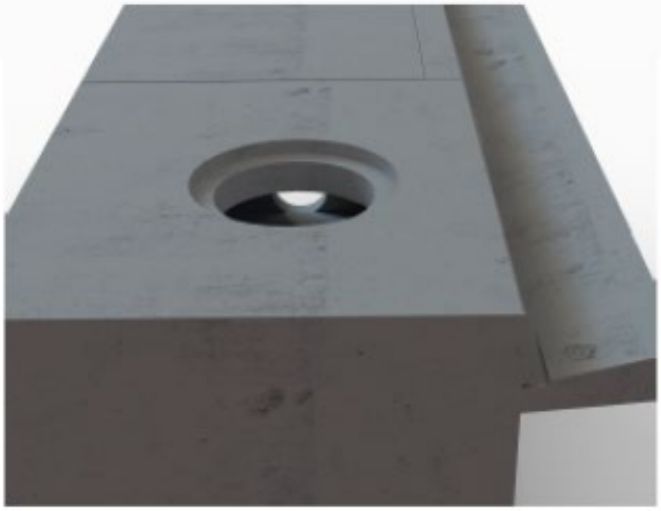


Figure 28 - Bio Clean® Curb Inlet Filter installed lower to increase visibility in larger vaults. Top View.

6.C. The MVCAC Letter of Verification as an attachment to the application when it becomes available. This letter shall verify that the Device design allows full visual access for presence of standing water and treatment of mosquitos when necessary. Table of Contents shall note the MVCAC approval letter.

An updated Letter of Verification from the MVCAC was received on October 20, 2021 and is attached as Appendix G.

7.0 RELIABILITY INFORMATION

7.A. Estimated design life of Device components before major overhaul;

The estimated design life for the Grate Inlet and Curb Inlet systems is 25 to 50 years. The design life is dependent on the materials utilized as well as the proper application of those materials.

7.B. Warranty Information; and

Bio Clean® provides an eight year limited warranty for the Grate Inlet and Curb Inlet Filter per the conditions listed in the warranty document included in the submittal in Appendix E.

7.C. Customer support Information

Bio Clean® is a California based company and has three facilities to provide Customer Support within the State.

Bio Clean® Corporate Office
398 Via El Centro
Oceanside, CA 92058
Phone: (760) 433-7640
Office Fax: (760) 433-3176
info@Bio_CleanEnvironmental.com
Maintenance@Bio_CleanEnvironmental.com

8.0 FIELD/LAB TESTING INFORMATION AND ANALYSIS

8.A. For devices with 5mm screening, any available field/lab testing information that demonstrates the device functionality and performance; and

Bio Clean® conducted laboratory testing on the proprietary non-blocking screen material utilized in the Grate Inlet and Curb Inlet Filters. Bio Clean® conducted this testing to empirically determine the unique properties of the screen including the Effective Open Area (EOA), the Coefficient of Discharge (C_d), and the flow capacity and characteristics. The results of the testing provided a clear relationship between discharge (Q) and head (h) acting on the screen. The results of the testing have been incorporated into the design of the Filters to determine both the treatment and peak flow rates for the Filters.

The test report has been included in this Application in Appendix F for review by the SWRCB and interested parties.

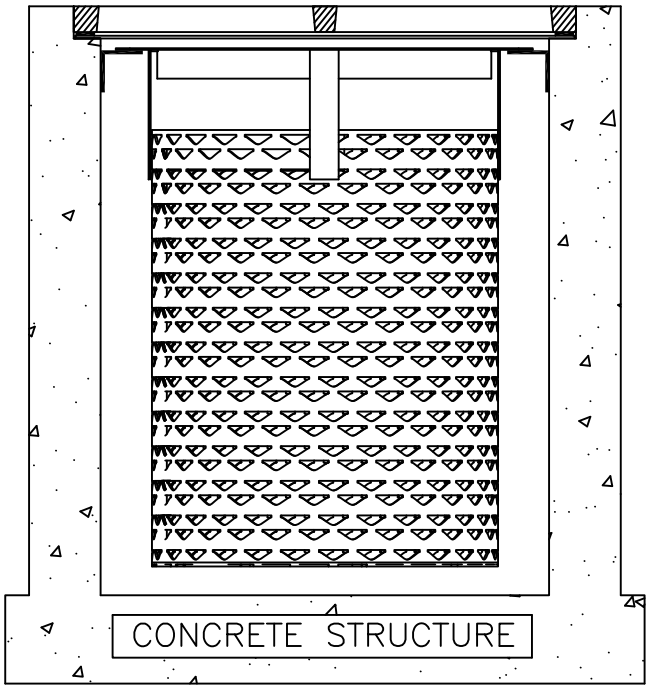
8.B. If the Device does not include a 5mm screen, adequate field/lab testing information that demonstrates the Device captures trash particles of 5mm or greater.

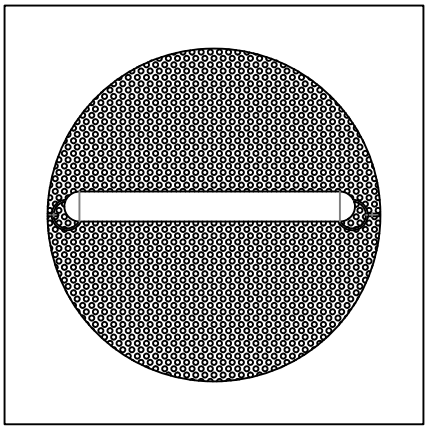
The Grate Inlet and Curb Inlet Filters include a 5mm screen with lab testing, which is available in Appendix F.

APPENDIX A

BIO CLEAN FULL CAPTURE FILTER

FOR USE IN GRATE INLETS

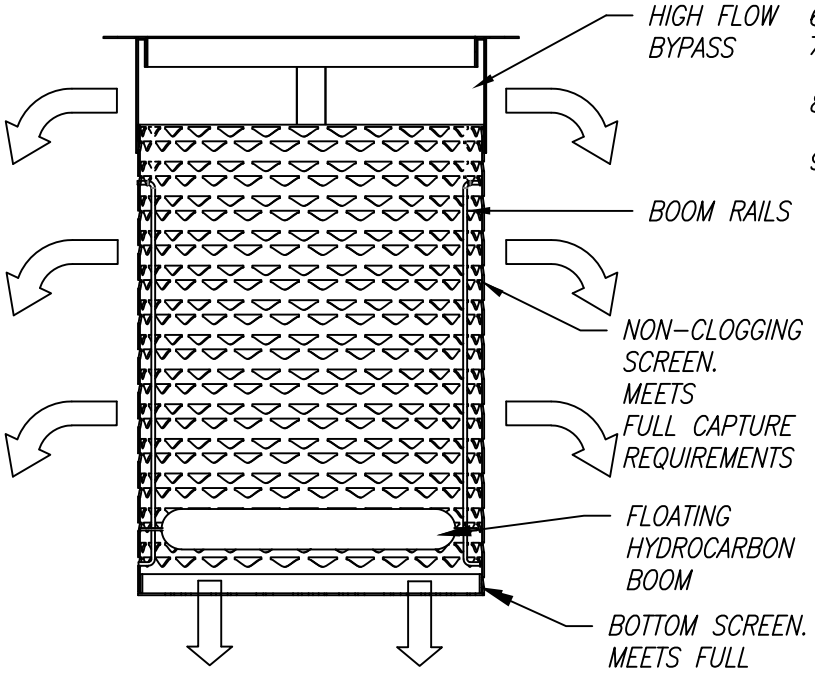




TOP VIEW

NOTES

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDIING DEPTH OF 6 INCHES.
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.



FLOW SCHEMATIC

MODEL NUMBER	TREATMENT FLOW (cfs)	BYPASS FLOW (cfs)	SOLIDS STORAGE CAPACITY (cu ft)
BIO-GRATE-FULL 12-12-12	1.55	1.55	0.27
BIO-GRATE-FULL 18-18-18	4.32	3.68	1.05
BIO-GRATE-FULL 24-24-24	7.67	4.83	2.41
BIO-GRATE-FULL 30-30-30	12.97	6.21	3.98
BIO-GRATE-FULL 24-40-24	13.53	6.59	4.16
BIO-GRATE-FULL 36-36-24	19.64	7.60	5.94
BIO-GRATE-FULL 48-48-18	25.59	10.13	7.92

DRAWING: BIO CLEAN CURB INLET FILTER DETAILS

WARRANTY: 1 YEAR MANUFACTURERS

BIO CLEAN ENVIRONMENTAL SERVICES. INC.
398 VIA EL CENTRO, OCEANSIDE, CA 92058
PHONE: 760-433-7640

SCALE: NTS; UNITS = INCHES

Bio Clean

A Forterra Company

BIO CLEAN FULL CAPTURE FILTER WITH TROUGH SYSTEM

FOR USE IN CURB INLETS

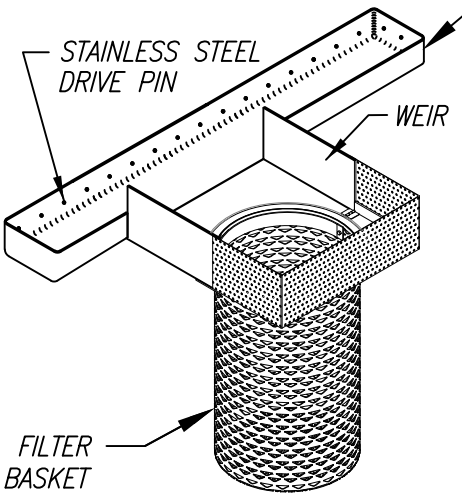


FIGURE 1:
DETAIL OF PARTS

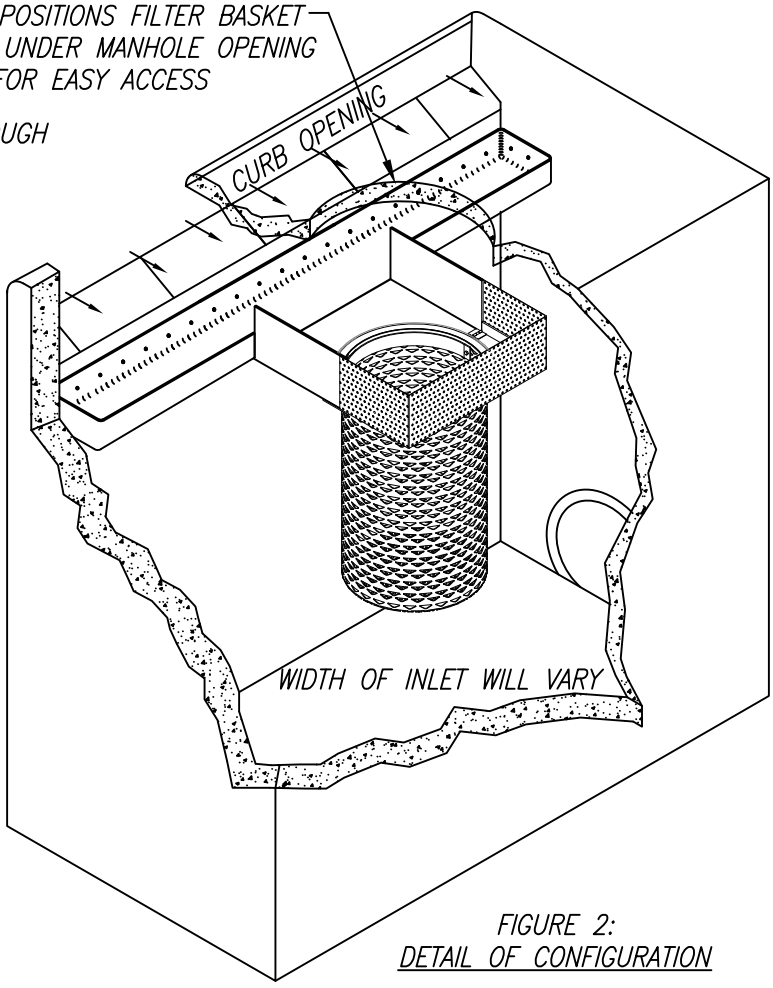


FIGURE 2:
DETAIL OF CONFIGURATION

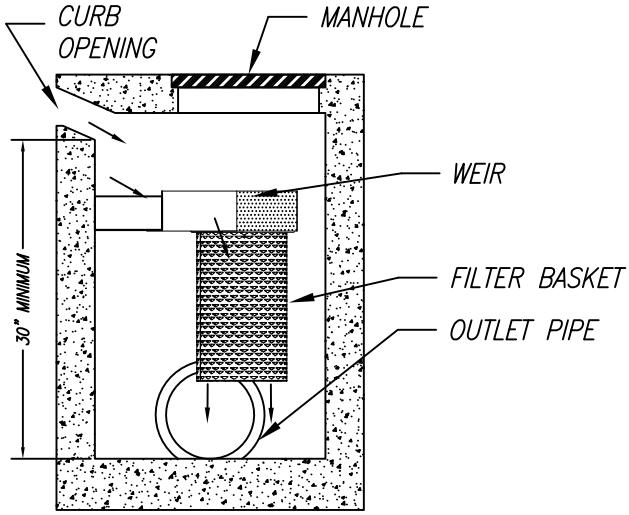


FIGURE 3:
DETAIL OF PROFILE

* SEE PAGE 2 FOR EXPLANATION OF FLOW RATES.

MODEL NUMBER	TREATMENT FLOW (cfs)*	SOLIDS STORAGE CAPACITY (cu ft)
BIO-CURB-FULL-24	2.85	1.40
BIO-CURB-FULL-18	2.85	1.05
BIO-CURB-FULL-12	2.85	0.70
DRAWING: BIO CLEAN CURB INLET FILTER DETAILS		
WARRANTY: 1 YEAR MANUFACTURERS		
BIO CLEAN ENVIRONMENTAL SERVICES. INC. 398 VIA EL CENTRO, OCEANSIDE, CA 92058 PHONE: 760-433-7640		
SCALE: NTS; UNITS = INCHES		

NOTES

1. TROUGH SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO FILTER.
2. TROUGH SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTER MANUFACTURED OF 100% STAINLESS STEEL.
5. FILTER MADE OF NON-CLOGGIN SCREEN WITH 4.7 MM OPENINGS AND MEETS FULL CAPTURE REQUIREMENTS.
6. FILTER CAN BE FITTED WITH HYDROCARBON ABSORBENT BOOM 7. FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE FOR EASY REMOVAL AND MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 2' TO 30'
9. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE - CONTACT BIO CLEAN FOR MORE INFORMATION.
10. CONSIDERS A SAFETY FACTOR OF 2.0
11. BYPASS IS FACILITATED VIA OVERFLOW OF THE TROUGH SYSTEM AND IS EQUAL TO THE CAPACITY OF THE CURB OPENING
12. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
13. ADDITIONAL TREATMENT AND STORAGE CAPACITY CAN BE ACHIEVED BY UTILIZING MULTIPLE FILTER BASKETS.

Bio Clean
A Forterra Company

MODEL # BIO-CURB-FULL FILTER

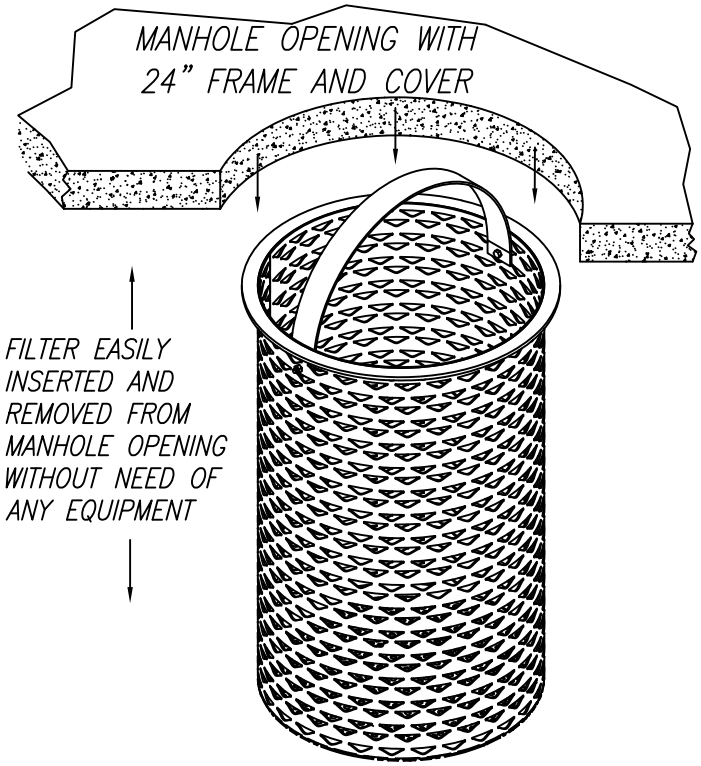


FIGURE 1:
DETAIL OF INSTALLATION

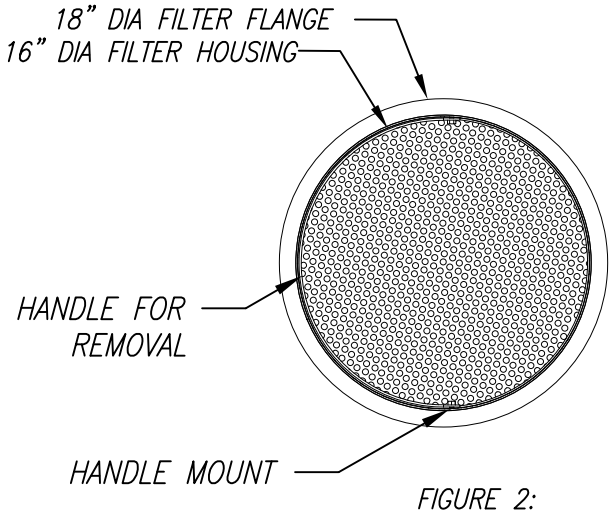


FIGURE 2:
DETAIL OF DIAMETERS

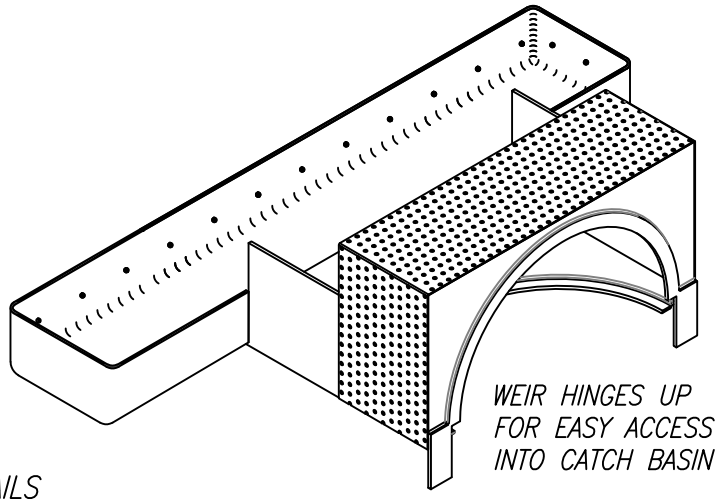


FIGURE 4:
DETAIL OF WEIR

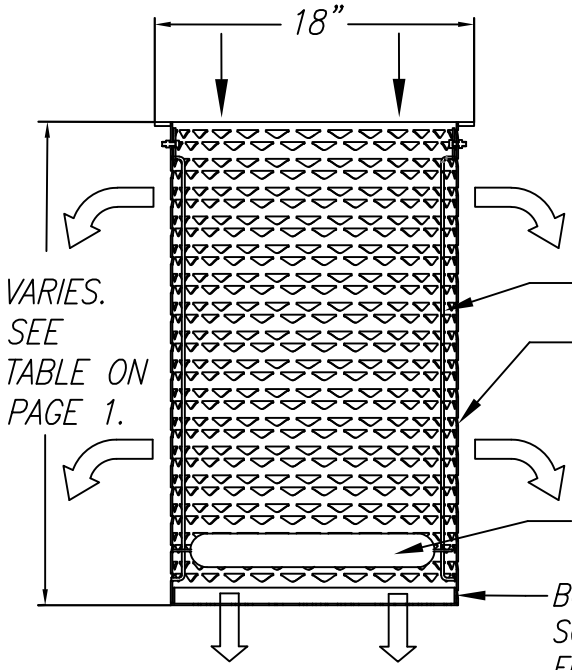


FIGURE 3:
DETAIL OF PARTS

FLOW RATES – CURB FILTER		
TREATMENT FLOW RATE	2.85 CFS	SAFETY FACTOR 2X

*TREATMENT FLOW RATE IS BASED ON THE CRITICAL POINT OF RESTRICTION, WHICH IS EITHER THE WEIR OR THE SCREEN CAPACITIES.

WEIR CAPACITY=2.85 CFS
SCREEN CAPACITY=4.82 CFS

**FLOW RATES CALCULATED USING THE FOLLOWING EQUATION

$Q = SO * c_d * A \sqrt{2 * g * h}$ c_d = COEFFICIENT of DISCHARGE = .62

DRAWING: BIO CLEAN CURB INLET FILTER DETAILS
WARRANTY: 1 YEAR MANUFACTURERS
BIO CLEAN ENVIRONMENTAL SERVICES. INC. 398 VIA EL CENTRO, OCEANSIDE, CA 92058 PHONE: 760-433-7640
SCALE: NTS; UNITS = INCHES

Bio Clean
A Forterra Company

BIO CLEAN FULL CAPTURE FILTER WITH TROUGH SYSTEM

FOR USE IN CURB INLETS WITH WINGS

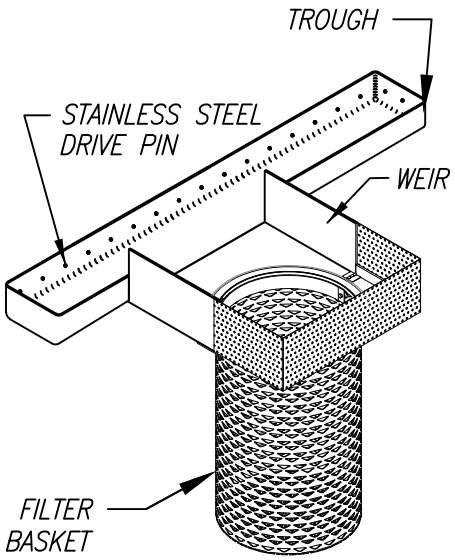


FIGURE 1:
DETAIL OF PARTS

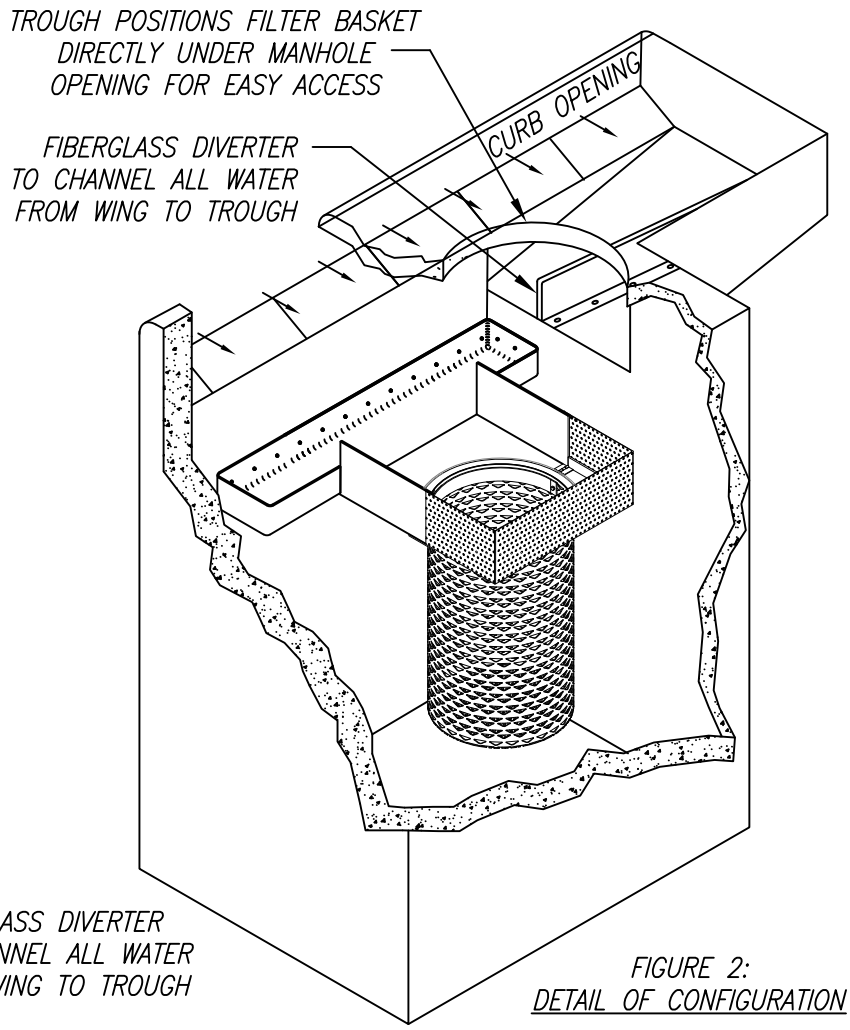


FIGURE 2:
DETAIL OF CONFIGURATION

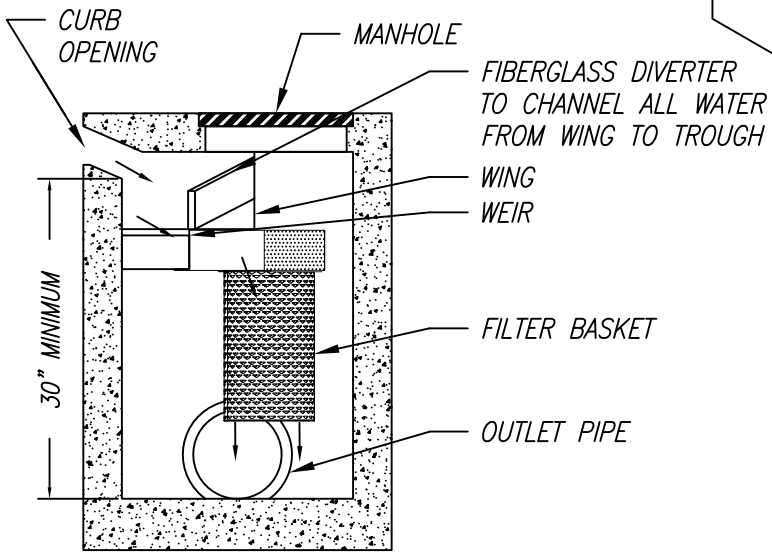


FIGURE 4:
DETAIL OF PROFILE

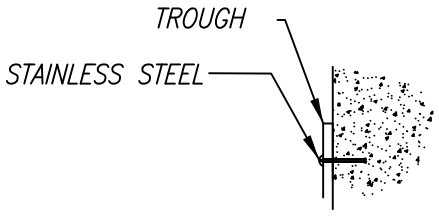


FIGURE 3:
DETAIL OF MOUNTING

DRAWING: BIO CLEAN CURB INLET FILTER DETAILS
WARRANTY: 1 YEAR MANUFACTURERS
BIO CLEAN ENVIRONMENTAL SERVICES. INC. 398 VIA EL CENTRO, OCEANSIDE, CA 92058 PHONE: 760-433-7640
SCALE: NTS; UNITS = INCHES

* SEE PAGE 1 FOR NOTES.

Bio Clean
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APPENDIX B

Section [_____]
Stormwater Catch Basin Filtration Device

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for devices used for filtration of stormwater runoff captured by catch basins with grates. 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 Catch Basin Filtration Devices (SCBFD) are used to filter stormwater runoff captured by catch basins. The SCBFD is a filter system composed of a SCBFD with a media filtration storm boom. SCBFDs are used to remove various pollutants from stormwater by means of screening, separation and media filtration.

01.03.00 Manufacturer
The manufacturer of the SCBFD 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 (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the SCBFD(s) shall be a filter device manufactured/distributed 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

01.04.00 Submittals

01.04.01 Submittal drawings will be provided with each order to the contractor and engineer of work.

01.04.02 Submittal drawings are to detail the SCBFD, its components and the sequence for installation, including:
- SCBFD configuration with primary dimensions
- Various SCBFD components
- Any accessory equipment

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of SCBFD.

01.05.02 Manufacturer to supply SCBFD(s):
- Filter Basket
- Media Filtration Storm Boom

01.05.03 Media Filtration Boom shall be provided with each Filter Basket housed in nylon netting and securely fastened entrance to the Filtration basket. Each media boom shall contain polymer beads to permanently absorb hydrocarbons.

01.06.00 Reference Standards

ASTM A 240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM F 716	Testing Sorbent Performance of Absorbents
ASTM F 726	Sorbent Performance of Absorbents
ASTM D3787 - 07	Standard Test Method for Bursting Strength of Textiles-Constant-Rate-of-Traverse (CRT) Ball Burst Test
ASTM D2690-98	Standard Test Method for Isophthalic Acid in Alkyd and Polyester Resins
ASTM C 582-02	Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment
ASTM D 638	Standard Test Method for Tensile Properties of Plastics
ASTM D 790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
ASTM D 2583	Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D 4097	Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks
ASTM D3409	Standard Test Method for Adhesion of Asphalt-Roof Cement to Damp, Wet, or Underwater Surfaces
IFI 114	Break Mandrel Blind Rivets

PART 2 – COMPONENTS

02.01.00 Filter Basket Components

All SCBFD components must be made of stainless steel, per these specifications. SCBFD's containing any fabrics or plastics will not be accepted.

02.01.01 Filter Housing shall be manufactured of 100% stainless steel.

02.02.02 Side Screens shall be manufactured of 100% stainless steel louver expanded metal with openings equal to or less than 4.7 mm in size.

- Screens shall be oriented with openings opposite to the flow of water into the filter and be non-clogging based on perpetual deflective shielding.

02.02.03 Bottom Screens shall be manufactured of 100% stainless steel perforated round openings less than 5 mm in size.

02.02.04 Media Filtration Boom shall be made up of granulated oil absorbing polymers that have been tested in accordance with section 11.2 of ASTM F 716.07 and held within a netting.

- Oil absorbing polymers 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 that 50%.

- Netting shall be 100% polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- Filter netting shall be 100% polyester with a number 16 sieve size, and strength tested per ASTM D 3787.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The SCBFD has no moving internal components and functions based on gravity flow, unless otherwise specified. Runoff enters the SCBFD from a catch basin with a grate opening and flows downward into the SCBFD. This SCBFD shall be positioned directly under the catch basin grate. After removal of the grate the SCBFD must be able to be removed through the catch basin opening without any further disassembly Stormwater enters the inside of the Filter Basket and flows downward toward the bottom portion of the Basket. The non-clogging screen has openings that are facing upward. As water flows downward the screening continuously removes debris from the screen's surface. Flowing water also makes contact with the Media Filtration Boom which absorbs free floating oils. Stormwater flow up to the peak treatment flow rate is processed through the filtration screens. During the heaviest flows the Basket fills with water and spills out the internal bypass and into the bottom of the catch basin.

03.01.02 Pollutants - The SCBFD will remove and retain debris, sediments, metals, nutrients, oxygen demanding substances and hydrocarbons entering the catch basin during frequent storm events and specified flow rates. For pollutant removal performance see section 03.02.00.

03.01.03 Treatment Flow Rate - The SCBFD operates using gravity flow. The SCBFD treatment flow rate varies by size and is provided on the drawings for each model. Flow rates must be supported by independent lab results.

03.01.04 Bypass Flow Rate – The SCBFD is designed to fit within the catch basin in a way not to affect the existing hydraulics and treat or bypass all flows. The bypass must be sized with a surface area greater then the outlet pipe size, thus the SCBFD shall not be a critical point of flow restriction. Bypass flow rate must be based on the SCBFD's inlet throat or bypass orifice capacity, which ever is less.

03.01.05 Pollutant Load – The SCBFD must be designed to have minimum storage

03.01.06 capacity as documented on the drawing for each particular size and model.

03.01.07 Performance Protocol and Results – All lab testing on filtration media must be performed by an independent third party consultant and testing lab.

03.02.00 Test Performance

At a minimum, the SCBFD shall be tested, according to section 03.01.06, and meet these performance specifications:

03.02.01 Filter Pollutant Removal Table

POLLUTANT	REMOVAL EFFICIENCY
Trash and Debris - (down to 5 mm)	100%

PART 4 - EXECUTION

04.01.00 General

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

04.02.00 Installation

The contractor shall furnish all labor, equipment, materials and incidentals required to install the (SCBFD) device(s) and appurtenances in accordance with the drawings, installation manual, and these specifications, and be inspected and approved by the local governing agency. Installation contractor should possess a Confined Space Entry Certification Permit, pursuant to OSHA standards. Any damage to catch basin and surrounding infrastructure caused by the installation of the SCBFD is the responsibility of the installation contractor.

04.02.01 Filter Basket and all components or accessories shall be inserted through the catch basin and properly secured per manufactures installation manual and these specifications.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – SCBFD 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 SCBFD(s) and its 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 SCBFD(s) and its components shall always be stored indoors and transported inside the original shipping container(s) until the SCBFD(s) are ready to be installed. The SCBFD 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 shall demonstrate that the SCBFD has been properly installed at the correct location(s), elevations, and with appropriate supports and fasteners. All components associated with the SCBFD and its installation shall be subject to inspection by the engineer of work, governing agency, and the manufacture at the place of installation. In addition, the contractor shall demonstrate that the SCBFD has been installed per the manufacturer's specifications and recommendations. SCBFD(s) shall be physically inspected regularly in accordance to owner's Stormwater Pollution Prevention Plans (SWPPP) and manufacture's recommendations. An inspection record shall be kept by the inspection operator. The record shall include the condition of the SCBFD and its appurtenances. The most current copy of the inspection record shall always be copied and placed in the owner's SWPPP.

04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal and replacement of the Media Filtration Boom as needed. The maintenance shall be preformed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information

regarding the maintenance of the SCBFD(s). A detailed Maintenance Record shall be kept by the maintenance operator. The Maintenance Record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the filter. The most current copy of the Maintenance Record shall always be copied and placed in the owner's Stormwater Pollution Prevention Plan (SWPPP) per governing agency.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured and removed from the SCBFD shall be transported and disposed of at an approved facility for disposal in accordance with local and state regulations. 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 SCBFD against all manufacturing defects in materials and workmanship for a period of (5) years from the date of delivery to the contractor. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The SCBFD is limited to recommended application for which it was designed.

[End of This Section]

Section [_____]
Stormwater Catch Basin Filtration Device

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for devices used for filtration of stormwater runoff captured by catch basins with curb openings. 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 Catch Basin Filtration Devices (SCBFD) are used to filter stormwater runoff captured by catch basins. The SCBFD is a filter system composed of a filter basket, media filtration boom and a trough system. SCBFDs are used to remove various pollutants from stormwater by means of screening, separation and media filtration.

01.03.00 Manufacturer
The manufacturer of the SCBFD 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 (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the SCBFD(s) shall be a filter device manufactured/distributed 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: (855) 566-3938
Fax: (760) 433-3176
www.BioCleanEnvironmental.com

01.04.00 Submittals

01.04.01 Shop drawings are to be submitted with each order to the contractor and engineer of work.

01.04.02 Shop drawings are to detail the SCBFD, its components and the sequence for installation, including:
- SCBFD configuration with primary dimensions
- Various SCBFD components
- Any accessory equipment

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of SCBFD.

01.05.02 Manufacturer to supply SCBFD(s):
- Filter Basket
- Trough System (weir and trough)
- Media Filtration Boom

01.05.03 Media Filtration Boom shall be provided with each Filter Basket housed in nylon netting and securely fastened entrance to the Filtration basket. Each media boom shall contain polymer beads to permanently absorb hydrocarbons.

01.06.00 Reference Standards

ASTM A 240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM F 716	Testing Sorbent Performance of Absorbents
ASTM F 726	Sorbent Performance of Absorbents
ASTM D3787 - 07	Standard Test Method for Bursting Strength of Textiles-Constant-Rate-of-Traverse (CRT) Ball Burst Test
ASTM D2690-98	Standard Test Method for Isophthalic Acid in Alkyd and Polyester Resins
ASTM C 582-02	Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment
ASTM D 638	Standard Test Method for Tensile Properties of Plastics
ASTM D 790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
ASTM D 2583	Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D 4097	Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks
ASTM D3409	Standard Test Method for Adhesion of Asphalt-Roof Cement to Damp, Wet, or Underwater Surfaces
IFI 114	Break Mandrel Blind Rivets

PART 2 – COMPONENTS

02.01.00 Trough System Components

02.01.01 Trough shall be manufactured from 100% marine grade polyester resin and fiberglass strands and stainless steel.

- The entire fiberglass structure must be coated with a polyester gel coating with ultra violet inhibitors incorporated into the coating for maximum ultra violet protection.
- Fiberglass must have a minimum thickness of 3/16".

02.01.02 Weir portion of the Trough System shall be manufactured from 100% stainless steel.

- The Weir shall fully surround the Filter Basket on all sides. On the end of the weir the sides shall be made of screen with perforated round openings less than 5 mm in size.
- Water flows in access of the capacity of the Filter Basket shall pass through the additional weir screen for added treatment and retention of trash and debris during higher bypass flows.
- The Weir shall be hinged in the middle along the centerline of the Filter Basket and hinge upward to allow for access into the catch basin.

02.01.03 Mounting Hardware shall be 100% non-corrosive metals.

- Nuts and bolts
- Rivets
- Support brackets
- Concrete anchors

02.01.04 Concrete Filler and Sealant shall be made of Acrylic Emulsion and have a minimum service temperature range of -30°F to 150°F.

02.02.00 Filter Basket Components

02.02.01 Filter Basket Housing shall be manufactured of 100% stainless steel.

02.02.02 Side Screens shall be manufactured of 100% stainless steel louver expanded metal with openings equal to or less than 4.7 mm in size.

- Screens shall be oriented with openings opposite to the flow of water into the filter and be non-clogging based on perpetual deflective shielding.

02.02.03 Bottom Screens shall be manufactured of 100% stainless steel perforated round openings less than 5 mm in size.

02.02.03 Handle shall be manufactured entirely of 100% stainless steel and be mounted to the Filter Basket Housing using mounting hardware per section 02.01.03

02.02.04 Media Filtration Boom shall be made up of granulated oil absorbing polymers that have been tested in accordance with section 11.2 of ASTM F 716.07 and held within a netting.

- Oil absorbing polymers 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 that 50%.
- Netting shall be 100% polyester with a number 16 sieve size, and strength tested per ASTM D 3787.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The SCBFD has no moving internal components and functions based on gravity flow, unless otherwise specified. The SCBFD is composed of a Trough System, Media Filtration Boom and a Filter Basket. Runoff enters the SCBFD from a curb opening and flows into the Trough System which is mounted under the face of the curb opening. It then flows horizontally inside the System's Trough to the Weir which holds the Filter Basket. This Trough System positions the Filter Basket directly under the catch basin access point (manhole cover, grate or hatch). The Filter Basket can be removed through the access point without disassembly. The Filter Basket can also be cleaned without entering the access point by using a vacuum truck. Within the Filter Basket is a Media Filtration Boom. Water flows through the Weir and into the Filter Basket. Stormwater enters the inside of the Filter Basket and flows downward toward the bottom portion of the Basket. The non-clogging screen has openings that are facing upward. As water flows downward the screening continuously removes debris from the screen's surface. Flowing water also makes contact with the Media Filtration Boom which absorbs free floating oils. Stormwater flow up to the peak treatment flow rate is processed through the

filtration screens. During the heaviest flows the Filter Basket fills with water and spills over the top to bypass directly into the bottom of the catch basin, while previously captured debris and solids are contained by the weir screens which prevents re-suspension.

03.01.02 Pollutants - The SCBFD will remove and retain debris, sediments, metals, nutrients, oxygen demanding substances, bacteria and hydrocarbons entering the filter during frequent storm events and specified flow rates. For pollutant removal performance see section 03.02.00.

03.01.03 Treatment Flow Rate - The SCBFD operates using gravity flow. The SCBFD treatment flow rate varies by size and is provided on the drawings for each model. Flow rates must be supported by independent lab results.

03.01.04 Bypass Flow Rate – The SCBFD is designed to fit within the catch basin in a way not to affect the hydraulics. The area over the top of the Trough System is always greater than the curb opening area and/or the area of the outflow pipe. Therefore, the SCBFD does not create a critical point of restriction.

03.01.05 Pollutant Load – The SCBFD must be designed to have minimum storage capacity as documented on the drawing for each particular size and model.

03.01.06 Performance Protocol and Results – All lab testing on filtration media must be performed by an independent third party consultant and testing lab.

03.02.00 Test Performance

At a minimum, the SCBFD shall be tested, according to section 03.01.03 & 03.01.06, and meet these performance specifications:

03.02.01 Filter Pollutant Removal Table

POLLUTANT	REMOVAL EFFICIENCY
Trash and Debris - (down to 5 mm)	100%

03.02.02 Maintenance Performance – The Filter Basket must be able to be maintained and cleaned from finish surface using a vacuum hose inserted through the manhole or hatch opening and not the curb face. All cleaning shall be done without entering the catch basin. The Filter Basket shall be removable from finish surface and reinstalled from finish surface without entrance into the catch basin.

PART 4 - EXECUTION

04.01.00 General

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

04.02.00 Installation

The contractor shall furnish all labor, equipment, materials and incidentals required to install the (SCBFD) device(s) and appurtenances in accordance with the drawings, installation manual, and these specifications, and be inspected and approved by the local governing agency. Installation contractor should possess a Confined Space Entry Certification Permit, pursuant to OSHA standards. Any damage to catch basin and surrounding infrastructure caused by the installation of the SCBFD is the responsibility of the installation contractor.

04.02.01 Trough System will be installed in accordance with manufactures' recommendations. The Trough component will be installed the complete width of the curb opening, or underneath any wings as to provide 100% coverage of incoming stormwater. The Weir component of the Trough System must be located directly under the manhole opening or other access point (not including the curb opening) regardless of its position relative of the curb opening. The Trough System must be properly mounted and assembled inside the catch basin with drive pins and pop rivets per manufacture's recommendations. Once the Trough System is secured to the walls of the catch basin all seams must be filled with sealant per section 02.01.03.

04.02.02 Filter Basket will be inserted through the manhole opening or access point of the catch basin directly without entry into the basin. The Filter Basket shall be fully visible from finish surface while looking into the access point for ease of inspection and maintenance. The curb opening itself is not a point of access as maintenance personnel cannot enter.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – SCBFD 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 SCBFD(s) and its 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 SCBFD(s) and its components shall always be stored indoors and transported inside the original shipping container(s) until the SCBFD(s) are ready to be installed. The SCBFD 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 shall demonstrate that the SCBFD has been properly installed at the correct location(s), elevations, and with appropriate supports and fasteners. All components associated with the SCBFD and its installation shall be subject to inspection by the engineer of work, governing agency, and the manufacture at the place of installation. In addition, the contractor shall demonstrate that the SCBFD has been installed per the manufacturer's specifications and recommendations. SCBFD(s) shall be physically inspected regularly in accordance to owner's Stormwater Pollution Prevention Plans (SWPPP) and manufacture's recommendations. An inspection record shall be kept by the inspection operator. The record shall include the condition of the SCBFD and its appurtenances. The most current copy of the inspection record shall always be copied and placed in the owner's SWPPP.

04.04.02 Maintenance – SCBFD(s) must be completely maintained from outside the catch basin. The SCBFD(s) shall be inspected, maintained and cleaned 1 to 4 times a year and/or in accordance to owner's Stormwater Pollution Prevention Plans (SWPPP). The maintenance shall be preformed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the SCBFD. A Maintenance Record shall be kept by the

maintenance operator. The Maintenance Record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the filter. The most current copy of the Maintenance Record shall always be copied and placed in the owner's SWPPP.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured and removed from the SCBFD shall be transported and disposed of at an approved facility for disposal in accordance with local and state regulations. 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 SCBFD against all manufacturing defects in materials and workmanship for a period of (8) years from the date of delivery to the contractor. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The SCBFD is limited to recommended application for which it was designed.

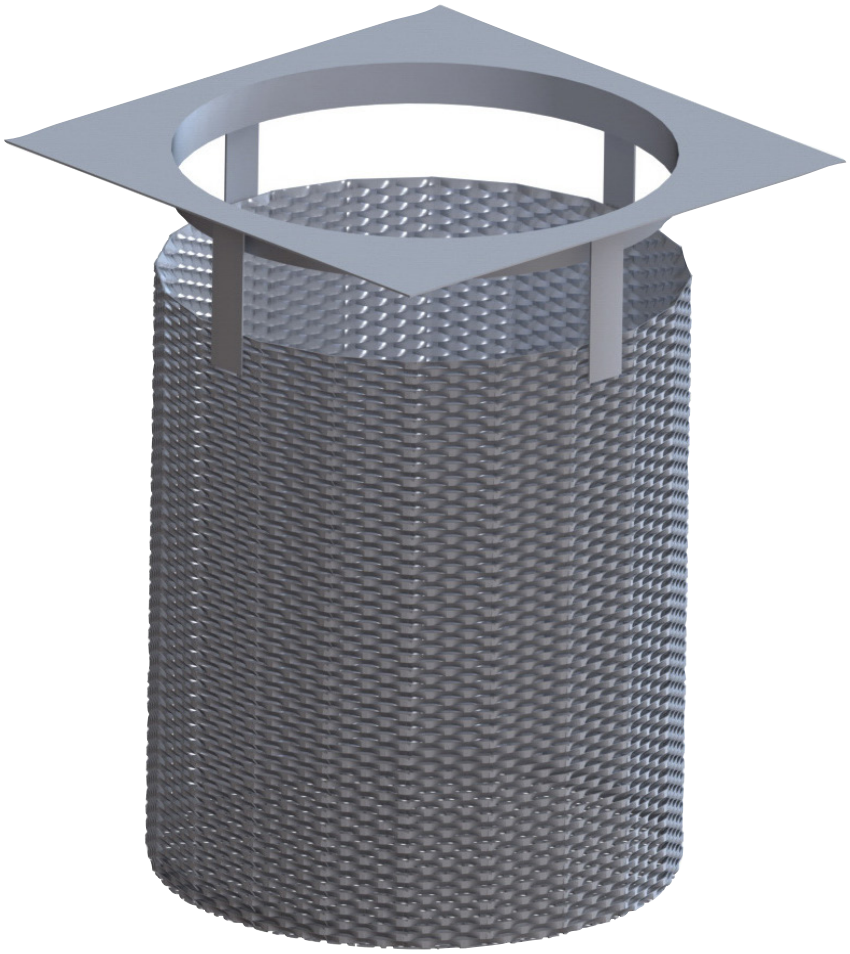
[End of This Section]

APPENDIX C

Grate Inlet Filter

Bio Clean
A Forterra Company

INSTALLATION MANUAL



Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

INSTALLATION PROCEDURES

The Bio Clean Grate Filter is a stormwater catch basin filter designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers installation procedures of all configurations. This filter is made of 100% stainless steel and is available and various sizes and depths allowing it to fit in any grated catch basin inlet. The filter is generally mounted under the grate flange but can also be mounted below the grate to the wall of the basin. This configuration is recommended in areas with "direct traffic" ratings such as roads with higher speed traffic. The flange is cut to size allowing for quick and simple installation.

Delivery

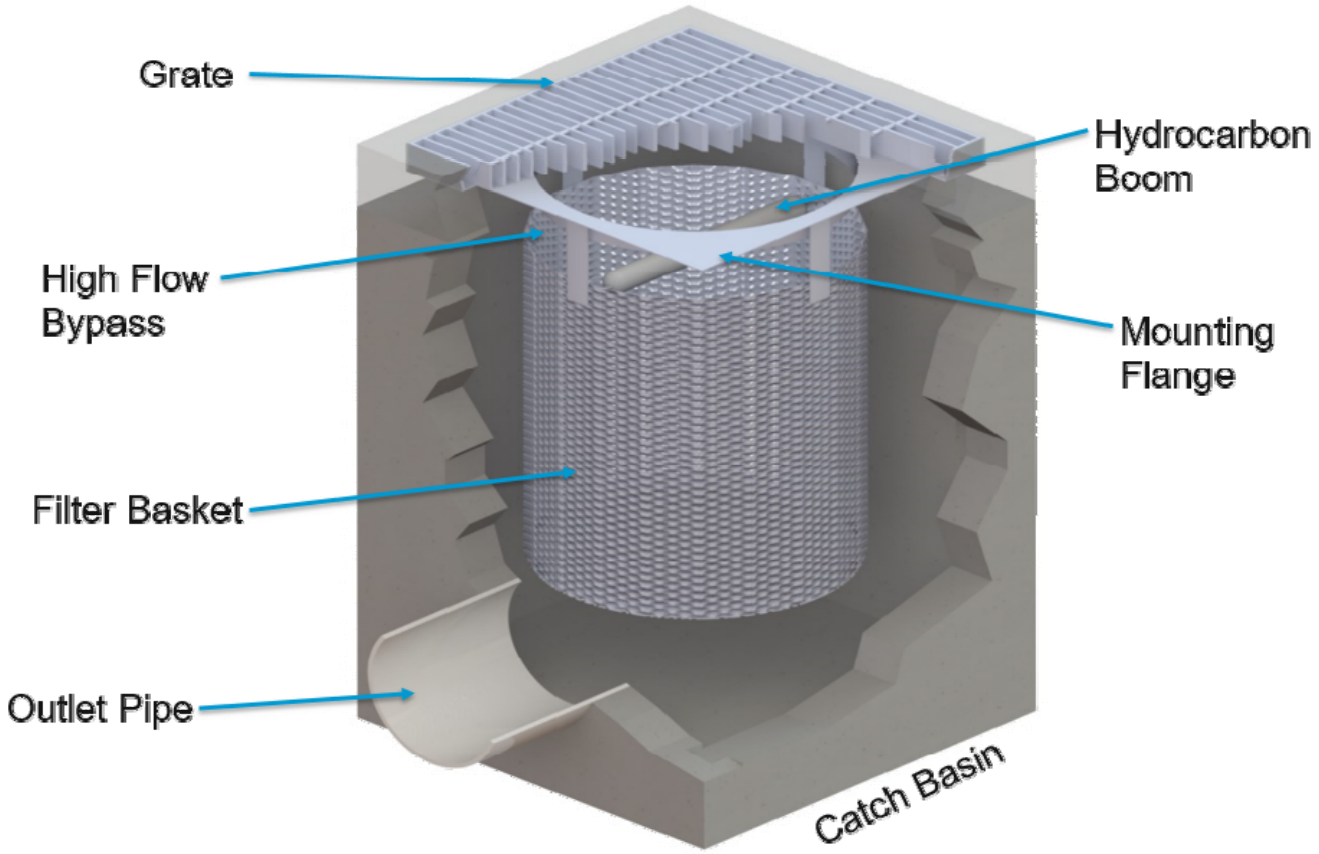
- Bio Clean Environmental Services, Inc. shall deliver the filter(s) to the site in coordination with the Contractor.

Inspection

- Inspection of the Grate Inlet Filter and all parts contained in or shipped shall be inspected at time of delivery by the site Engineer/Inspector and the Contractor. Any non-conformance to approved drawings or damage to any part of the system shall be documented on the Bio Clean shipping ticket.

Catch Basin Preparation

- The Contractor is responsible for providing adequate and complete catch basin and fall protection including gas metering and other safety equipment when installing the Grate Inlet Filter.
- The Contractor shall adhere to all jurisdictional and/or OSHA safety rules during installation of the filter.
- The Contractor or Owner is responsible for appropriately barricading the catch basin from traffic (in accordance with local codes).



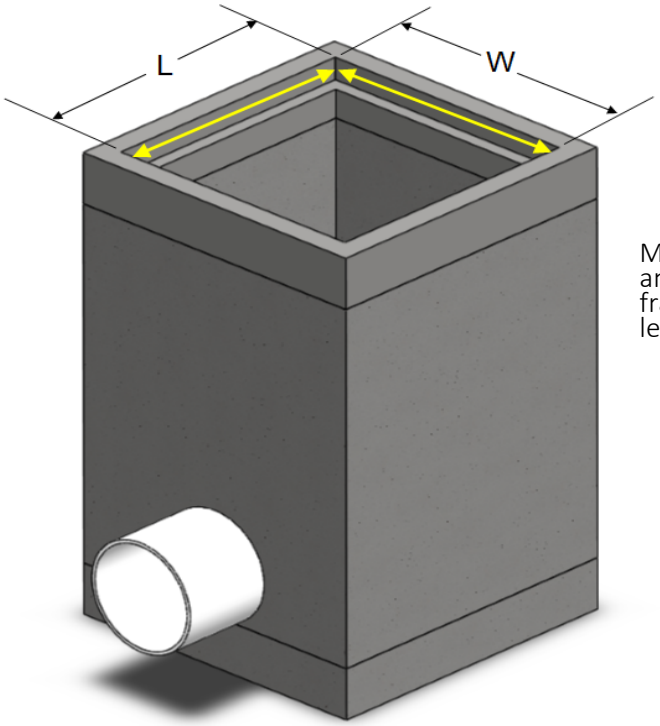
Filter Diagram:

Installation (non-under mount configuration)

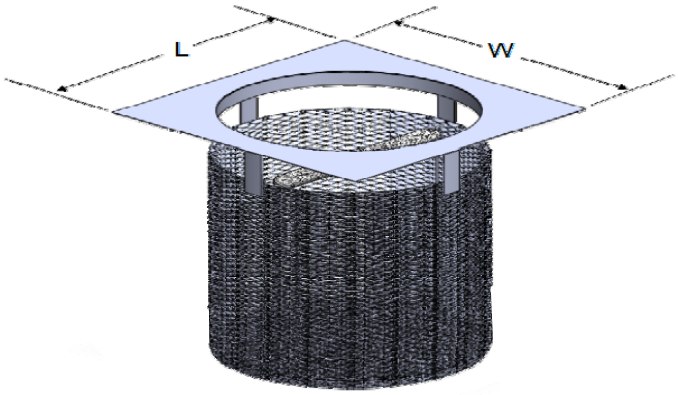
- Each Grate Inlet Filter shall be installed based on the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.
- It is recommended that the catch basin is properly cleaned and inspected for any damage prior to installing the Grate Inlet Filter. If under mounts are being used for "direct traffic" installations, the under mounts connect directly to the walls of the catch basin using concrete wedge and/or drive anchors/pins.
- Step one (non-under mount configuration) involves double checking measurements to ensure the filter will properly and fully fit the catch basin opening. Once the grate is removed use a tape measure to pull the dimensions (length and width) of the grate frame lip. Next check the dimensions (length and width) on the mounting flange. The mounting flange should be approximately ¼" to ½" shorter than the grate frame flange. If the mounting flange is larger

than the grate frame dimensions trimming of the flange will be required. Various tools and methods can be used to cut the flange such as a circular saw, cut-off-saw, plasma cutter or grinder. After cutting off the flange ensure that any sharp or protruding edges are removed with a grinder. Sharp edges could cause injury. Once cut, verify again that dimensions are accurate and the filter will properly fit. If a filter is delivered with a flange smaller than grate frame, meaning that the edge of the flange is too short to rest on the grate frame lip please call the manufacturer for guidance. Either a new filter can be sent out, a replacement flange piece or the filter under mounted.

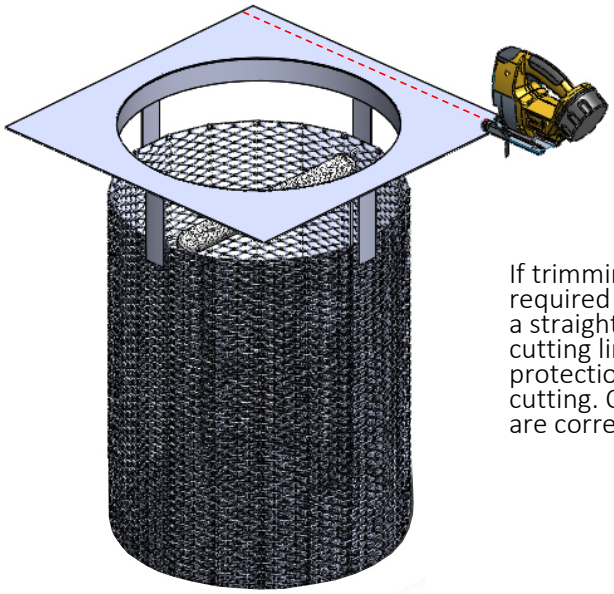
STEP 1



Measure the length and width of the grate frame as shown to the left.

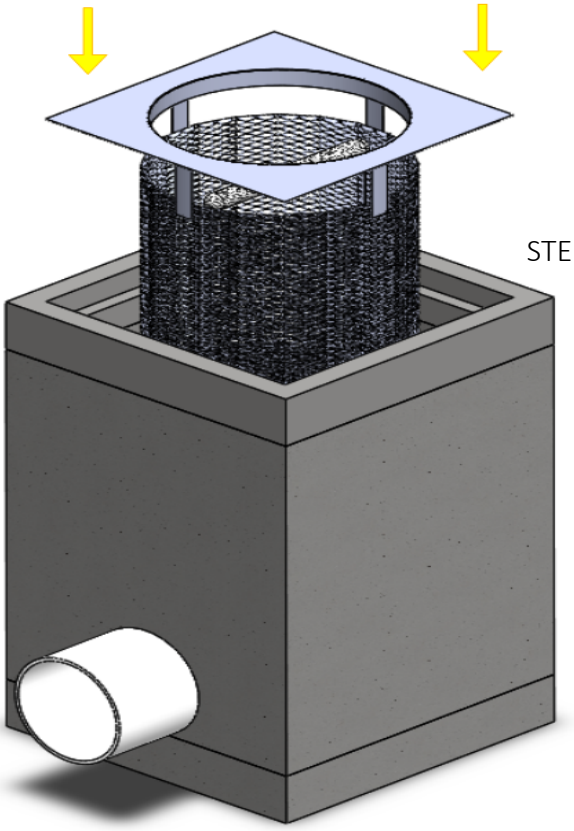


Measure the length and width of the mounting flange as shown to the right.



If trimming of the mounting flange is required use a tape measure along with a straightedge and market to draw a cutting line. Use proper tools and safety protection such as eyewear before cutting. Once cut verify measurements are correct.

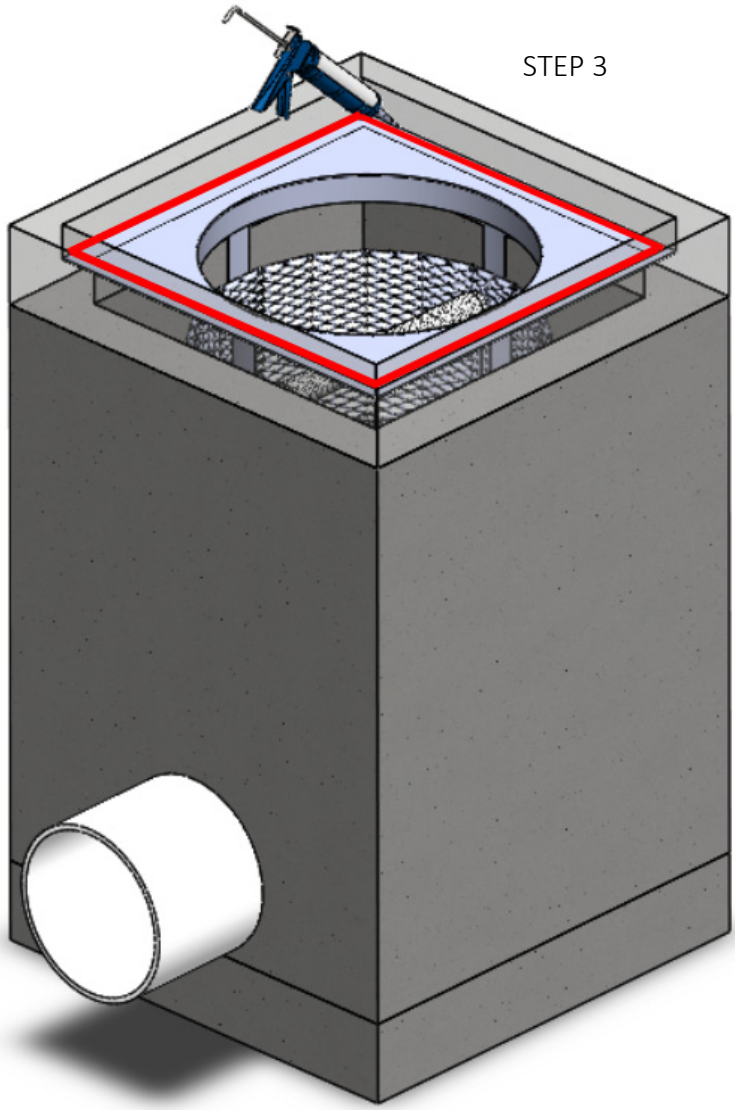
- Step 2 now that the filter is ready for installation, simply set the filter into place resting the mounting flange on the grate frame lip. Before setting, clean the grate frame lip of any debris. It is recommended the gloves are worn and proper lifting techniques are used. Larger filter may require two people to set in place. Do not drop the filter in place. Ensure that the filter is in proper position. Center the filter in the grate frame so any gaps are even on all four sides.



STEP 2

Installation of the filter is simple and fast. Set the filter in place on the grate frame lip and center.

- Step 3 requires using sealant to seal all seams, gaps and joints to ensure no leakage. All surfaces in which the stainless steel flange make contact with a concrete surface must be fully filled with sealant and made completely watertight. Sealant must be Sil-Flx (RTV 7500). See below for diagram highlighting all areas where sealant is required:

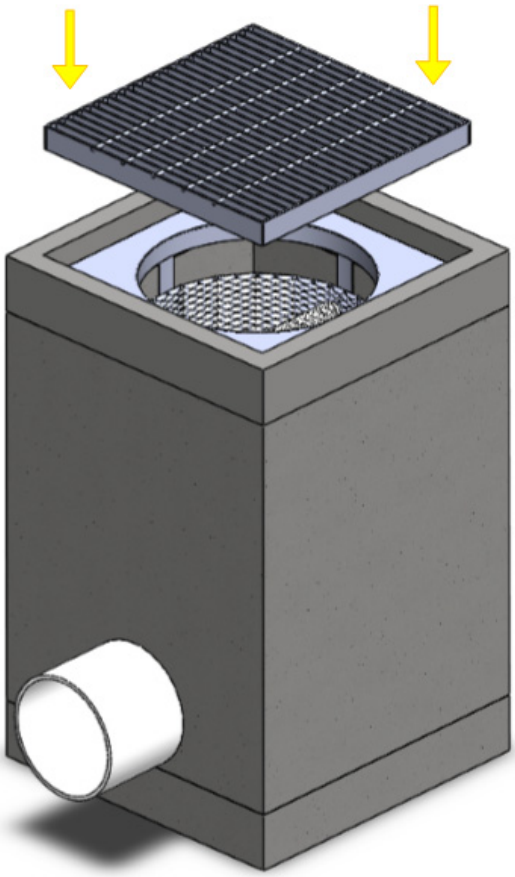


STEP 3

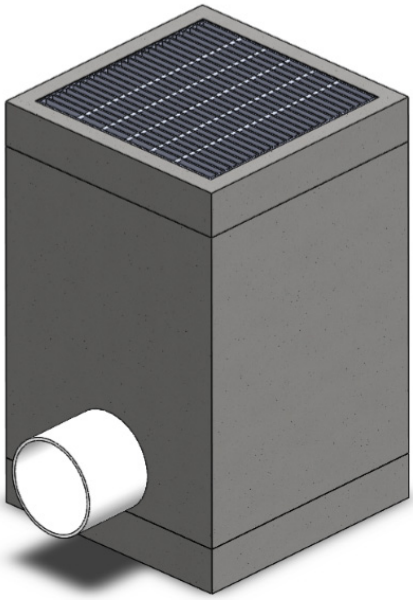
Making sure the seams of the flange are watertight is important to ensure 100% of stormwater entering the catch basin is directed through the filter, especially smaller dry weather flows.

- Step 4 installation is now complete. Be sure to remove all tools and seal up the catch basin by replacing the grate and take down any traffic control.

STEP 4



Not that installation of the filter is complete ensure that the grate is replaced and the install site is returned to its original condition.



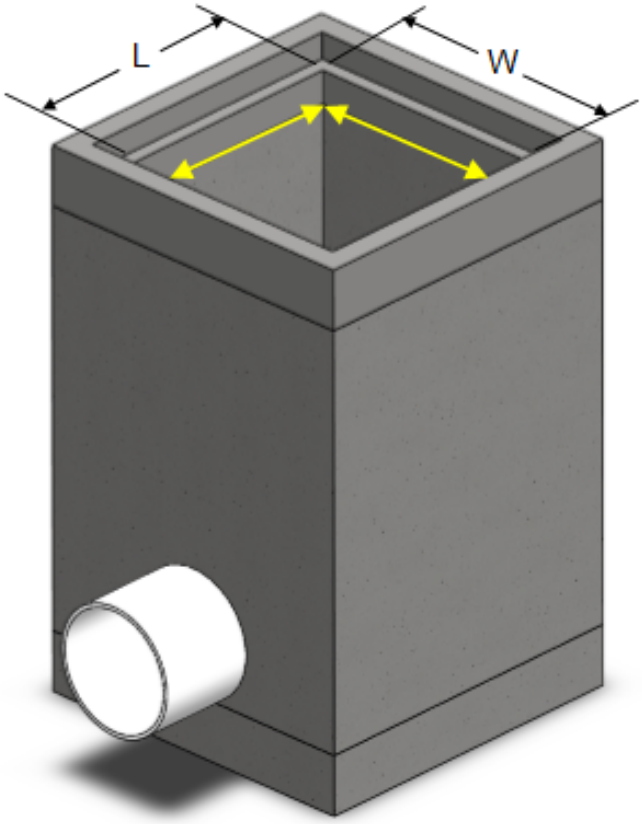
Installation (under mount configuration)

- Each Grate Inlet Filter shall be installed based on the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.
- It is recommended that the catch basin is properly cleaned and inspected for any damage prior to installing the Grate Inlet Filter. If under mounts are being used for "direct traffic" installations the under mounts connect directly to the walls of the catch basin using concrete wedge and/or drive anchors/pins.

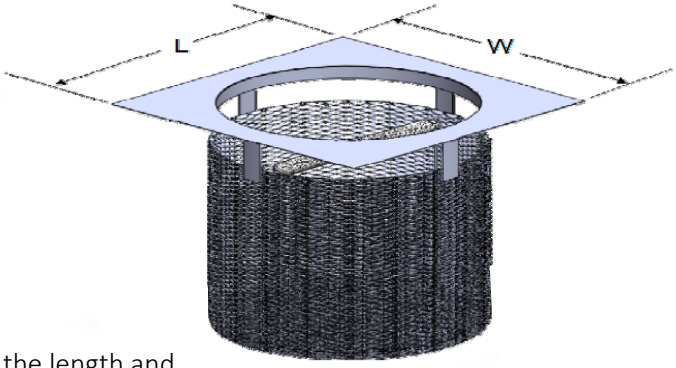
- <u>Step one (under mount configuration)</u> involves double checking measurements to ensure the filter will properly and fully fit the catch basin opening. Once the grate is removed use a tape measure to pull the dimensions (length and width) of catch basin walls below the grate frame

lip. Next check the dimensions (length and width) on the mounting flange. The mounting flange should be approximately ¼" to ½" shorter than the catch basin ID. If the mounting flange is larger than the catch basin ID trimming of the flange will be required. Various tools and methods can be used to cut the flange such as a circular saw, cut of saw, plasma cutter or grinder. After cutting of the flange ensure that any sharp or protruding edges are removed with a grinder. Sharp edges could cause injury. Once cut verify again that dimensions are accurate and the filter will properly fit.

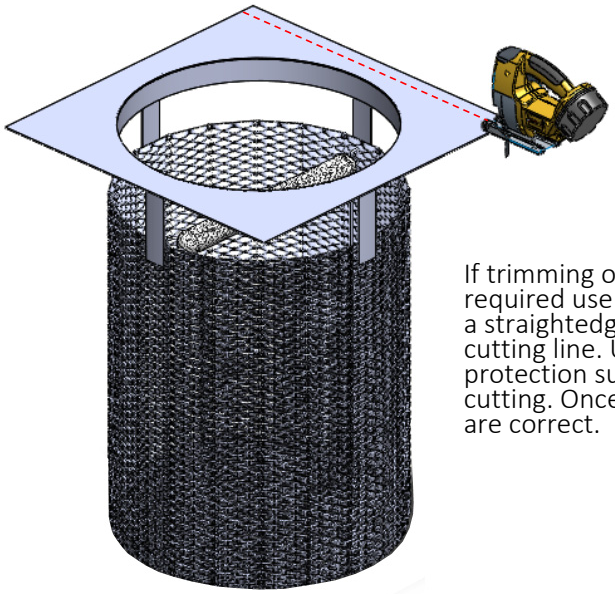
STEP 1



Measure the length and width of the catch basin ID as shown to the left.



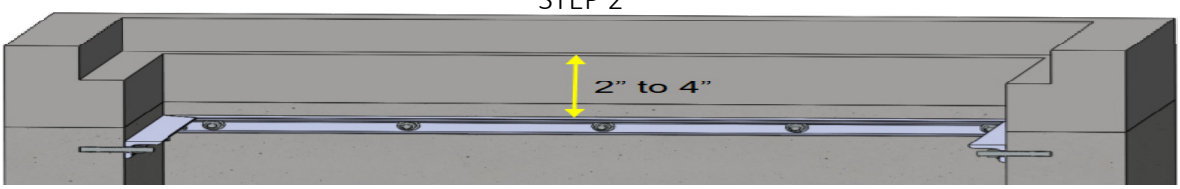
Measure the length and width of the mounting flange as shown to the right.



If trimming of the mounting flange is required use a tape measure along with a straightedge and market to draw a cutting line. Use proper tools and safety protection such as eyewear before cutting. Once cut verify measurements are correct.

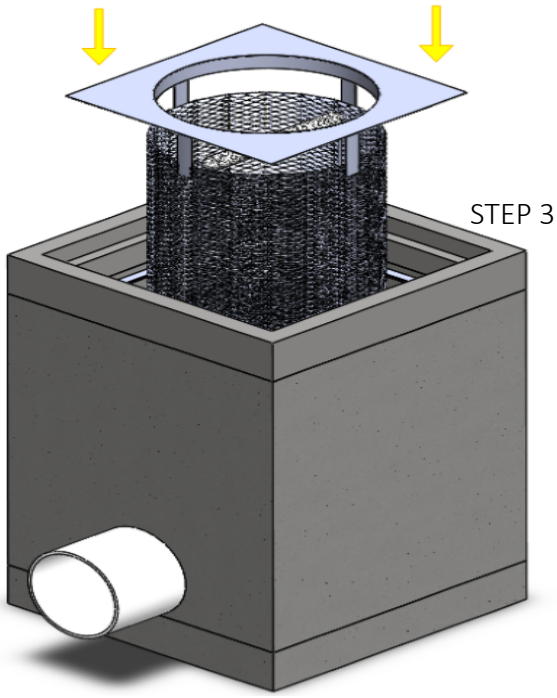
- Step 2 involves mounting the under mounts which are supplied with the filter. Under mounts will be either aluminum or stainless steel L metal with holes pre-drilled for mounting. Using a tape measure along chalk or a large marker to draw a guideline 1 to 2" below the edge of the grate flange on all four sides of the basin walls. Ensure that the lines are level. This guideline shows where the top edge of the L metal under mounts will be positioned. Next check the length of each under mount. There should be two longer pieces and two shorter pieces. Double check their length and trim down if necessary to properly fit inside the basin. Next, while holding the first under mount in place use a rotary hammer with a 1/4" diameter concrete drill bit to drill holes 2 ¾" deep (minimum) at each location along the under mount that there is a pre-drilled hole. Once all holes are drilled, insert a ¼" diameter by 2 ¾" long stainless steel drive pins into each hole. This will temporarily support the weight of the under mount. Next drive the wedge anchors or drive pin tight using the hammer. Repeat the process on the other 3 under mounts.

STEP 2



Under mounts should be installed with their top flange 2 to 4” below the grate flange to allow for proper clearance. Ensure the under mounts are level.

- Step 3 now that the filter is ready for installation and the under mount installed simply set the filter into place resting the mounting flange on the under mounts. Before setting clean the under mounts of any debris. It is recommended the gloves are worn and proper lifting techniques are use. Larger filter may require two people to set in place. Do not drop the filter in place. Ensure that the filter is in proper position. Center the filter in the grate frame so any gaps are even on all four sides.

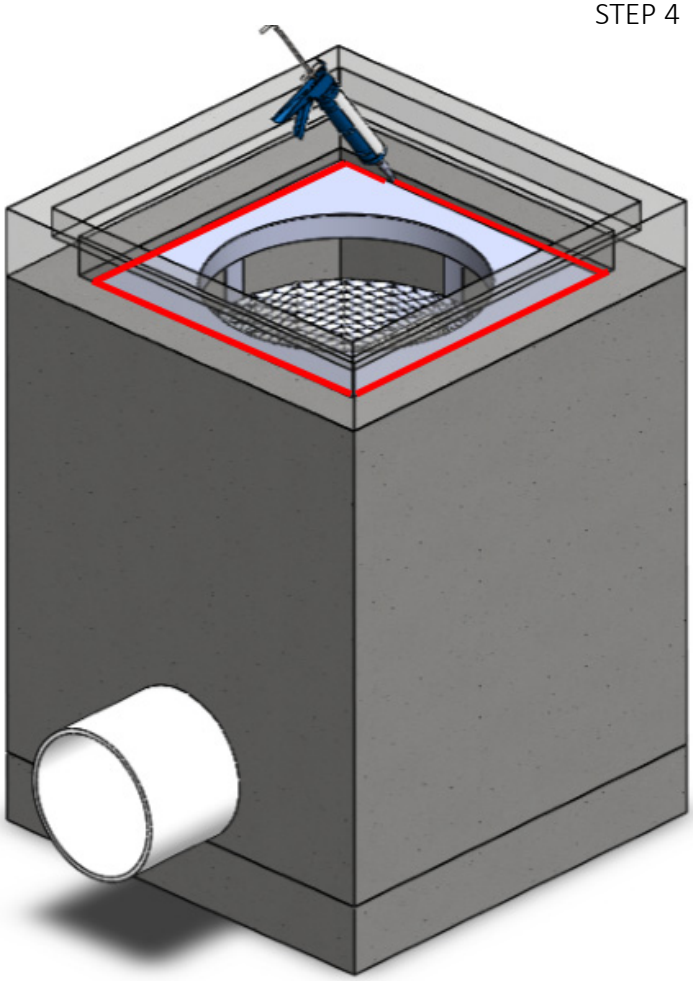


STEP 3

Installation of the filter is simple and fast. Set the filter in place on the grate frame lip and center.

- Step 4 requires using sealant to seal all seams, gaps and joints to ensure no leakage. All surfaces in which the stainless steel flange make contact with a concrete surface must be fully filled with sealant and made completely watertight. Sealant must be Sil-Flx (RTV 7500). See below for diagram highlighting all areas where sealant is required:

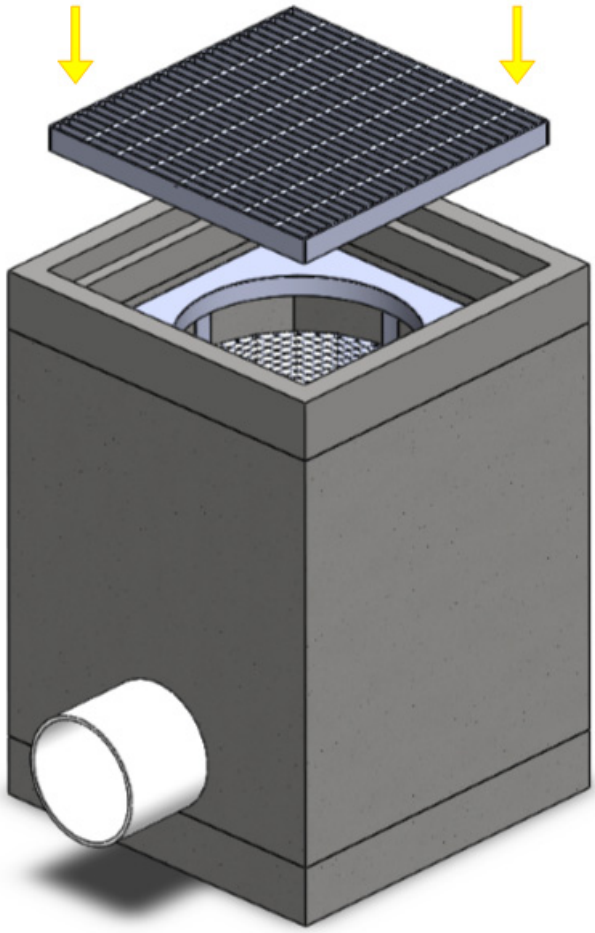
STEP 4



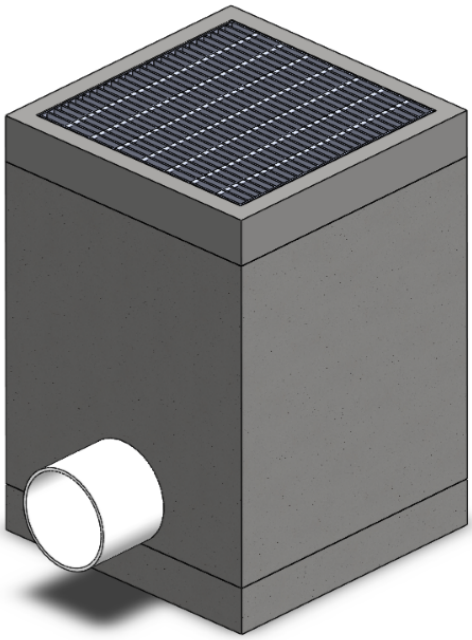
Making sure the seams of the flange are watertight is important to ensure 100% of stormwater entering the catch basin is directed through the filter, especially smaller dry weather flows.

- Step 5 installation is now complete. Be sure to remove all tools and seal up the catch basin by replacing the grate and take down any traffic control.

STEP 5



Not that installation of the filter is complete ensure that the grate is replaced and the install site is returned to its original condition.

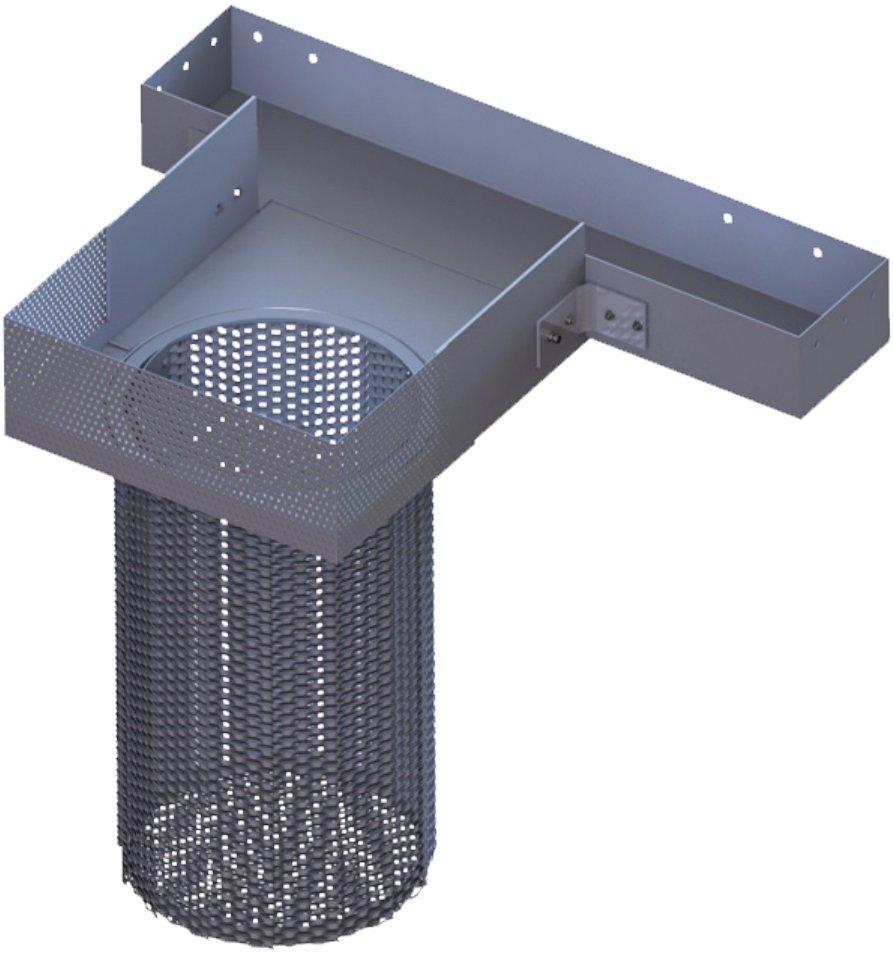


For Installation Support or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Curb Inlet Filter

Bio Clean
A Forterra Company

INSTALLATION MANUAL



Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

INSTALLATION PROCEDURES

The Bio Clean Curb Inlet Filter is a stormwater catch basin filter designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers installation procedures of all configurations. The innovative trough & weir system is mounted along the curb face and directs incoming stormwater toward the filter basket which is positioned "directly" under the manhole access opening regardless of its location in the catch basin. This simple yet profound design allows the filter to be cleaned from finish surface without access into the catch basin, therefore drastically reducing maintenance time and eliminating confined space entry. The filter lifting handle allows for the filter to be removed easily through the manhole. The weir also folds up to allow for unimpeded access into the basin for routine maintenance or pipe jetting.

Delivery

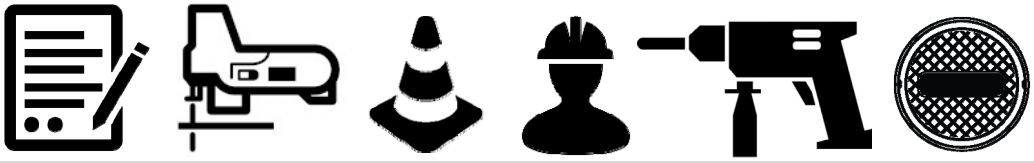
- Bio Clean Environmental Services, Inc. shall deliver the filter(s) to the site in coordination with the Contractor.

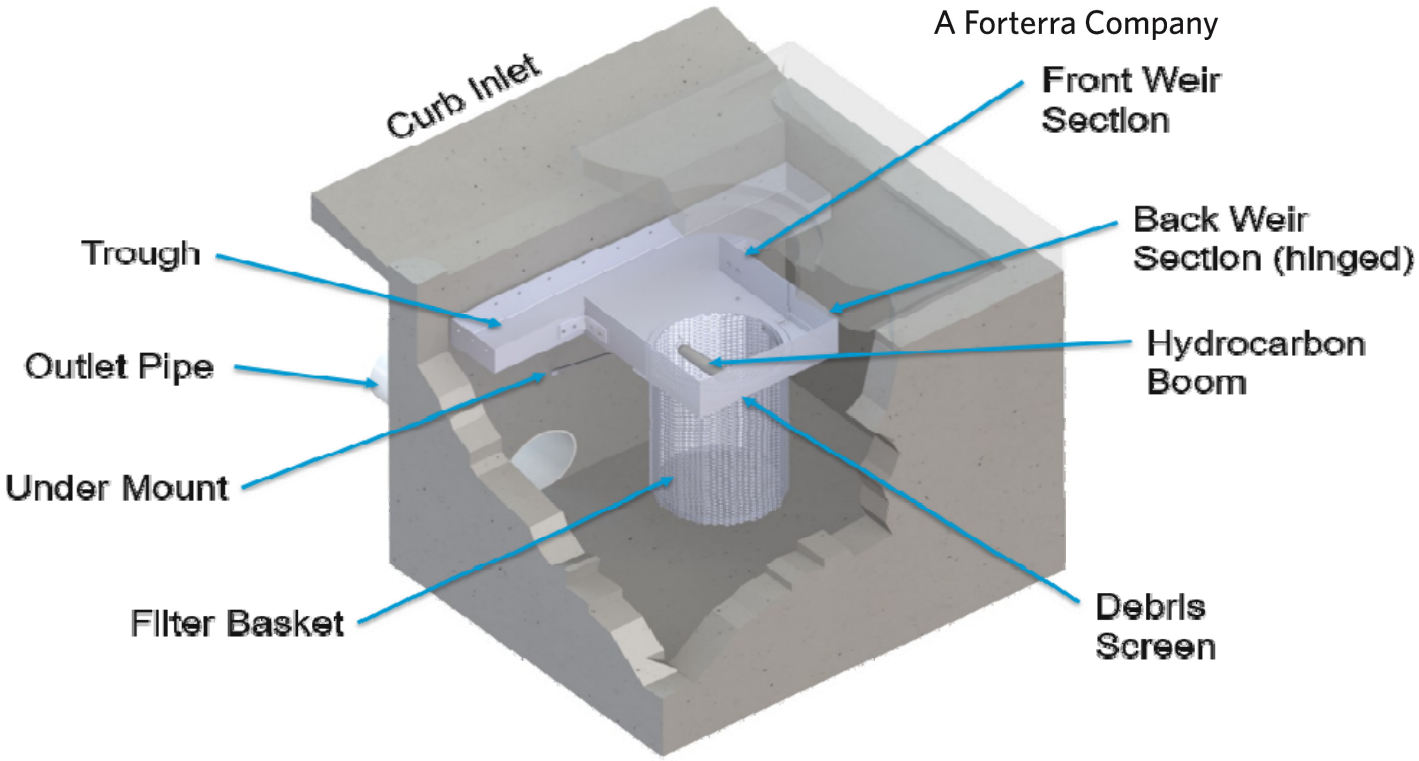
Inspection

- Inspection of the Curb Inlet Filter and all parts contained in or shipped shall be inspected at time of delivery by the site Engineer/Inspector and the Contractor. Any non-conformance to approved drawings or damage to any part of the system shall be documented on the Bio Clean shipping ticket.

Catch Basin Preparation

- The Contractor is responsible for providing adequate and complete catch basin and fall protection including gas metering and other safety equipment when installing the Curb Inlet Filter.
- The Contractor shall adhere to all jurisdictional and/or OSHA safety rules during installation of the filter.
- The Contractor or Owner is responsible for appropriately barricading the catch basin from traffic (in accordance with local codes).





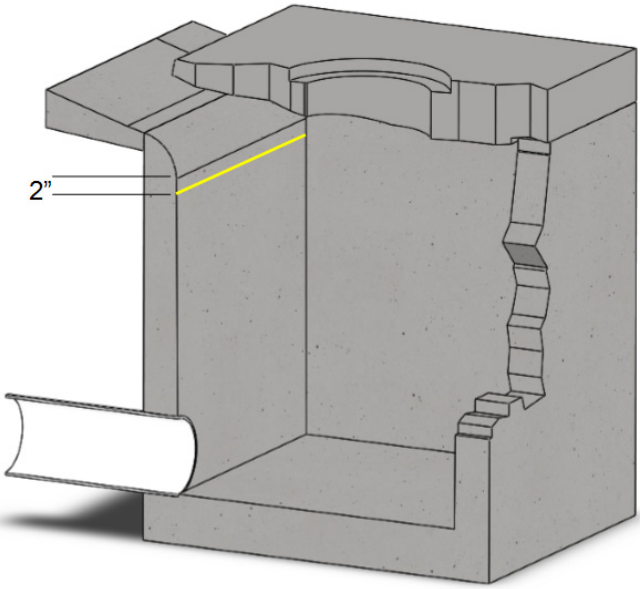
Filter Diagram:

Installation

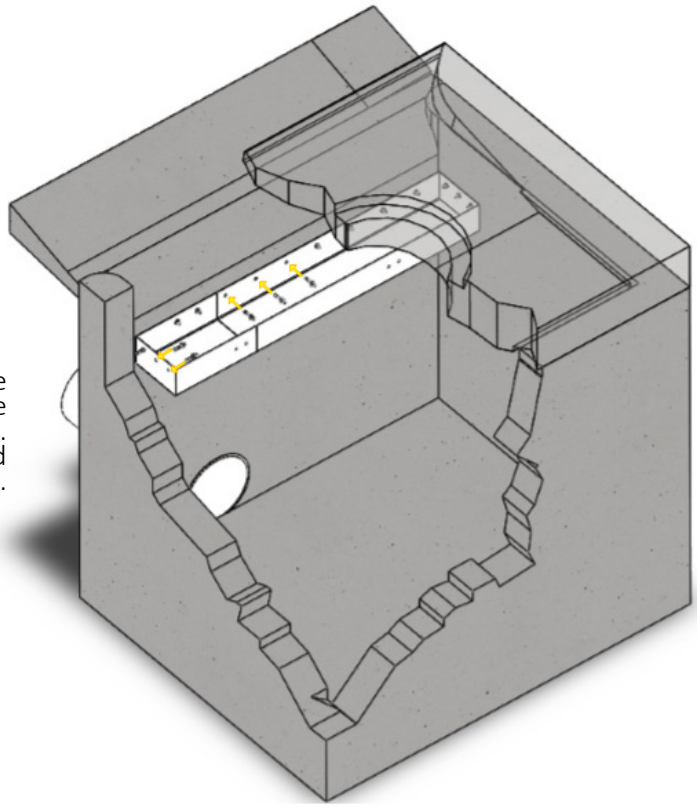
- Each Curb Inlet Filter shall be installed based on the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.
- It is recommended that the catch basin is properly cleaned and inspected for any damage prior to installing the Curb Inlet Filter. The trough and weir system mount directly to the walls of the catch basin using concrete wedge and/or drive anchors.
- Step one involves positioning and mounting the trough under the face of the curb. The top of the trough should be approximately 2" below the end of the local depression transition into the catch basin where the catch basin wall is vertical to allow for a flush mounting surface as shown below and enough vertical clearance from the ceiling of the catch basin to allow for proper maintenance access. Use chalk or a large marker to mark this position on the basin wall. Next use a tape measure and a level to measure a slope of 0.5% from the corners of the catch basin sloping toward the position where the filter basket and weir will be located. Use chalk or a large marker to draw a guideline along where the top of the trough wall will be located for proper mounting. Next, while holding the trough in place use a rotary hammer with a 1/4"

diameter concrete drill bit to drill holes 2 ¾" deep (minimum) at each location along the trough that there is a pre-drilled hole on the front and end sides. As each hole is drilled insert a ¼" diameter by 2 ¾" long stainless steel drive pin into each hole. This will temporarily support the weight of the trough. Next drive the wedge anchors tight using the hammer. For longer catch basin openings several sections of trough will need to be joined together. The installation kit will include trough section coupler pieces and end pieces if required. Repeat the process for the other end of the trough system if the manhole is in the center of the basin:

STEP 1



The yellow line represents the plane at which the top of the trough should be mounted to the wall of the catch basin. Make sure it is mounted to a vertical section of the wall and not above any curb opening transition.

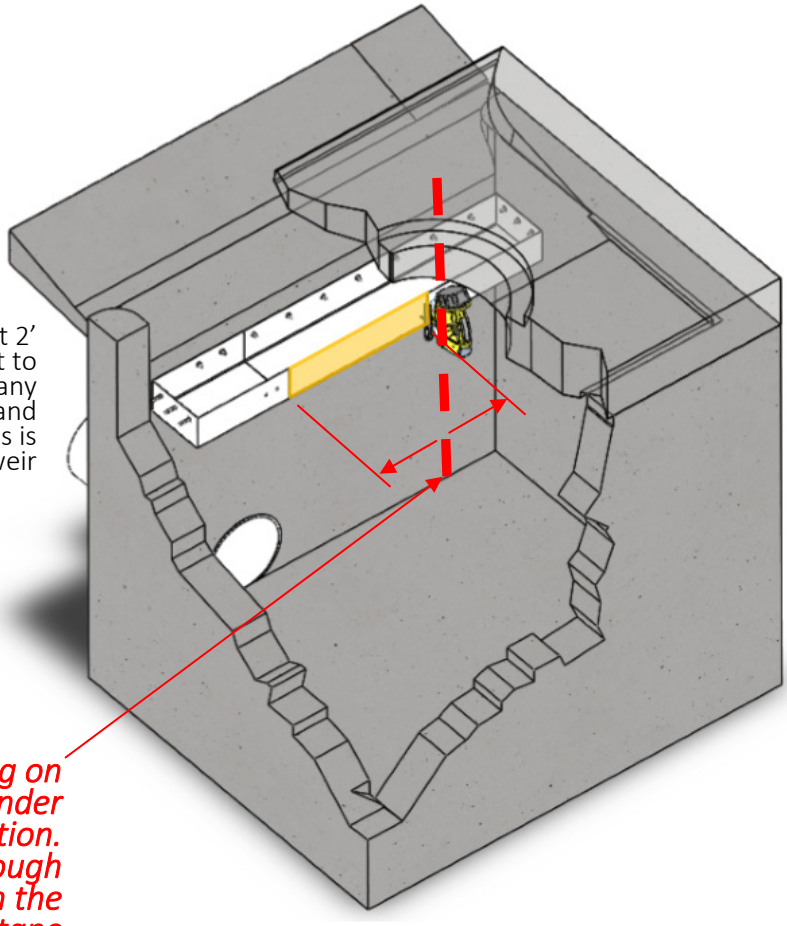


The trough is mounted along the line from above. Use drive pins to secure the trough to the wall on all three sides. Ensure drive pins are fully secured and hammered down tightly.

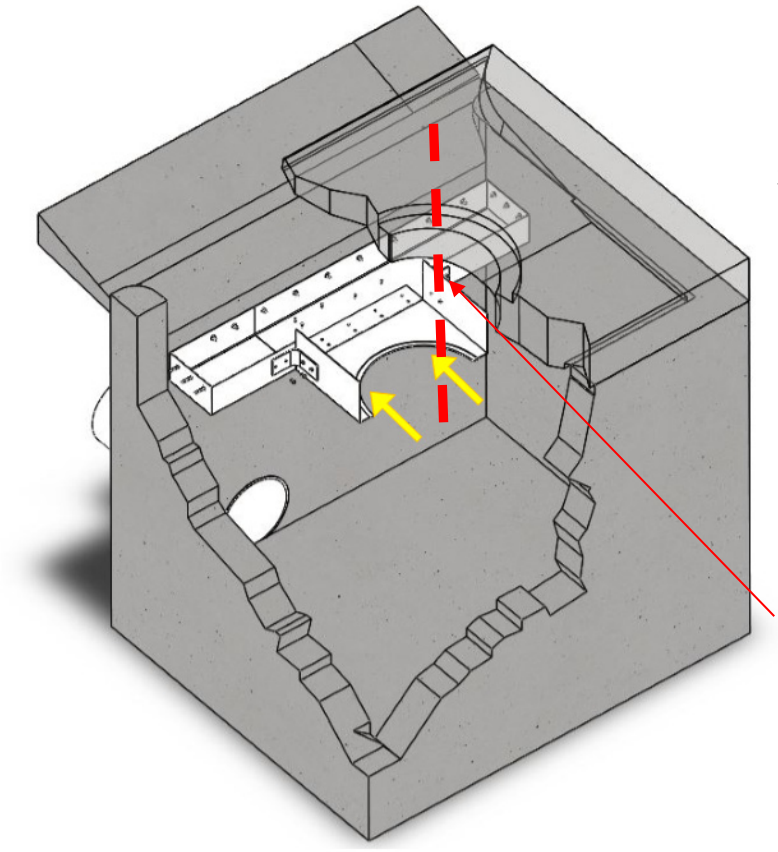
- Step 2 requires notching out a side of the trough where the front weir section will mount. This is done with a jigsaw or reciprocating saw. The side of the trough shall be cut out to the bottom as shown below to a width of 2'. Once the side of the trough is removed the front weir section can be attached to the trough using pop rivets and the two side mounting brackets. Next, position the front weir section into the cut out portion of the trough. The mounting flange of the weir will rest on the floor of the trough. Line up so that the walls of the trough intercept the walls of the weir at 90 degrees. Holes are pre-drilled in the mounting flange of the front weir section. Using a drill bit size #11, drill through the fiberglass trough via the pre-drilled holes. Using pop rivets (3/16" diameter by 1' long large flange dome head stainless steel) placed in the holes and a cordless or air powered rivet gun, fasten the weir to the trough. See below images for details on this step.

STEP 2

Ensure that the cut is accurate at 2' wide and the side is fully cut out to the bottom of the trough. If any upward protrusions remain sand flat with floor of trough. This is crucial for install of front weir



NOTE: It is critical that the opening on the weir for the basket is directly under the manhole for proper installation. Therefore the side cut out on the trough must be perfectly centered with the manhole opening center. Using a tape measure ensure these two centers are lined up before making the cut.



STEP 2 Con't

Make sure the walls of the trough intercept the walls of the weir at their ends. There should be no gap or overlap between these two surfaces. The mounting brackets are pre-drilled for these surfaces to properly align.

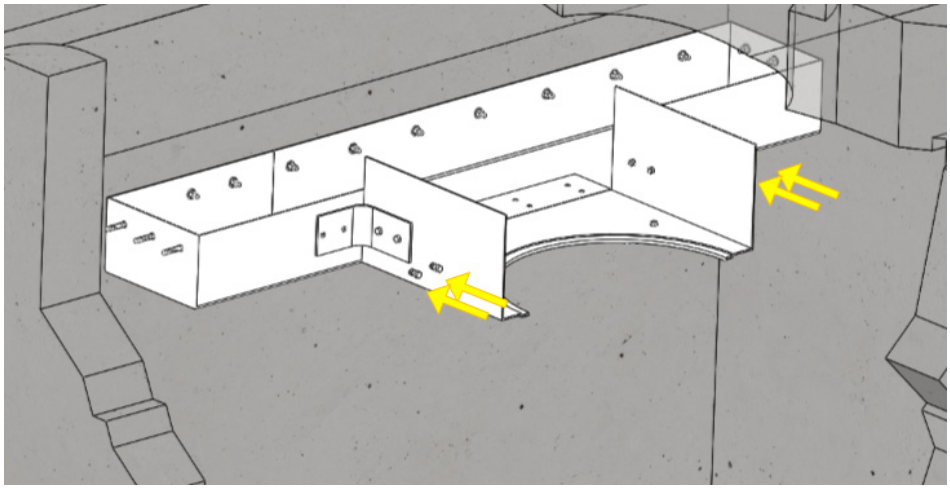
NOTE: It is critical that the opening on the weir for the basket is directly under the manhole for proper installation. The weir section length is customized for each basin. If they opening does not line up STOP installation and request the appropriate length weir from the manufacturer.

- Step 3 requires using the mounting brackets to connect the side of the trough to the side of the weir. The mounting brackets will be pre-bolted to the weir. The brackets will have slides on this side for adjustability. The side of the mounting bracket the attaches to the trough will have holes pre-drilled. Once lined up use a ¼" diameter drill bit to drill through the fiberglass wall of trough behind the pre-drilled holes of the mounting bracket. Using a stainless steel bolt ¼" diameter x 20 x 1" length with washer and nylon nut fasten the pieces together. See below for details on this step. All mounting hardware will be provided with the unit:

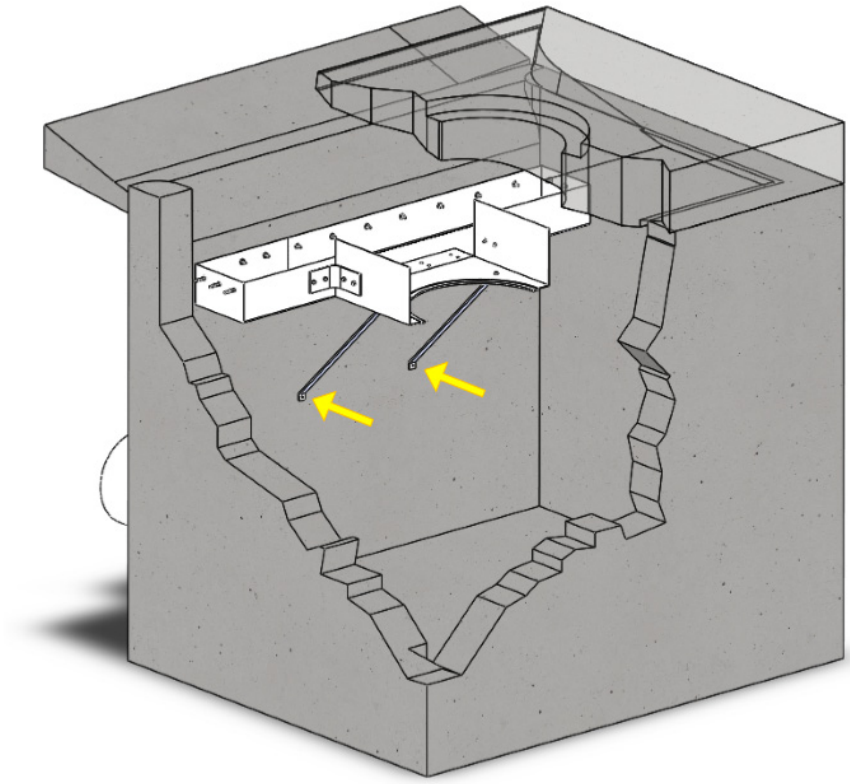
STEP 3

Proper fastening of the mounting brackets are a must and this connection ensures the weir and trough does not pull apart during operating conditions. Also, double check to ensure all revits have been secured between the floor of the weir and trough.

NOTE: Use anti-seize on all nuts and bolts.



- Step 4 requires attaching the 45 degree under mounts (two – one on each side) from the bottom of the front weir section to the walls of the catch basin. The hole will be pre-drilled in the floor of the weir. Fasten the under mount to the weir with a stainless steel bolt ¼" diameter x 20 x 1" length with washer and nylon nut. Next use a level to make sure the horizontal plane of the weir is at 1% slope from the trough sloping down toward the back of the catch basin. Mark the hole position on the opposite side of the under mount where it will attach to the wall of the catch basin. Next, while holding the under mount in place use a rotary hammer with a 1/4" diameter concrete drill bit to drill holes 2 ¾" deep (minimum). Next, insert a ¼" diameter by 2 ¾" long stainless steel drive pins into each hole and use a hammer to fasten in place.

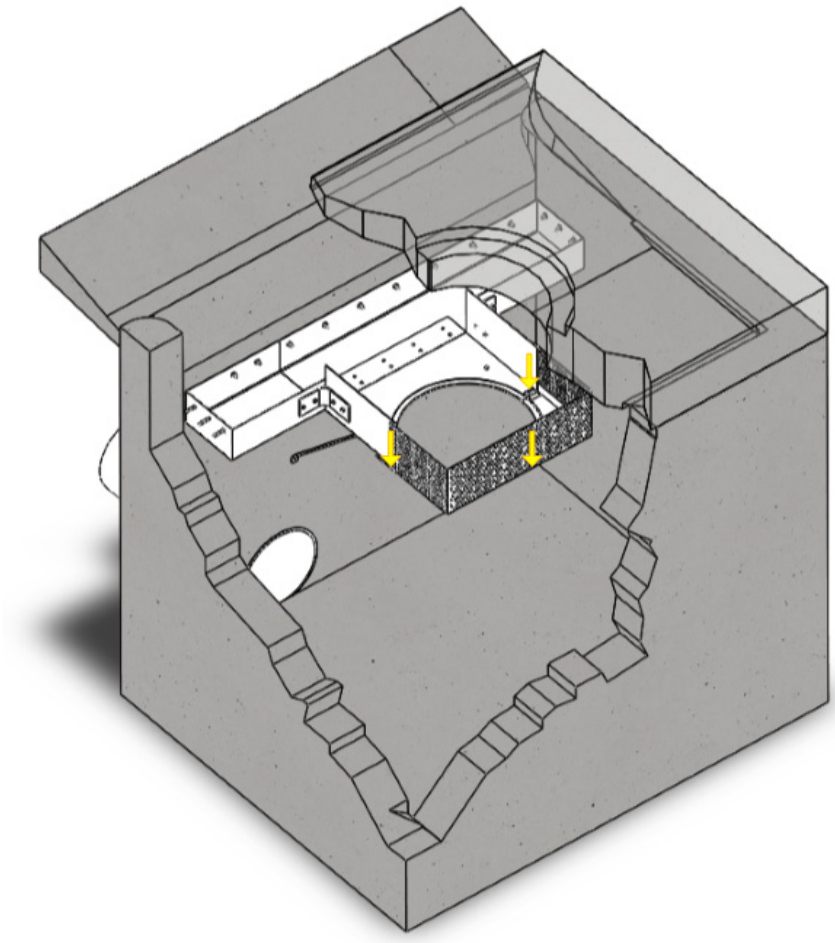


STEP 4

Under mounts help support the weight of the weir, trough and filter basket under operating conditions. They also ensure the slope and level of the weir. It is critical that the weir is sloping at 0.5% toward the basket. There can absolutely be no negative slope on the weir from trough the basket.

NOTE: Use anti-seize on all nuts and bolts.

- Step 5 requires attaching the back weir section to the front weir section and trough assembly. The back weir section has two hinges welded to it. The other side of the hinges bolt to the front weir section. Use 2 stainless steel bolt ¼" diameter x 20 x 1/2" length with washer and nylon nut to fasten the pieces together. Once fastened make sure the back weir piece hinges up and down freely.



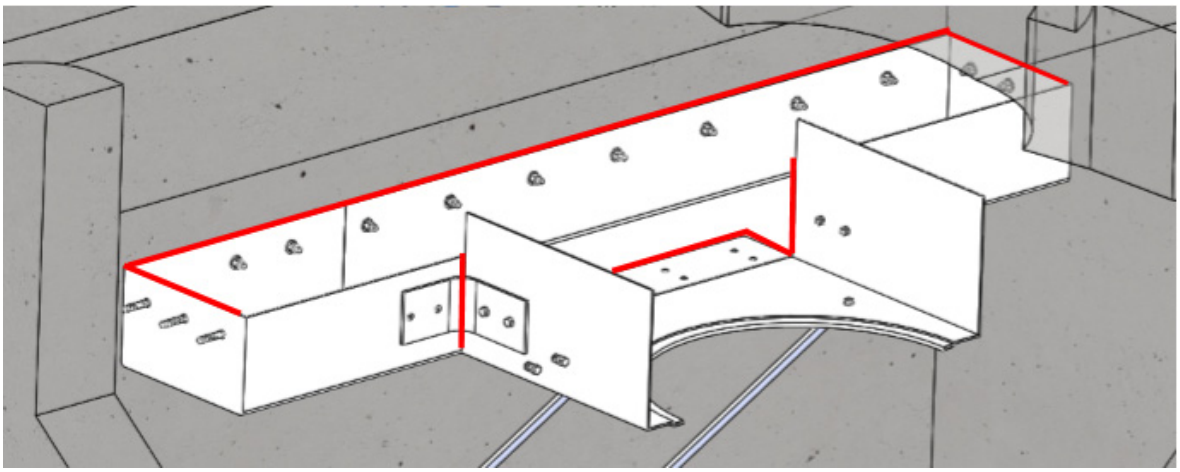
STEP 5

The back weir section is supplied with the hinges pre-welded. The hinges need only be bolted to the front weir section. Ensure the proper bolts and washer are used and tightened. The bolts should be torqued to at least 40 in-lbs.

NOTE: Use anti-seize on all nuts and bolts.

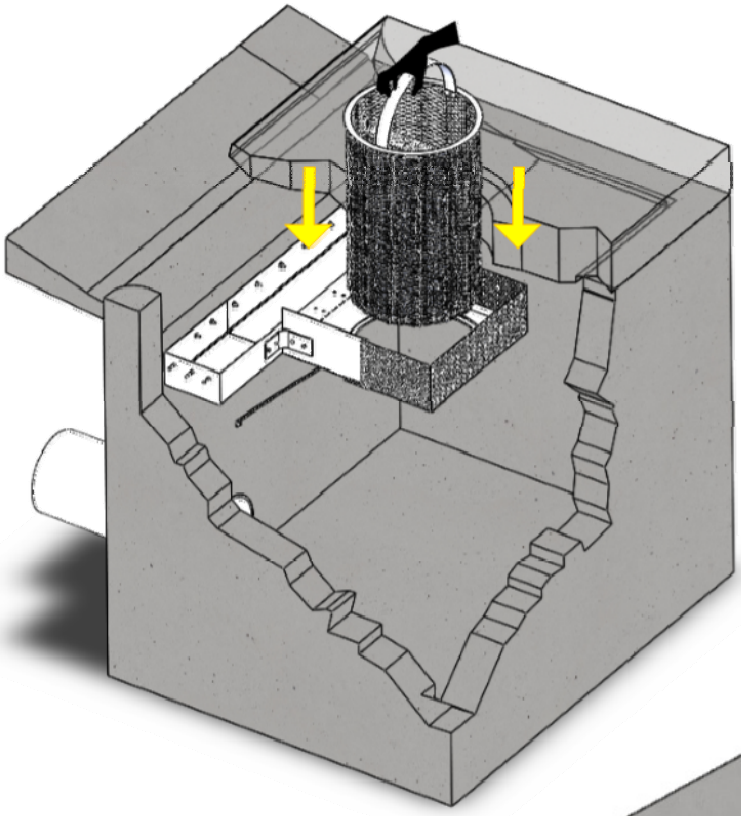
- Step 6 requires using sealant to seal all seams, gaps and joints to ensure no leakage. All surfaces in which the fiberglass and stainless steel trough and wier make contact with a concrete surface or each other must be fully filled with sealant and made completely watertight. Sealant must be Sil-Flx (RTV 7500). See below for diagram highlighting all areas where sealant is required:

STEP 6



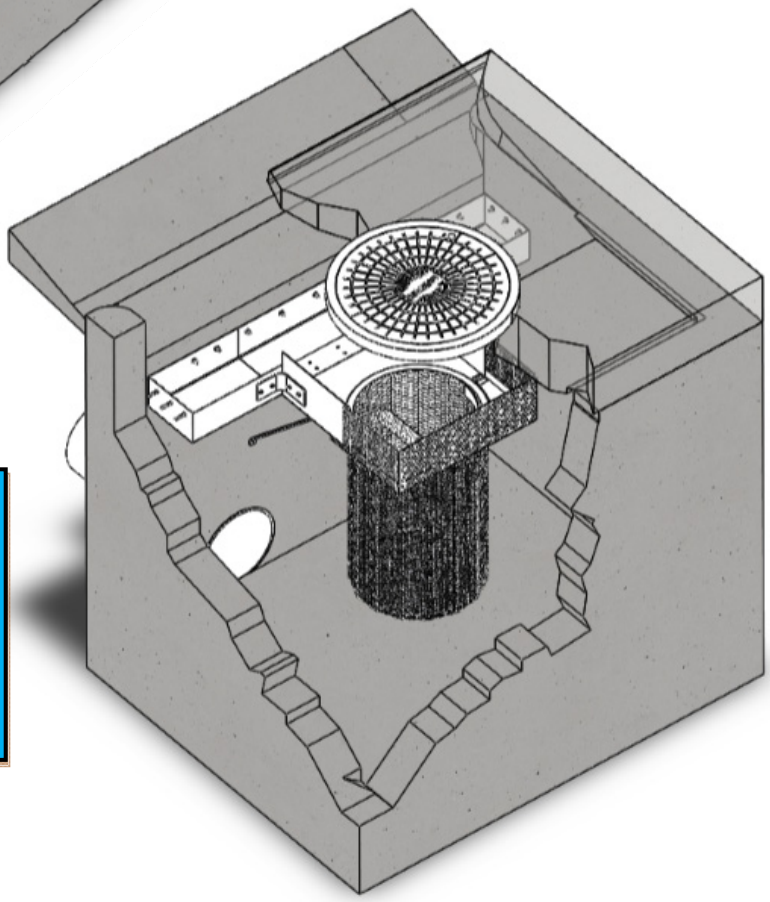
The back weir section is supplied with the hinges pre-welded. The hinges need only be bolted to the front weir section. Ensure the proper bolts and washer are used and tightened. The bolts should be torqued to at least 40 in-lbs.

- Step 7 installation is now complete. The last step is to drop the basket into weir and clean up and left over debris. Be sure to remove all tools and seal up the catch basin by replacing the manhole cover and take down any traffic control.



STEP 7

Not that installation of the shelf and weir section is complete the filter basket can be dropped into place by hand. The opening in the weir section should be directly under the manhole opening to easy installation. Once the basket is in place ensure that the manhole lid is replaced and the install site is returned to its original condition.



For Installation Support or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

Bio Clean
A Forterra Company

FILTER MEASUREMENT SHEET
(ROUND FLAT GRATE INLETS)

COMPANY:

CONTACT:

PHONE: FAX: EMAIL:

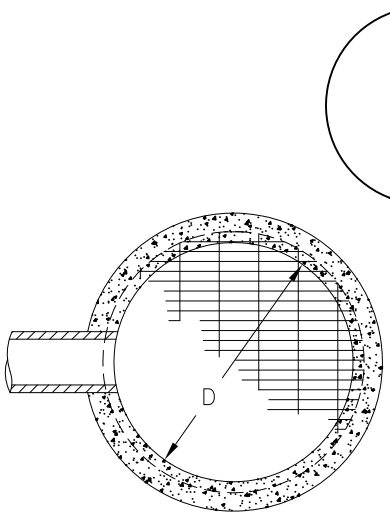
JOB NAME:

JOB LOCATION:

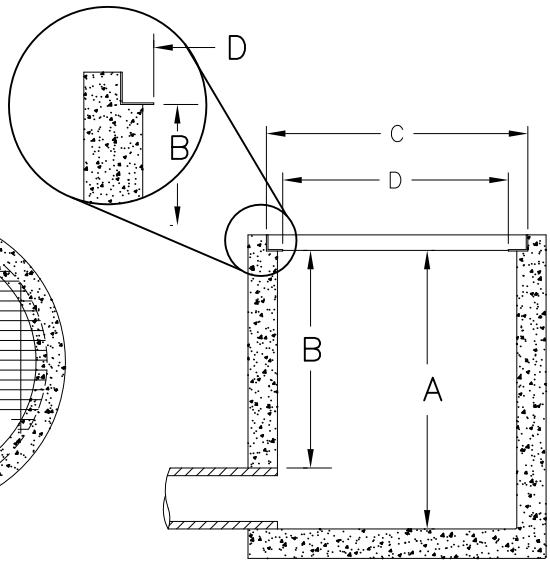
NOTE: PLEASE GIVE MEASUREMENTS TO WITHIN 1/8"

INSTRUCTIONS:

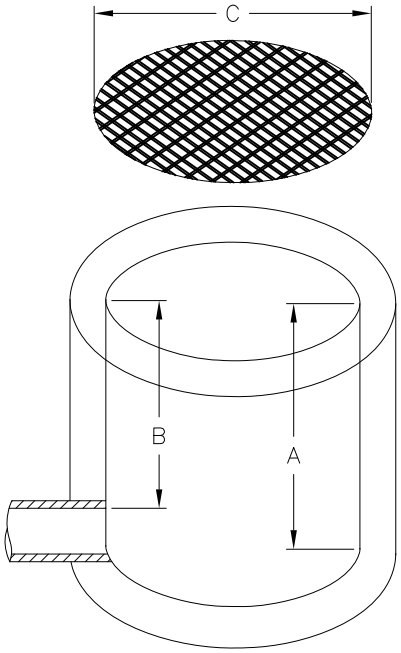
1. Check appropriate grate type.
2. List grate manufacturer & part number.
3. Measure the outside Diameter dimensions of the grate (C).
4. Measure the frame clear opening (D) or catch basin, whichever is less.
5. Measure from the bottom of the frame to the top of the outlet pipe (B).
6. Measure from the bottom of the frame to the bottom of the catch basin (A).
7. Describe in the note section any obstructions that protrude into the space directly within 24" under the opening, including any inflow pipes and ladder rungs.



PLAN VIEW



SECTION VIEW



ISOMETRIC VIEW

Qty/Drain No.	GRATE TYPE	GRATE MFR. AND PART #	NOTE 6 A	NOTE 5 B	NOTE 3 C	NOTE 4 D		
	☐ STEEL ☐ CAST IRON							
	☐ STEEL ☐ CAST IRON							

Notes: _____

_____

Bio Clean Environmental Services Inc., P.O. BOX 869, Oceanside, CA. 92049, Phone: (760) 433–7640, Fax: (760) 433–3176
email: info@biocleanenvironmental.net

Bio Clean
A Forterra Company

FILTER MEASURMENT SHEET

(SQUARE/RECTANGULAR FLAT GRATE INLETS)

COMPANY: _____

CONTACT: _____

PHONE: _____ FAX: _____ EMAIL: _____

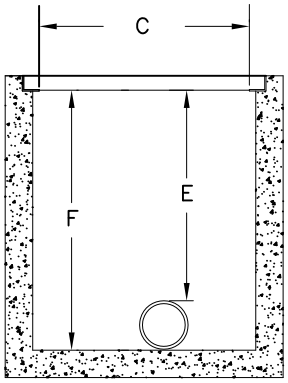
JOB NAME: _____

JOB LOCATION: _____

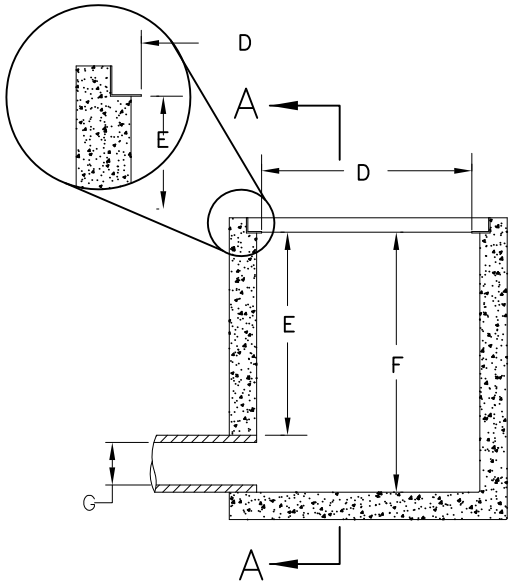
NOTE: PLEASE GIVE MEASUREMENTS TO WITHIN 1/8"

INSTRUCTIONS:

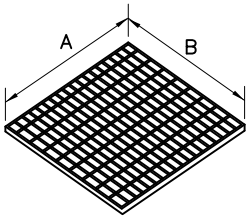
1. Check appropriate grate type.
2. List grate manufacturer & part number.
3. Measure the outside dimensions of the grate (A & B).
4. Measure the frame clear opening (C & D.) or catch basin, whichever is less.
5. Measure from the bottom of the frame to the top of the outlet pipe (E).
6. Measure from the bottom of the frame to the bottom of the catch basin (F).
7. Describe in the note section any obstructions that protrude into the space directly within 24" under the opening, including any inflow pipes.
8. List ID pipe size (G).

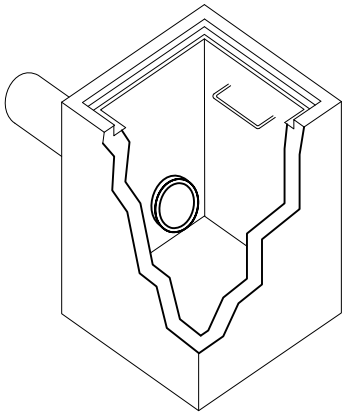


SECTION A–A



SECTION VIEW





ISOMETRIC VIEW

Qty/Drain No.	GRATE TYPE	GRATE MFR. AND PART #	GRATE O.D. A	GRATE O.D. B	FRAME CLEAR OPENING C	FRAME CLEAR OPENING D	NOTE 3 E	NOTE 4 F	NOTE 8 G
	☐ STEEL								
	☐ CAST IRON								
	☐ STEEL								
	☐ CAST IRON								

Notes: _____

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email: info@biocleanenvironmental.net

Bio Clean
A Forterra Company

FILTER MEASURMENT SHEET

(CURB INLETS STD. NO WINGS)

COMPANY:

CONTACT:

PHONE: FAX: EMAIL:

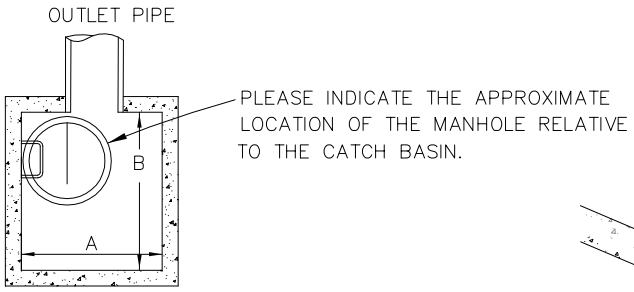
JOB NAME:

JOB LOCATION:

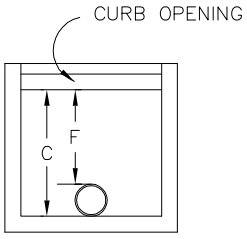
NOTE: PLEASE GIVE MEASUREMENTS TO WITHIN 1/8"

INSTRUCTIONS:

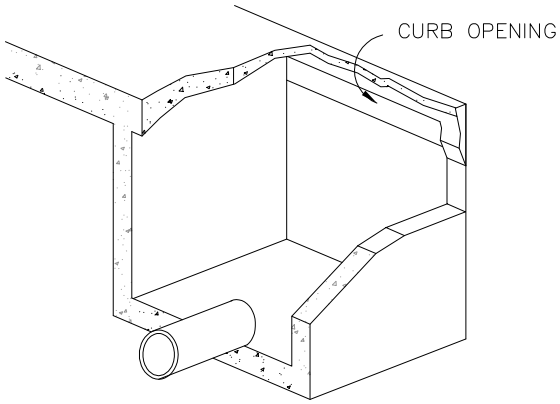
1. Please give measurements to within 1/8".
2. Measure total curb opening (A).
3. Measure inside width of CB, (B).
4. Total CB inside depth below inlet flowline (C).
5. Measure from inlet flowline to top of outlet pipe (F).



TOP VIEW



ELEVATION



ISO VIEW

Qty/Drain No.	NOTE 2	NOTE 3	NOTE 4	NOTE 5
	A	B	C	F

Notes: _____

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A Forterra Company

FILTER MEASURMENT SHEET
(CURB INLET WITH WINGS)

COMPANY:

CONTACT:

PHONE: FAX: EMAIL:

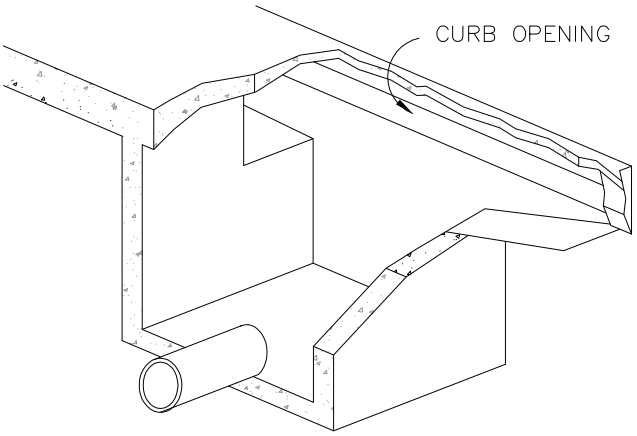
JOB NAME:

JOB LOCATION:

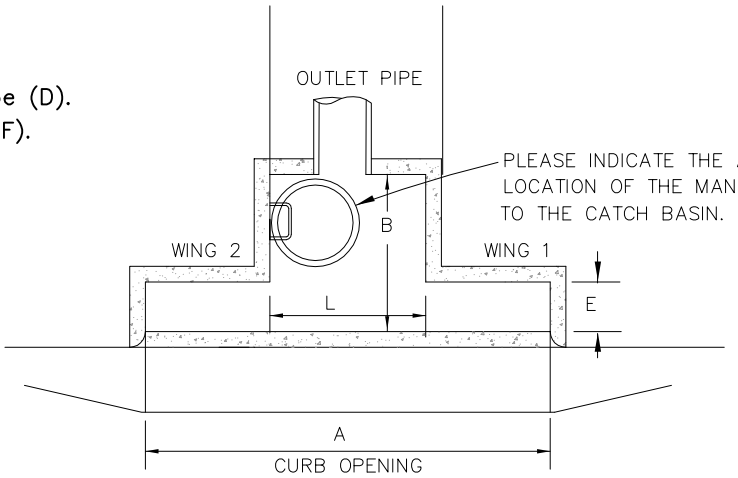
NOTE: PLEASE GIVE MEASUREMENTS TO WITHIN 1/8"

INSTRUCTIONS:

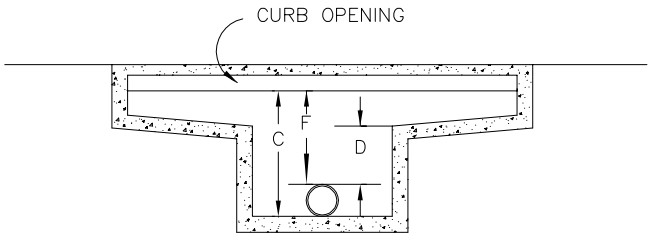
1. Please give measurements to within 1/8".
2. Measure total curb opening (A).
3. Measure inside length of CB. (L).
4. Measure inside width of CB, (B).
5. Total CB inside depth below inlet flowline (C).
6. Measure from bottom of wing to top of outlet pipe (D).
7. Measure from inlet flowline to top of outlet pipe (F).



ISO VIEW



TOP VIEW



ELEVATION

Qty/Drain No.	NOTE 2	NOTE 3	NOTE 4	NOTE 5	NOTE 6	WING WIDTH	NOTE 7	# OF
	A	L	B	C	D	E	F	WINGS

Notes: _____

_____

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FILTER MEASURMENT SHEET
(CURB INLET WITH WINGS)

Bio Clean
A Forterra Company

COMPANY: _____

CONTACT: _____

PHONE: _____ FAX: _____ EMAIL: _____

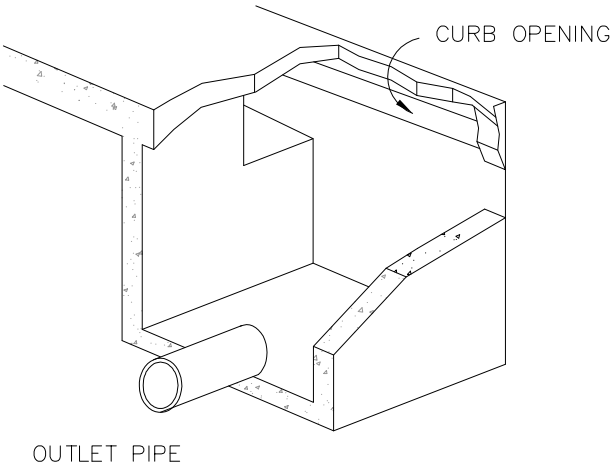
JOB NAME: _____

JOB LOCATION: _____

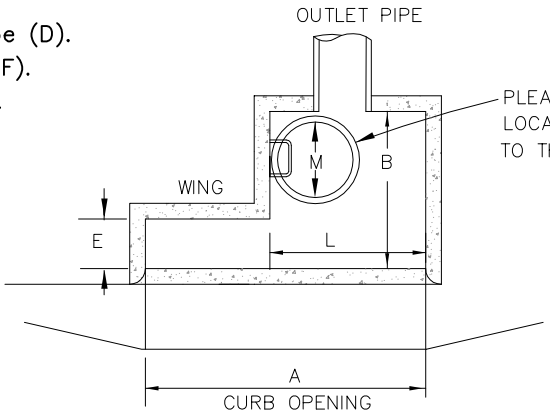
NOTE: PLEASE GIVE MEASUREMENTS TO WITHIN 1/8"

INSTRUCTIONS:

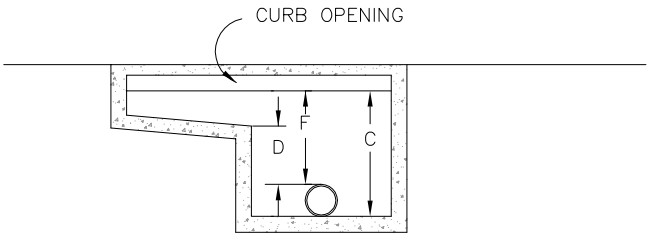
1. Please give measurements to within 1/8".
2. Measure total curb opening (A).
3. Measure inside length of CB. (L).
4. Measure inside width of CB, (B).
5. Total CB inside depth below inlet flowline (C).
6. Measure from bottom of wing to top of outlet pipe (D).
7. Measure from inlet flowline to top of outlet pipe (F).
8. Measure the clear opening inside the manhole (M).



ISO VIEW



TOP VIEW



ELEVATION

Qty/Drain No.	NOTE 2	NOTE 3	NOTE 4	NOTE 5	NOTE 6	WING WIDTH	NOTE 7	# OF
	A	L	B	C	D	E	F	WINGS

Notes: _____

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Bio Clean
A Forterra Company

FILTER MEASURMENT SHEET

(COMBINATION INLETS)

COMPANY: _____

CONTACT: _____

PHONE: _____ FAX: _____ EMAIL: _____

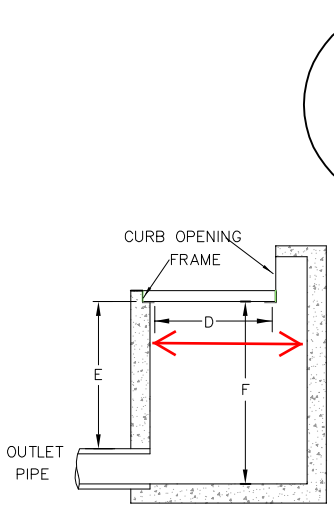
JOB NAME: _____

JOB LOCATION: _____

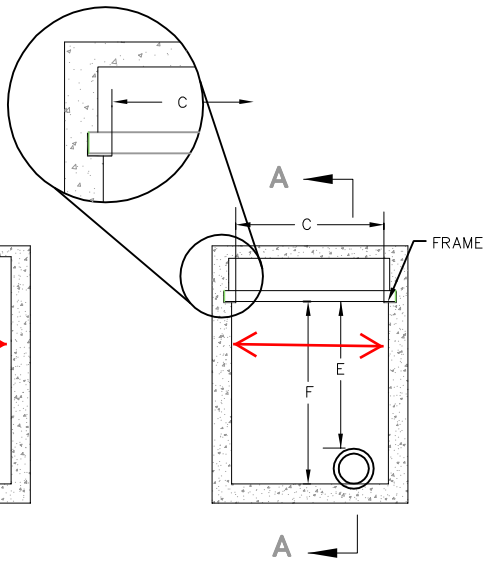
NOTE: PLEASE GIVE MEASUREMENTS TO WITHIN 1/8"

INSTRUCTIONS:

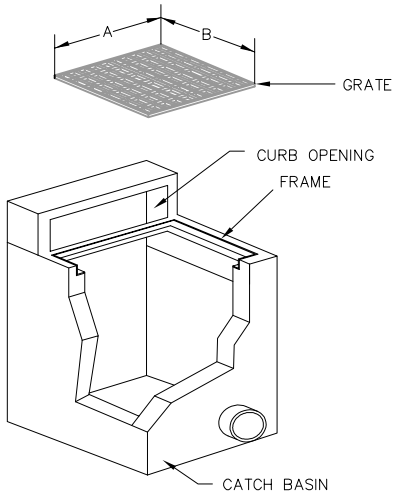
1. Check appropriate grate type.
2. List grate manufacturer & part number.
3. Measure the outside dimensions of the grate (A & B).
4. Measure the frame clear opening(C &D) inside the grate frame, or catch basin, whichever is less.
5. Measure from the bottom of the frame to the top of the outlet pipe (E).
6. Measure from the bottom of the frame to the bottom of the catch basin (F).
7. Describe in the note section any obstructions that protrude into the space directly within 24" under the opening, including any inflow pipes.



SECTION A–A



SECTION VIEW



ISOMETRIC VIEW

Qty/Drain No.	GRATE TYPE	GRATE MFR. AND PART #	GRATE O.D. A	GRATE O.D. B	FRAME CLEAR OPENING C	FRAME CLEAR OPENING D	NOTE 4 E	NOTE 5 F
	☐ STEEL ☐ CAST IRON							
	☐ STEEL ☐ CAST IRON							

Notes: _____

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A Forterra Company

FILTER MEASURMENT SHEET
(CURB INLET WITH WINGS)

COMPANY:

CONTACT:

PHONE: FAX: EMAIL:

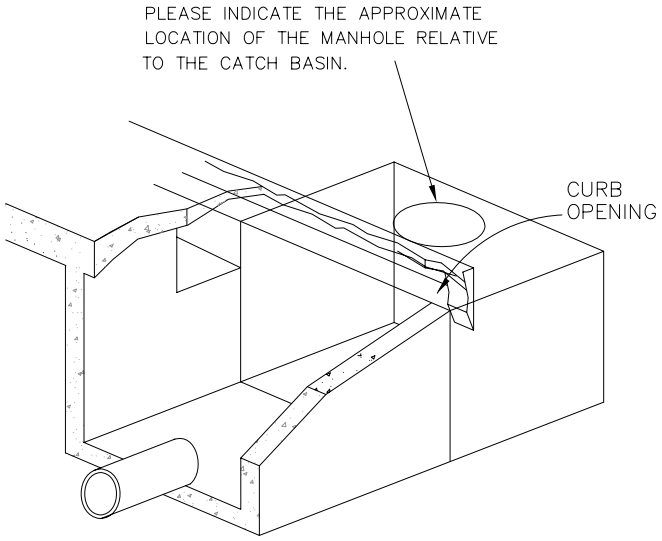
JOB NAME:

JOB LOCATION:

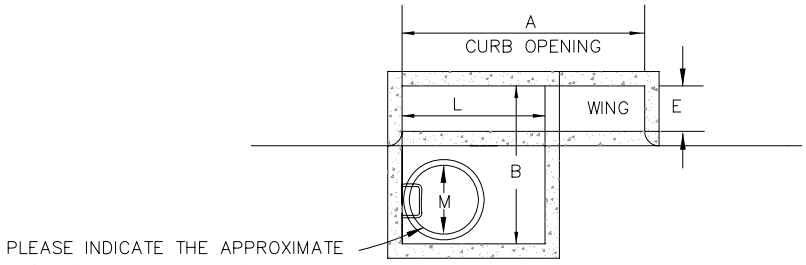
NOTE: PLEASE GIVE MEASUREMENTS TO WITHIN 1/8"

INSTRUCTIONS:

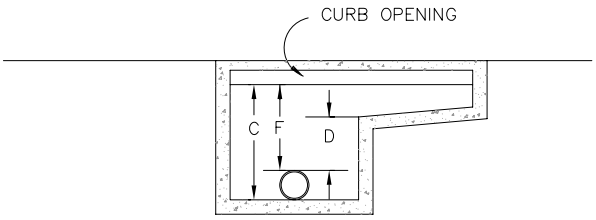
1. Please give measurements to within 1/8".
2. Measure total curb opening (A).
3. Measure inside length of CB. (L).
4. Measure inside width of CB, (B).
5. Total CB inside depth below inlet flowline (C).
6. Measure from bottom of wing to top of outlet pipe (D).
7. Measure from inlet flowline to top of outlet pipe (F).



ISO VIEW



TOP VIEW



ELEVATION

Qty/Drain No.	NOTE 2	NOTE 3	NOTE 4	NOTE 5	NOTE 6	WING WIDTH	NOTE 7	# OF
	A	L	B	C	D	E	F	WINGS

Notes: _____

_____

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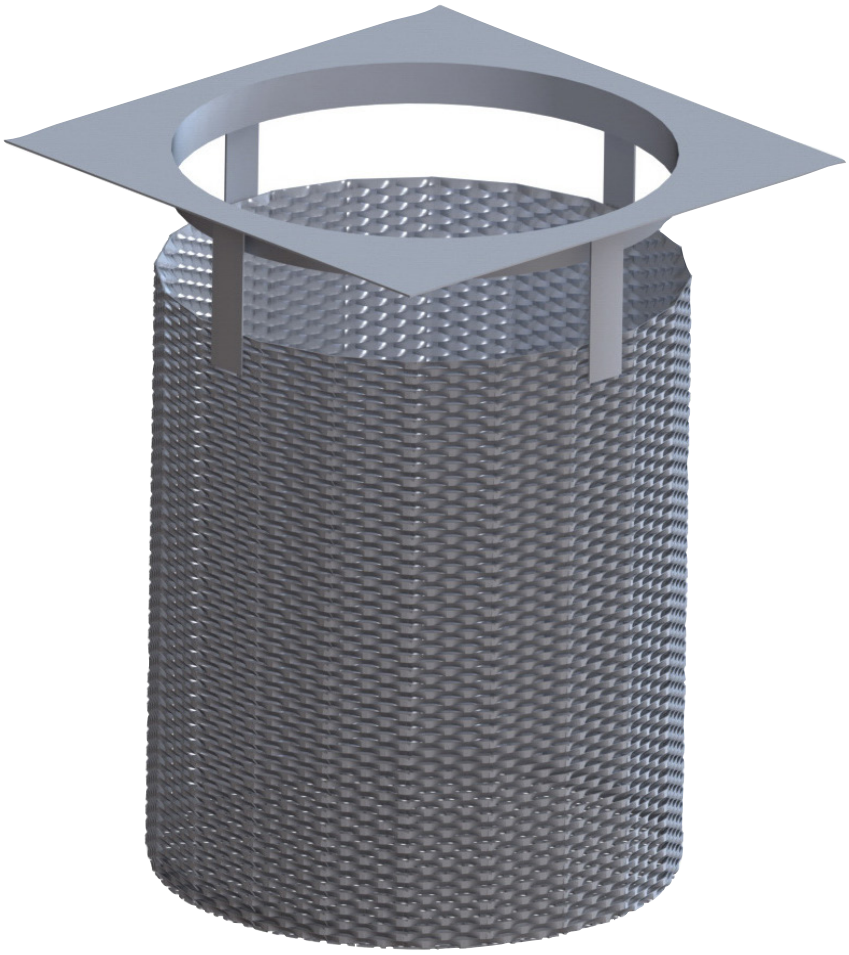
APPENDIX D

Grate Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



Bio Clean Environmental Services, Inc.
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Oceanside, CA 92058

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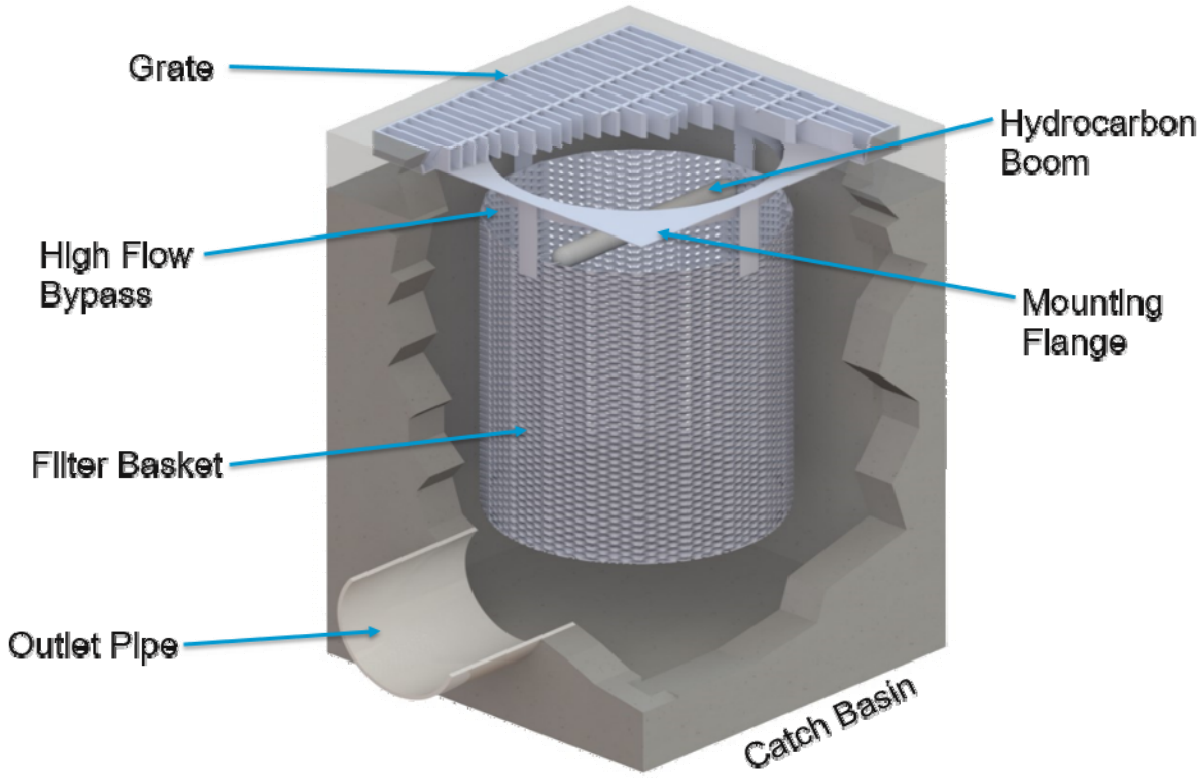
f: 760.433.3176

OPERATION & MAINTENANCE

The Bio Clean Grate Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. This filter is made of 100% stainless steel and is available and various sizes and depths allowing it to fit in any grated catch basin inlet. The filters heavy duty construction allows for cleaning with any vacuum truck. The filet can also easily be cleaned by hand.

As with all stormwater BMPs, inspection and maintenance on the Grate Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Grate Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Grate Inlet Filter are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Grate Inlet Filter can be inspected though visual observation. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open grated inlet. Once the grate has been safely removed the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the filter with the grate removed.
- Look for any out of the ordinary obstructions on the grate or in the filter and its bypass. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the filter basket and its bypass.
- Excessive accumulation of trash, foliage and sediment in the filter basket. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-GRATE-12-12-12	10.00	12.00	0.27	0.55
BC-GRATE-18-18-18	16.00	18.00	1.05	2.09
BC-GRATE-24-24-24	21.00	24.00	2.41	4.81
BC-GRATE-30-30-24	27.00	24.00	3.98	7.95
BC-GRATE-36-36-24	33.00	24.00	5.94	11.88
BC-GRATE-48-48-18	44.00	18.00	7.92	15.84

Maintenance Equipment

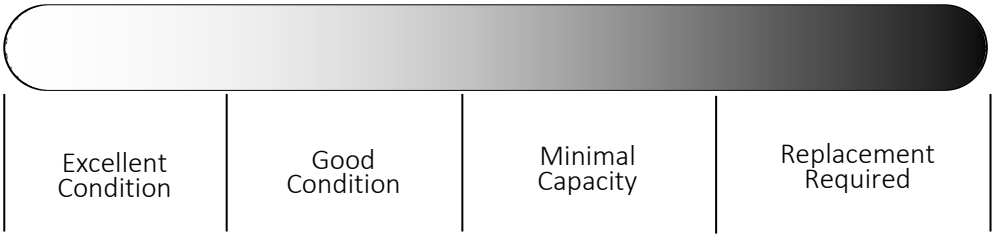
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can easily cleaned by hand:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to remove the grate.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Grate Inlet Filter can be performed utilizing a vacuum truck. Once all safety measures have been set up cleaning of the Grate Inlet Filter can proceed as followed:

- Remove grate (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened catch basin. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. Power wash off the filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

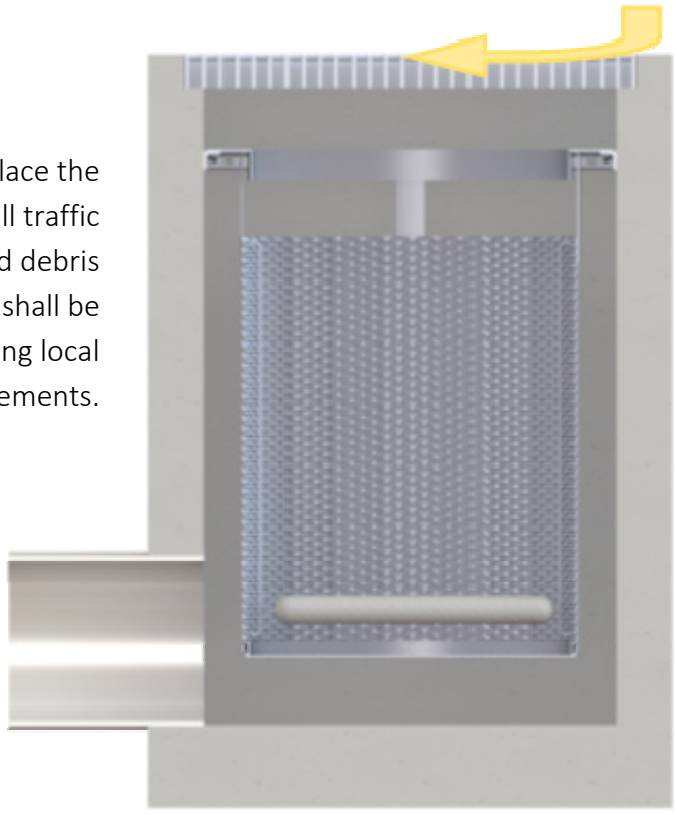
Maintenance Sequence

Remove grate and set up vacuum truck to clean the filter basket.

Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off screens.

Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the grate and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ ☐

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

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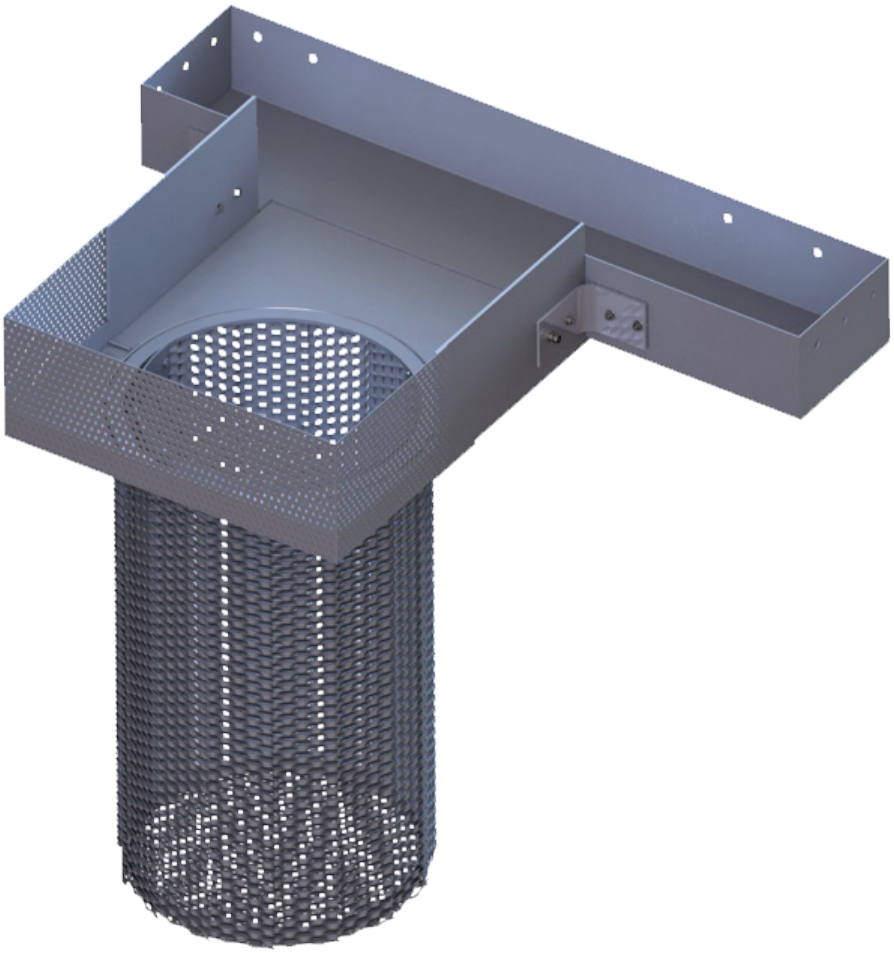
Curb Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



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Bio Clean
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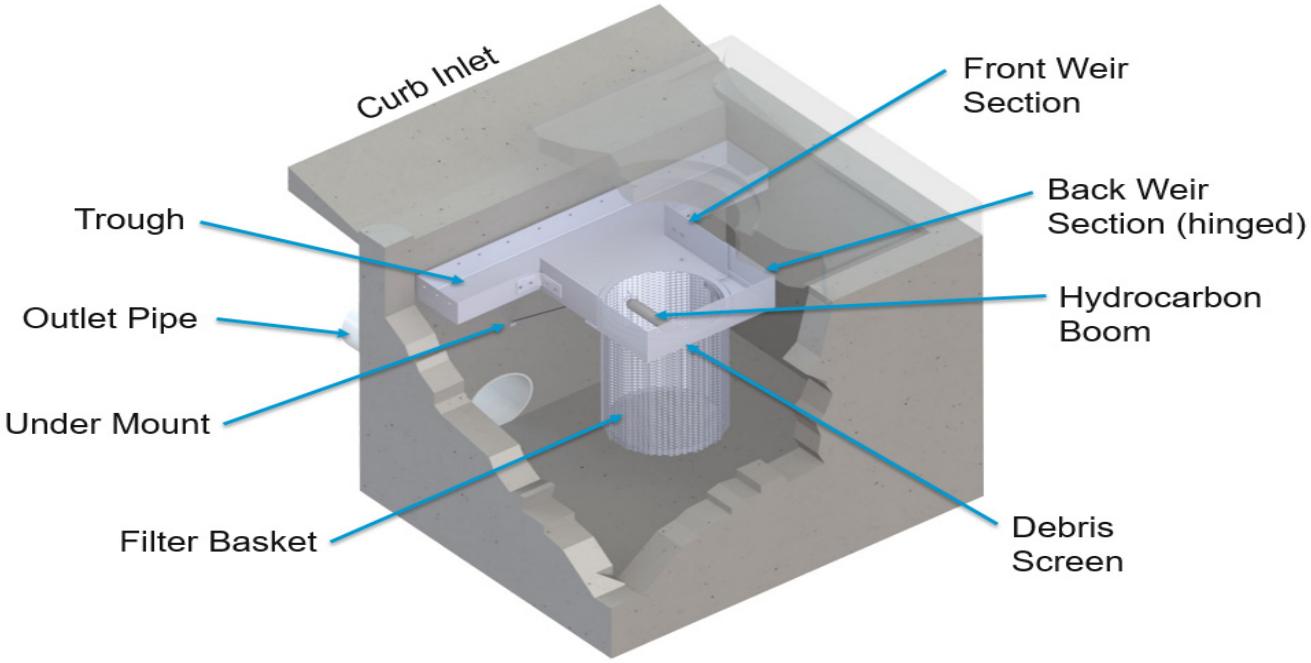
OPERATION & MAINTENANCE

The Bio Clean Curb Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. The innovative trough & weir system is mounted along the curb face and directs incoming stormwater toward the filter basket which is positioned "directly" under the manhole access opening regardless of its location in the catch basin. This innovative design allows the filter to be cleaned from finish surface without access into the catch basin, therefore drastically reducing maintenance time and eliminating confined space entry. The filter has a lifting handle allowing for the filter to be removed easily through the manhole. The weir also folds up to allow for unimpeded access into the basin for routine maintenance or pipe jetting.

As with all stormwater BMPs, inspection and maintenance on the Curb Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Curb Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Curb Inlet Fitler are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Curb Inlet Filter can be inspected though visual observation without entry into the catch basin. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once the manhole has been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the catch basin through the manhole. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the catch basin.
- Look for any out of the ordinary obstructions in the catch basin, trough, weir, filter basket, basin floor our outlet pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the trough, weir, filter basket or catch basin.
- Excessive accumulation of trash, foliage and sediment in the filter basket and/or trough and weir sections. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-CURB-30	18	30	2.21	4.42
BC-CURB-24	18	24	1.77	3.53
BC-CURB-18	18	18	1.33	2.65
BC-CURB-12	18	12	0.88	1.77

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter though it can easily cleaned by hand:

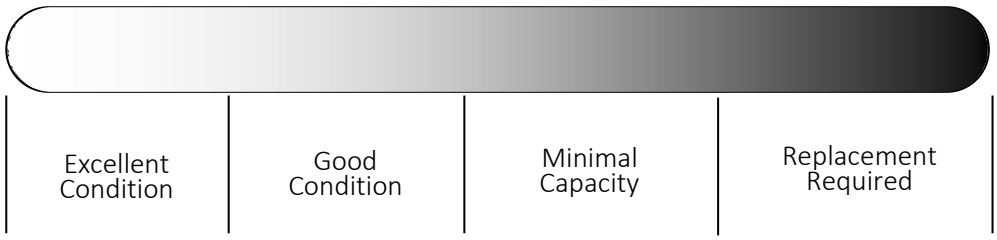
- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Curb Inlet Filter can be performed from finish surface without entry into catch basin utilizing a vacuum truck. Some unique

and custom configurations may create conditions which would require entry for some or all of the maintenance procedures. Once all safety measures have been set up cleaning of the Curb Inlet Filter can proceed as followed:

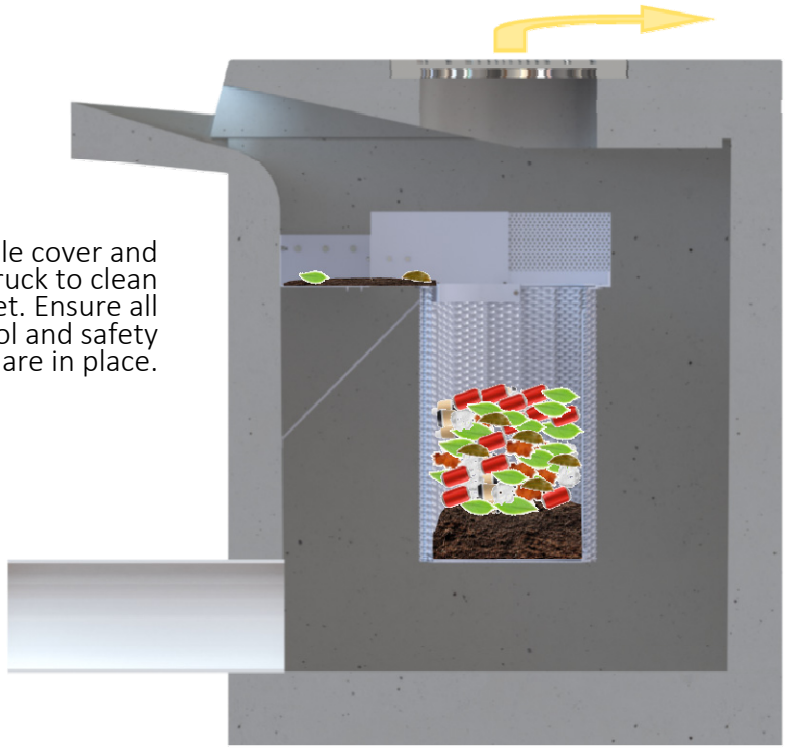
- Remove all manhole cover or access hatches (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened manhole or hatch opening. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. If the filter basket is full, trash, sediment, and debris will accumulate inside the trough and weir sections of the system. Once the filter basket is clean power wash the weir and trough pushing these debris into the filter basket (leave the hose in the filter basket during this process so entering debris will be sucked out). Power wash off the trough, weir, debris screen, and filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



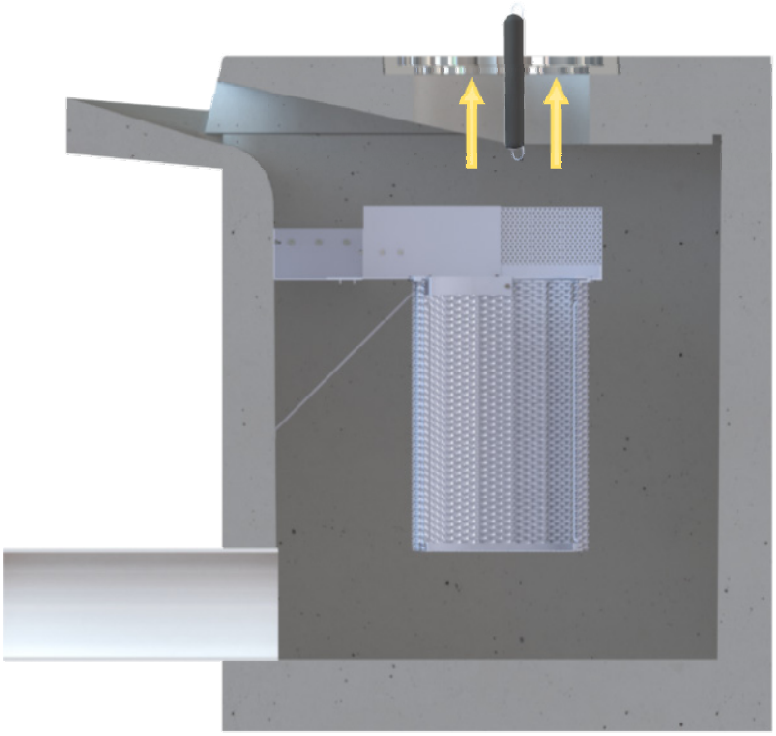
- The last step is to close up and replace the manhole or hatch and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

Maintenance Sequence

Remove manhole cover and set up vacuum truck to clean the filter basket. Ensure all traffic control and safety measures are in place.

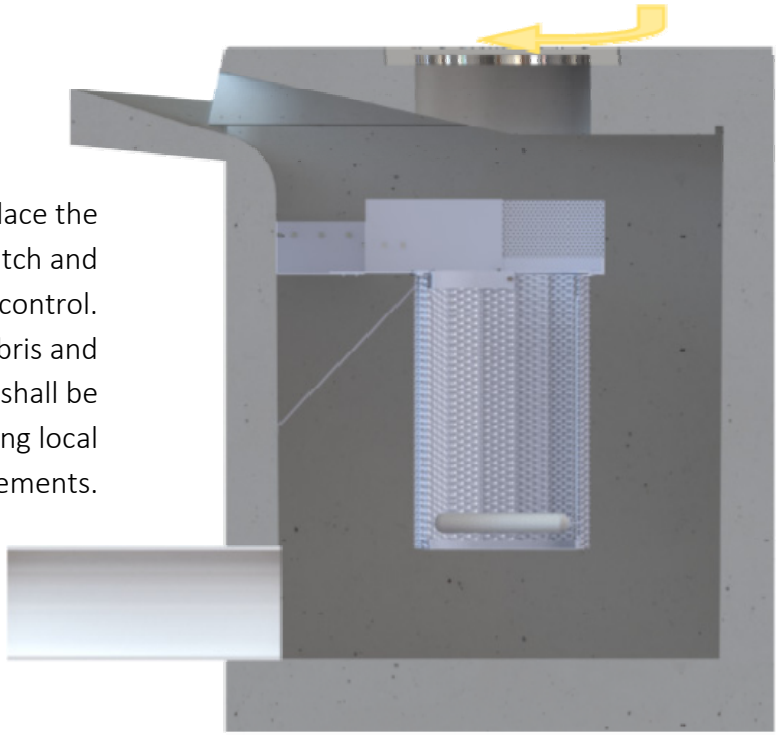


Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off the weir and trough and vacuum out any remaining debris.



Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the manhole or hatch and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ ☐

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

398 Via El Centro, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

APPENDIX E

Product Warranty

BIO CLEAN CURB & GRATE TYPE INLET FILTERS

Bio Clean Environmental Services, Inc. products are engineered and manufactured with the intent to be considered as permanent infrastructure. Bio Clean Environmental Services, Inc. warranties its products to be free of manufacturer's defects for a period of 8 years from the date of purchase. Bio Clean Environmental Services, Inc. warranties that the materials used to manufacture its products will be able to withstand and remain durable to environmental conditions for a period of 8 years from the date of purchase. If a warranty claim is made and determined to be valid, Bio Clean Environmental Services, Inc. will either repair or replace the product, at the discretion of Bio Clean Environmental Services, Inc. Warranty claims must be submitted, evaluated, and approved by Bio Clean Environmental Services, Inc. for the claim to be determined to be valid. All warranty work and/or corrective action must be authorized by Bio Clean Environmental Services, Inc. prior to beginning the work not covered by this warranty. There are no other warranties either expressed or implied other than what is specifically specified herein. Abusive treatment, neglect, or improper use of Bio Clean Environmental Services, Inc. products will not be covered by this warranty.

760-433-7640

Bio Clean
A Forterra Company

info@biocleanenvironmental.com

APPENDIX F

2596 Dunwin Drive
Mississauga ON L5L 1J5
Phone: 905.696.7276
Fax: 905.696.7279

Test Report

CUSTOMER:	Bio Clean Environmental Services & Modular Wetlands 398 Via El Centro Oceanside California 92058
Report Date: October 06, 2017	
Date(s) Analysis Performed: September 28 - 29	

Good Harbour Laboratories was asked to determine the head loss that occurs as water passes through a section of expanded metal grating that was supplied by Bio Clean Environmental Services. The screen had a diamond pattern that could be oriented either horizontally or vertically, as well as one side that had raised edges.

The section of screen (Figure 1) was mounted in a wooden frame that exposed a screen face 16-5/8 inches wide and 16-1/2 inches high when the diamonds were in the vertical position. The frame was mounted in a trough and water was passed through the screen. The difference in water height before and after the screen was used to determine head loss.

Figure 1: Expanded Metal Screen

2596 Dunwin Drive
Mississauga ON L5L 1J5
Phone: 905.696.7276
Fax: 905.696.7279

TEST RESULTS:

Test 1: Diamond opening placed vertically; raised face on inlet side (against flow).

Flow rate	Water Height[1]		Head Loss, ΔH	
(gpm)	Inlet (cm)	Outlet (cm)	cm	inch
50	5.4	1.9	3.5	1.4
100	8.2	2.7	5.5	2.2
200	12.7	3.5	9.2	3.6
300	16.0	4.4	11.6	4.6
400	19.3	5.2	14.1	5.6

Test 2: Diamond opening placed vertically; raised face on outlet side (with flow).

Flow rate	Water Height[1]		Head Loss, ΔH	
(gpm)	Inlet (cm)	Outlet (cm)	cm	inch
50	5.2	1.8	3.4	1.3
100	7.7	2.6	5.1	2.0
200	12.7	3.6	9.1	3.6
300	15.8	4.5	11.3	4.4
400	19.5	5.3	14.2	5.6

Test 3: Diamond opening placed horizontally; raised face on outlet side (with flow).

Flow rate	Water Height[1]		Head Loss, ΔH	
(gpm)	Inlet (cm)	Outlet (cm)	cm	inch
50	5.2	1.6	3.6	1.4
100	7.2	2.5	4.7	1.9
200	11.4	3.9	7.5	3.0
300	14.7	4.3	10.4	4.1
400	18.5	5.0	13.5	5.3

[1] Water height has been corrected for the thickness of the wood frame.

2596 Dunwin Drive
Mississauga ON L5L 1J5
Phone: 905.696.7276
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The above tests were repeated however for the second set of tests, the effluent side of the screen was allowed to free-fall into a receiving tank. The water height on the inlet side of the grating was recorded:

Test 4: Diamond opening placed vertically; raised face on inlet side (against flow).

Flow rate (gpm)	Inlet Water Height[1]	
	cm	inch
50	5.3	2.1
100	7.7	3.0
200	12.0	4.7
300	15.5	6.1
400	19.0	7.5

Test 5: Diamond opening placed vertically; raised face on outlet side (with flow).

Flow rate (gpm)	Inlet Water Height[1]	
	cm	inch
50	5.1	2.0
100	7.3	2.9
200	10.9	4.3
300	15.2	6.0
400	18.6	7.3

Test 6: Diamond opening placed horizontally; raised face on outlet side (with flow).

Flow rate (gpm)	Inlet Water Height[1]	
	cm	inch
50	4.9	1.9
100	7.4	2.9
200	11.0	4.3
300	14.4	5.7
400	17.3	6.8

2596 Dunwin Drive
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Phone: 905.696.7276
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Results Summary:

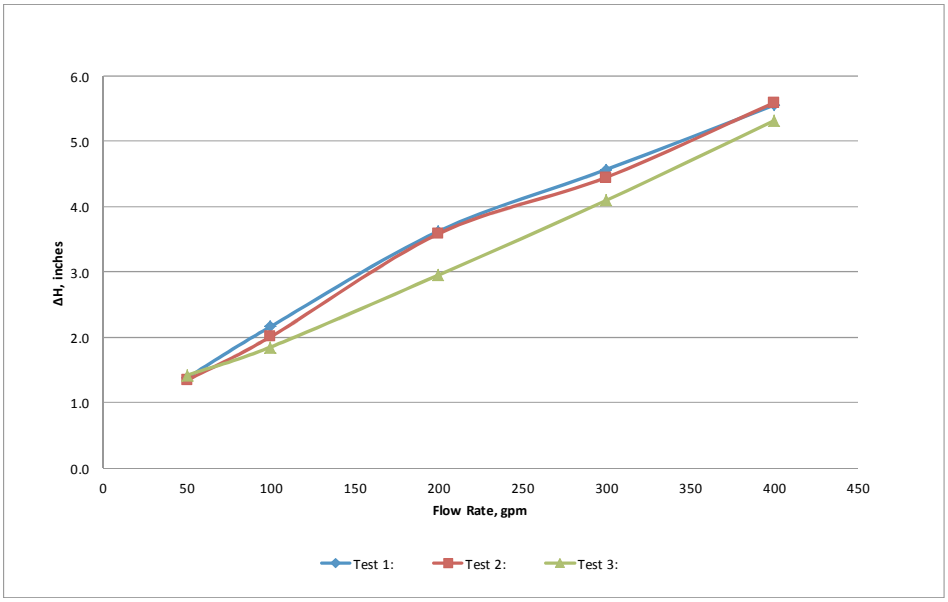


Figure 1: Head loss across expanded metal grating

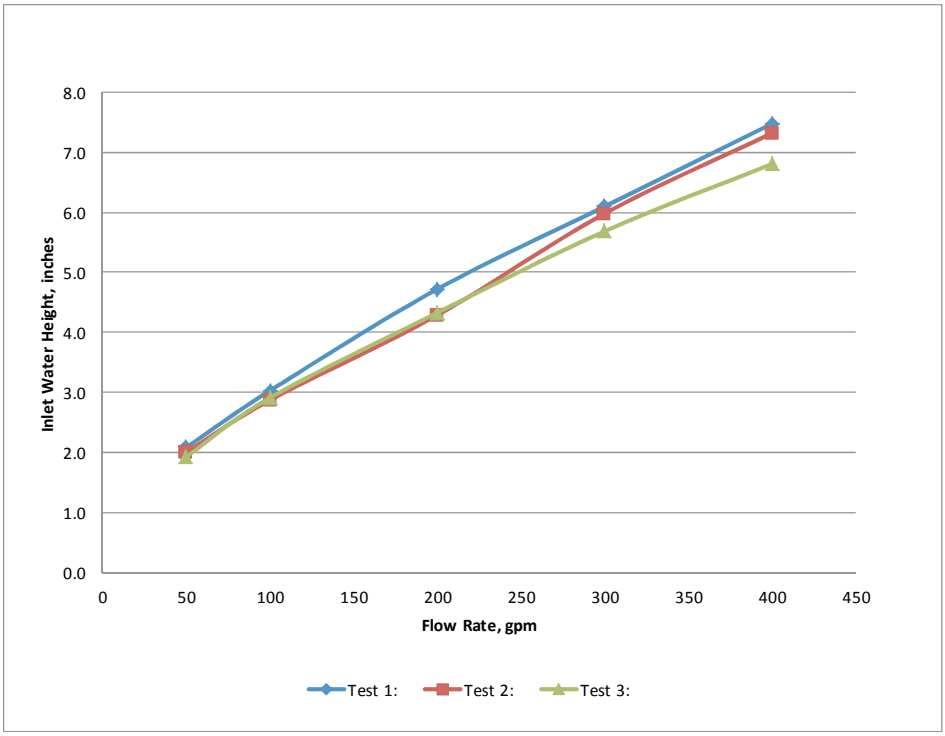


Figure 2: Inlet water height with effluent free-fall

Good Harbour Laboratories

2596 Dunwin Drive
Mississauga ON L5L 1J5
Phone: 905.696.7276
Fax: 905.696.7279

Test Report

Released By:	Joe Costa		Oct. 06, 2017
	Name	Signature	Date
	Senior Scientist		
	Title		

APPENDIX G

MVCAC
Mosquito and Vector Control Association of California
One Capitol Mall, Suite 800 • Sacramento, CA 95814 • p: (916) 440-0826 • f: (916) 444-7462 • e: mvcac@mvcac.org

Bio Clean
398 Via El Centro
Oceanside, CA 92058

October 20, 2021

Dear Mr. Hasan,

Thank you for the submission of the Bio Clean Grate Inlet and Curb Inlet full trash capture devices for review by the Mosquito and Vector Control Association of California pursuant to the SWRCB Trash Treatment Control Device Application Requirements. The Association has reviewed the conceptual drawings for the Grate Inlet and Curb Inlet devices and verifies that provisions have been included in the design that allow for full visual access to all areas for presence of standing water, and when necessary, allows for treatments of mosquitoes.

While this verification letter confirms that inspection and treatment for the purpose of minimizing mosquito production should be possible with the Bio Clean Grate Inlet and Curb Inlet full trash capture devices as presented, it does not affect the local mosquito control agency's rights and remedies under the State Mosquito Abatement and Vector Control District Law. For example, if the installed device or the associated stormwater system infrastructure becomes a mosquito breeding source, it may be determined by a local mosquito control agency to be a public nuisance in accordance with California Health and Safety Code sections 2060-2067.

"Public nuisance" means any of the following:

1. Any property, excluding water, that has been artificially altered from its natural condition so that it now supports the development, attraction, or harborage of vectors. The presence of vectors in their developmental stages on a property is prima facie evidence that the property is a public nuisance.
2. Any water that is a breeding place for vectors. The presence of vectors in their developmental stages in the water is prima facie evidence that the water is a public nuisance.
3. Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors. (Heal. & Saf. Code § 2002 (j).)

Declaration of a facility or property as a public nuisance may result in penalties as provided under the Health and Safety Code. Municipalities and the vendors they work with are encouraged to discuss the design, installation, and maintenance of stormwater trash capture devices with their local mosquito control agency to reduce the potential for disease transmission and public nuisance associated with mosquito production.

Sincerely,

Bob Achermann,
MVCAC Executive Director

APPENDIX H

Bio Clean Grate and Curb Insert Filter – Full Capture Type Example calculations

Equations used for flow calculations and referenced on following example calculation pages.

Filtered Flow Capacity = $Q_F = (C_d A_f \sqrt{2gh})/SF$

where	C_d =	Coefficienct of discharge (non-blocking screen) =	0.66	unitless
	C_d =	Coefficienct of discharge (non-blocking screen) =	0.62	unitless
	A_f =	screen open area, ft^2 = A_s (Open Area)		
	g =	gravitational acceleration =	32.174	ft/s^2
	h =	filter driving head, ft		
	SF =	Safety Factor (Vertical Screen) =	2	unitless
	SF =	Safety Factor (Horizontal Screen) =	3	unitless

Bypass Flow Capacity = $Q_B = (C_d A_b \sqrt{2gH})/SF$

where	C_d =	Coefficienct of discharge =	0.62	unitless
	A_b =	bypass area, ft^2		
	g =	gravitational acceleration =	32.174	ft/s^2
	h =	bypass driving head, ft		
	SF =	Safety Factor =	2	unitless

Interception Capacity = $Q_i = C_w(L + 1.8W_o)d^{1.5}$

where	C_w =	Weir coefficient =	2.3	$ft^{0.5}ft/s$
	L =	Length of opening, ft		
	W_o =	depression width, ft		ft
	d =	head at inlet opening, ft		

Example Calculation – BIO-GRATE-FULL-24-24-24

Filtered Flow Capacity - $Q_F = \left(Cd1A_{f1}\sqrt{2gh1}\right)/SF + \left(Cd2A_{f2}\sqrt{2gh2}\right)/SF$ = 13.65 CFS

Filtered Flow Capacity greater than throat capacity – Filtered Flow revised to Throat capacity = 7.67 CFS

where	C_{d1} =	Coefficienct of discharge (non-blocking screen) =	0.66	unitless
	C_{d2} =	Coefficienct of discharge (non-blocking screen) =	0.62	unitless
	A_{f1} =	Cylinder screen open area, ft^2 = A_s (Open Area)	4.07	sq-ft
	A_{f2} =	Bottom screen open area, ft^2 = A_s (Open Area)	1.26	sq-ft
	g =	gravitational acceleration =	32.174	ft/s^2
	h_1 =	filter driving head, ft	1	ft
	h_2 =	filter driving head, ft	2	ft
	SF =	Safety Factor (Vertical Screen) =	2	unitless
	SF =	Safety Factor (Horizontal Screen) =	3	unitless

Bypass Flow Capacity - $Q_B = \left(CdA_b\sqrt{2gH}\right)/SF$ = 4.83 CFS;

Bypass Flow Capacity less than throat capacity – Bypass flow capacity confirmed.

where	C_d =	Coefficienct of discharge	0.62	unitless
	A_b =	bypass area, ft^2	1.83	sq-ft
	g =	gravitational acc. =	32.174	ft/s^2
	h =	bypass driving head, ft	0.63	ft
	SF =	Safety Factor =	2	unitless

Throat Capacity Check - $Q_{Throat} = \left(Cd * A_{Throat}\sqrt{2gH}\right)/SF$ = 7.67 CFS

where	C_d =	Coefficienct of discharge	0.62	unitless
	A_{Throat} =	Throat open area, ft^2	2.18	sq-ft
	g =	gravitational acc. =	32.174	ft/s^2
	h =	bypass driving head, ft	0.5	ft
	SF =	Safety Factor = N/A	1	unitless

1. Other standard and custom model sizes available - contact Bio Clean for more information.
2. Cylinder screen based on 37% Open Area.
3. Bottom screen based on 51% Open Area.
4. Considers a SF of 2.0 for side discharge and a SF of 3.0 for bottom discharge.
5. Considers a local depression ponding depth of 6-inches and grate thickness of 3.5-inches.
6. Storage capacity based on the basket half full.
7. In some cases the filtered flow capacity has been reduced to the maximum possible inflow to the filter.
8. In some cases the bypass capacity has been reduced to the maximum possible inflow to the filter.

Example Calculation – BIO-CURB-FULL-24

Filtered Flow Capacity - $Q_F = \left(Cd1A_{f1}\sqrt{2gh1}\right)/SF + \left(Cd2A_{f2}\sqrt{2gh2}\right)/SF + \left(Cd2A_{f3}\sqrt{2gh3}\right)/SF$ = 11.23 CFS

Filtered Flow Capacity greater than Interception capacity – Filtered Flow revised to interception capacity = 2.85 CFS

where	C_{d1} =	Coefficienct of discharge (non-blocking screen) =	0.66	unitless
	C_{d2} =	Coefficienct of discharge (non-blocking screen) =	0.62	unitless
	A_{f1} =	Cylinder screen open area, ft^2 = A_s (Open Area)	3.49	sq-ft
	A_{f2} =	Bottom screen open area, ft^2 = A_s (Open Area)	0.90	sq-ft
	A_{f3} =	Perforated Ext. open area, ft^2 = A_s (Open Area)	0.49	sq-ft
	g =	gravitational acceleration =	32.174	ft/s^2
	h_1 =	filter driving head, ft	1	ft
	h_2 =	filter driving head, ft	2	ft
	h_3 =	filter driving head, ft	1	ft
	SF =	Safety Factor (Vertical Screen) =	2	unitless
	SF =	Safety Factor (Horizontal Screen) =	3	unitless

Interception Capacity Check - $Q_i = C_w(L + 1.8W_o)d^{1.5}$ = 2.85 CFS

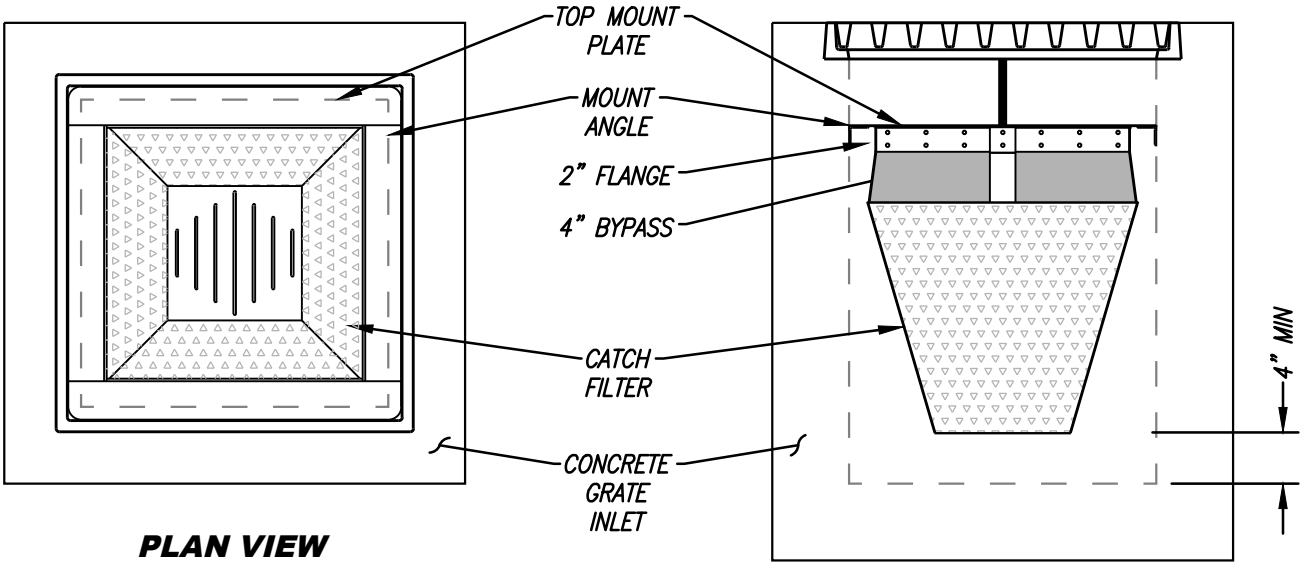
where	C_w =	Weir coefficient =	2.3	$ft^{0.5}ft/s$
	L =	Length of opening, ft	2	ft
	W_o =	depression width, ft	0.83	ft
	d =	head at inlet opening, ft	0.5	ft

1. Other standard and custom model sizes available - contact Bio Clean for more information.
2. Cylinder screen based on 37% Open Area.
3. Bottom screen based on 51% Open Area.
4. Considers a SF of 2.0 for side discharge and a SF of 3.0 for bottom discharge.
5. Storage capacity based on the basket half full.
6. In some cases the filtered flow capacity has been reduced to the maximum possible inflow to the filter.

APPENDIX I

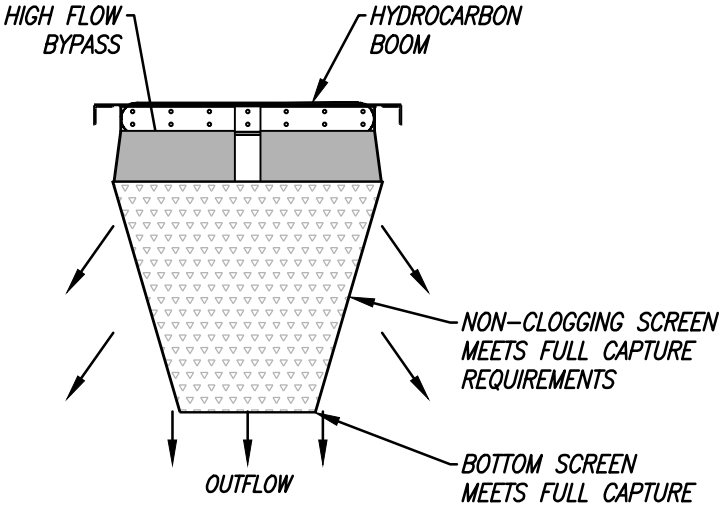
BIO CLEAN FULL CAPTURE FILTER

FOR USE IN GRATE INLETS



PLAN VIEW
(GRATE NOT SHOWN)

ELEVATION VIEW



FLOW DIAGRAM

MODEL #	TREATMENT FLOW RATE (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BIO-GRATE-KMF 18-18-12	1.35	3.87	0.26
BIO-GRATE-KMF 26-26-12	1.79	5.25	0.45
BIO-GRATE-KMF 24-40-12	2.27	6.35	0.60
BIO-GRATE-KMF 26-26-24	7.11	5.25	1.34
BIO-GRATE-KMF 24-40-24	8.71	6.35	1.79
BIO-GRATE-KMF 36-36-24	11.32	8.75	3.31

INSTALLATION NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL.
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT.
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS.
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDIING DEPTH OF 6 INCHES..
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.

1:15 SCALE

Bio Clean
A Forterra Company

GRATE INLET FILTER
FULL CAPTURE
STANDARD DETAIL

9/22/21GSCHIPPER

Figure 29 – Grate Inlet Filter Alternative Configuration

Bio Clean Grate Inlet Filter Alternative Configuration – Full Capture Type Example calculations

Equations used for flow calculations and referenced on following example calculation pages.

Filtered Flow Capacity = $Q_F = (C_d A_f \sqrt{2gh})/SF$

where	C_d =	Coefficienct of discharge (non-blocking screen) =	0.66	unitless
	C_d =	Coefficienct of discharge (non-blocking screen) =	0.62	unitless
	A_f =	screen open area, ft^2 = A_s (Open Area)		
	g =	gravitational acceleration =	32.174	ft/s^2
	h =	filter driving head, ft		
	SF =	Safety Factor (Vertical Screen) =	2	unitless
	SF =	Safety Factor (Horizontal Screen) =	3	unitless

Bypass Flow Capacity =

$$Q_B = \left(C_d A_b \sqrt{2gH}\right)/SF$$

where	C_d =	Coefficienct of discharge =	0.62	unitless
	A_b =	bypass area, ft^2		
	g =	gravitational acceleration =	32.174	ft/s^2
	h =	bypass driving head, ft		
	SF =	Safety Factor =	2	unitless

Interception Capacity =

$$Q_i = C_w(L + 1.8W_o)d^{1.5}$$

where	C_w =	Weir coefficient =	2.3	$ft^{0.5}ft/s$
	L =	Length of opening, ft		
	W_o =	depression width, ft		ft
	d =	head at inlet opening, ft		

Example Calculation – BIO-GRATE-FULL-26-26-24

Filtered Flow Capacity - $Q_F = \left(Cd1A_{f1}\sqrt{2gh1}\right)/SF + \left(Cd2A_{f2}\sqrt{2gh2}\right)/SF$ = 7.11 CFS

where	C_{d1} =	Coefficienct of discharge (non-blocking screen) =	0.66	unitless
	C_{d2} =	Coefficienct of discharge (non-blocking screen) =	0.62	unitless
	A_{f1} =	Total Side Panel open area, ft^2 = A_s (Open Area)	3.04	sq-ft
	A_{f2} =	Bottom screen open area, ft^2 = A_s (Open Area)	0.77	sq-ft
	g =	gravitational acceleration =	32.174	ft/s^2
	h_1 =	filter driving head, ft	1	ft
	h_2 =	filter driving head, ft	2	ft
	SF =	Safety Factor (Vertical Screen) =	2	unitless
	SF =	Safety Factor (Horizontal Screen) =	3	unitless

Bypass Flow Capacity - $Q_B = \left(CdA_b\sqrt{2gH}\right)/SF$ = 5.25 CFS;

Bypass Flow Capacity less than throat capacity – Bypass flow capacity confirmed.

where	C_d =	Coefficienct of discharge	0.62	unitless
	A_b =	bypass area, ft^2	2.11	sq-ft
	g =	gravitational acc. =	32.174	ft/s^2
	h =	bypass driving head, ft	0.63	ft
	SF =	Safety Factor =	2	unitless

Throat Capacity Check - $Q_{Throat} = \left(Cd * A_{Throat}\sqrt{2gH}\right)/SF$ = 11.28 CFS

where	C_d =	Coefficienct of discharge	0.62	unitless
	A_{Throat} =	Throat open area, ft^2	2.78	sq-ft
	g =	gravitational acc. =	32.174	ft/s^2
	h =	bypass driving head, ft	0.5	ft
	SF =	Safety Factor = N/A	1	unitless

1. Other standard and custom model sizes available - contact Bio Clean for more information.
2. Based on 10% Open Area.
3. Based on 37% Open Area.
4. Considers a SF of 2.0 for side discharge and a SF of 3.0 for bottom discharge.
5. Considers a local depression ponding depth of 6-inches and grate thickness of 2-inches.
6. Storage capacity based on the basket half full.
7. In some cases the filtered flow capacity has been reduced to the maximum possible inflow to the filter.
8. In some cases the bypass capacity has been reduced to the maximum possible inflow to the filter.