

BayFilter™

Design Manual



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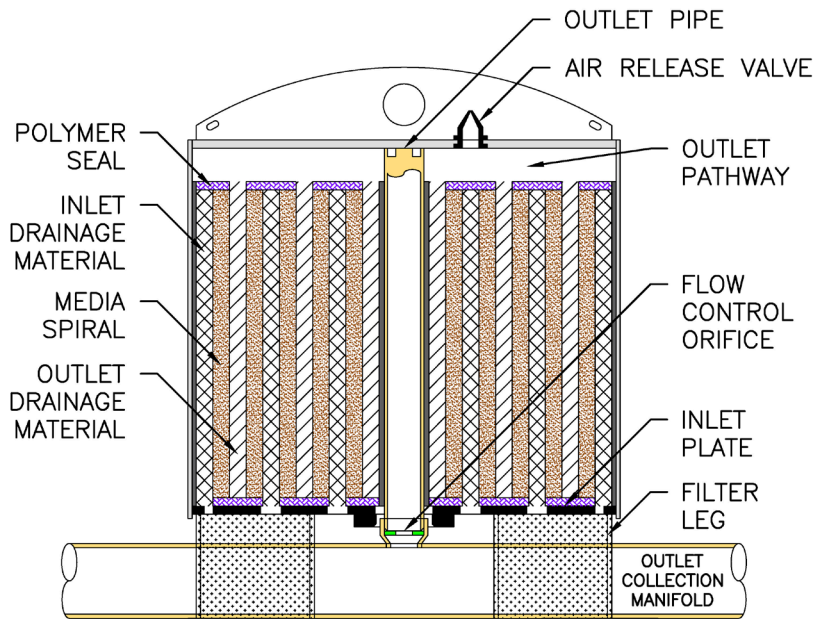
Introduction

Clean water is essential to quality of life. Advanced Drainage Systems is 100% committed to minimizing pollution in stormwater which helps protect our water resources. By collaborating with the regulatory and engineering communities to develop products and processes, ADS continually develops state of the art stormwater filters that are proven to effectively remove pollutants such as sediments, phosphorous, metals, nitrogen, trash, and hydrocarbons.

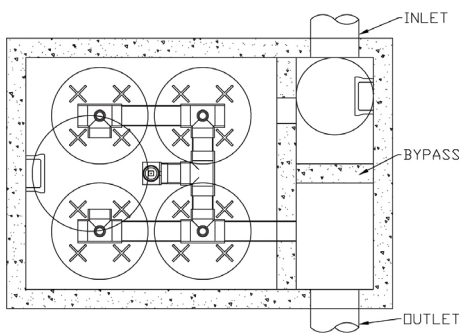


BayFilter

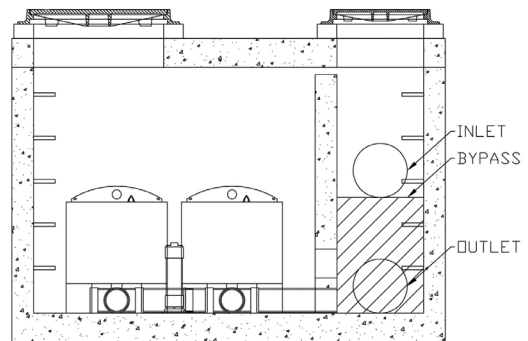
The BayFilter cartridge system is an ongoing commitment to state of the art stormwater treatment. The compound spiral media configuration allows for a large filter surface area in a compact footprint. This configuration results in the most efficient and effective stormwater filter available in the marketplace. The BayFilter is available in multiple sizes with multiple media configurations to meet any flow rate and design consideration while being able to target specific pollutants. A BayFilter System is typically a concrete structure (precast vault, manhole, or cast in place structure) with a single or multiple BayFilter cartridges. Inside the structure the BayFilters are connected to an outlet manifold through which the treated water exits the system.



BayFilter Cutaway



Plan View



Profile View

Basic Principles of Stormwater Filtration

Stormwater treatment has unique requirements, which often require the treatment of large volumes of water at relatively high flow rates to high levels of pollutant removal with long periods of time between maintenance intervals. At ADS we believe it is our responsibility to engineer a balance within these variables to provide effective stormwater treatment at an exceptional value to our clients.

What makes for an effective and efficient stormwater filter? A filter must be able to remove the pollutants of concern and function for a reasonable period of time as defined by industry and regulatory standards. A filter system should also be designed to limit re-suspension or release of pollutants that have been collected between maintenance periods.

The traditional pollutants of concern in stormwater is sediment. Phosphorous, metals, turbidity, nitrogen, fecal coliform, and bacteria are also pollutants of concern although they are not commonly regulated nationwide. ADS has completed both field and laboratory testing of the BayFilter. Testing demonstrates BayFilter's effectiveness and efficiency at capturing the pollutants listed above.

Settling and filtration are the two primary methods to remove pollutants from stormwater. Some settling of particles and pollutants occurs as the influent enters the filter vault. Settling typically removes the larger particles and debris, it does not remove the small particles or any dissolved materials. It is the filter which performs the work of removing the very small particles, and dissolved nutrients and metals. The media within a filter must be small enough to intercept the tiny sediment particles which won't settle (fig. 1), and be capable of attracting and attaching charged and elemental particles through ion exchange.

The area of media provided by a stormwater filter is an important factor to consider when selecting and specifying a filter system. The more surface area provided by the media, the greater the potential flow through and across the media and the greater the pollutant removal potential of the filter. The vertically oriented and patented compound spiral media configuration of the BayFilter maximizes a media filter's area potential.



Figure 1: Coarse Industry Media

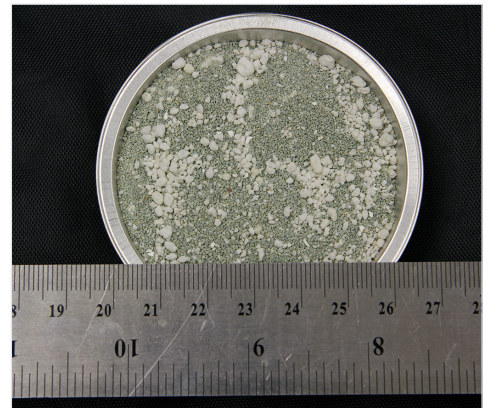


Figure 2: BayFilter Media

The particle size of the media is also important with respect to pollutant interception and adsorption. A tightly packed, fine media (fig 2) captures a greater percentage of fine and dissolved pollutants when compared to a loosely packed, coarse media or a membrane media. A fine and tightly packed media not only minimizes the interstitial spaces between the media particles to optimize interception of pollutants, it also maximizes the amount of surface area in a given volume provided by the media for ion exchange.

The quantity of sediment a filter is capable of capturing is a significant component to filter longevity. A filter must be able to treat large quantities of sediment while maintaining claimed flow rates and removal efficiencies. The sediment loading capacity of the BayFilter is 350 pounds (158.7 kg) for the 45 gpm (170.3 lpm) and 30 gpm (113.6 lpm) cartridges.

Surface area and loading rate contribute significantly to filter longevity. Greater filter surface area (sf) allows for a reduced loading rate (gpm/sf of filter media), which in turn increases the service life of the filter. For example, a 10 square foot (0.9 m²) filter with a loading rate of 1 GPM (3.8 l/min) per square foot of filter area will pass 10 GPM (37.9 l/min). A 20 ft² filter with a loading rate of 0.5 GPM (1.9 l/min) per square foot of filter area will also pass 10 GPM (37.9 l/min). If one gallon of treated water will occlude one square foot of filter area every 10 days, a 10 ft² (0.9 m²) filter flowing at one GPM (3.8 l/min) will be expired in 100 days. A 20 ft² (1.9 m²) filter flowing at 0.5 GPM (1.9 l/min) will be expired in 400 days. Increasing media area and reducing flow rate has a beneficial impact on pollutant removal and filter longevity and these are some of the core engineering principles on which the BayFilter design is based.

ADS is committed to the purpose of protecting public waterways. Permanently capturing pollutants, effectively backwashing media, allowing media to drain between storm events, and providing an economically reasonable maintenance interval are key design parameters for properly functioning stormwater filtration systems. The BayFilter cartridge system helps meet and exceed these key requirements needed to protect our water resources.



Top of Cartridge

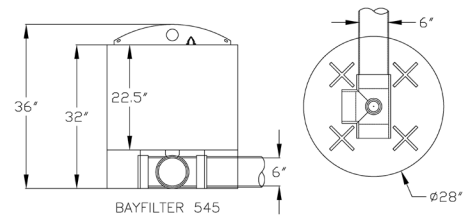


Bottom of Cartridge

BayFilter Product Details

BayFilter 545

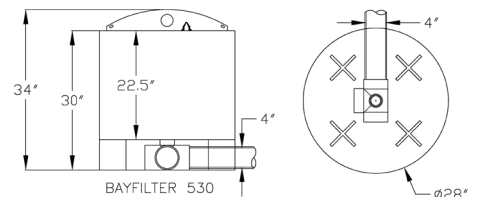
Size = 28" (711 mm) diameter
Weight = 250 lbs. (113 kg)
Media Area = 90 ft² (8.4 m²)
Flow Rate = 45 gpm (170 l/min)
Flow Rate per Square Foot = 0.50 gpm/ft² (20 l/min/m²)
Minimum Operational Head = 32" (813 mm)
Recommended Design Head = 34" (864 mm)
Sediment Capture Capacity = 350 lbs (159 kg)
Manifold Diameter = 6" (152 mm)



BayFilter 545

BayFilter 530*

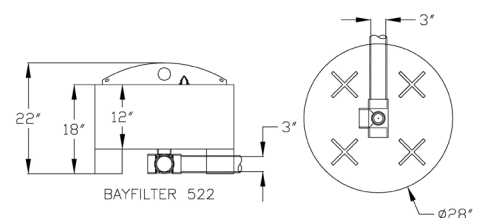
Size = 28" (711 mm) diameter
Weight = 250 lbs. (113 kg)
Media Area = 90 ft² (8.4 m²)
Flow Rate = 30 gpm (114 l/min)
Flow Rate per Square Foot = 0.33 gpm/ft² (13 l/min/m²)
Minimum Operational Head = 30" (762 mm)
Recommended Design Head = 32" (813 mm)
Sediment Capture Capacity = 350 lbs (159 kg)
Manifold Diameter = 4" (102 mm)



BayFilter 530

BayFilter 522**

Size = 28" (711 mm) diameter
Weight = 125 lbs. (57 kg)
Media Area = 45 ft² (4.2 m²)
Flow Rate = 22.5 gpm (85 l/min)
Flow Rate per Square Foot = 0.50 gpm/ft² (20 l/min/m²)
Minimum Operational Head = 18" (457 mm)
Recommended Design Head = 20" (508 mm)
Sediment Capture Capacity = 175 lbs (79 kg)
Manifold Diameter = 3" (76 mm)



BayFilter 522

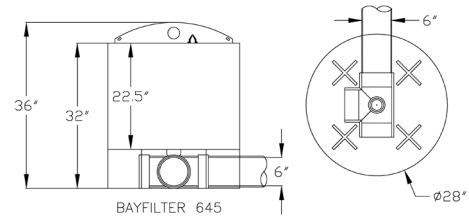
NOTES: The 500 series is for Total Suspended Solids (TSS) and Phosphorous and utilizes EMC media.

*BayFilter 530 replaces BFC cartridge.

** BayFilter 522 replaces 545L cartridge.

BayFilter 645

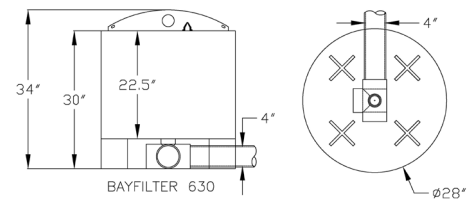
Size = 28" (711 mm) diameter
Weight = 250 lbs. (113 kg)
Media Area = 90 ft² (8.4 m²)
Flow Rate = 45 gpm (170 l/min)
Flow Rate per Square Foot = 0.50 gpm/ft² (20 l/min/m²)
Minimum Operational Head = 32" (813 mm)
Recommended Design Head = 34" (864 mm)
Sediment Capture Capacity = 350 lbs (159 kg)
Manifold Diameter = 6" (152 mm)



BayFilter 645

BayFilter 630

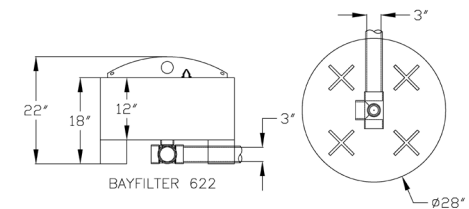
Size = 28" (711 mm) diameter
Weight = 250 lbs. (113 kg)
Media Area = 90 ft² (8.4 m²)
Flow Rate = 30 gpm (114 l/min)
Flow Rate per Square Foot = 0.33 gpm/ft² (13 l/min/m²)
Minimum Operational Head = 30" (762 mm)
Recommended Design Head = 32" (813 mm)
Sediment Capture Capacity = 350 lbs (159 kg)
Manifold Diameter = 4" (102 mm)



BayFilter 630

BayFilter 622

Size = 28" (711 mm) diameter
Weight = 125 lbs. (57 kg)
Media Area = 45 ft² (4.2 m²)
Flow Rate = 22.5 gpm (85 l/min)
Flow Rate per Square Foot = 0.50 gpm/ft² (20 l/min/m²)
Minimum Operational Head = 18" (457 mm)
Recommended Design Head = 20" (508 mm)
Sediment Capture Capacity = 175 lbs (79 kg)
Manifold Diameter = 3" (76 mm)



BayFilter 622

NOTES: The 600 series is for enhanced metals treatment.

BayFilter Operation

Stormwater runoff enters the manhole or concrete structure via an inlet pipe and begins to fill the structure. When the water surface elevation in the vault/manhole reaches the minimum operating level, water flows through the BayFilter driven by a hydrostatic head. Within the BayFilter, the water flows through a proprietary filter media and drains via a vertical pipe. The vertical pipe is connected to the under drain system, which conveys filtered water to the outfall.

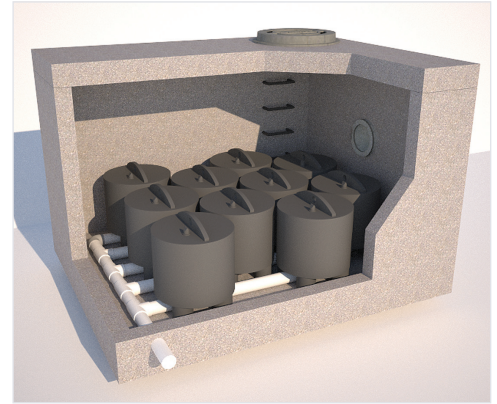
During a typical storm event, the BayFilter system has four cycles:

- A. BayFilter cartridge fills and releases air
- B. Positive head filtration
- C. Siphon (negative head) filtration
- D. Siphon break and hydrodynamic backwash

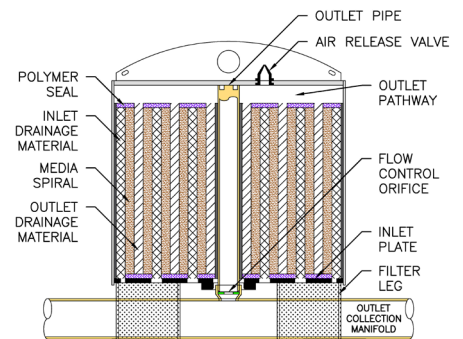
The cycle operation of a BayFilter is as follows:

- A. BayFilter cartridge fill and air release: The BayFilter vault and BayFilter cartridges fill when stormwater flow enters the system. As the vault fills, water enters the BayFilter cartridge through the inlet plate on the bottom. Air is purged from the media spiral and filter housing during this process.

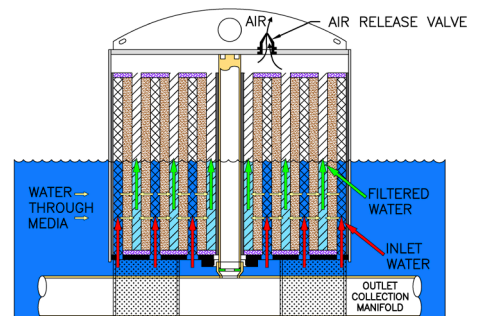
The air release is critical for the proper functioning of the siphon. The siphon draws flow through the BayFilter during periods of low water in the vault.



BayFilter Vault



BayFilter Cutaway



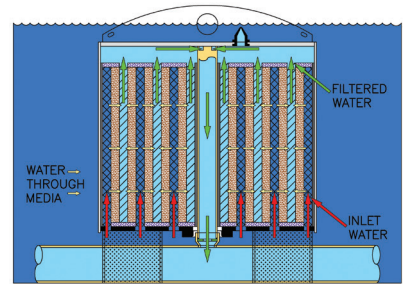
Cartridge Filling

B. Positive Head Filtration: Water enters the Filter from the bottom of the filter housing and travels upward through the inlet-flow conduit-spiral. From the inlet spiral, untreated water flows horizontally through the engineered media. Treated water exits the engineered media and flows into the outlet-flow conduit-spiral. Treated water flows vertically to the top of the cartridge where it can exit through the outlet pipe—please see product details (pg.6) for operating head levels. Finally, filtered water leaves the system via the outlet.

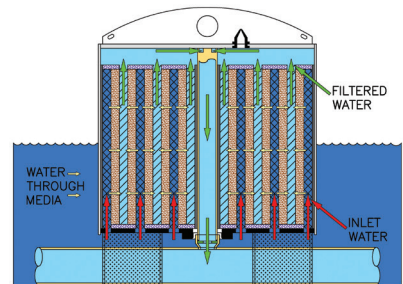
C. Siphon (Negative Head) Filtration: After the water level in the vault falls below the top of the filter cartridge—minimum operating head level, a siphon is established and water will continue to flow through the filter media until the siphon is broken. During siphon, the water level in the vault will decrease until it reaches the inlet plate of the BayFilter.

D. Siphon Break and Hydrodynamic Backwash: When the water level drops below the inlet plate, air enters the filter and the siphon breaks. Once the siphon breaks, a gravity-driven backwash occurs with all of the water flowing from the outlet pathway backwards through the filter media. This backwash has the effect of dislodging particles captured in the filtration layers and re-establishing porosity. Dislodged particles are transported back in to the filter vault and accumulate on the filter vault floor.

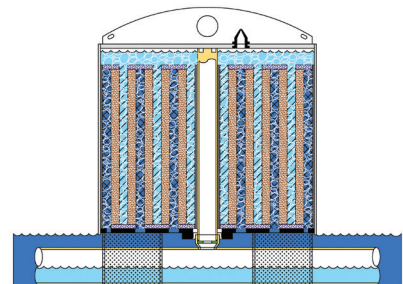
Each BayFilter has a maximum flow rating. At this flow, each cartridge can treat the specified total sediment load before requiring maintenance. BayFilter flow may also be custom regulated to meet specified design parameters by modifying the flow control orifice. Please contact ADS for custom design requirements.



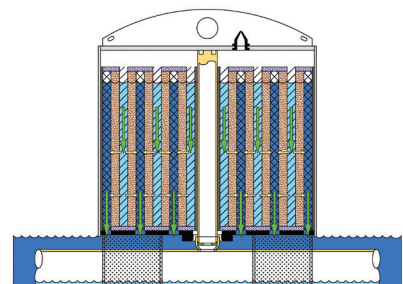
Positive Filtration



Siphon Filtration



Siphon Break



Backwash

BayFilter System Design & Sizing

The BayFilter cartridge system design is easily completed in four phases:

- A. BayFilter System Configuration
- B. BayFilter Site Plan Placement
- C. BayFilter System Sizing
- D. Final Check

The design process can be iterative until the determined design parameters are satisfied. Some of the items to consider when designing a stormwater filtration system:

- **Site specific constraints and proposed BayFilter system location**
- **BayFilter system configuration—on-line or off-line**
- **Pretreatment requirements**
- **Operating head**
- **Treatment efficiency requirements and local regulations**
- **Pollutant loading (sediment load)**
- **Treatment flow rates and hydraulics**
- **Maintenance intervals**

BayFilter System Configuration

BayFilter systems can accommodate any treatment flow requirement. The peak design flow through the storm drain system will be significantly greater than the treatment design flow through BayFilter. It is a best practice to only convey the required treatment flow through a stormwater filter and this will extend the filter's life cycle. Conveying the peak design flow around a stormwater filter is considered off-line treatment.

Off-Line Design

Schematics of off-line BayFilter systems are shown below. In Figure 3, the bypass structure diverts treatment flows to the BayFilter system and allows high flows to pass to a separate outfall. The bypass structure will feature flow controls designed by an engineer to ensure that the required treatment flows are sent to the BayFilter. In Figure 4, this same concept is accomplished within a 3-chamber vault.

In stormwater filter system installations, sediment will accumulate in the filter cartridge and on the vault floor. In off-line installations, high intensity flows are routed away from the vault minimizing the risk of resuspending the sediment accumulated on the vault floor. In online applications it is possible for high flows to mobilize and release this sediment.

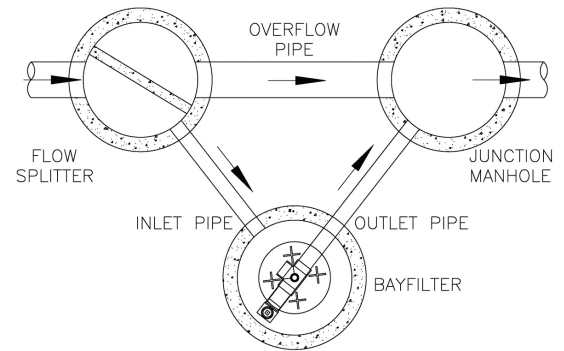


Figure 3: Offline Configuration External Bypass

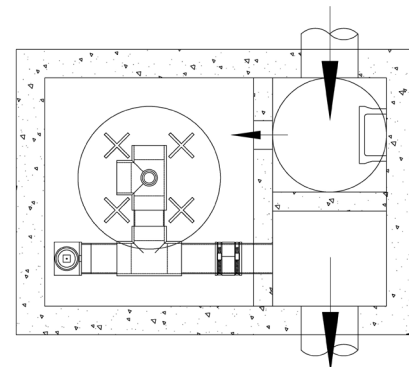


Figure 4: Inline Configuration Internal Bypass

Operating Head

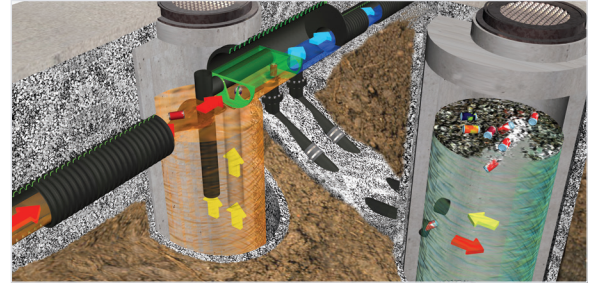
Head is required to activate BayFilter flow and establish siphon flow. The height of individual BayFilter cartridges will determine the operating head. Please consult product details for individual operating head levels. The drainage system and network does not need to provide the operating head. Filter systems can easily be designed on sites where the elevation drop of the hydraulic grade line is less than the required operating head of the filter. Consult ADS Engineering Department for verification based on your particular site conditions.

Pretreatment

Regional regulations may require pretreatment of stormwater flows prior to flow entering filters. Pretreatment will remove a portion of the influent pollutant load. This will lessen the pollutant load received by a filter and potentially increase the maintenance interval duration. The BaySeparator™ system (Figures 5 & 6) is an ideal hydrodynamic separator that removes sediments and floatables from stormwater runoff. Please contact your ADS representative for additional pretreatment options.

BayFilter Site Plan Placement

Locating a BayFilter system on your site will be determined by giving consideration to several factors including: maintenance access, the unit's footprint, available head, available depth, and the surface elevation of the receiving waters. A BayFilter system must be installed in an area that is accessible to maintenance equipment. The maintenance of a BayFilter system requires a vacuum truck as well as the removal and replacement of the filter cartridges. The manhole covers, and or access hatches of the BayFilter must be placed in locations that can be easily reached by such a vehicle. Consult the ADS Engineering Department for expert assistance.



Traditional BaySeparator

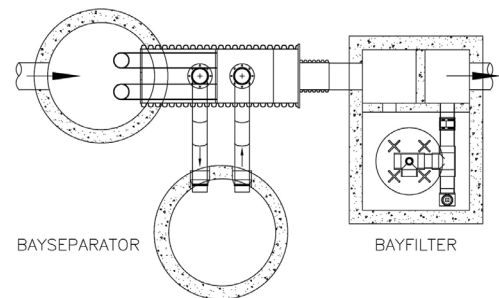


Figure 5: Traditional BaySeparator Pre-Treatment Configuration

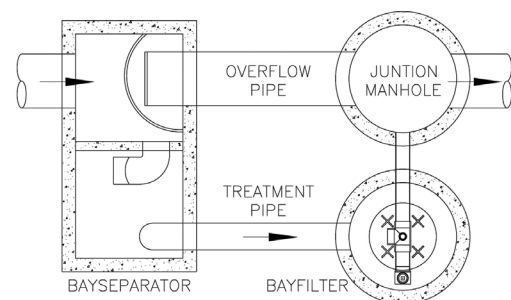


Figure 6: BaySeparator FS Unit Pre-Treatment Configuration

BayFilter System Sizing

Each BayFilter system relies on a collection of individual BayFilter cartridges to achieve the desired removal efficiency. Accurately determining the required number of filters is important to efficient operation. Undersizing a system may lead to shorten service life.

A valuable stormwater treatment system will be provided when the three design parameters listed below are given consideration.

- **Jurisdiction – specific sizing requirements**
- **Flow capacity of the system**
- **Treated sediment load of the system**

Each parameter results in a required number of BayFilter cartridges. After computing the number of filters for each parameter, determine which requires the most filters, and this is the limiting design parameter and the number of required BayFilter cartridges for your drainage area.

Jurisdiction

Local regulatory requirements play a significant role in any BayFilter design. Depending on the jurisdiction in which the project site is located, the engineer may have to meet minimum treatment flow rates, treatment volumes or some other criteria such as filter bed area. Some jurisdictions specify a methodology for calculating a minimum treatment flow rate for a given site.

Flow Capacity

Regulatory requirements will determine water quality treatment values. The BayFilter system is simply applied by the design professional to their computed values. Typically, the primary treatment value is treatment flow rate (Q_{TRT}). This value tells us the rate at which flow must pass through a filter system. Other common treatment values are water quality volume and phosphorous load reduction. Please contact ADS Engineering Department when designing to volume or phosphorous requirements.

The minimum number of BayFilter cartridges can be determined by dividing the treatment flow rate by flow rate of the BayFilter you have chosen. This calculation provides the minimum number of BayFilters that will be necessary to fully treat the water quality flow from the site. The step-by-step procedure is shown below.

BayFilter Series 500 System Sizing Table

BayFilter Cartridge	Treatment Flow Rate gpm (l/min)	Treatment Volume f ³ (m ³)
522	22.5 (85.1)	1250 (35.4)
530	30.0 (113.6)	2500 (70.8)
545	45 (170.3)	2500 (232.2)

BayFilter Series 600 System Sizing Table

BayFilter Cartridge	Treatment Flow Rate gpm (l/min)	Treatment Volume f ³ (m ³)
622	22.5 (85.1)	1250 (35.4)
630	30.0 (113.6)	2500 (70.8)
645	45.0 (170.3)	2500 (70.8)

1. Determine the required treatment flow rate (Q_{TRT}) based on locally approved methodologies for the project site. This may involve the use of the Rational Method, TR-55 or another locally specified hydrologic model. If a locally approved methodology is not specified, ADS recommends using one of these commonly accepted models.

2. Using the BayFilter cartridge treatment flow rate ($Q_{BayFilter}$), calculate the minimum numbers of BayFilter cartridges required to treat that flow using Equation 1. Refer to the product details for BayFilter flow rates.

The minimum number of BayFilter cartridges is equal to the maximum treatment flow rate divided by $Q_{BayFilter}$, rounded up to the next whole number.

$$\# \text{ Cartridges} = \frac{Q_{TRT} (cfs) \times 448.8 \frac{gpm}{cfs}}{Q_{BayFilter}}$$

Equation 1

Sediment Load Capacity

BayFilter sediment load capacity allows the professional designer to establish the maintenance interval for the stormwater system. Establishing a sediment load is a straight forward computation which may be completed once the number of BayFilter cartridges required to treat the flow is known. With the known filter quantity, a designer will establish the sediment load capacity for the BayFilter system, and compare this value to the annual sediment load for the site. The following equations may be used to compute these values and help determine BayFilter suitability for a specific site design.

$$V_{TRT} (ft^3) = P \times A \times c \times \frac{ft}{12 \text{ in}} \times \frac{43,560 \text{ ft}^2}{\text{acre}} \times \% \text{ capture}$$

Equation 2

Sediment Load Capacity Calculations

1. Calculate the annual treated runoff volume according to Equation 2. V_{TRT} is the annual treated runoff volume, P is the average annual precipitation (in inches), A is the area of the site (in acres), c is the runoff coefficient of the site (c is dimensionless), and $\% \text{ Capture}$ is the fraction of the total annual runoff that is treated by the stormwater quality system. If $\% \text{ Capture}$ is not otherwise specified, a default value of 0.90 can be used. Please check local regulations.

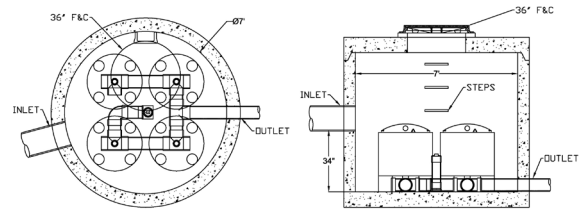
2. Using the annual treated runoff volume, calculate the anticipated total system sediment load to BayFilter according to Equation 3. In Equation 3, L is the mass of sediment that BayFilter is exposed to annually (in pounds), V_{TRT} is the annual treated runoff volume as calculated in step 1 (in ft^3), and TSS_{in} is the influent concentration of TSS in the runoff (in mg/L). The influent TSS concentration (TSS_{in}) depends greatly on the site and the surrounding land use. In the absence of readily available data, ADS recommends using a minimum event mean concentration (EMC) TSS value of 60 mg/l .

$$L (lbs) = V_{TRT} \times TSS_{in} \times \frac{28.3 \text{ lt}}{ft^3} \times \frac{kg}{10^6 mg} \times \frac{2.2 \text{ lbs}}{kg}$$

Equation 3

The impact on the filter cartridge will also be less if the filtration system is preceded by pretreatment. In these cases, the influent TSS to the BayFilter system need to be reduced to reflect pretreatment sediment removal. The ADS Engineering Department can assist with these calculations.

- Once the total annual system sediment load (L) is calculated, the engineer must ensure that the number of cartridges specified will be able to remove that sediment load at the specified design flow rate. Divide the total system sediment load L by the capacity of each BayFilter and note the associated BayFilter flow rate. Round up to the next whole number to get the minimum number of BayFilters required. This quantity of BayFilters will need to treat this sediment load at the required flow rate per BayFilter. The ADS Engineering Department is available to assist with the required calculations.



Example of a manhole BayFilter system

Final Check

It may be beneficial to perform a Final Check on the BayFilter design for your site. The ADS Engineering Department is available to assist you with this function.

Standard Details and Notes

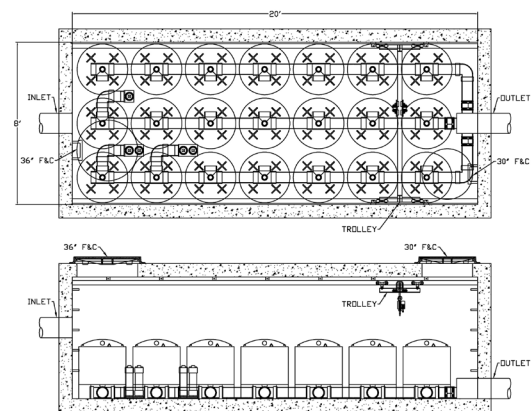
Standard details are available on the Website at www.adspipe.com or by calling **1.800.229.7283**.

BayFilter Configurations

BayFilter Systems include the four typical concrete structures: manhole, precast vault, box culvert, and cast in place. ADS can also design BayFilter systems with Nyloplast structures, and HP Pipe manholes.

BayFilter systems in manholes have a small footprint and easily fit into site plans. Manhole BayFilter systems are ideal for applications downstream from water quality detention structures. Please consult with the ADS Engineering Services Department for more details.

When designing access for a BayFilter utilizing manhole frame and covers a minimum of 30" (762) diameter should be used, however, it is recommended that a 36" (914) diameter opening is used to provide ample access for filter replacement and maintenance. In each BayFilter system, the BayFilters are arranged so that a maintenance worker can stand on the floor of the manhole while installing or removing the cartridges.



Example of a precast vault BayFilter system

Installation

Note: BayFilters are not recommended to be used as erosion control during site construction operations. BayFilters should remain offline or uninstalled until site stabilization has occurred. Please contact your local ADS representative if you should have any questions.

1. Contact utility locator to mark any nearby underground utilities and make sure it is safe to excavate.
2. Reference the site plan and stake out the location of the BayFilter manhole/vault.
3. Excavate the hole, providing any sheeting and shoring necessary to comply with all federal, state and local safety regulations.
4. Level the subgrade to the proper elevation. Verify the elevation against the manhole/vault dimensions, the invert elevations, and the site plans. Adjust the base aggregate, if necessary.
5. Have the soil bearing capacity verified by a licensed engineer for the required load bearing capacity. On solid subgrade, set the first section of the BayFilter manhole/vault.
6. Check the level and elevation of the first section to ensure it is correct before adding any riser sections.
7. If additional section(s) are required, add a watertight seal to the first section of the BayFilter manhole/vault. Set additional section(s) of the manhole/vault, adding a watertight seal to each joint.
8. Install the outlet pipe in BayFilter manhole/vault.
9. Install the inlet pipe to the BayFilter manhole/vault.
10. Install the trolley system (if applicable).
 - a. Attach the mounting brackets to the track.
 - b. Each track is split in sections. The length and number of sections vary depending on the vault. It is generally better to start installing longer track sections first. Hold a section in place and align the top of the brackets with the ceiling of the vault. Mark the center of the hole in each bracket and remove the track.
 - c. Using a hammer drill and $\frac{1}{4}$ " (6 mm) bit, drill a hole approximately 3" (76 mm) deep at each mark.
 - d. Hold the track back in place and realign the brackets with the holes. Place a plastic spacer block behind each bracket and using the supplied $\frac{1}{4}$ " (6 mm) x $3\frac{1}{4}$ " (83 mm) anchor bolts mount the track in place. Only install one section of track at this stage.



Modular Vault Assembly



Vault End Section

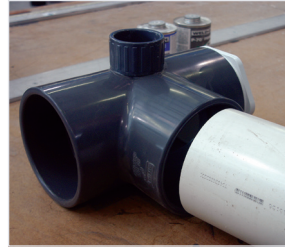


Trolley System

- e. Repeat this procedure on the opposite wall of the vault directly across from the first section.
 - f. Bolt the 4 trolleys to the aluminum I-beam as shown in the attached diagram. Make sure that the wheels for each trolley are mounted an equal distance from the top of the I-beam.
 - g. Lift the I-beam in to place and insert the trolleys in to the track.
 - h. Using the supplied couplers, install the second sections of track via the same procedure. Continue until the track runs the length of the vault or as designed.
11. Install the PVC manifold. Glue all PVC joints with the exception of the BayFilter cartridge coupling. See Parts List drawing.
 12. After the site has stabilized, remove any accumulated sediment or debris from the vault.
 13. Install the Bayfilter Vertical Drain Down Modules (VDDM) to the manifold system (if applicable).
 14. Install a row of BayFilter cartridges. Place each cartridge so the handle or "top eye hook" points across the vault. Make sure the air valve is on the side closer to the outlet.
 15. Place one (1) full set of hold down bar and two retainer brackets across the top plate of a row of aligned BayFilters. Mark and drill (using a hammer drill and a 5/8" concrete bit) two 5/8" holes per retainer bracket approximately 1.5" into the wall. Each retainer bracket has 4 possible holes, use only two, and preferably in a diagonal position per retainer bracket. Insert the anchor bolts into the wall, slide the retainer bracket over the bolts and use either a 3/4" wrench or deep ratchet socket to attach the anchor bolts and retainer bracket to the wall, creating a strong positive connection.
 16. After fully anchoring the retainer brackets, place the left end of the hold down bar into position and lock into place using the quick release restraining pin attached to the retainer bracket. Do the same for the right end of the bar.
 17. Repeat steps 14, 15 and 16 for each set (or row) of BayFilter Cartridges and hold down bar sets until the whole system is installed. See parts list drawing for the hold down bar placement.

Tool List

- PVC glue and primer
- Crane/lifting mechanism to lower the cartridges in the vault (each cartridge weighs 230-350 lbs (104-159))
- Screwdriver or nut driver for Fernco® couplers



Filter Tee



Drain Down Module



Filter Placement



Hold Down Bar Bracket



Hold Down Bar and Bracket



Chain Hoist System



BayFilter Vault Overview



Vault Internal Assembly

- Hammer and soft blow hammer
- Saw (in case PVC Sch 40 piping length needs to be adjusted)
- Hammer drill
- 1/4" (6 mm) and 5/8" (16 mm) concrete drill bit
- 3/4" (19 mm) wrench
- 1/4" (6 mm) and 5/8" (16 mm) concrete drill bits for the trolley and hold down bars, respectively.
- 3/4" (19 mm) wrench or deep socket ratchet for the hold down bar anchors



BayFilter System Cleanout

Pre-Assembled Manifold

In some areas the vaults can be provided with pre-installed manifold systems. Please contact your local ADS representatives for additional details.

Inspection and Maintenance

The BayFilter system requires periodic maintenance to continue operating at the design efficiency. The maintenance process is comprised of the removal and replacement of each BayFilter cartridge, vertical drain down module; and the cleaning of the vault or manhole with a vacuum truck.

The maintenance cycle of the BayFilter system will be driven mostly by the actual solids load on the filter. The system should be periodically monitored to be certain it is operating correctly. Since stormwater solids loads can be variable, it is possible that the maintenance cycle could be more or less than the projected duration.

BayFilter systems in volume-based applications are designed to treat the WQv in 24 to 48 hours initially. Late in the operational cycle of the BayFilter, the flow rate will diminish as a result of occlusion. When the drain down exceeds the regulated standard, maintenance should be performed.

When a BayFilter system is first installed, it is recommended that it be inspected every six (6) months. When the filter system exhibits flows below design levels the system should be maintained. Filter cartridge replacement should also be considered when sediment levels are at or above the level of the manifold system. Please contact the ADS Engineering Department for maintenance cycle estimations or assistance at **1.800.229.7283**.

Maintenance Procedures

1. Contact ADS for replacement filter cartridge pricing and availability at 800-821-6710.
2. Remove the manhole covers and open all access hatches.



Vector Truck Maintenance



Jet Vacuoring Through Access Hatch

3. Before entering the system make sure the air is safe per OSHA Standards or use a breathing apparatus. Use low O₂, high CO, or other applicable warning devices per regulatory requirements.
4. Using a vacuum truck remove any liquid and sediments that can be removed prior to entry.
5. Using a small lift or the boom of the vacuum truck, remove the used cartridges by lifting them out.
6. Any cartridges that cannot be readily lifted can be easily slid along the floor to a location they can be lifted via a boom lift.
7. When all the cartridges have been removed, it is not practical to remove the balance of the solids and water. Loosen the stainless clamps on the Fernco couplings for the manifold and remove the drain pipes as well. Carefully cap the manifold and the Ferncos and rinse the floor, washing away the balance of any remaining collected solids.
8. Clean the manifold pipes, inspect, and reinstall.
9. Install the exchange cartridges and close all covers.
10. The used cartridges may be sent back to ADS for recycling.



Manifold Tee View of a Cleaned System



Cartridge Hoist Point

BayFilter Availability and Cost

BayFilter systems are available throughout the United States from ADS. Material, installation, and maintenance costs vary with location. For BayFilter pricing in your area, please contact ADS at 800-821-6710.

BayFilter cartridges and outlet components can be shipped anywhere in the world. Manholes and precast vaults are also supplied by ADS as part of a complete stormwater filtration system.

BayFilter Specifications

Products

- A. Internal components: all components including concrete structure(s), PVC manifold piping and filter cartridges, shall be provided by ADS **800-821-6710**.
- B. PVC manifold piping: all internal PVC pipe and fittings shall meet ASTM D1785. Manifold piping shall be provided to the contractor pre-cut and/or preassembled. Minor field modifications may be necessary.
- C. Filter cartridges: external shell of the filter cartridges shall be substantially constructed of polyethylene or equivalent material acceptable to the manufacturer. Filtration media shall be arranged in a spiral layered fashion to maximize available filtration area.

An orifice flow control (i.e. flow disk) shall be supplied with each cartridge to restrict the flow rate to a maximum of 45 gpm (170 l/min).

- D. Filter media: filter media shall be a proprietary mix produced by Advanced Drainage Systems and may consist of the following materials: zeolite, perlite, and activated alumina and/or other materials required to meet the project pollutant removal requirements.
- E. Precast concrete vault: concrete structures shall be provided according to ASTM C478, C858, and C913. The materials and structural design of the devices shall be per ASTM C478 and ACI 318. Precast concrete shall be provided by Advanced Drainage Systems.

Performance

- A. The stormwater filter system shall be capable of treating 100% of the required treatment flow at full sediment load conditions.
- B. The stormwater filter system's cartridges shall have no moving parts.
- C. The stormwater treatment unit shall be designed to remove a minimum of 80% of suspended solids, 60% of total phosphorus, 50% of turbidity, 40% of total copper, and 40% of total zinc. All filter designs shall comply with local regulations.
- D. The stormwater filtration system shall not have any components that leach nitrates, phosphates or metals.
- E. The stormwater filtration cartridge shall be equipped with a hydrodynamic backwash mechanism to extend the filter's life and optimize its performance.
- F. The stormwater filtration system's cartridges shall have a treated sediment capacity for 80% TSS removal between 150-350 lbs (68-159 kg).

When BayFilter is initially installed, we recommend that an inspection be performed on the system in the first six (6) months. After that, the inspection cycle typically falls into an annual pattern given normal storm occurrence and actual solids loads.

When BayFilter exhibits flows below design levels, the system should be inspected and maintained as soon as practical. If flow monitoring is not available, BayFilter cartridges should be replaced when sediment levels are at or above the top of the manifold.

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