



August 19th, 2024
Mr. Leo Cosentini
California State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-0100

Dear Mr. Cosentini,

Thank you for this opportunity for Fabco Industries Inc. to submit an amended application to the California State Water Resources Control Board for certification of the **StormTrough (Application 43)** as a Full Capture System Trash Treatment Control Device.

For brief description, the StormTrough is a uniquely designed filter device installed below the basin side opening of a curb opening inlet which allows surface runoff entering the inlet to be directed to a filter basket which screens and retains any trash, debris, or particles larger than 5 mm in diameter or greater. Provisions have also been made to ensure that Mosquito Vector Control personnel are easily able to inspect the device without need of perform confined space entry. Fabco StormTroughs have been installed and successfully protect waterways in stormwater infrastructure projects nationwide, including in California within the cities of Sacramento and Poway.

The amended application now indicates a critical design change to the feeder trough of the StormTrough. Horizontal depth of the trough increased from 6" to 8", height of the vertical back wall was increased to 8-½" from 5", and a reverse (45 degree) angled back splash flange has been added to prevent overtopping of water and trash. The amended application also details that StormTrough units manufactured prior to July 31st, 2024, will be retrofitted with an extension plate with reverse angle back splash on the trough sections to prevent trash from overtopping. A report of performance testing for the StormTrough's feeder trough is also now included in the application.

Two new options for the device filter basket have been added. Both new options are made of stainless-steel, with one including additional bypass windows on the filter basket. Additionally, there are now three new standard depths of filter sack/basket. Hydraulic capacities for each new standard depth are provided in the application for each type of filter style. The functionality of StormTrough is unchanged from the original application for all new optional components.

A new configuration of the StormTrough is also added to the application called the Standpipe Filter. In this configuration of the device, feeder troughs are not utilized, instead the device is installed inside a vertical standpipe. The filter basket in the Standpipe Filter configuration utilizes an expanding mounting ring to clamp to the inside walls of the vertical outlet pipe, and a center plate with vector control access is attached to the mounting ring. The filter basket is then secured by the center plate. Hydraulic capacity, trash capture components/mechanism, and vector control access are unchanged from the standard configuration.

Within the application below we have spoken to each of the submittal requirements within the Trash Treatment Control Device Certification and Fact Sheet Update Requirements and maintained the requested layout (April 2024 Revision).

Thank you again for your consideration and time taken to review our application. If any additional information is needed, please do not hesitate to contact myself Hilme Athar or our V.P. of Engineering, John Peters. Both of our contact information can be found within the application below.

Sincere regards,

A handwritten signature in black ink that reads "Hilme Athar". The signature is written in a cursive, flowing style.

Hilme Athar
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1. Cover Letter

1.A. Device Name and General Description

The StormTrough (Application 43) is a trash full capture device designed and manufactured by Fabco Industries, Inc. In standard configuration it is a modular device designed specifically to be installed in curb opening inlet storm drains. The key components that comprise the StormTrough are a center tray from which a filter basket hangs, trough segments which attach to each other and to the tray, and end caps which close off the trough. All components of the StormTrough can fit through a $\varnothing 21$ " manhole entrance of a curb opening inlet, where inside the parts can be assembled. The assembly is then mounted directly to the wall below the opening of a curb inlet using concrete anchors. The StormTrough acts as a gutter or pan for the curb opening, directing drainage flow toward the filter basket with $\varnothing 3/16$ " (~ 4.8 mm) round openings. The filter basket then captures any trash larger than 5 mm in diameter from the surface runoff entering the inlet. Components of the StormTrough are available in a variety of sizes to allow the device to fit in different types and sizes of curb opening inlets.

Additionally, the StormTrough is also available in an alternative configuration called the Standpipe Filter in which the device is installed within a vertical standpipe. In this configuration, the device is mounted utilizing an expanding mounting ring which clamps the device to the inside walls of a vertical standpipe. The mounting ring is designed to be inserted into an outlet pipe, where a turnbuckle rod found on the mounting ring can be utilized to expand and lock in place the device. A center plate with vector control access is then secured to the mounting ring. The filter basket of the device is then held in place by the center tray. The same filter baskets with $\varnothing 3/16$ " (~ 4.8 mm) round openings from the standard configuration are utilized, capturing any trash larger than 5 mm in diameter utilizing the same filter basket.

1.B. Applicant's Contact Information and Location

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1.C. Manufacturer's Website Page for Device

<https://fabco-industries.com/open-curb-stormwater-filter/>

1.D. Device's Manufacturing Location

Fabco Industries, Inc.
390 Oser Avenue
Hauppauge, NY 11788
(631) 393-6024

1.E. Brief Summary of Field/Lab Testing Results

The StormTrough captures trash from stormwater drainage using a polyethylene mesh basket or alternatively a stainless-steel basket, with $\varnothing 3/16''$ (or $\approx \varnothing 4.8\text{mm}$) openings. When installed within a curb opening inlet, the entire surface runoff design flow is directed through the filter basket so all trash 5 mm or greater in diameter is physically captured from the peak design flow. No lab testing is required as all trash 5 mm and greater in diameter are physically blocked by the screening material from flowing past. Existing installations of the StormTrough, including project sites in California, have yielded only positive results. All filtered flow rates reported in the hydraulic capacity table (Section 3.C.) have been calculated using the percent open area of the filter basket, pressure head measured to the bypass of the device, and a standard coefficient of discharge of 0.62 for the orifice equation.

1.F. Brief Summary of Device Limitations, and Operational, Sizing, and Maintenance Considerations

The StormTrough is modular, and each component is available in several standard sizes enabling it to fit in various curb opening inlet sizes. Accessibility within a curb opening inlet installation site is taken into high consideration, with all components of the StormTrough designed to fit through a $\varnothing 21''$ manhole opening or through the curb opening of an inlet.

Ease of installation is also considered with minimal tools required for installation of the device. Additionally, a mandatory vector control viewing port is ensured for all StormTrough units installed in California to allow access to the bottom of catch basins by Mosquito Vector Control Personnel without need for confined space entry.

The filtered flowrate of the StormTrough is designed to completely screen at least the trash treatment peak design flow of a storm drain. In addition, StormTrough units are sized to maintain hydraulic capacity prior to required maintenance as specified by an applicable Municipal Stormwater permit.

Regular maintenance is necessary for StormTrough to function properly. Fabco typically suggests maintenance be scheduled twice a year, but true necessary maintenance frequency will depend on site-specific conditions. The applicable Municipal Stormwater permit may specify more frequent maintenance intervals as well. Fabco Industries recommends the use of a vacuum truck to most easily clean captured trash within the StormTrough.


1.G. Description, or List of Locations, where Device has been Installed.

StormTrough units have been installed for stormwater management projects throughout California and nationally. Below are some example current install sites within the state of California:

Current Install Sites	
Project	Contact
Sacramento, CA	Patrick Murphy Area Sales Manager Ferguson Waterworks, Geo & Stormwater Solutions
Poway, CA	Phone: 916-402-3210 Email: Patrick.Murphy@ferguson.com

1.H. 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.

X 

John Peters
V.P. of Engineering
(631) 393-6024
johnp@fabco-industries.com

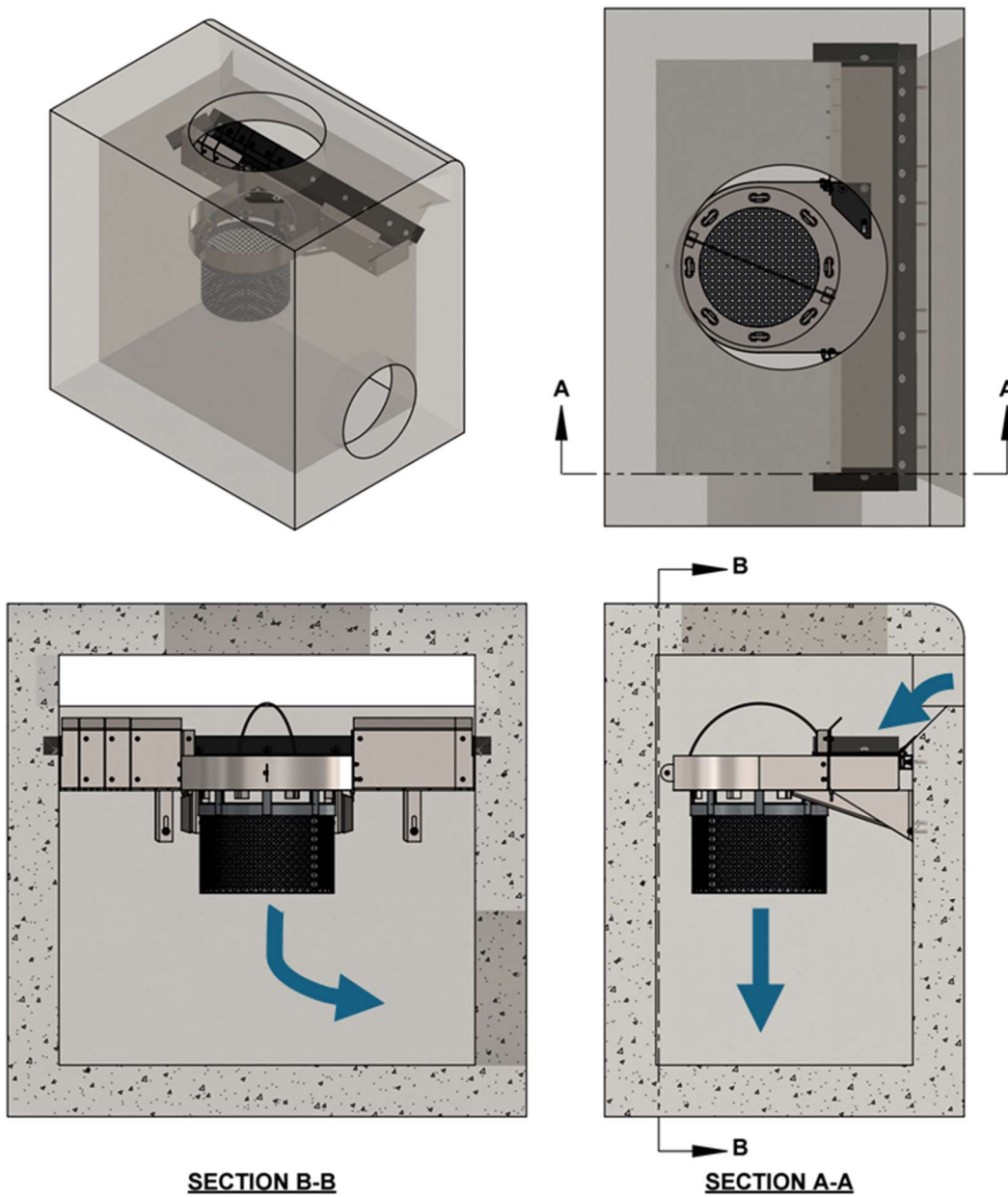
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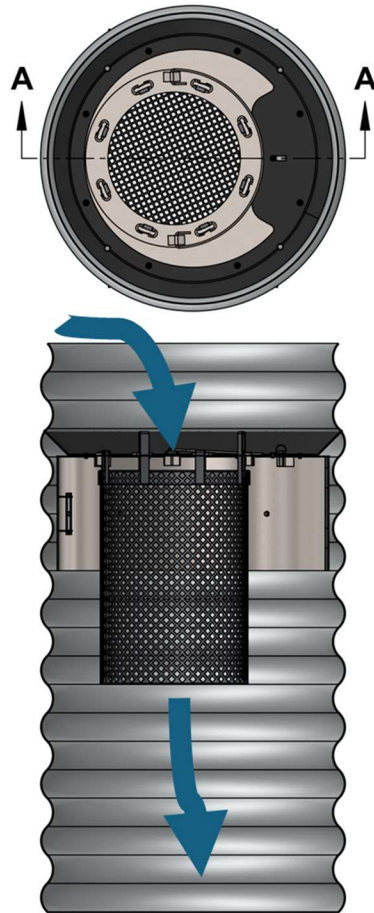
3. Physical Description

3.A. Trash Capture

The primary component of the StormTrough that captures trash 5 mm or greater in diameter is a replaceable filter basket with $\text{Ø}3/16''$, approximately $\text{Ø}4.8\text{mm}$, openings (available in polyethylene or stainless-steel). During a storm event the entire design flow is directed through the filter basket downwards trapping any trash 5mm or greater in diameter within the basket and allowing water to flow past into the bottom of the catch basin. Below are diagrams of the device in standard configuration and the Standpipe configuration with notes showing how design flow is directed through the device and down towards downstream stormwater infrastructure:



STANDARD CONFIGURATION



SECTION A-A

STANDPIPE CONFIGURATION

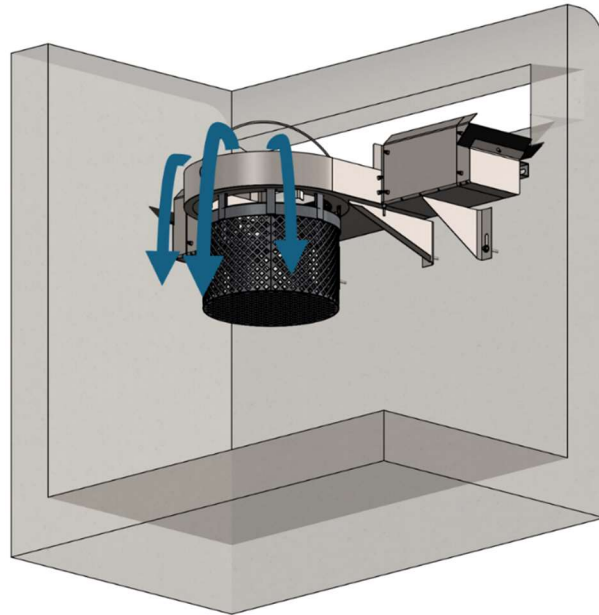
3.B. Peak Flows/Trash Volumes

Please see the table within Section 3.C. for the hydraulic capacity and recommended max trash storage volume for the different types and sizes of filter basket available for the StormTrough. Note trough length for a StormTrough unit can vary, but hydraulic capacity is dependent on the filter basket style and size and not configuration.

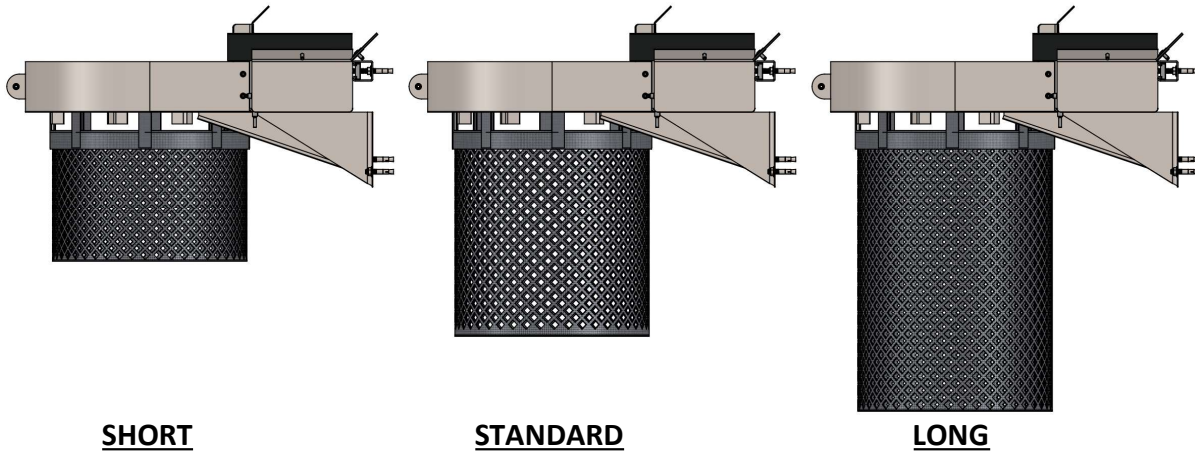
The StormTrough filter basket can capture trash 5 mm or greater in diameter from surface runoff flowing into an install site up to the max flowrates stated at each trash capacity level. In the standard configuration of the StormTrough the center tray functions as a bypass weir, allowing water to flow freely over it during bypass event. Note there are three filter styles available for the StormTrough, a polyethylene filter basket which includes bypass openings along the top of the basket, a stainless-steel basket with bypass openings along the top of the basket, and a stainless-steel basket with no bypass openings at the top of the basket. The maximum trash volume is equal to the total open volume inside the filter basket.

Please note for the Standpipe configuration, only the polyethylene filter basket and stainless-steel basket with bypass openings along the top of the basket are available as there is no center tray acting as weir bypass.

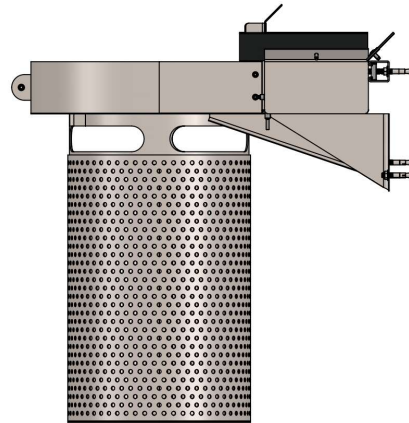
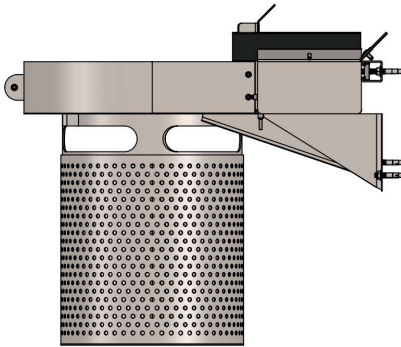
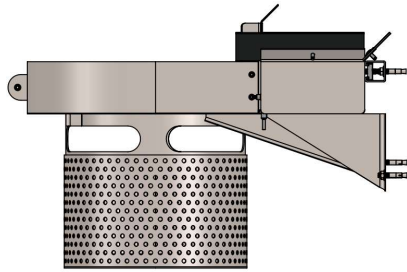
3.C. Hydraulic Capacity



Center Tray Acting as Weir	Bypass Flow Rate (CFS)
Standard Configuration	3.0



Poly Mesh Basket w/ Additional Bypass Openings						
Filter Depth	Hydraulic Capacity					Recommended Max Trash Storage Volume (CF)
	Filtered Flow Rate				Additional Bypass Flow (CFS)	
	Empty (CFS)	25% Full (CFS)	50% Full (CFS)	75% Full (CFS)		
Short	8.7	6.5	4.4	2.2	2.1	1.1
Standard	12.4	9.3	6.2	3.1	2.1	1.8
Long	16.0	12.0	8.0	4.0	2.1	2.5

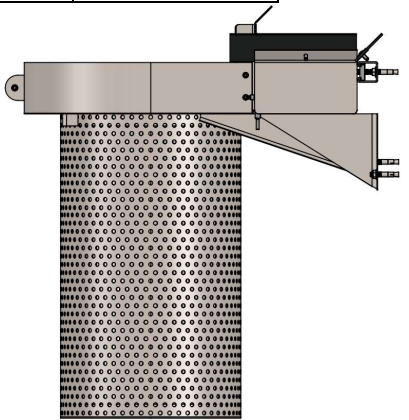
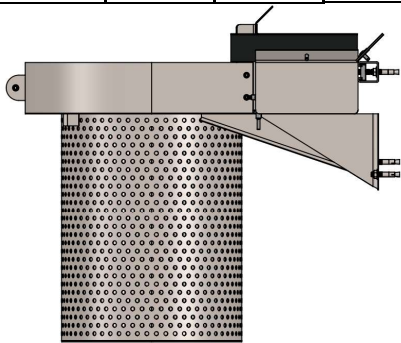
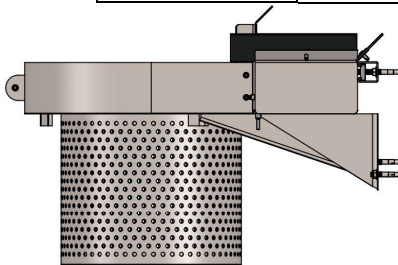


SHORT

STANDARD

LONG

Stainless-Steel Basket w/ Additional Bypass Openings						
Filter Depth	Hydraulic Capacity				Additional Bypass Flow (CFS)	Recommended Max Trash Storage Volume (CF)
	Filtered Flow Rate					
	Empty (CFS)	25% Full (CFS)	50% Full (CFS)	75% Full (CFS)		
Short	5.5	4.1	2.8	1.4	2.1	0.8
Standard	10.8	8.1	5.4	2.7	2.1	1.2
Long	17.8	13.4	8.9	4.5	2.1	1.8



SHORT

STANDARD

LONG

Stainless Steel Basket w/ No Additional Bypass						
Filter Depth	Hydraulic Capacity				Additional Bypass Flow Rate (CFS)	Recommended Max Trash Storage Volume (CF)
	Filtered Flow Rate					
	Empty (CFS)	25% Full (CFS)	50% Full (CFS)	75% Full (CFS)		
Short	8.3	6.2	4.2	2.1	Configuration only utilizes Weir Bypass	0.8
Standard	14.2	10.7	7.1	3.6		1.2
Long	21.2	15.9	10.6	5.3		1.8

The equations below are used to calculate the hydraulic capacity of the StormTrough filter basket:

Orifice Equation: $Q = C_d A \sqrt{2gh}$
 Narrow Crested Weir Equation: $Q = \frac{2}{3} C_d \cdot L \cdot \sqrt{2g} \cdot (h)^{\frac{3}{2}}$

where,

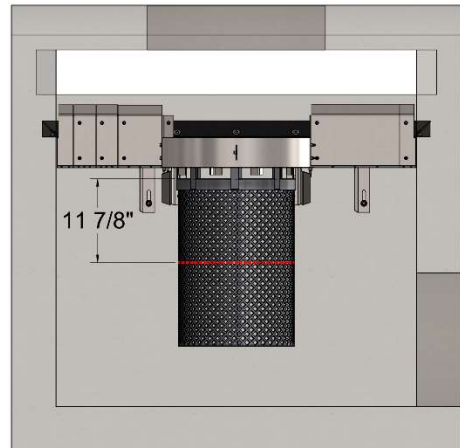
- Q = flow rate [in^3/s] * converted to [CFS and GPM]
- C_d = coefficient of discharge [0.62 used by Fabco Industries]
- A = area of orifice or net open area [in^2] = area of screen [in^2] * % open area
- g = acceleration from gravity [in/s^2]
- h = head acting on centerline of each screening window [in]
- L = weir length [in]

Example Calculation of Empty Filtered Flow Rate for StormTrough w/ Long Poly Mesh Basket

$$Q_1 = (0.62) * (729[\text{in}^2] * 64\%) * \sqrt{2 * \left(386.4 \frac{[\text{in}]}{[\text{s}^2]}\right) * (11.8[\text{in}])}$$

$$Q_1 = 27,648 \frac{[\text{in}^3]}{[\text{s}]} \div 1,728$$

$$Q_1 = 16 [\text{CFS}]$$



3.D. Comparison Table

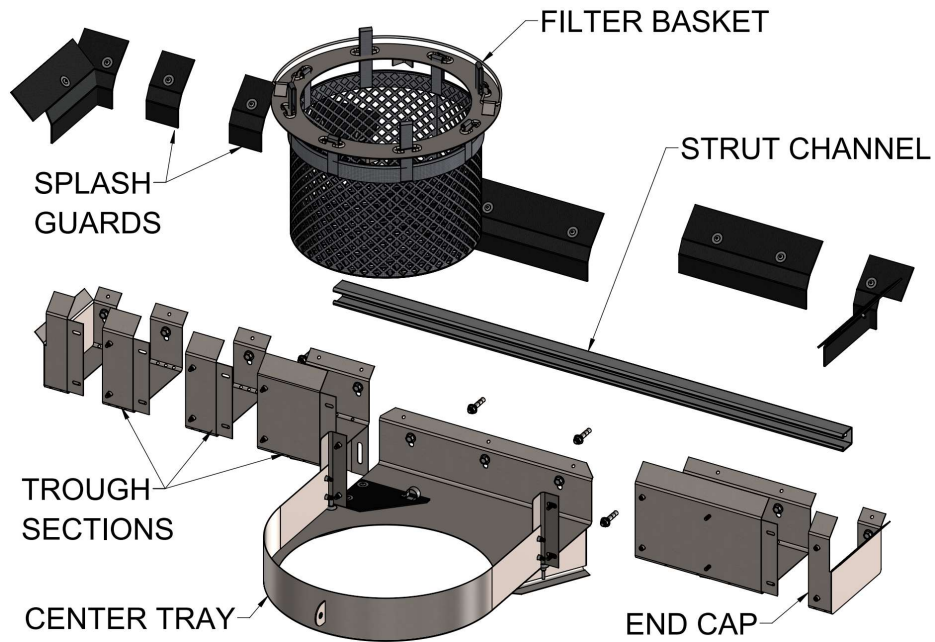
Please see tables in Section 3.C. for hydraulic capacity of the three available filter styles and three basket depths for each style.

3.E. Design Drawings

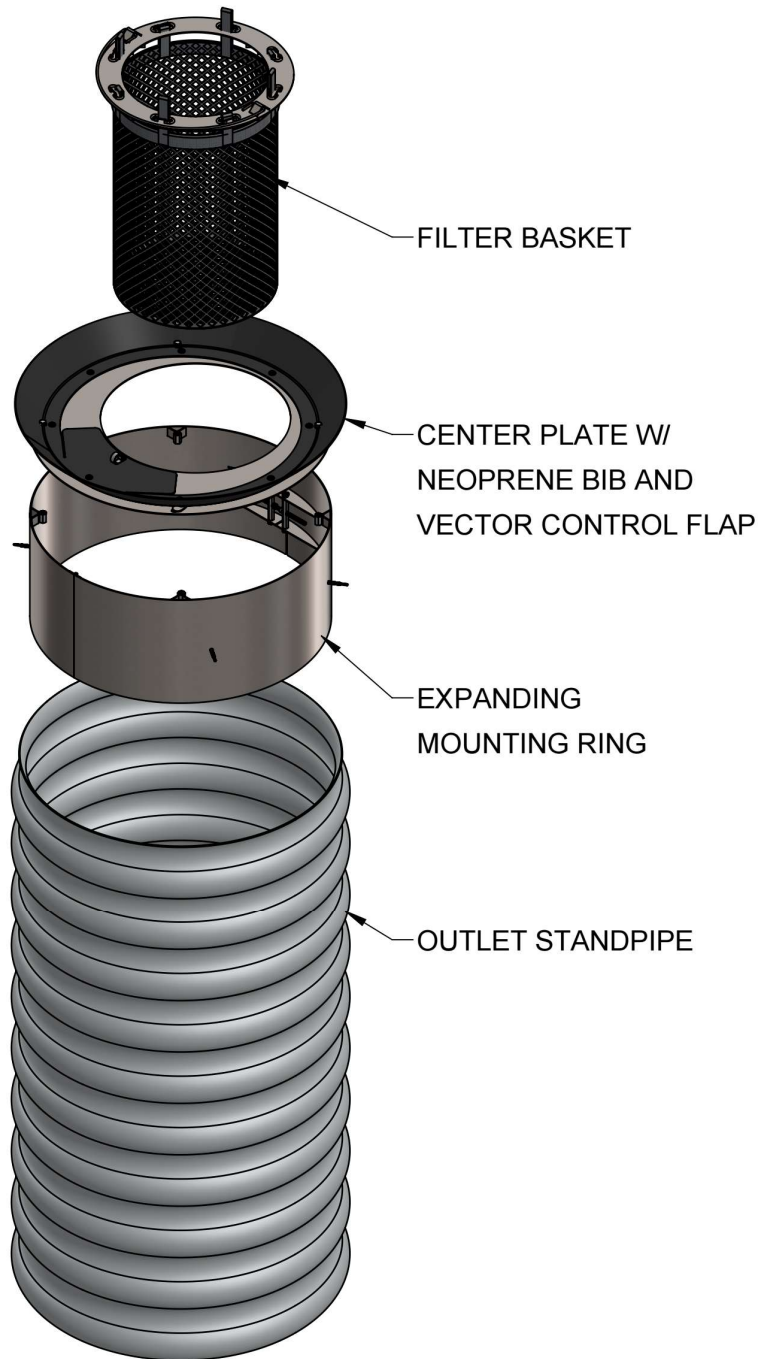
Please refer to Appendix A for a representative design drawing of a 48" Length StormTrough. Please refer to Appendix B for a design drawing of a 6" Trough Section. Please refer to Appendix C for a representative design drawing of the Standpipe Filter Configuration.

3.F. Optional Components

The StormTrough in standard configuration is a modular device and as such there are different lengths of trough segment pieces available to allow sizing up or down of the StormTrough to different sites. Standard lengths of feeder trough sections available are 2", 4", 6", 8", and 12". Below is a reference image of a StormTrough separated into modular pieces. End caps are mandatory for the StormTrough.

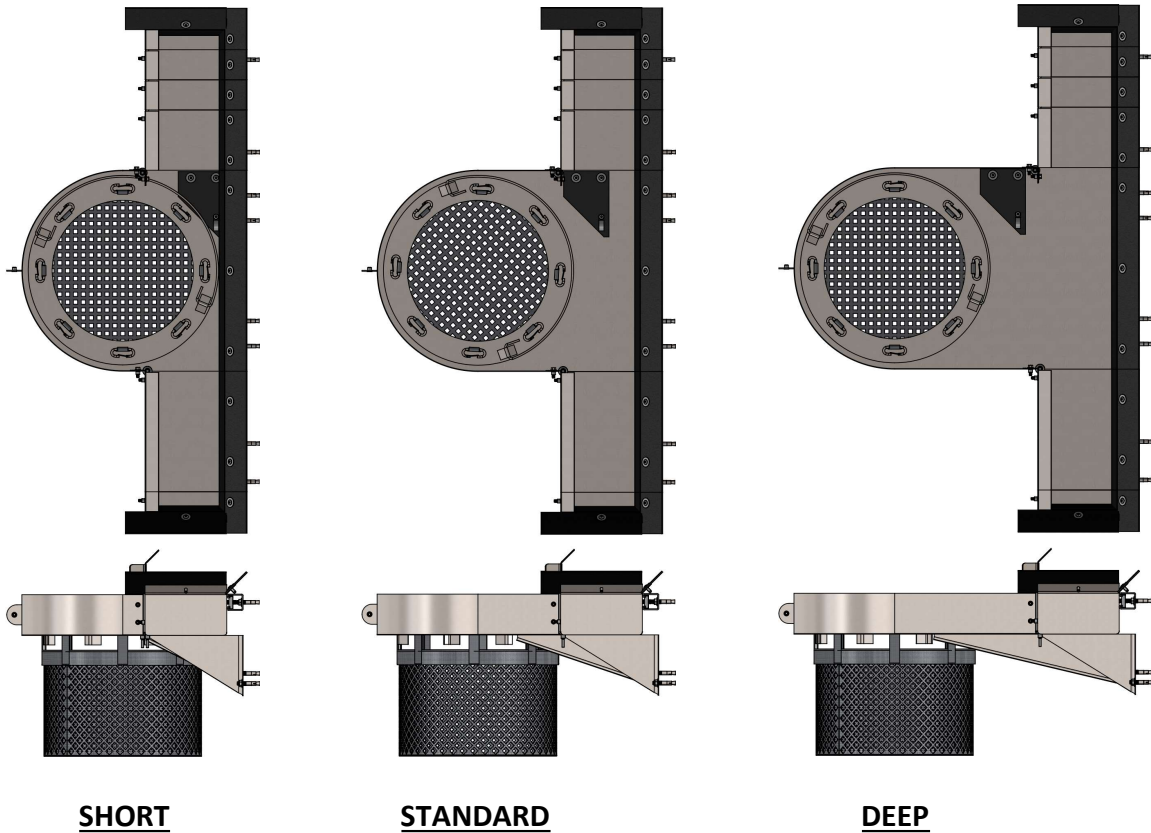


STANDARD CONFIGURATION

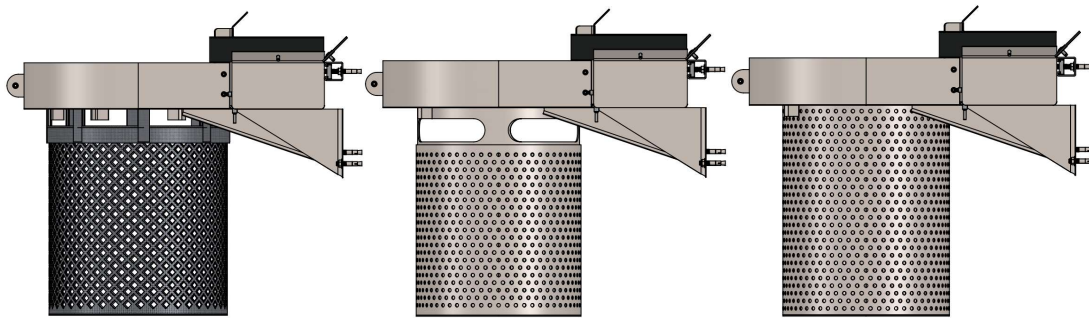


STANDPIPE CONFIGURATION

The StormTrough center tray is also available in three optional lengths: short, standard, and deep. Each of these options varies in how far the center tray and filter basket are dimensioned away from the curb opening wall. These options allow the filter basket of the StormTrough to be sited closer to directly under an inlet's manhole cover. Below is a reference image of the three different styles for a 48" Length StormTrough.



The StormTrough is available with three different filter basket options with each also having three standard depth sizes. The three styles are: Polyethylene Mesh Basket, Stainless Steel Basket w/ Bypass, Stainless Steel Basket w/ No Bypass. The three filter options provide flexibility to the needs of different projects. The filter baskets with bypass openings provide increased bypass flow in projects sites which have very heavy rainfall; and enable bypass for the Standpipe configuration. The stainless-steel options are suitable for projects which require increased durability and preference to not replace the filter basket during the lifetime of the StormTrough.

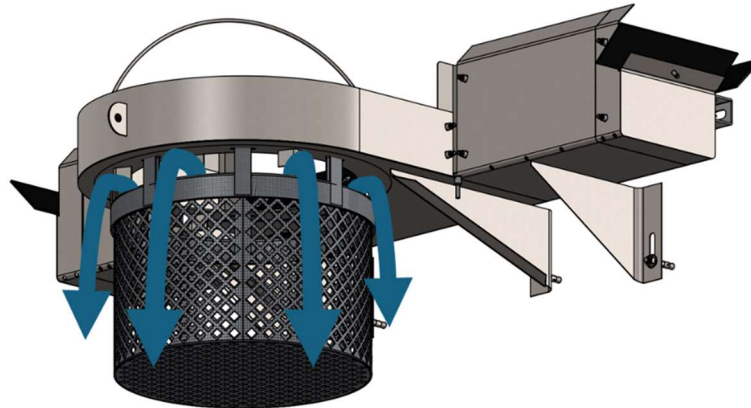


All three filter options are available in standard depths of 12", 18", and 24" deep. All three filter styles have mandatory $\text{Ø}3/16"$ (~4.8 mm) round openings, blocking any trash 5 mm or greater in diameter.

3.G. Bypass

Please see tables in Section 3.C. for maximum bypass flow capability of the three available filter styles and three basket depths for each style.

In the standard configuration of the StormTrough, storm drainage can bypass over and above the walls of the StormTrough center tray if the filter basket of the StormTrough is not maintained and unexpected rainfall greater than designed peak flow occurs. The filter basket types with bypass include a series of open windows on the filter basket. These open windows are found between the top of the filter basket and the bottom of the center tray. The StormTrough is engineered to filter at least the trash treatment peak design flow. Thus, the bypass openings of the StormTrough are only used when flow into the catch basin exceeds the peak design flow or when peak flows occur after the device has not been maintained to keep blinding to a minimum.



STANDARD CONFIGURATION

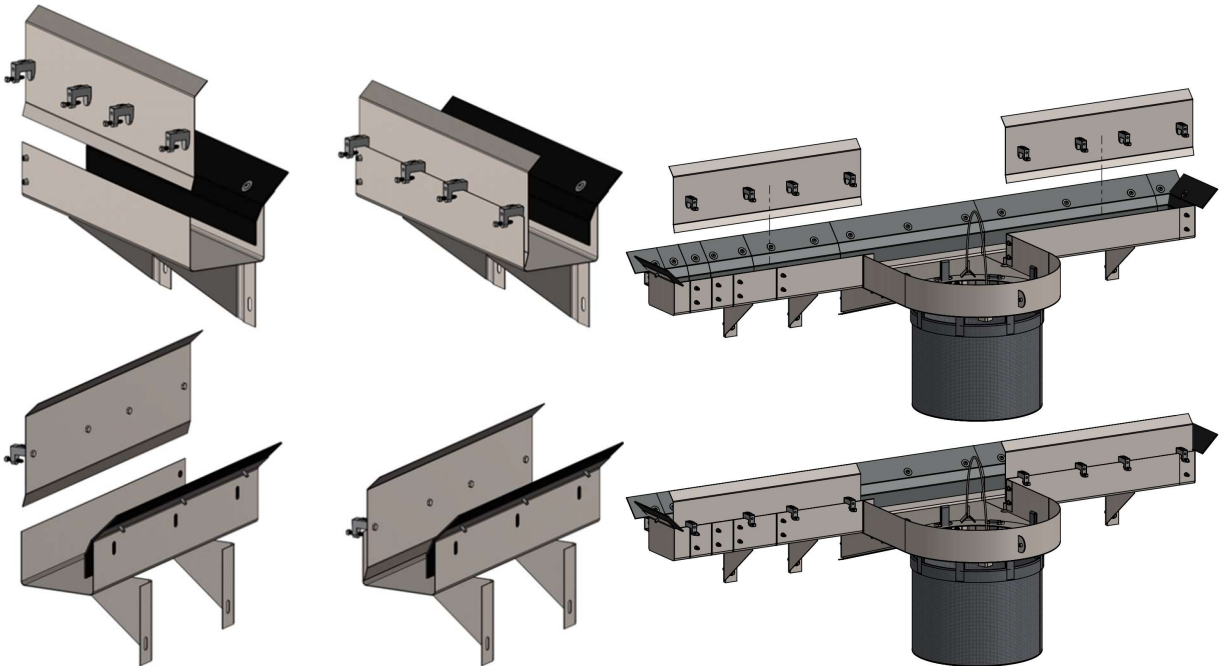


PARTS HIDDEN FOR CLARITY
STANDPIPE CONFIGURATION

3.H. Feeder Troughs

The feeder troughs of the standard configuration StormTrough are designed to minimize clogging and overtopping of floatable trash. The 8" width (front-to-back) and 8-½" height of the vertical back wall of the trough are designed to accommodate large floatable trash like water bottles without allowing them to become lodged. The back wall also includes a reverse (45-degree) angled back-splash flange to redirect and prevent water and trash from overtopping during high-flow rain events. To ensure no standing water remains in the feeder trough, seepage holes smaller than $\varnothing 3/16"$ (approximately $\varnothing 4.8\text{mm}$) have also been included on the trough. Through discussion with the CA Waterboard, testing was conducted on the effectiveness of the feeder trough of the StormTrough. Please see Appendix D for the testing report.

Please note prior to July 31st, 2024, Fabco StormTrough's were designed with a 6" horizontal depth. All existing units of this type are retrofitted with an extension plate and reverse-angled back splash mounted to the rear vertical wall of each trough section to prevent trash over-topping of water and trash.

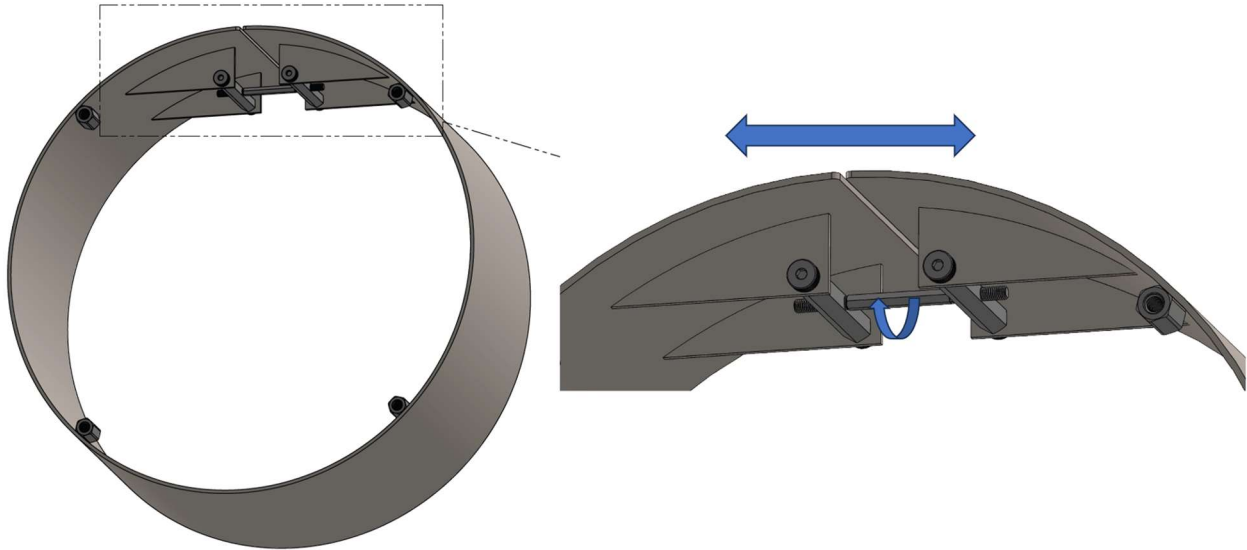


The extension pieces have no openings greater than $\varnothing 5\text{mm}$ ($3/16"$) and are attached using corrosion resistant heavy duty beam clamps. Please see Appendix E for installation instructions and engineering drawings of the retrofit configuration.

3.I. Calibration Feature

The standard configuration of the StormTrough is designed with several different standard size pieces which can be mixed and matched to allow fitting in different curb opening inlet sizes and allows for the center tray to be aligned as needed to the location of the manhole cover of the curb inlet. The neoprene splash guard of the device can also be cut to size to fit snug along the opening of a curb inlet.

The Standpipe mounting ring adjusts in diameter using a turnbuckle rod. This feature is used to lock the mounting ring onto the inside walls of the outlet pipe of a catch basin.



3.J. Previously Trapped Trash

The only scenario in which previously trapped trash can be re-introduced to the downstream stormwater infrastructure is if there is floating trash which rises above the center tray of the standard configuration StormTrough or through the bypass windows of the filter basket when a bypass flow scenario occurs as explained in Section 3.G.

3.K. Material Type

Below is a list of all materials which comprise the StormTrough and where the materials are used on the device:

Standard Configuration:

- Center Tray, Trough Segments, and End Caps: Stainless-Steel Sheet Metal
- Polyethylene Basket Mounting Plate: Stainless-Steel Sheet Metal
- Filter Basket Material Options:
 - Polyethylene Mesh with $\text{Ø}3/16''$ (approximately $\text{Ø}4.8\text{mm}$) Round Openings
 - 2.5mm Thick Stainless-Steel Sheet Metal with $\text{Ø}3/16''$ (approximately $\text{Ø}4.8\text{mm}$) Round Openings
- Polyethylene Basket Support Rod: Stainless-Steel Rod
- Splash Guard: Thick Neoprene Rubber
- Strut Channel: Zinc-Plated Steel
- Vector Control Flap: Neoprene Rubber
- Vector Control Hooking Point: Stainless Steel Loop
- Hardware:
 - Stainless Steel Hex Bolts
 - Strut Nuts
 - Flat Washers
 - Rivet Nuts
 - Blind Rivets
 - Concrete Anchors

Standpipe Configuration:

- Expanding Ring: Stainless-Steel Sheet Metal
- Center Plate: Stainless-Steel Sheet Metal
- Filter Basket Material Options:
 - Polyethylene Mesh with $\text{Ø}3/16''$ (approximately $\text{Ø}4.8\text{mm}$) Round Openings
 - 2.5mm Thick Stainless-Steel Sheet Metal with $\text{Ø}3/16''$ (approximately $\text{Ø}4.8\text{mm}$) Round Openings
- Polyethylene Basket Support Rod: Stainless-Steel Rod
- Vector Control Flap: Neoprene Rubber
- Vector Control Hooking Point: Stainless Steel Loop
- Stainless Steel Hardware:
 - Turnbuckle Rod
 - Hex Bolts
 - Flat Washers
 - Rivet Nuts
 - Blind Rivets

3.L. Design Life

With expected stormwater conditions and regular maintenance, the StormTrough center tray, and feeder trough have an expected design life of approximately 10 years. The mounting ring, and center plate of Standpipe configuration have an expected design life of 10 years. The stainless-steel filter basket styles have an expected design life of approximately 10 years; however, the polyethylene filter basket has a design life of 5 years.

4. Installation Guidance

4.A. Standard Device Installation Procedures and Considerations

General Note: Installation should be performed by qualified personnel only. Be sure to follow the proper road safety precautions in accordance with local regulations. Standard installation of a StormTrough follows the procedure steps below:

Safety: Set up proper safety precautions in accordance with local regulations. Use Traffic Cones to block off the work area. Wear protective gear such as a hard hat, eye protection, kneepads, etc.

Standard Configuration:

Step 1: Unpack, separate, and verify that all the components are accounted for and undamaged. This kit should include the following:

- Strut Channel
- Center Tray
- Trough Segments
- End Caps
- Filter Basket
- Mounting Plate (Polyethylene Basket Configuration Only)
- Support Rod (Polyethylene Basket Configuration Only)
- Aluminum Tape
- Hardware: Hex Bolts, Strut Nuts, and Concrete Anchors

Step 2: Remove any manhole cover to access the curb opening inlet or install location.

Step 3: Align the top of the strut channel approximately 6" below the drip ledge and mark position. Mark holes for concrete anchors. Drill holes using a masonry drill.

Step 4: Secure the strut channel to the inlet wall using provided concrete anchors.

Step 5: Align center tray to below the manhole entrance and attach to the strut channel using provided strut nuts and hex bolts. Then attach trough segments as needed to the center tray and strut channel to create a gutter directly below curb opening. Keep segments tightly pressed against each other.

Step 6: Mark and drill holes for center tray and trough section gussets. Then secure gussets to inlet wall using provided concrete anchors.

Step 7: Insert polyester filter basket lifting tabs/loops into the mounting plate and lock in place using the support rod. (Skip step if stainless-steel basket)

Step 8: Place the filter basket assembly into the center tray.

Step 9: If needed use aluminum tape provided to seal any minor gaps.

Step 10: Carefully replace and secure manhole cover and clean work area making sure not to leave behind any tools or objects that may cause a traffic hazard or pedestrian tripping hazard.

Standpipe Configuration:

Step 1: Unpack, separate, and verify that all the components are accounted for and undamaged. This kit should include the following:

- Expanding Mounting Ring
- Center Plate
- Filter Basket
- Support Rod (Polyethylene Basket Configuration Only)
- Hardware: Hex Bolts

Step 1: Begin by removing any grate or manhole cover from the inlet. Some type of lifting mechanism is highly recommended. Carefully place the grate or manhole cover on the ground away from the work area.

Step 2: Clean and verify that the standpipe is free of sediment and/or debris that might inhibit direct contact between the expanding ring and the pipe inside diameter.

Step 4: Slide the expanding mounting ring of the Standpipe fully into the pipe so that the top edge is at least 2" below the top of the standpipe.

Step 5: Using a 9/16" open-end wrench, torque the turnbuckle rod found at the gap of the expanding ring to expand the ring against the inside diameter of the pipe.

Step 6: Verify that the ring is firmly secured to the pipe with no rocking or movement in any direction.

Step 7: With the Expanding Ring installed, align the center plate slotted holes with the threaded standoffs on the Expanding Ring.

Step 8: Plumb and secure the center plate to the expanding mounting ring using the 3/8" bolts and washers provided.

Step 9: Insert polyester filter basket lifting tabs/loops into the mounting plate and lock in place using the support rod. (Skip step if stainless-steel basket)

Step 10: Place the filter basket assembly into the center plate.

Step 11: Verify vector control access flap is accessible.

Step 11: Carefully replace and secure manhole cover and clean work area making sure not to leave behind any tools or objects that may cause a traffic hazard or pedestrian tripping hazard.

4.B. Description of Device Installation Limitations and Non-Standard Device Installation Procedure

Installation of a StormTrough may be limited by the existing protrusions within a curb opening inlet. If any non-standard installation is required, the installer should please contact their respective sales representative or Fabco sales support at sales@fabco-industries.com or (631) 393-6024. Installation procedure may differ, but the design of the StormTrough cannot change.

4.C. Methods for Diagnosing and Correcting Installation Errors

Once installed, ensure a proper installation by performing a visual inspection of the entire installed unit. Confirm the device is centered within the curb inlet and is mounted securely. If the StormTrough does not fit securely, clear the opening, remove it, and reinstall the StormTrough again following the instructions in Section 4.A. If issues persist, contact Fabco sales support to further identify possible solutions. If any critical questions at all arise during or after installation, the install team should please contact their respective sales representative or Fabco sales support (Email: sales@fabco-industries.com; Phone: (631) 393-6024) for project specific assistance.

5. Operation and Maintenance Information

5.A. Inspection Procedures and Frequency Considerations

Safety Precautions: The StormTrough should be maintained by trained individuals who are familiar with local traffic safety regulations and disposal procedures. If working in the street, proper safety equipment should be worn, including but not limited to a hardhat, vest, gloves and eye protection, and all local traffic safety rules & regulations should be followed.

Inspecting the StormTrough: To maintain the efficiency of the StormTrough, regular maintenance is necessary. Fabco Industries advises inspecting the unit every six months, following the steps outlined below. It's important to note that inspection and cleaning should only take place after 24 hours of no rainfall. It's also recommended to periodically examine the surrounding areas for pollutants, such as oil or paint dumping, minor spills, and leaks from dumpsters, and take the appropriate measures to have the source removed.

To begin the inspection, remove the manhole cover to gain full access to the StormTrough filter unit. Be cautious, as manhole covers can be quite heavy, and a lifting mechanism is recommended. Use a battery-powered flashlight or droplight to conduct a thorough visual inspection, checking for heavy sediment, debris loading, and trash.

Certain signs indicate that cleaning or component replacement is necessary. These include standing water in the StormTrough filter basket, center tray, or trough segments; inability to see the filter unit due to sediment, trash, or debris; and damage to the device, such as abrasions, tears, or punctures. If any of these signs are present, make a note of your observations and comments on a maintenance log sheet. It may also be useful to take digital photographs or sketches to maintain accurate historical records.

5.B. Description of Maintenance Frequency Considerations

The StormTrough needs regular cleaning, but determining the appropriate cleaning intervals is not an exact science. Typically, smaller units and installation sites with more sediment or vegetation require more frequent maintenance. Fabco Industries suggests cleaning the unit(s) at least twice annually by manually removing debris, sand, and silt or using a vacuum-assisted device. In situations where there is a greater amount of sediment or vegetation at the installation site, it may be advisable to increase the cleaning frequency of the unit(s) beyond the recommended bi-annual cleaning schedule suggested.

5.C. Maintenance Procedures

Step 1: To access the StormTrough unit, carefully remove the manhole cover and place it in a designated safe area. Assess whether removing the filter basket is required for cleaning. If removal is necessary, utilize the handle of the basket assembly. While lifting the filter basket out of the storm drain, it is essential to ensure that at least two workers lift evenly to prevent injury or damage to the StormTrough center tray.

Step 2: For deep cleaning, rinse the filter basket with a high-pressure hose to dislodge and remove trash and debris that may be clogging the filter basket and restricting flow. If a high-pressure hose is not available, a stiff scrub-brush can be used instead. Using an industrial vacuum or gloves and shovel remove any trash that may have been captured in the trough segments of the StormTrough. If necessary, replace the filter basket.

Step 3: After completing the maintenance work on the StormTrough, ensure that the filter basket is reinstalled correctly if it was removed, and confirm that the center tray and trough segments are secure to guarantee proper functioning. If required, record any pertinent observations or comments about the maintenance on a maintenance log sheet.

Step 4: As a final step before reinstalling the manhole cover, be sure to thoroughly clean the work area making sure not to leave behind any tools or objects that may cause a traffic hazard or a pedestrian tripping hazard. Reinstall the manhole cover making sure it is seated properly on the frame.

Disposal: Proper handling and disposal of all captured liquid, oils, sediment, debris, trash, and other accumulations from the StormTrough must comply with local, state, and federal regulations. As part of a well-planned and scheduled maintenance regime, disposal considerations should be considered. Generally, solid waste disposal can be arranged with a local landfill, while liquid waste can be disposed of at either a wastewater treatment plant or a municipal vacuum truck decant facility.

5.D. Essential Equipment and Materials for Proper Maintenance Activities

Fabco Industries recommends the following equipment for maintenance of the StormTrough:

- Proper safety equipment including but not limited to hard hats, safety vests, gloves, kneepads, and eye protection.
- Any required traffic control equipment.
- A battery powered flashlight or drop light.
- Shovels and buckets or industrial vacuum.
- Pressure washer (optional).
- Manhole cover removal/reinstallation tools.

5.E. Description of the Effects of Deferred Maintenance on Device Structural Integrity, Performance, Odors, Etc.

If maintenance is deferred for the StormTrough, the full trash and debris capacity of the StormTrough can be reached causing a bypass event when a rainstorm occurs. During a bypass event, debris and trash will flow past the StormTrough system and discharge into any downstream stormwater infrastructure or water body. Deferred maintenance will not affect the structural integrity of the StormTrough.

5.F. Repair Procedures for Device's Structural and Screening Components

If during inspection or maintenance of the StormTrough it's found that the device needs repair, photographs and documentation should be sent to the Fabco assistance team at: sales@fabco-industries.com. The Fabco engineering and technical support team can then assess the damage and suggest a repair plan or begin a warranty repair or replacement.

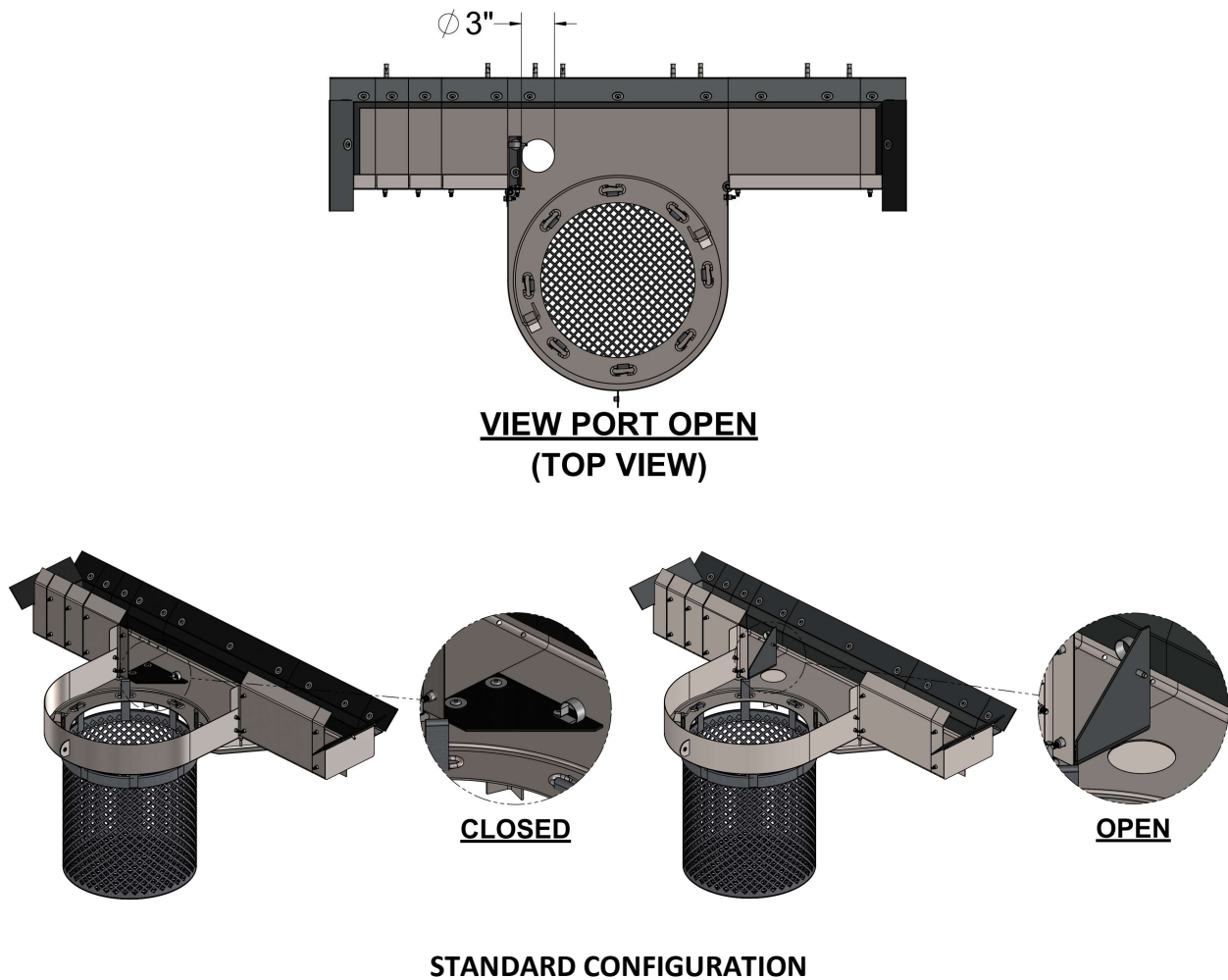
6. Vector Control Accessibility

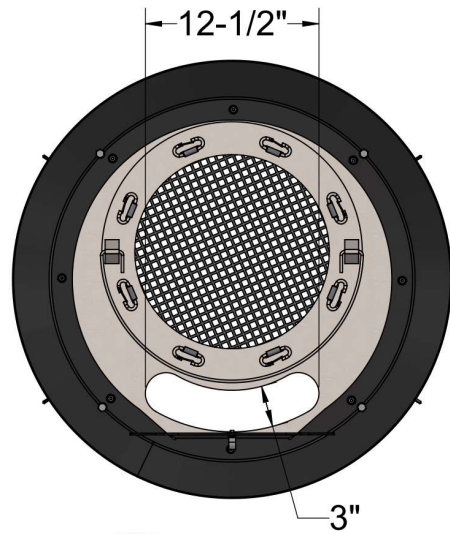
6.A. Date of Application Submittal to Mosquito Vector Control Association

Application to the Mosquito and Vector Control Association of California (MVCAC) for the Fabco StormTrough was submitted on August 19th, 2024, and letter of verification was received on September 27, 2024. Please see Appendix F for MVCAC verification letter.

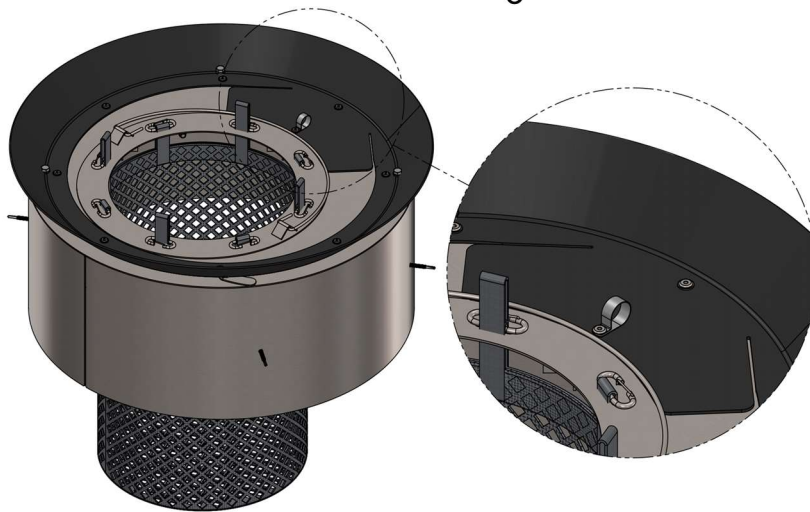
6.B. Description of Access for Vector Control Personnel

The StormTrough features a vector control viewing port allowing for easy access by Vector Control personnel without requiring any confined space entry. The view port is a self-closing rubber flap located directly to the left of the filter basket opening of the StormTrough. It can be accessed from above the StormTrough while manhole cover is removed. The rubber flaps can be pulled open upward with a hook tool or equivalent. When open, a $\varnothing 3''$ view port opening allows visual and physical access to the bottom of the catch basin for inspection or treatment by Mosquito Vector Control personnel.

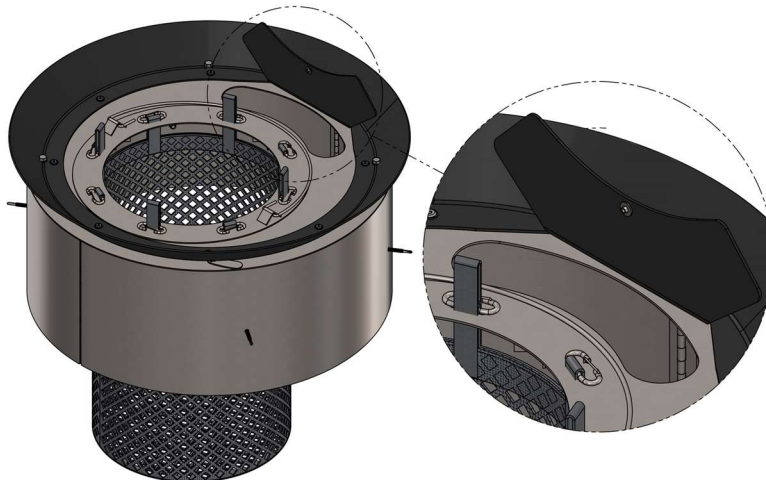




VIEW PORT OPEN
TOP VIEW



CLOSED



OPEN

STANDPIPE CONFIGURATION

6.C. Mosquito Vector Control Association of California Letter of Verification

Please refer to Appendix F to find the MVCAC letter of verification for the StormTrough.

7. Reliability Information

7.A. Estimated Design Life of Device Components before Major Overhaul

The life expectancy of the StormTrough is estimated by consideration of the materials used to fabricate the StormTrough. With expected stormwater conditions and regular maintenance, the StormTrough has an estimated design life of 10 years.

7.B. Warranty Information

Fabco Industries, Inc., warrants that the StormTrough shall be free from defects in materials and workmanship for a period of 10 years from the date of delivery. The warranty coverage requires that the products must be installed in accordance with all site conditions required by state and local codes, applicable product or industry specifications and guidelines, manufacturer's installation recommendations and other applicable laws. Specifically excluded from the warranty are damages arising from ordinary wear and tear, alteration, or repair by anyone other than Fabco Industries, Inc. or under the direction of Fabco Industries inc. Furthermore, damage due to accident, misuse, abuse or neglect, or any other event not caused by Fabco Industries Inc, is also not covered by the warranty.

If a warranty claim is made and determined to be valid, Fabco Industries Inc. will either repair or replace the product, solely at the discretion of Fabco Industries, Inc. All warranty claims must be submitted, evaluated, and approved by Fabco Industries, Inc., for the claim to be determined to be valid. There are no other warranties either expressed or implied other than what is specifically specified herein.

7.C. Customer Support Information

Fabco customer support can provide technical information and help with any questions regarding Fabco Industries' products. You can reach our customer support service at:

Fabco Industries, Inc.

390 Oser Avenue

Hauppauge, NY 11788

Phone: (631) 393-6024

Email: sales@fabco-industries.com

Website: fabco-industries.com

8. Field/Lab Testing Information and Analysis

The entire design flow must flow through the filter basket so all trash larger than 5 mm are captured from the peak design flow. Field/Lab testing is not required for StormTrough. All treated design flow must pass through the basket to enter the outlet pipe, and as such all trash 5mm or larger in diameter within the treatment flow will be physically blocked from passing through. Existing installations of the StormTrough, including project sites in California, have yielded only positive results.

APPENDIX A

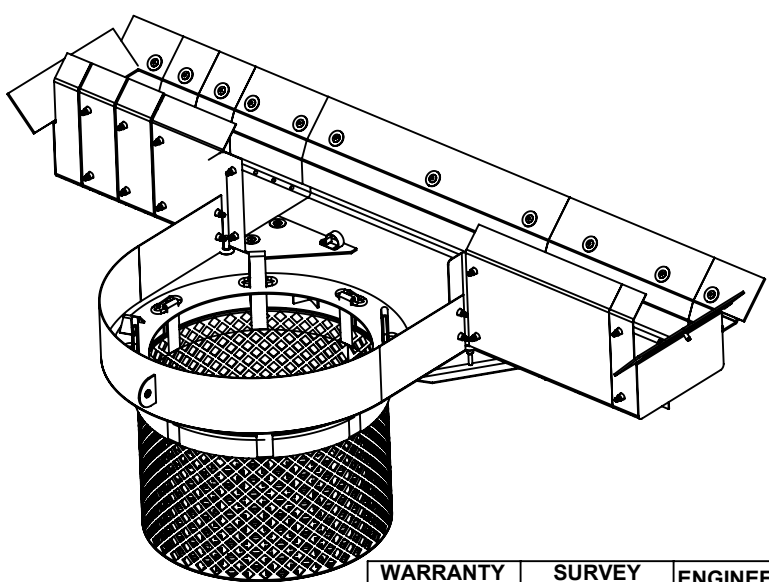
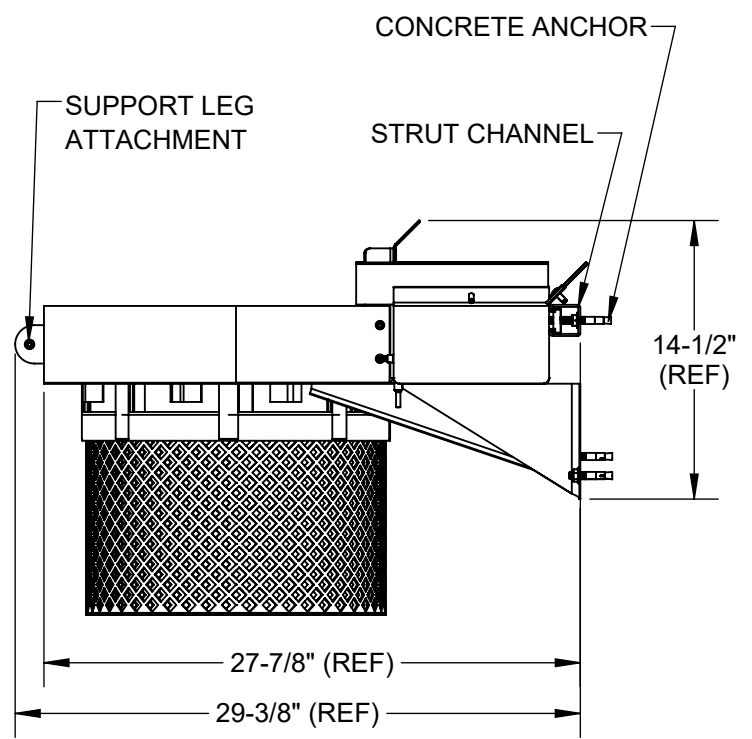
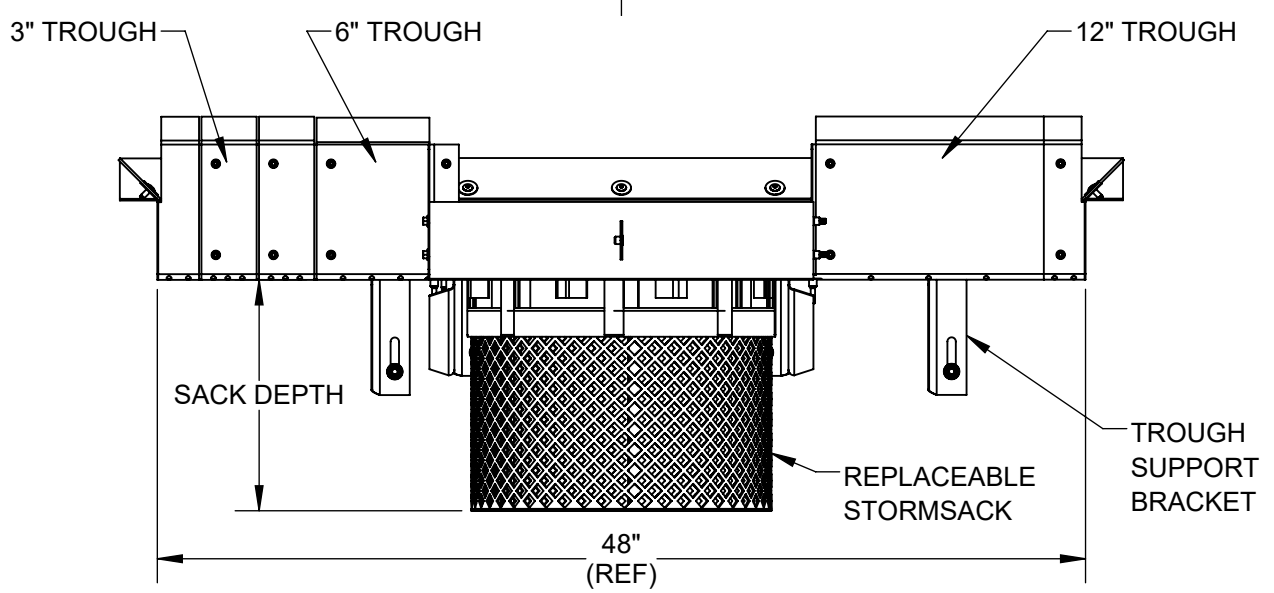
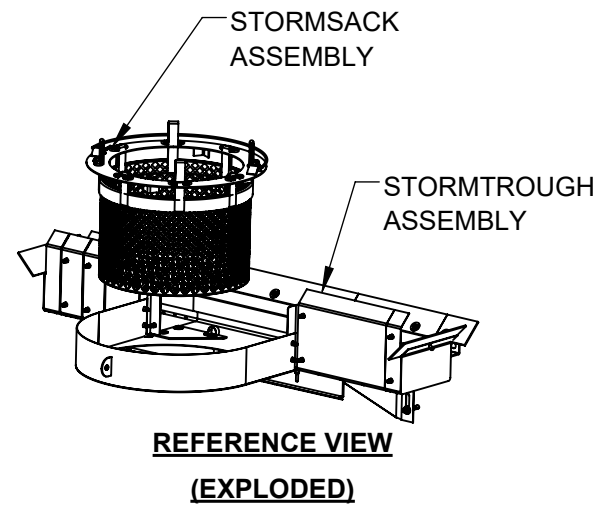
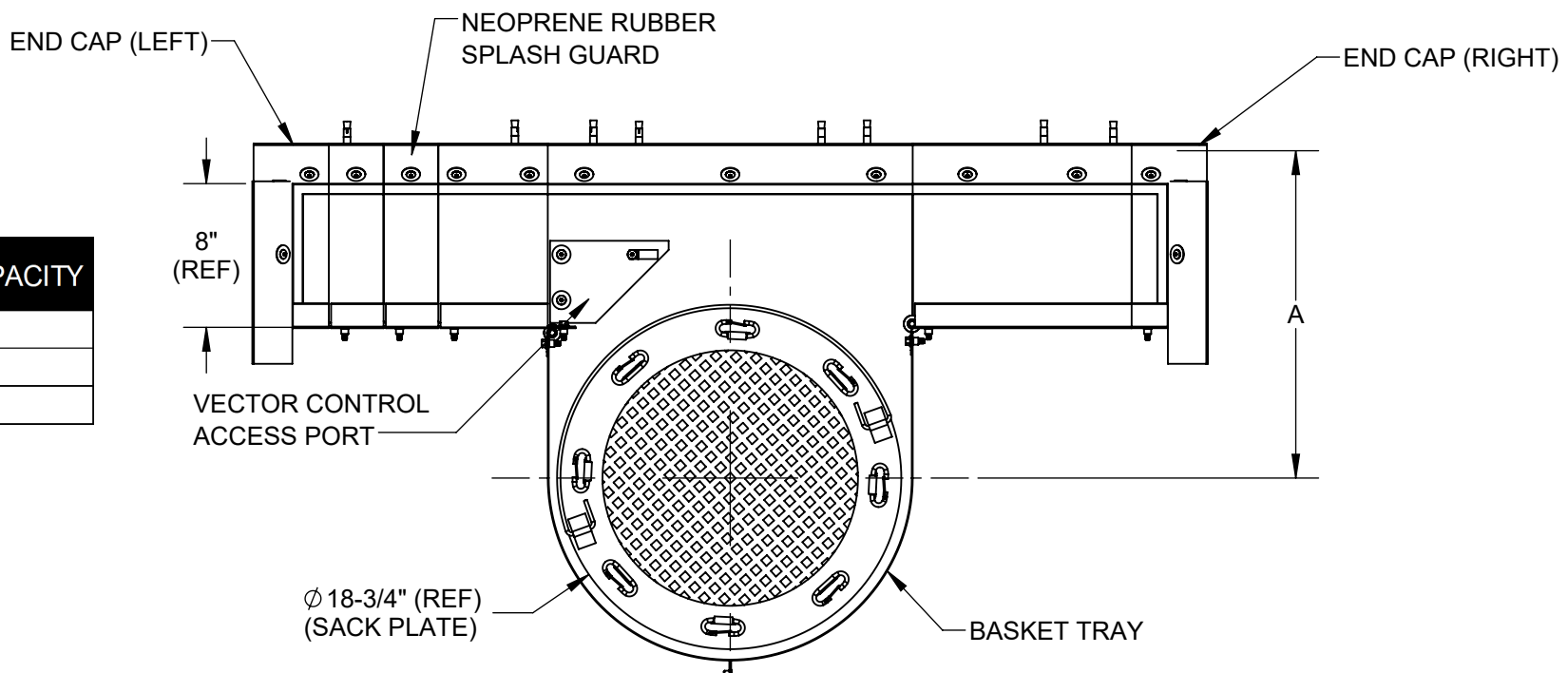
NOTES:

- WEIGHT (EST.): 65 LBS MAX
- MATERIALS:
 - TROUGHS: STAINLESS STEEL
 - STRUT CHANNEL/HARDWARE: CRS EXTRUSION
 - STORMSACK: POLYETHYLENE, 5mm MESH OPENING
- PERFORMANCE CHARACTERISTICS (TYP) :
 - SACK PERFORMANCE:

SACK DEPTH	FILTERED FLOW RATE	BYPASS FLOW RATE	DEBRIS CAPACITY
12"	9.5 CFS	2.1 CFS	1.3 CU-FT
18"	13 CFS	2.1 CFS	1.9 CU-FT
24"	16 CFS	2.1 CFS	2.5 CU-FT

2. BYPASS FLOW RATE: 7.8 CFS

- ALL MOUNTING HARDWARE IS INCLUDED
- ALL COMPONENTS DESIGNED TO FIT THROUGH A 21" CLEAR MANHOLE OPENING
- WARRANTY: 8-YEARS ON ALL COMPONENTS
- AVAILABLE ADD-ONS:
 - OIL BOOM
 - TRAY SUPPORT LEG
 - STRAIGHT TROUGH SEGMENTS, VARIOUS SIZES
 - CORNER EXPANSION KIT
 - WING DIVERTER
- STANDARD STORMSACK DEPTH IS 12". ALTERNATIVE STORMSACK DEPTHS: 18" AND 24"
- CONTACT FERGUSON REP FOR STORMTROUGHS GREATER THAN 8' LONG



PART NUMBER SUFFIX	BASKET TRAY DEPTH (A)
-1	18"
-1S	12"
-1D	24"

REFERENCE VIEW



ENGINEER AND CONTRACTOR NOTE: FABCO INDUSTRIES WATER QUALITY INSERTS (WQIS) ARE MANUFACTURED TO PROPERLY FIT INLETS BY USING SPECIFIC INFORMATION COMPILED IN A SURVEY OF THE "AS-BUILT" INLET. IN RETROFIT SITUATIONS THE SURVEY IS DONE TO DOCUMENT THE THREE CRITICAL ASPECTS OF WQI DESIGN (GRATE/FRAME MEASUREMENTS, OPEN/CLEAR SPACE MEASUREMENTS, AND PROTRUSION MEASUREMENTS). IN NEW CONSTRUCTION, FABCO PRODUCT DRAWINGS ARE ESSENTIALLY PLACE HOLDERS BASED ON THE SPECIFIED INLETS. ONCE THE INLETS ARE BUILT, THE PROCESS REVERTS TO THE RETROFIT APPROACH OF SURVEYING THE AS-BUILT INLETS TO CONFIRM FABCO INSERT DESIGN. PLEASE USE THE QR CODE TO ACCESS THE SURVEY FORM AND COMPREHENSIVE GUIDANCE OF THE SURVEY PROCESS. ALTERNATIVELY, NAVIGATE TO www.fabco-industries.com/stormwater-inlet-survey-assistance

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UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS
BREAK SHARP EDGES .002 - .020
FILLETS .020 MAX
DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES

TOLERANCES:
DEC .00 ± .01
DEC .000 ± .005
FRACT ± 1/16
ANGLE ± 2°

PROJECT: SEE NOTES

APPROVAL	DATE
DWN J.C.	6/14/2024
CHKR J.P.	6/14/2024
ENGR	
UPD	

fabco Industries Inc

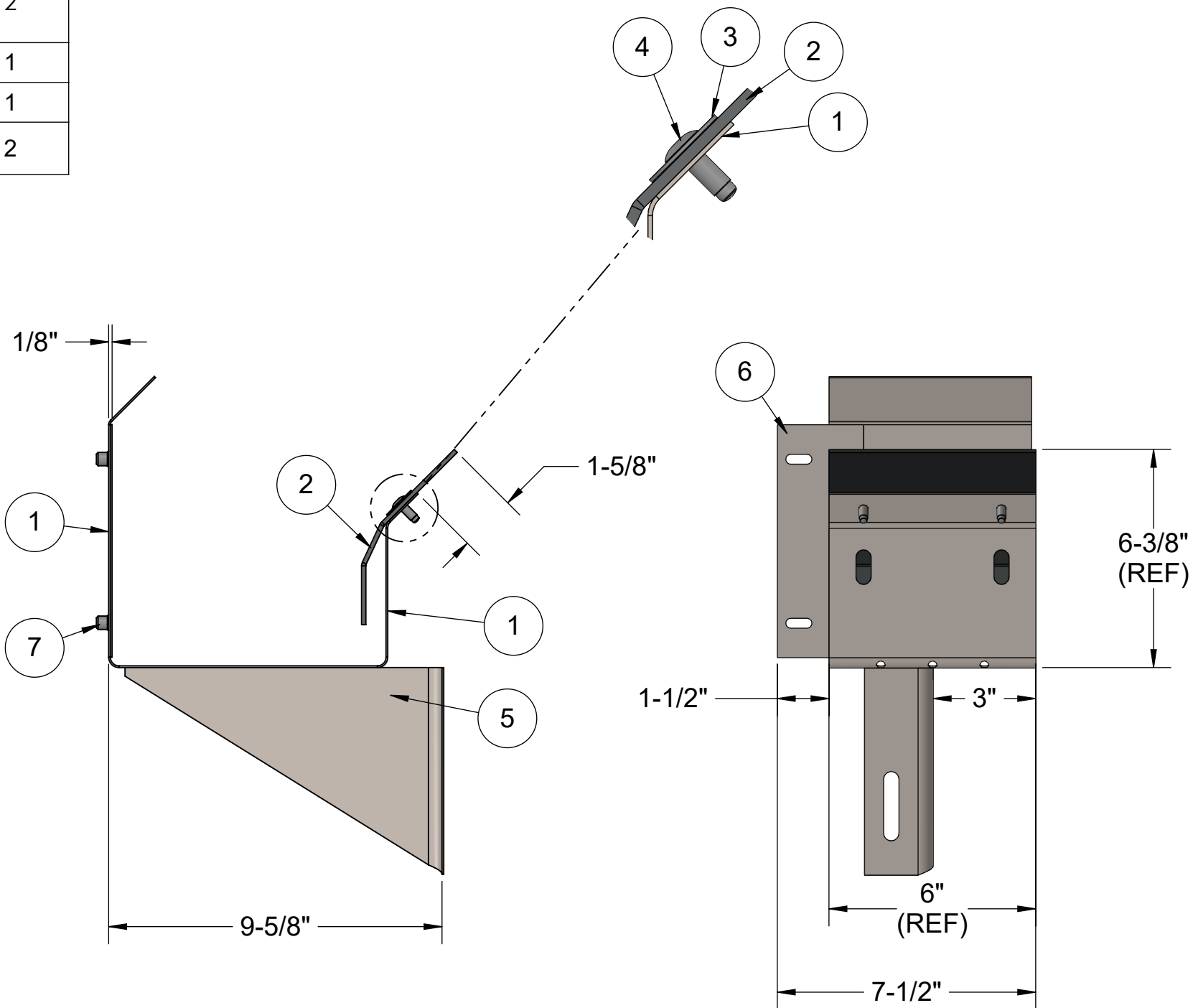
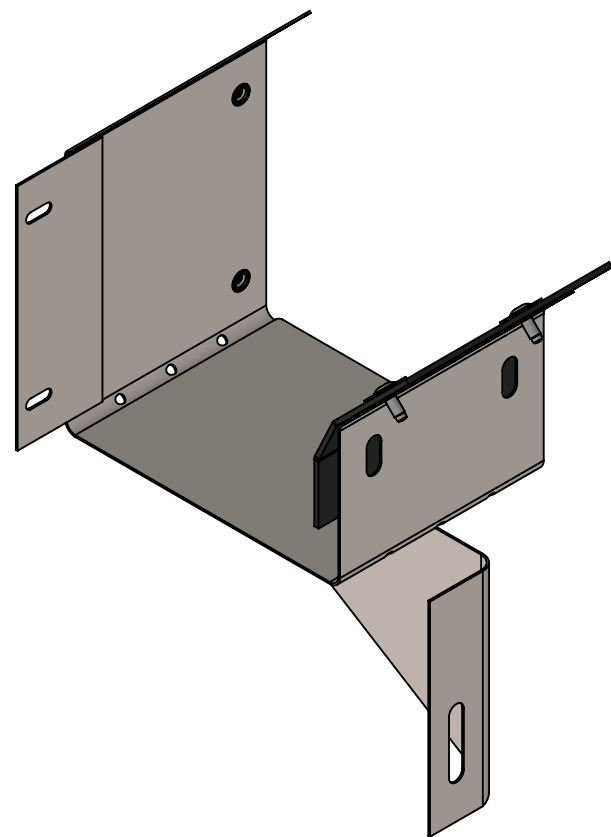
4' STORMTROUGH PLUS

SIZE DWG. NO. **B** MTS48.0-KIT-1 REV **A**

SCALE: NONE SHEET 1 OF 1

APPENDIX B

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	MTS6.0-TRS-1-046	TROUGH SECTION	1
2	MTS6.0-TRS-1-051	RUBBER FLANGE	1
3	90313A107	Flat Washer, 18-8 SS large Dia./ 1/4" screw size, 1" od	2
4	97525A553	18-8 SS Blind Rivet w 18-8 SS Mandrell, Domed, 1/4" dia,X 5/8" long	2
5	MTS6.0-TRS-1-019	SUPPORT GUSSET	1
6	MTS-COMM-001	TROUGH CONNECTOR	1
7	97467A725	18-8 STAINLESS STEEL HEAVY-DUTY RIVET NUT	2



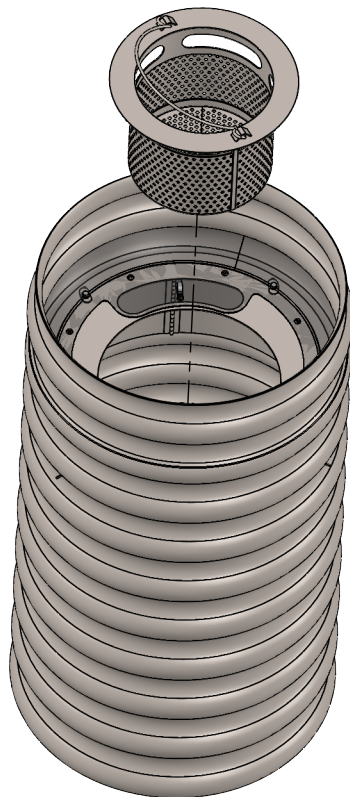
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	PROJECT MATERIAL SEE BOM	FABCO INDUSTRIES, INC. 24 CENTRAL DRIVE FARMINGDALE, NY 11735 WWW.FABCO-INDUSTRIES.COM	SIZE DWG. NO. B MTS6.0-TRS-1		REV C
	SCALE: NONE		SHEET 1 OF 1		

APPENDIX C

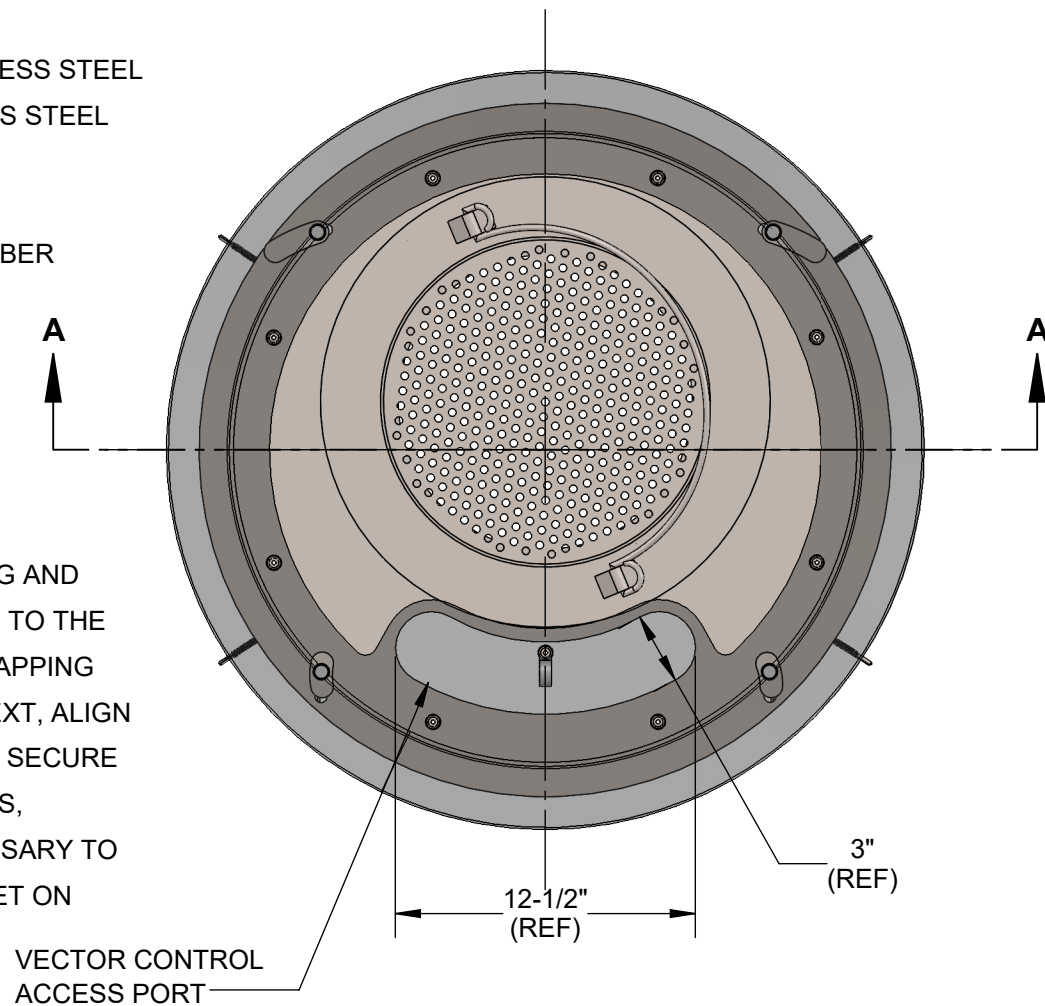
NOTES:

1. WEIGHT (EMPTY): 68 LBS MAX
2. MATERIAL:
 1. BASKET AND EXPANDING RING: 13-GA 304 STAINLESS STEEL
 2. PERF BASKET: PERFORATED 14-GA 304 STAINLESS STEEL
Ø5mm HOLES, 51% OPEN AREA
 3. HARDWARE: STAINLESS STEEL
 4. VECTOR PORT AND RUBBER BIB: NEOPRENE RUBBER
3. PERFORMANCE CHARACTERISTICS (TYP):
 1. DEBRIS CAPACITY: 0.8 CU-FT
 2. FILTERED FLOW RATE: 5.5 CFS
 3. BYPASS FLOW RATE: 2.1 CFS
4. DESIGNED FOR 29-1/2" INSIDE DIAMETER STAND PIPE
5. TYPICAL INSTALLATION:

CAREFULLY PLACE EXPANDING RING INTO THE PIPE OPENING AND TORQUE THE BOLT AT THE TOP UNTIL THE RING IS SECURED TO THE INNER WALLS OF THE PIPE OPENING. USE PROVIDED SELF TAPPING SCREWS IN PILOT HOLES ON RING TO LOCK RING IN PIPE. NEXT, ALIGN THE TRANSITION PLATE WITH THE STANDOFFS ON RING AND SECURE THE PLATE ONTO THE RING USING THE PROVIDED HEX BOLTS, WASHERS AND SLOT COVERS. TRIM RUBBER BIB AS NECESSARY TO DIVERT WATER AND SEAL EDGES. PLACE REMOVABLE BASKET ON TRANSITION PLATE.



REFERENCE VIEW



VECTOR CONTROL ACCESS PORT

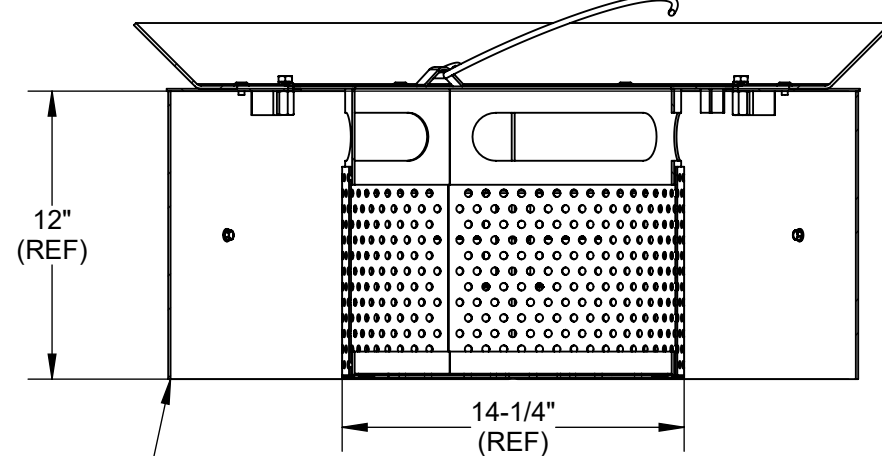
LIFTING HANDLE

12" (REF)

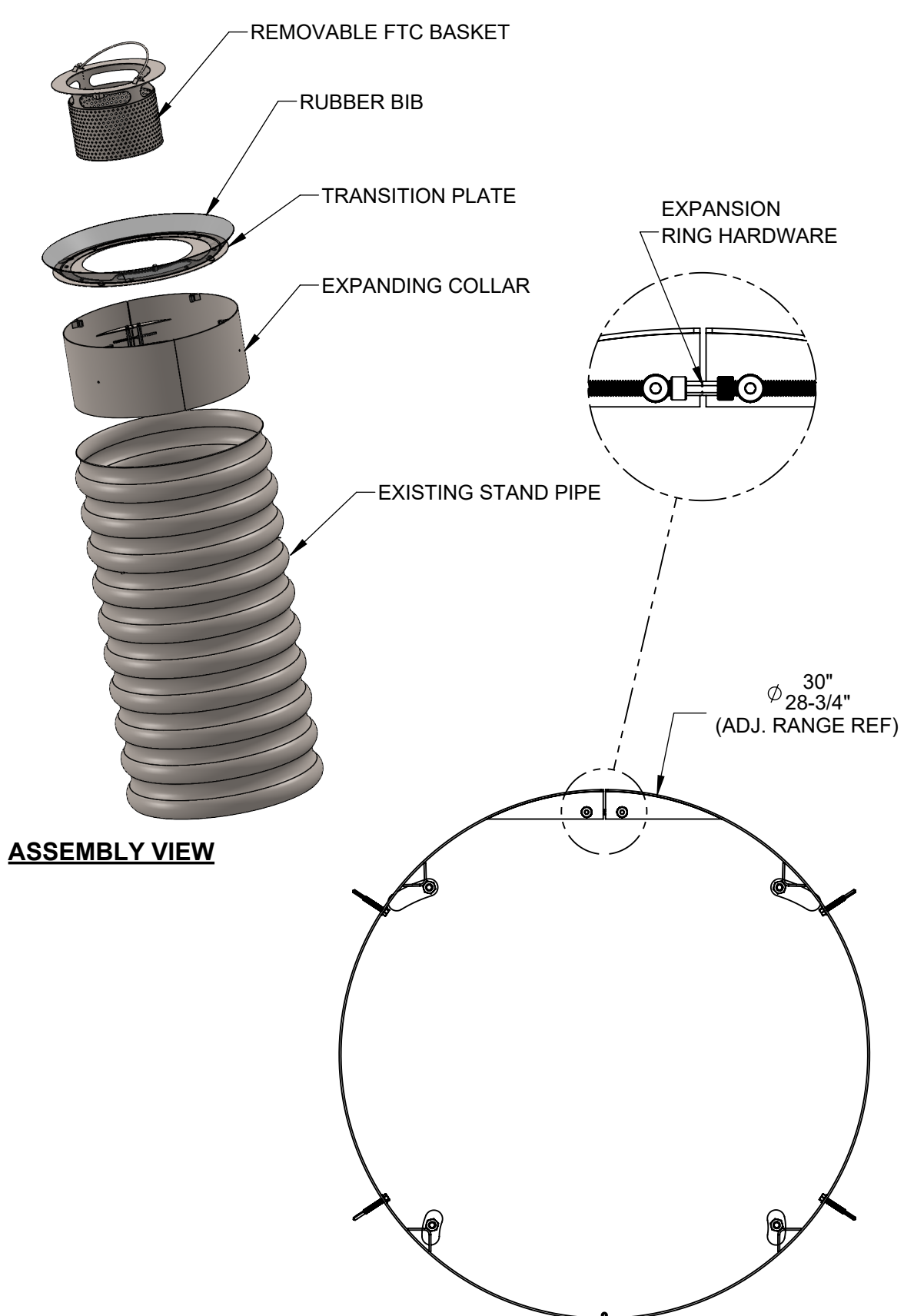
3" (REF)
12-1/2" (REF)

EXPANDING RING ASSEMBLY

SECTION A-A



14-1/4" (REF)



ASSEMBLY VIEW



ENGINEER AND CONTRACTOR NOTE: FABCO INDUSTRIES WATER QUALITY INSERTS (WQIS) ARE MANUFACTURED TO PROPERLY FIT INLETS BY USING SPECIFIC INFORMATION COMPILED IN A SURVEY OF THE "AS-BUILT" INLET. IN RETROFIT SITUATIONS THE SURVEY IS DONE TO DOCUMENT THE THREE CRITICAL ASPECTS OF WQI DESIGN (GRATE/FRAME MEASUREMENTS, OPEN/CLEAR SPACE MEASUREMENTS, AND PROTRUSION MEASUREMENTS). IN NEW CONSTRUCTION, FABCO PRODUCT DRAWINGS ARE ESSENTIALLY PLACE HOLDERS BASED ON THE SPECIFIED INLETS. ONCE THE INLETS ARE BUILT, THE PROCESS REVERTS TO THE RETROFIT APPROACH OF SURVEYING THE AS-BUILT INLETS TO CONFIRM FABCO INSERT DESIGN. PLEASE USE THE QR CODE TO ACCESS THE SURVEY FORM AND COMPREHENSIVE GUIDANCE OF THE SURVEY PROCESS. ALTERNATIVELY, NAVIGATE TO www.fabco-industries.com/stormwater-inlet-survey-assistance

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UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS BREAK SHARP EDGES .002 - .020 FILLETS .020 MAX DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES		TOLERANCES: DEC .00 ± .01 DEC .000 ± .005 FRACT ± 1/16 ANGLE ± 2°	
PROJECT	CITY OF CAMARILLO, CA	APPROVAL	DATE
MATERIAL		DWN	J.C. 8/30/2024
		CHKR	
		ENGR	J.P. 8/30/2024
		UPD	

FABCO INDUSTRIES, INC. 24 CENTRAL DRIVE FARMINGDALE, NY 11735 WWW.FABCO-INDUSTRIES.COM	
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Ø 29-1/2" NOM. STAND PIPE CASQA FTC PERF BASKET	
SIZE	DWG. NO.
B	SPS29.5-1-000
SCALE: NONE	REV A
SHEET 1 OF 1	

APPENDIX D

Test Report: StormTrough Stormwater Filtering System

Prepared by: John Peters, Chief Engineer, Fabco Industries, Inc.

Date of Test: June 17, 2024

Executive Summary

To confirm the flow rates and treatment capabilities of its recently updated StormTrough stormwater filtering system, Fabco Industries conducted an internal detailed study, documenting the flow of water and debris into the StormTrough during a simulated 10-year, 1-hour storm event typically associated with the California Bay Area, specifically San Francisco. Rainfall intensity data was collected from the NOAA website and is included in this document. The calculated flow rate used for the test was 360 GPM, which was channeled to the StormTrough unit via a 4-foot-wide by 8-foot-long tilting flow table adjusted to a 2-degree slope, which is consistent with a standard road cross-slope or camber. Miscellaneous debris, including floatable and settleable materials such as plastic water bottles, paper plates, fast food wrappers, dirt, and dry foliage, was scattered into the influent water upstream of the StormTrough to simulate typical roadside litter.

The cross-sectional configuration of the StormTrough channels was modified from the original design by increasing the trough's horizontal depth from 6 inches to 8 inches, increasing the vertical height of the backwall by 3 inches, and adding a reverse-angled (45-degree) flange to the backwall to prevent overtopping of water and debris during high-flow rain events.

To confirm the effectiveness of these modifications, Fabco Industries designed and constructed a High-Flow hydraulic test setup capable of delivering over 360 GPM to the unit under test. The test setup consisted of a 1000-gallon poly tank fitted with a 4-inch ball valve used to supply the 4-foot by 8-foot tilting flow table positioned to dump directly into the StormTrough unit mounted to a vertical concrete wall. The test flow rate was controlled by monitoring the scaled drop in the tank's water level at 15-second intervals. To maintain the proper flow rate as the pressure head decreased, the valve was slowly opened to compensate for the loss of pressure head.

This report confirms the functionality and effectiveness of the StormTrough system in collecting and transporting influent stormwater mixed with typical roadside trash and debris to the collection basket under high-flow conditions. As an added factor of safety, Fabco assumed a 10-year, 1-hour storm event, even though the actual requirement is for a substantially lower flow rate storm associated with a 1-year, 1-hour storm event. The report includes photographic evidence of the testing performed, flow calculations that accurately predicted the test outcome, a test schematic, and an engineering detail drawing of the revised trough's cross-sectional configuration.

1. Introduction

The StormTrough system, designed by Fabco Industries, is an advanced stormwater filtration solution intended for installation inside open curb style storm drain inlets. The system is mounted below the inlet (mouth) opening, typically 6 to 8 inches below the flow line. Its primary function is to capture and transport influent stormwater along with the trash and debris it carries through a trough leading to a collection basket. The collection basket, featuring 5mm openings, allows water to pass through while retaining trash and debris. Positioned under the manhole opening, the basket is easily accessible for maintenance and cleanout.

Open curb inlets, which typically range from 4 feet to 12 feet in length, are designed to collect stormwater from roads. However, these inlets also capture unwanted trash and debris, which need to be removed before reaching nearby waterways. The StormTrough system addresses this issue by efficiently collecting and retaining roadside trash in a centralized basket for easy cleanout.

This test aimed to verify the StormTrough system's ability to collect typical roadside trash and debris, preventing it from entering waterways.

2. Test Objectives

The objectives of the test were to:

1. Confirm the flow rates and treatment capabilities of the StormTrough system.
2. Evaluate the effectiveness of recent design modifications.
3. Simulate a 10-year, 1-hour storm event to assess performance under extreme conditions.
4. Ensure the system meets or exceeds the actual requirement of a 1-year, 1-hour storm event.

3. Test Setup and Methodology

3.1. Test Setup

The test setup consisted of the following components:

- Feed Tank: A 1000-gallon poly tank fitted with a 4-inch ball valve.
- Tilting Flow Table: A 4-foot-wide by 8-foot-long table, tilted at a 2-degree slope.
- StormTrough System: Mounted approximately 6 inches below the flow table's end.

3.2. Methodology

1. Flow Regulation: The feed tank was marked with 6.5-inch vertical intervals to indicate the water level drop every 15 seconds. Using a stopwatch, the valve operator adjusted the valve to ensure the water level matched the marks, maintaining a consistent flow rate of 360 GPM.
2. Simulated Debris: Miscellaneous debris, including plastic water bottles, paper plates, fast food wrappers, dirt, and dry foliage, was introduced into the flow upstream of the StormTrough.

3. Monitoring: The flow rate was continuously monitored, and adjustments were made to the valve to compensate for pressure head loss.
4. Data Collection: Photographs were taken, and flow calculations were recorded throughout the test.

4. Test Results

4.1. Flow Rate and Debris Collection:

The StormTrough system successfully captured all incoming debris and transported it to the collection basket without failure. The system effectively handled the simulated 10-year, 1-hour storm event, far exceeding the specified requirement for a 1-year, 1-hour storm event.

4.2. Design Modifications:

The design modifications—an increased trough depth, a higher backwall, and a reverse-angled flange—proved effective in preventing overtopping and ensuring efficient debris capture.

4.3. Flow Regulation:

The flow rate was consistently maintained at 360 GPM by regulating the ball valve based on the feed tank's water level marks. This method ensured accurate simulation of stormwater flow conditions.

5.2. Periodic Scheduled Maintenance

Regular maintenance is crucial to ensure the long-term effectiveness and reliability of the StormTrough system. The following points emphasize the importance and benefits of scheduled maintenance:

- **Optimal Performance:** Regular inspections and cleanings ensure that the collection basket remains free of blockages, maintaining optimal water flow and debris capture efficiency.
- **Preventive Measures:** Scheduled maintenance helps identify and address potential issues before they escalate, reducing the risk of system failures during critical storm events.
- **Extended Lifespan:** Routine upkeep prolongs the lifespan of the StormTrough system components by preventing wear and tear and other forms of damage.
- **Compliance with Regulations:** Adhering to maintenance schedules ensures compliance with local and state regulations regarding stormwater management and environmental protection.
- **Cost Savings:** Proactive maintenance reduces the likelihood of costly emergency repairs and replacements, resulting in long-term cost savings for municipalities and other users.

This section on periodic scheduled maintenance highlights its importance in maintaining the system's effectiveness and longevity, thereby ensuring continuous protection of waterways from stormwater-related debris.

5. Conclusion

The StormTrough system designed by Fabco Industries has demonstrated its capability to meet and exceed the specified requirements for stormwater filtration and debris collection. The system successfully captured and retained typical roadside trash and debris, preventing it from entering waterways. The design modifications enhanced the system's performance, ensuring reliable operation under high-flow conditions.

The comprehensive testing confirmed the functionality and effectiveness of the StormTrough system, providing confidence in its ability to handle real-world stormwater management challenges.

This concludes the test report for the StormTrough system. The results indicate that the system is well-suited for effective stormwater management, providing a robust solution for capturing and retaining roadside trash and debris.

6. Appendices

1. Appendix A: Photographic Evidence of Testing
2. Appendix B: Flow Calculations and Predictions
3. Appendix C: Engineering Detail Drawing of the Revised Trough Configuration
4. Appendix D: Appendix E: NOAA Rainfall Intensity Data for San Francisco
5. Appendix E: Reference photographs of installed units in California.

Appendix A: Photographic Evidence of Testing

Photographs documenting the test setup, flow conditions, and debris collection process.

Test Setup: 1000-gallon feed tank with a 4" ball-valve and water diffuser pipe.



Test #1: Dry trash on flow table prior to inlet water flow.



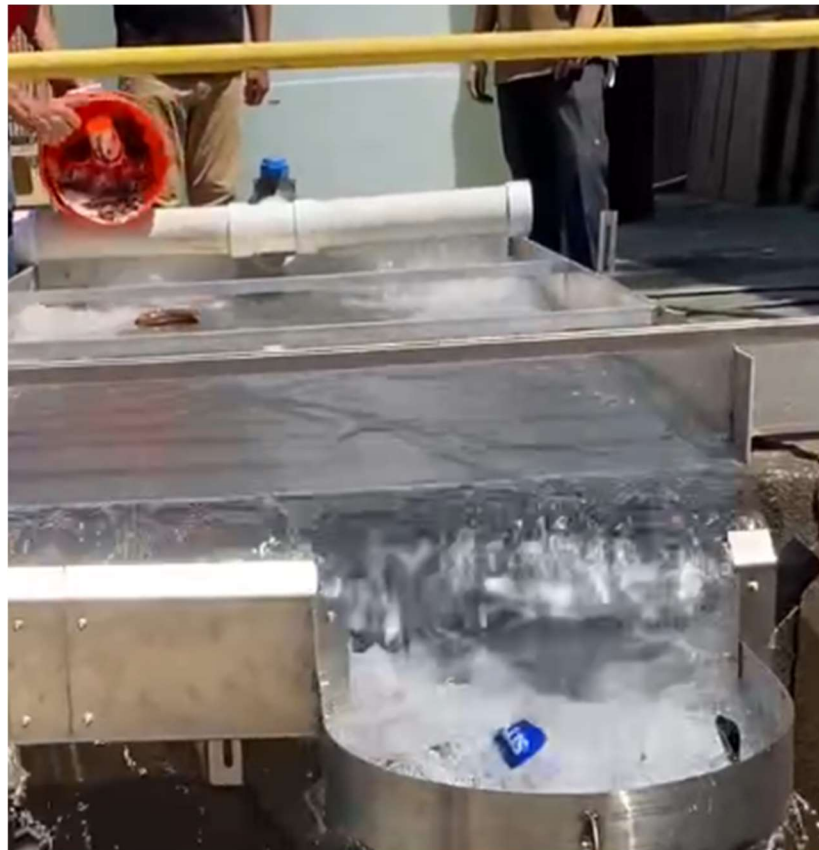
Test #1: Dry trash on flow table prior to inlet water flow. (continued)



Test #2: Trash introduced during flow.



Test #2: Trash introduced during flow. (continued)



Test #2: Trash introduced during flow. (Continued)



Appendix B: Flow Calculations and Predictions

Calculations to predict the test outcomes, including:

- Expected Max Tank Flow
- Water-Jump
- Tank Flow Regulation Scale.

Expected Max Tank Flow:

Torricelli's Theorem (The Orifice Equation)

Area of Orifice, A	=	2.2	[in ²]
Head to Centerline of Orifice, h	=	3.0	[in]
Acceleration of Gravity, g	=	386.4	[in/s ²]
Discharge Coefficient, C _d	=	0.62	[N/A]

Q _{flow}	=	64.5	[in ³ /s]
	=	0.0	[CFS]
	=	16.7	[GPM]

V _{jet}	=	3.9	FPS
------------------	---	-----	-----

$$(0 + gh + 0)_1 = (0 + 0 + \frac{1}{2}v^2)_2$$

$$(gh)_1 = (\frac{1}{2}v^2)_2$$

$$v_2 = \sqrt{2gh_1} \quad \text{*This is Torricelli's Equation}$$

Basic Equation for Flow

$$Q = vA$$

Q = Flow Rate

v = velocity

A = Area

$$v = \frac{Q}{A}$$

Combining the two equations by substituting for v₂

$$\frac{Q}{A} = \sqrt{2gh_1}$$

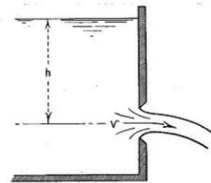
$$Q = A_2\sqrt{2gh_1}$$

This Equation does not account for the friction on the walls of the tank thus a constant C_d is added.

$$C_d = 0.62$$

Final Equation:

$$Q = C_d A_2 \sqrt{2gh_1} \quad \text{OR} \quad Q = 0.62 * A_2 \sqrt{2gh_1}$$



$$Q = C_d A \sqrt{2gh}$$

Solve for Q:	Solve for A:	Solve for h:
Cd= 0.62	Cd=	Cd=
A= 12.57 sq-in	Q=	A=
h= 52 in	h=	Q=
Q= 1,562.29 cfs	A=	h=
Q= 0.90 cfs	A=	h=
Q= 405.76 gpm	A=	h=

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- GIS Grids
- Maps
- Time Series
- Temporals
- Documents
- Probable Maximum Precipitation
- Documents
- Miscellaneous
- Publications
- Storm Analysis
- Record Precipitation
- Contact Us
- Inquiries

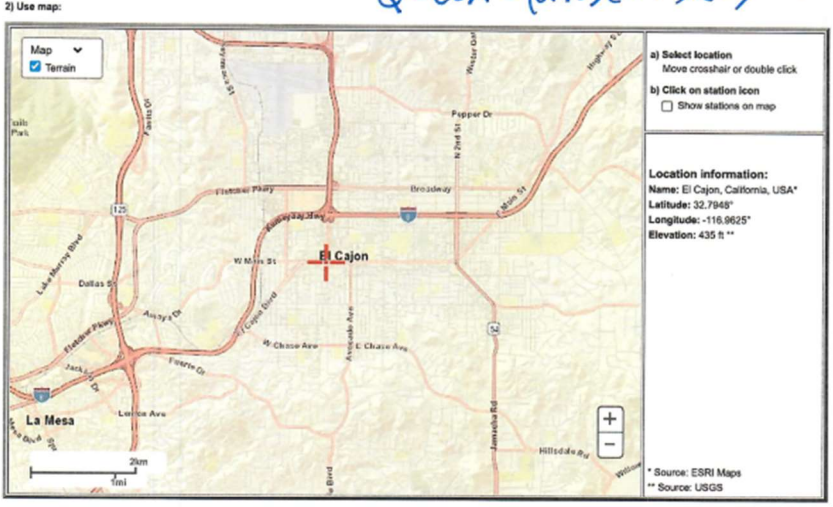
NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description
 Data type: Precipitation intensity Units: English Time series type: Partial duration

Select location
 1) Manually:
 a) By location (decimal degrees, use "*" for S and W): Latitude: Longitude: Submit
 b) By station (list of CA stations): Select station
 c) By address: El Cajon, CA, USA (San Diego Count X)

$$Q = CiA = (0.95)(0.401)(1) = 0.381 \text{ CFS}$$

$$= 171 \text{ GPM}$$



POINT PRECIPITATION FREQUENCY (PF) ESTIMATES
 WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
 NOAA Atlas 14, Volume 6, Version 2

PF tabular PF graphical Supplementary information Print page

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.42 (1.15-1.70)	1.79 (1.50-2.15)	2.29 (1.91-2.76)	2.70 (2.23-3.29)	3.25 (2.60-4.10)	3.70 (2.89-4.76)	4.14 (3.16-5.47)	4.60 (3.41-6.25)	5.22 (3.71-7.44)	5.71 (3.91-8.44)
10-min	1.01 (0.852-1.22)	1.28 (1.07-1.54)	1.64 (1.37-1.98)	1.93 (1.60-2.35)	2.33 (1.87-2.95)	2.65 (2.07-3.41)	2.96 (2.26-3.92)	3.29 (2.44-4.49)	3.74 (2.66-5.33)	4.10 (2.80-6.05)
15-min	0.816 (0.684-0.980)	1.03 (0.868-1.24)	1.32 (1.10-1.60)	1.56 (1.29-1.90)	1.88 (1.50-2.37)	2.13 (1.67-2.75)	2.39 (1.82-3.16)	2.66 (1.97-3.62)	3.02 (2.14-4.30)	3.30 (2.26-4.88)
30-min	0.568 (0.476-0.682)	0.718 (0.602-0.864)	0.918 (0.768-1.11)	1.08 (0.898-1.32)	1.31 (1.05-1.65)	1.48 (1.15-1.91)	1.66 (1.27-2.20)	1.85 (1.37-2.52)	2.10 (1.48-2.99)	2.29 (1.57-3.30)
60-min	0.401 (0.337-0.482)	0.507 (0.426-0.611)	0.649 (0.543-0.783)	0.765 (0.634-0.931)	0.924 (0.738-1.17)	1.05 (0.820-1.35)	1.17 (0.895-1.55)	1.30 (0.866-1.78)	1.46 (1.05-2.11)	1.62 (1.11-2.35)
2-hr	0.276 (0.232-0.332)	0.348 (0.292-0.419)	0.443 (0.371-0.536)	0.522 (0.433-0.635)	0.620 (0.503-0.793)	0.712 (0.557-0.918)	0.797 (0.608-1.08)	0.885 (0.655-1.21)	1.00 (0.712-1.43)	1.10 (0.751-1.62)
3-hr	0.220 (0.185-0.265)	0.278 (0.233-0.335)	0.354 (0.296-0.428)	0.417 (0.345-0.508)	0.503 (0.402-0.634)	0.569 (0.445-0.734)	0.637 (0.486-0.843)	0.707 (0.524-0.964)	0.803 (0.569-1.14)	0.877 (0.600-1.30)
6-hr	0.147 (0.123-0.176)	0.186 (0.156-0.224)	0.238 (0.199-0.298)	0.281 (0.233-0.342)	0.339 (0.271-0.428)	0.384 (0.301-0.496)	0.430 (0.328-0.570)	0.478 (0.354-0.652)	0.543 (0.385-0.773)	0.594 (0.406-0.877)
12-hr	0.095 (0.080-0.115)	0.123 (0.103-0.148)	0.159 (0.133-0.193)	0.189 (0.157-0.231)	0.230 (0.184-0.290)	0.261 (0.205-0.337)	0.293 (0.224-0.389)	0.327 (0.242-0.445)	0.372 (0.285-0.529)	0.407 (0.278-0.601)
24-hr	0.060 (0.053-0.070)	0.078 (0.069-0.091)	0.103 (0.090-0.120)	0.123 (0.107-0.145)	0.151 (0.127-0.182)	0.172 (0.142-0.212)	0.193 (0.156-0.244)	0.215 (0.169-0.279)	0.245 (0.186-0.330)	0.268 (0.197-0.373)
2-day	0.038 (0.033-0.044)	0.050 (0.044-0.058)	0.066 (0.067-0.078)	0.078 (0.068-0.092)	0.096 (0.081-0.116)	0.109 (0.090-0.135)	0.123 (0.099-0.155)	0.137 (0.108-0.177)	0.156 (0.118-0.210)	0.170 (0.125-0.237)
3-day	0.028 (0.025-0.033)	0.037 (0.033-0.043)	0.049 (0.043-0.056)	0.059 (0.051-0.070)	0.072 (0.061-0.088)	0.083 (0.069-0.102)	0.093 (0.079-0.117)	0.103 (0.081-0.134)	0.118 (0.089-0.168)	0.129 (0.094-0.179)
4-day	0.023 (0.020-0.026)	0.030 (0.027-0.035)	0.040 (0.036-0.047)	0.048 (0.042-0.057)	0.059 (0.050-0.072)	0.068 (0.056-0.084)	0.076 (0.062-0.096)	0.085 (0.067-0.110)	0.097 (0.072-0.130)	0.106 (0.079-0.147)

Tank Flow Regulation Scale:

SAN FRANCISCO, CA
 10-YR 1-HR RAINFALL
 $i = \text{INTENSITY} = 0.843 \text{ in/hr}$
 1 ACRE Fully PAVED
 $C = 0.95$

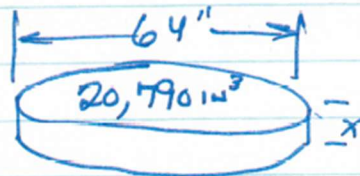
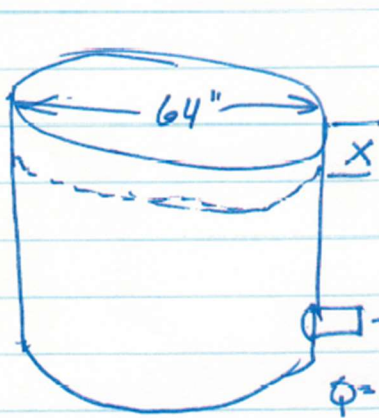
$$Q = CiA = (0.95)(0.843)(1)$$

$$Q = \underline{0.8 \text{ CFS}} = \underline{360 \text{ GPM}}$$

MEASURED WATER
 DROP EVERY 15 SEC.

$$\therefore \frac{360}{4} = \underline{90} \frac{\text{GAL}}{15 \text{ sec}}$$

$$90 \text{ GAL} = 20,790 \text{ in}^3$$

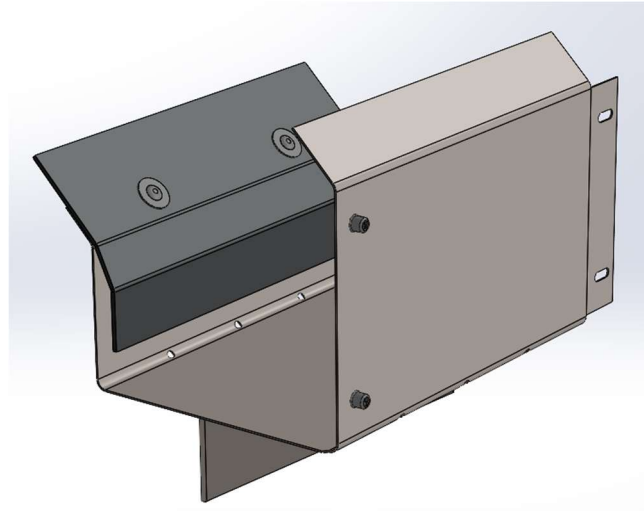


$$\therefore \frac{\pi(64)^2}{4} * X = 20,790 \text{ in}^3$$

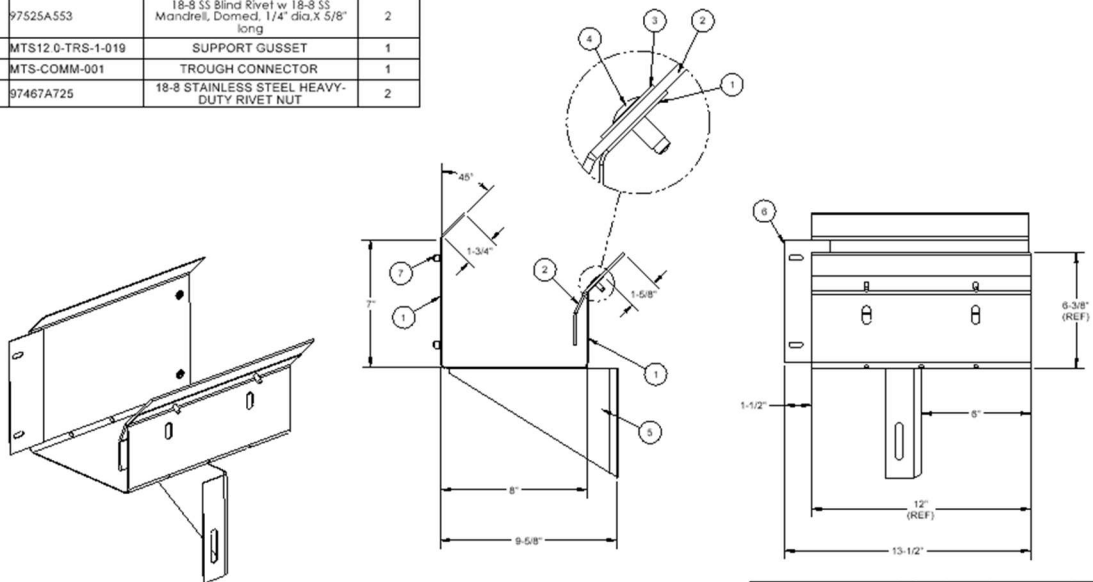
$$X = \underline{6.5 \text{ PER 15 SEC}}$$

Appendix C: Engineering Assembly Detail Drawing

Detail Drawing of the Revised Trough Configuration



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	MTS12 0-TRS-1-046	TROUGH SECTION	1
2	MTS12 0-TRS-1-051	RUBBER FLANGE	1
3	90313A107	Flat Washer, 18-8 SS large Dia./ 1/4" screw size, 1" Od	2
4	97525A553	18-8 SS Blind Rivet w/ 18-8 SS Mandrel, Domet, 1/4" dia. x 5/8" long	2
5	MTS12 0-TRS-1-019	SUPPORT GUSSET	1
6	MTS-COMM-001	TROUGH CONNECTOR	1
7	97467A725	18-8 STAINLESS STEEL HEAVY-DUTY RIVET NUT	2



REVISIONS 1. REVISED TO REFLECT THE REVISIONS TO THE TROUGH SECTION ASSEMBLY DRAWING. 2. REVISED TO REFLECT THE REVISIONS TO THE TROUGH SECTION ASSEMBLY DRAWING. 3. REVISED TO REFLECT THE REVISIONS TO THE TROUGH SECTION ASSEMBLY DRAWING. 4. REVISED TO REFLECT THE REVISIONS TO THE TROUGH SECTION ASSEMBLY DRAWING. 5. REVISED TO REFLECT THE REVISIONS TO THE TROUGH SECTION ASSEMBLY DRAWING. 6. REVISED TO REFLECT THE REVISIONS TO THE TROUGH SECTION ASSEMBLY DRAWING. 7. REVISED TO REFLECT THE REVISIONS TO THE TROUGH SECTION ASSEMBLY DRAWING.		DATE: 05/20/2015 DESIGNED BY: J. B. BROWN CHECKED BY: J. B. BROWN APPROVED BY: J. B. BROWN	 TROUGH SECTION ASSY - RIGHT MTS12 0-TRS-1 100 B
WORKING SEE BOM		DATE: 05/20/2015 DESIGNED BY: J. B. BROWN CHECKED BY: J. B. BROWN APPROVED BY: J. B. BROWN	DATE: 05/20/2015 DESIGNED BY: J. B. BROWN CHECKED BY: J. B. BROWN APPROVED BY: J. B. BROWN

Appendix D: NOAA Rainfall Intensity Data for San Francisco

Rainfall intensity data collected from the NOAA website, to simulate the storm event.



NOAA Atlas 14, Volume 6, Version 2
 Location name: San Francisco, California, USA*
 Latitude: 37.7801°, Longitude: -122.4202°
 Elevation: m/ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaris, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchon

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

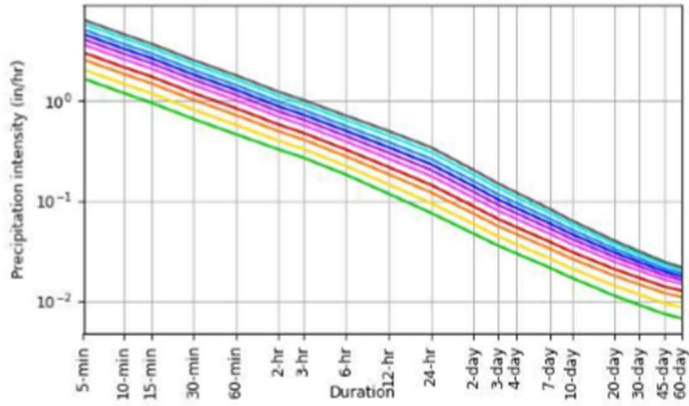
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.67 (1.49-1.88)	2.05 (1.84-2.34)	2.58 (2.29-2.94)	3.02 (2.65-3.48)	3.64 (3.06-4.36)	4.12 (3.38-5.06)	4.62 (3.68-5.84)	5.14 (3.96-6.73)	5.86 (4.30-8.06)	6.43 (4.54-9.23)
10-min	1.19 (1.06-1.35)	1.48 (1.31-1.67)	1.85 (1.64-2.11)	2.17 (1.90-2.50)	2.60 (2.20-3.12)	2.95 (2.42-3.62)	3.31 (2.64-4.19)	3.68 (2.84-4.82)	4.20 (3.08-5.78)	4.61 (3.25-6.61)
15-min	0.960 (0.856-1.09)	1.19 (1.06-1.35)	1.50 (1.32-1.70)	1.75 (1.54-2.01)	2.10 (1.77-2.52)	2.38 (1.96-2.92)	2.67 (2.13-3.38)	2.97 (2.29-3.89)	3.39 (2.48-4.66)	3.72 (2.62-5.33)
30-min	0.658 (0.586-0.746)	0.814 (0.724-0.922)	1.02 (0.906-1.16)	1.20 (1.05-1.37)	1.44 (1.21-1.72)	1.63 (1.34-2.00)	1.82 (1.45-2.31)	2.03 (1.57-2.66)	2.32 (1.70-3.19)	2.54 (1.79-3.65)
60-min	0.464 (0.414-0.526)	0.574 (0.511-0.651)	0.721 (0.639-0.821)	0.843 (0.741-0.970)	1.01 (0.854-1.21)	1.15 (0.943-1.41)	1.29 (1.03-1.63)	1.43 (1.10-1.88)	1.63 (1.20-2.25)	1.79 (1.26-2.57)
2-hr	0.327 (0.292-0.371)	0.400 (0.356-0.454)	0.498 (0.442-0.567)	0.580 (0.509-0.667)	0.695 (0.586-0.833)	0.786 (0.646-0.966)	0.880 (0.702-1.12)	0.980 (0.756-1.28)	1.12 (0.821-1.54)	1.23 (0.866-1.76)
3-hr	0.271 (0.241-0.307)	0.330 (0.294-0.374)	0.410 (0.364-0.467)	0.478 (0.420-0.550)	0.573 (0.483-0.686)	0.648 (0.532-0.797)	0.726 (0.580-0.920)	0.810 (0.624-1.06)	0.926 (0.679-1.27)	1.02 (0.717-1.46)
6-hr	0.183 (0.163-0.208)	0.224 (0.199-0.254)	0.280 (0.248-0.318)	0.326 (0.287-0.376)	0.393 (0.331-0.471)	0.446 (0.366-0.548)	0.501 (0.400-0.635)	0.560 (0.432-0.734)	0.644 (0.472-0.886)	0.710 (0.500-1.02)
12-hr	0.118 (0.105-0.134)	0.146 (0.130-0.166)	0.185 (0.164-0.211)	0.218 (0.192-0.251)	0.266 (0.224-0.319)	0.304 (0.250-0.374)	0.345 (0.275-0.436)	0.388 (0.299-0.508)	0.450 (0.330-0.620)	0.500 (0.352-0.718)
24-hr	0.076 (0.068-0.086)	0.095 (0.086-0.108)	0.122 (0.109-0.139)	0.145 (0.129-0.166)	0.178 (0.154-0.210)	0.205 (0.173-0.246)	0.233 (0.193-0.287)	0.264 (0.213-0.333)	0.307 (0.239-0.403)	0.343 (0.259-0.465)
2-day	0.047 (0.042-0.053)	0.059 (0.053-0.067)	0.075 (0.067-0.085)	0.088 (0.079-0.101)	0.108 (0.093-0.127)	0.124 (0.105-0.149)	0.140 (0.118-0.173)	0.158 (0.128-0.200)	0.184 (0.143-0.241)	0.205 (0.154-0.277)
3-day	0.035 (0.032-0.040)	0.044 (0.040-0.050)	0.056 (0.050-0.063)	0.066 (0.059-0.075)	0.080 (0.069-0.094)	0.091 (0.077-0.110)	0.103 (0.086-0.127)	0.116 (0.094-0.147)	0.134 (0.104-0.176)	0.149 (0.112-0.202)
4-day	0.030 (0.027-0.034)	0.037 (0.033-0.042)	0.047 (0.042-0.053)	0.055 (0.049-0.063)	0.066 (0.057-0.078)	0.076 (0.064-0.091)	0.085 (0.071-0.105)	0.096 (0.077-0.121)	0.110 (0.086-0.145)	0.122 (0.092-0.165)
7-day	0.021 (0.019-0.024)	0.026 (0.023-0.030)	0.033 (0.030-0.038)	0.039 (0.034-0.044)	0.047 (0.040-0.055)	0.053 (0.045-0.064)	0.059 (0.049-0.073)	0.066 (0.053-0.083)	0.075 (0.058-0.099)	0.083 (0.062-0.112)
10-day	0.017 (0.015-0.019)	0.021 (0.019-0.024)	0.026 (0.023-0.030)	0.031 (0.027-0.035)	0.037 (0.032-0.043)	0.041 (0.035-0.050)	0.046 (0.038-0.057)	0.051 (0.041-0.065)	0.058 (0.045-0.076)	0.063 (0.048-0.086)
20-day	0.011 (0.010-0.012)	0.014 (0.012-0.016)	0.018 (0.016-0.020)	0.020 (0.018-0.024)	0.024 (0.021-0.029)	0.027 (0.023-0.033)	0.030 (0.025-0.037)	0.033 (0.027-0.042)	0.037 (0.029-0.049)	0.040 (0.030-0.054)
30-day	0.009 (0.008-0.010)	0.011 (0.010-0.013)	0.014 (0.013-0.016)	0.017 (0.015-0.019)	0.020 (0.017-0.023)	0.022 (0.019-0.027)	0.024 (0.020-0.030)	0.026 (0.021-0.033)	0.029 (0.022-0.038)	0.031 (0.023-0.042)
45-day	0.007 (0.006-0.008)	0.009 (0.008-0.010)	0.012 (0.010-0.013)	0.014 (0.012-0.016)	0.016 (0.014-0.019)	0.018 (0.015-0.021)	0.019 (0.016-0.024)	0.021 (0.017-0.027)	0.023 (0.018-0.030)	0.024 (0.018-0.033)
60-day	0.006 (0.006-0.007)	0.008 (0.007-0.009)	0.011 (0.009-0.012)	0.012 (0.011-0.014)	0.014 (0.012-0.017)	0.016 (0.013-0.019)	0.017 (0.014-0.021)	0.019 (0.015-0.024)	0.020 (0.016-0.027)	0.021 (0.016-0.029)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

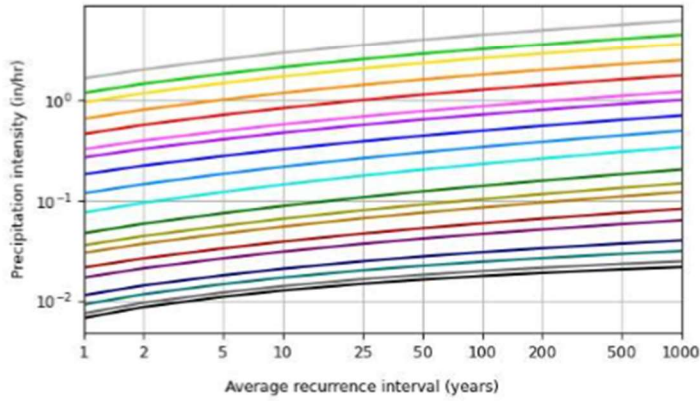
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PF graphical

PDS-based intensity-duration-frequency (IDF) curves
 Latitude: 37.7801°, Longitude: -122.4202°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
60-day

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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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Could not retrieve elevation data due to Cross-Origin permissions.

Appendix E: Reference photographs of installed units in California.

Note: The following photographs of currently installed StormTrough units were taken and supplied to Fabco by a third-party independent contractor. These images further demonstrate the functionality and effectiveness of the Fabco StormTrough system's ability to successfully capture trash and debris under real-world conditions. It is also noteworthy that all of the units pictured below feature the previous, certified CA SWRCB 6-inch trough configuration.







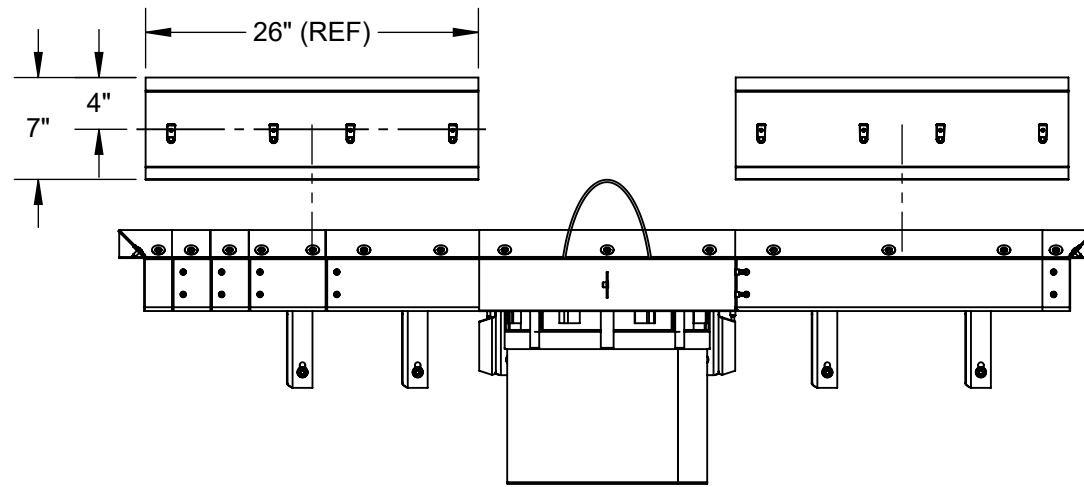
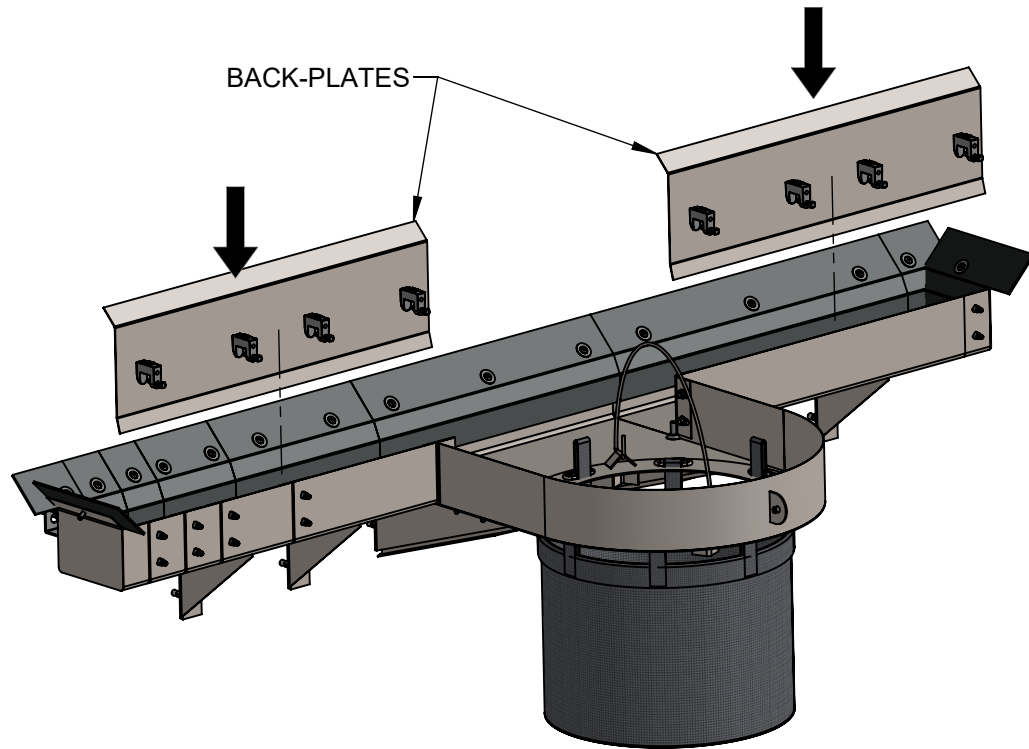




APPENDIX E

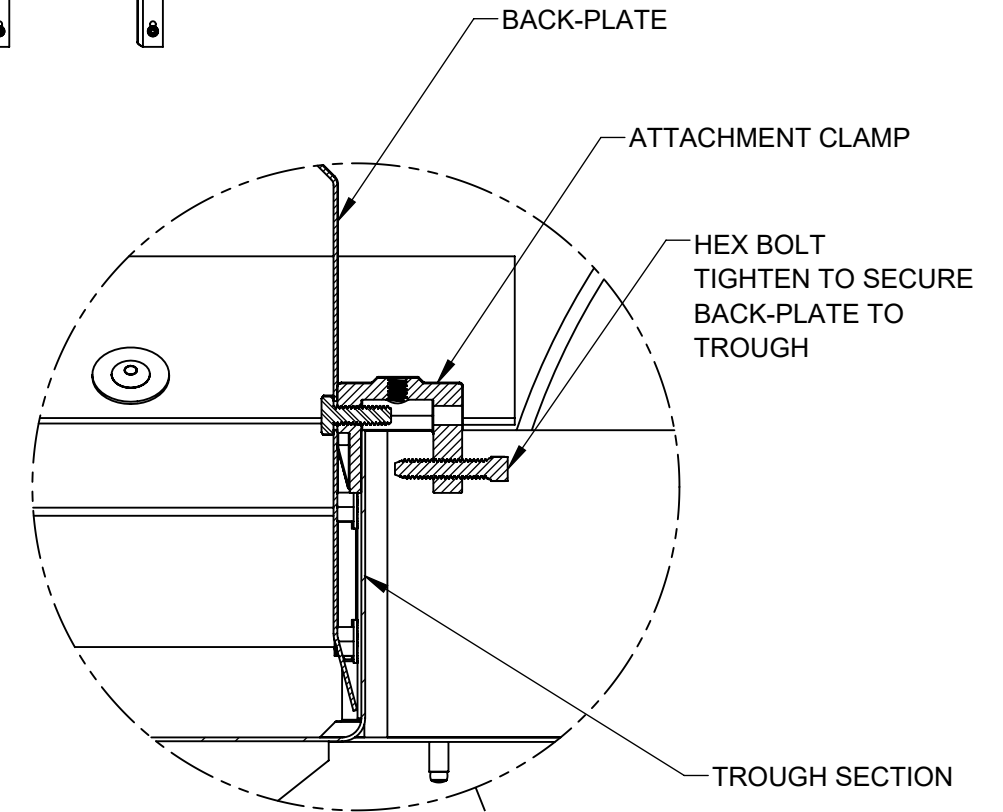
PURPOSE:

THE PURPOSE OF ADDING THE BACK-PLATES IS TO ENSURE THAT STORMWATER FLOWING INTO EACH TROUGH SECTION DOES NOT OVERTOP THE TROUGH. THE BACK-PLATES CREATE A PHYSICAL BARRIER THAT REDIRECTS THE WATER DOWNWARD AND INTO THE TROUGH.

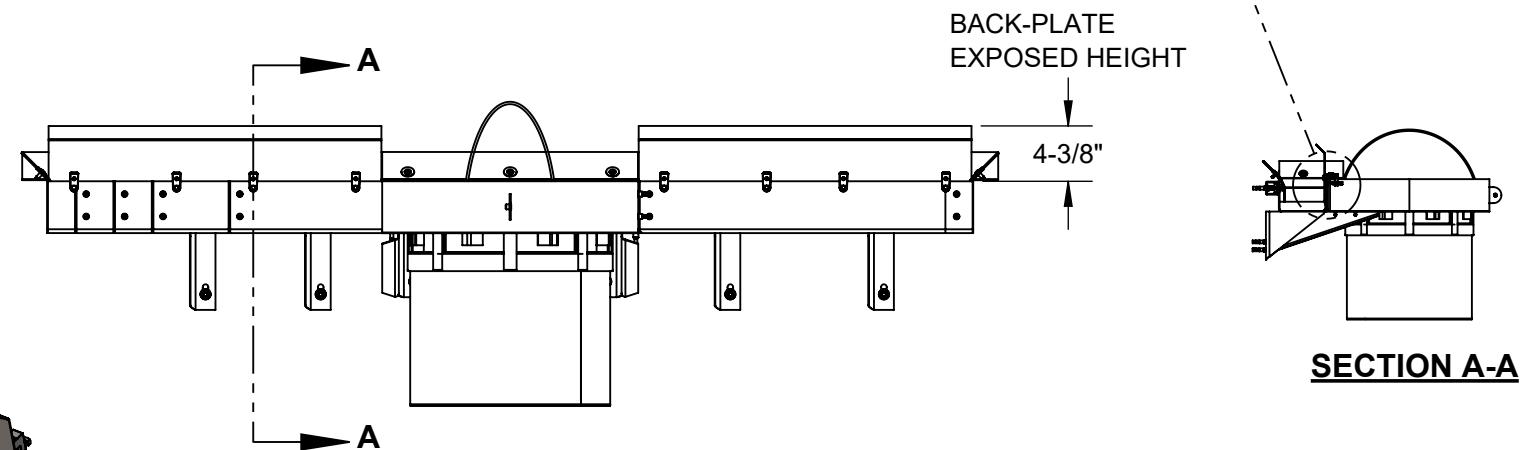
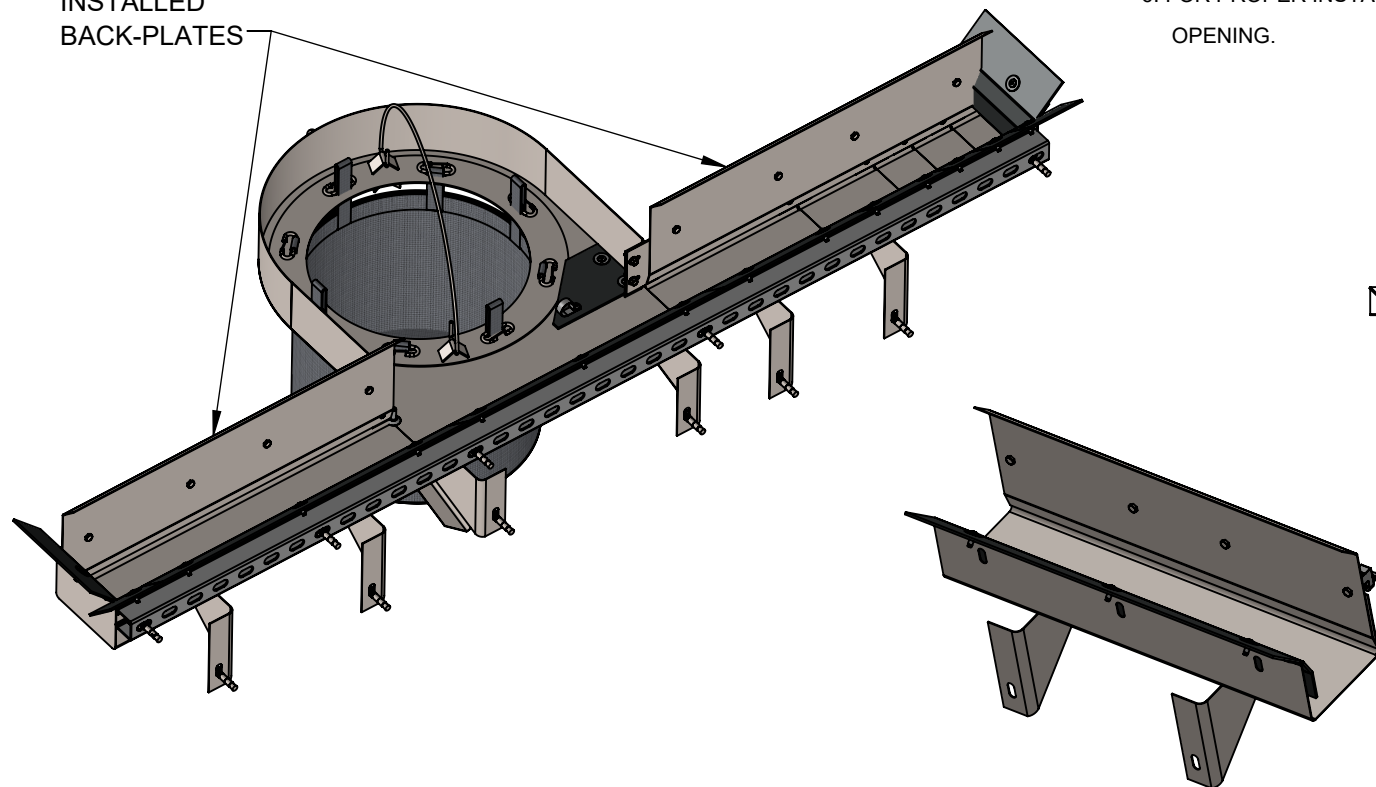


INSTALLATION PROCEDURE:

1. VERIFY THE TROUGH SECTIONS ARE FREE FROM DEBRIS THAT MAY INTERFERE WITH BACK-PLATE INSTALLATION.
2. POSITION THE BACK-PLATES SO THAT THE ATTACHMENT CLAMP STRADDLES THE REAR VERTICAL WALL OF THE TROUGH SECTION. NOTE THAT IT MAY BE NECESSARY TO CUT ONE OR TWO OF THE BACK-PLATES TO FIT PROPERLY BETWEEN THE TROUGH END WALLS.
3. ENSURE THE BACK-PLATES DO NOT BLOCK THE TRAY OPENING LEADING TO THE DEBRIS SACK.
4. SECURE EACH BACK-PLATE TO THE VERTICAL TROUGH WALL BY TIGHTENING EACH HEX NUT.
5. INSTALL THE TOP RUBBER EDGE CLIP OVER VERTICAL SEAMS ONLY WHEN THE PLATES ARE POSITIONED SIDE-BY-SIDE TO ENSURE THEY DO NOT SEPARATE FROM ONE ANOTHER.
6. FOR PROPER INSTALLATION, ENSURE THAT NO GAPS EXCEED A 5mm (3/16") OPENING.

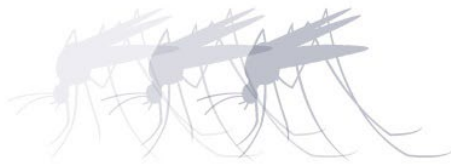


INSTALLED BACK-PLATES



<p>PROPRIETARY AND CONFIDENTIAL THIS DOCUMENT IS THE PROPERTY OF FABCO INDUSTRIES AND IS CONVEYED WITH THE EXPRESS CONDITION THAT IT AND THE INFORMATION CONTAINED IN IT ARE NOT TO BE USED, DISCLOSED, OR REPRODUCED IN WHOLE OR IN PART, FOR ANY PURPOSE WITHOUT THE EXPRESS WRITTEN CONSENT OF FABCO INDUSTRIES; AND THAT NO RIGHT IS GRANTED TO DISCLOSE OR SO USE ANY INFORMATION CONTAINED IN SAID DOCUMENT.</p>	UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS BREAK SHARP EDGES .002 - .020 FILLETS .020 MAX DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES		TOLERANCES: DEC .00 ± .01 DEC .000 ± .005 FRACT ± 1/16 ANGLE ± 2°		APPROVAL	DATE
	DWN	H.G.	6/12/2024			BACK-PLATE INSTALLATION
	CHKR	J.P.	6/12/2024			
	ENGR	UPD				
PROJECT	FABCO INDUSTRIES, INC. 24 CENTRAL DRIVE FARMINGDALE, NY 11735 WWW.FABCO-INDUSTRIES.COM		SIZE	DWG. NO.	REV	
MATERIAL			B	MTS24-BP-INSTALL	A	
			SCALE: NONE	SHEET 1 OF 1		

APPENDIX F



MVCAC
Mosquito and Vector Control Association of California

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Mr. Hime Athar
Fabco Industries, Inc
390 Oser Avenue.
Hauppauge, NY 11788

September 27, 2024

Dear Mr. Athar,

Thank you for the submission of the Fabco StormTrough with Standpipe Filter configuration full trash capture device 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 Fabco StormTrough and Standpipe Filter configuration 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 Fabco StormTrough and Standpipe Filter 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,

Megan MacNee
MVCAC Executive Director