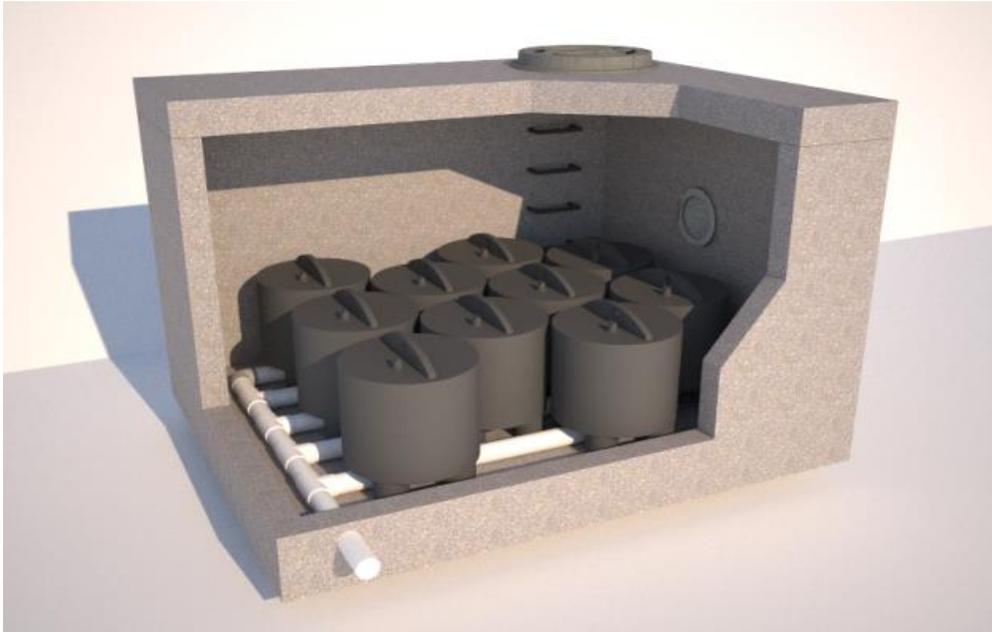


D-4. BayFilter by ADS



Design Objective

A BayFilter system shall be designed to capture the design storm in either a flow based or volume based application. Flow based treatment relies on filtering the water quality flow (cfs) as it comes into the unit, while the volume based approach has storage upstream of the BayFilter system and treats the stored water quality stormwater volume as it exits the storage cell. Stormwater shall have an adequate flow path with drop or driving head to bring about removal of sediment (TSS) and nutrients through media filtration. The BayFilter system shall be designed in a manner that the system is able to conservatively treat either the peak flow or total water quality volume and provide an adequate service life before being maintained. The BayFilter system should be inspected regularly and maintained when needed to ensure it is performing to protect and improve water quality.

Design Flow Rate and Water Quality Volume

The sizing the BayFilter cartridge system for a flow based treatment application should handle one of three flow rates based on the size and surface area of a given cartridge. Each BayFilter 522 and 622 cartridge will handle 22.5 gallons per minute (gpm); the BayFilter 530 and 630 cartridges will handle 30 gpm each; and the BayFilter 545 and 645 cartridges will handle 45gpm each. The 500 series of cartridges contains the standard media for most commercial applications, while the 600 series targets metals removal as well.

When the BayFilter cartridge system is used in a volume based application the system is sized to drain down the water quality volume within a 24 to 48 hour period. Each BayFilter 522 and 622 will conservatively handle 1,250 cubic feet (cft) of water quality volume; the Bayfilter 530, 630, 545 and 645 will conservatively handle 2,500 cft of water quality volume. As with the flow based designs, the total water quality volume required will be divided by the filtration volume rate per cartridge type to address the total number of BayFilter cartridges required to filter the entire water quality volume. When the BayFilter system is used in conjunction with an upstream detention system, it should be sized to provide capture and treatment of 75% of the first 1.0" rainfall or the first 1.5" rainfall in coastal counties. If retention (infiltration) is used on the site, it is recommended that it should occur after the BayFilter treatment has taken place.

Figure 1: BayFilter Cartridge

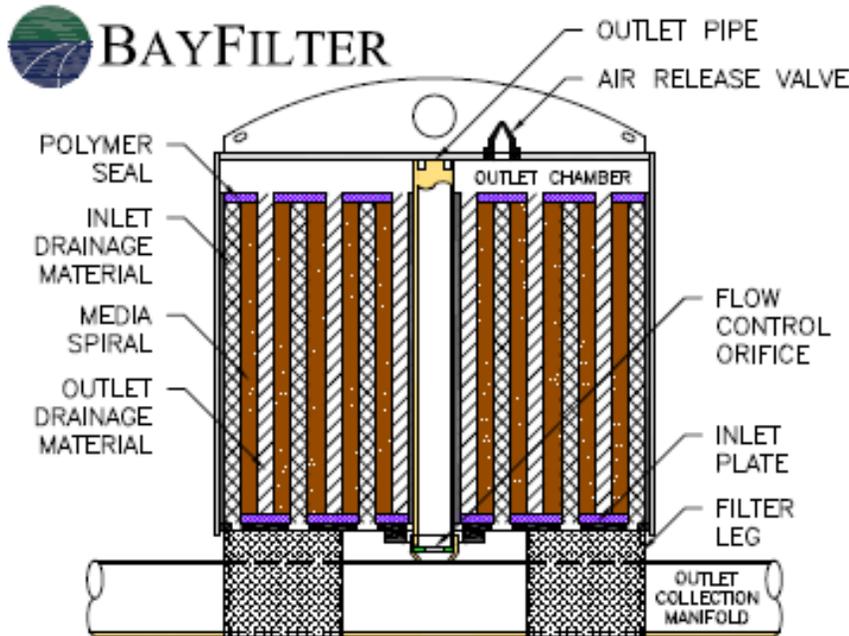
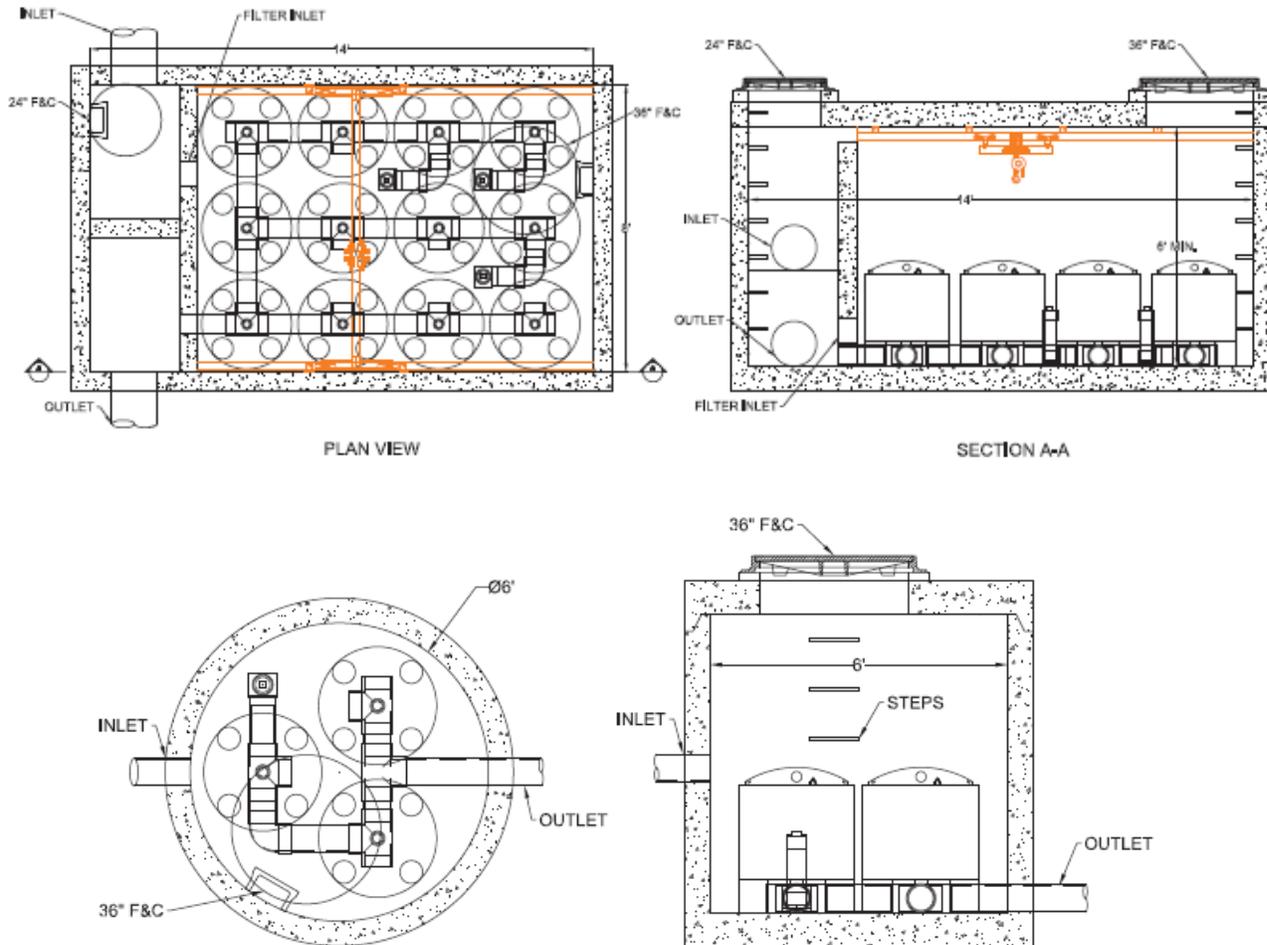


Figure 2: Standard Configurations Examples (Vault and Manhole)



Guidance on the MDC

MDC 1. FLOW BASED SIZING.

To size a flow based BayFilter system, calculate the flow rate created by the water quality storm over the total inflow area (i.e., typically the water quality event is one that is represented for 85-95% of the storms seen in a geographic area- many times this is considered the 1-yr storm event). For North Carolina it is the 1 inch and 1.5 inch (coastal counties) rainfall event.

Determining the number of cartridges required for a flow application involves the following:

- First, the water quality flow rate is computed.
- Secondly, the WQ flow rate is divided by the individual BayFilter cartridge rate. All fractional values require rounding up to the next cartridge minimum. For example, if the flow rate is 0.53 cfs if using the BayFilter 545 cartridge at 0.1 cfs per cartridge would require 5.3 BayFilter Cartridges. This value is rounded up to the next whole number, 6.

- Finally, a mass removal calculation is performed to determine an anticipated maintenance cycle for the cartridges that will be a minimum of 1 year. See Table 1 below for BayFilter’s assumptions regarding influent concentrations of TSS.

MDC 2. VOLUME BASED SIZING.

When utilizing upstream retention/detention, size the storage system and filter to capture and treat 75% of the first 1.0" rainfall or the first 1.5" rainfall in coastal counties.

Determining the number of cartridges required is a dual design process where:

- First, the water quality volume is computed by converting the 1.0” or 1.5” rainfall event into a water quality volume based on the inflow area (impervious area, C-value, etc.).
- Secondly, the WQ volume is multiplied by 0.75 to yield the modified volume required for filtration. This computed volume is divided by the BayFilter cartridge 24-hour filtration volume detailed above in this document (i.e., 1,250 cft, or 2,500 cft). All fractional values require rounding up to the next cartridge minimum. For example, if the adjusted water quality volume is 11,250 cft and if the designer is using the BayFilter 545 cartridge at 2,500 cft per cartridge it would require 4.5 BayFilter Cartridges. This value is rounded up to the next whole number, 5. Finally, a mass removal calculation is performed to determine an anticipated maintenance cycle for the cartridges that will be a minimum of 1 year. See Table 1 below for BayFilter’s assumptions regarding influent concentrations of TSS.

Table 1: Assumed Influent Concentrations of TSS

Type of Land Use	Assumed Influent Concentration of TSS
Residential	60 mg/L
Commercial	70 mg/L
Industrial	100 mg/L

MDC 3. MEDIA FLOW RATE

The BayFilter Media Flow Rate shall be a maximum of 0.5 GPM/ft² of Media Surface Area.

After the number of cartridges has been determined, a single, equivalent orifice calculation can be provided by BaySaver/ADS to the designer in order to assist in modeling the BayFilter in routing calculations and sizing the flow disk for the BayFilter Vault. The equivalent orifice calculation is based on the flow rate as specified above, the number of cartridges, and the available driving Head (H). H is defined as the height of water in the system above the orifice (in inches).

MDC 4. SEDIMENTATION

The System Pretreatment Credit shall be 30% if system includes a minimum sediment sump with minimum dimensions of 4' diameter by 2' deep.

The sediment sump is normally located at the inlet(s) of the upstream detention/retention systems. BayFilter cartridges can remove either 262 lbs (BayFilter 530, 545, 630 or 645) or 131 lbs (BayFilter 522 or 622) of sediment per cartridge depending on the size of cartridge used.

MDC 5. MEDIA TYPE

BaySaver uses the same media for both sediment (TSS) and Nutrient (TP) removal. For Metals removal, a granular activated carbon (GAC) component is used to facilitate “enhanced metals” (e.g., Zinc and Copper) removal. In Nutrient Sensitive Watersheds (NSW) and for Nutrient removal credit, it is up to NCDEQ and the local permitting authority to allow the use of the BayFilter device.

The standard BayFilter media is a lightweight media comprised of Zeolite, Perlite and activated alumina. It removes total suspended solids (TSS) mainly by physical “inception” and the media removes total phosphorus (TP) by both absorbing/adsorbing dissolved phosphorus and physically filtering particulate phosphorus simultaneously.

The type of media shall be designated in print label on the top of cartridge shell, EMC 545, 530, 522 for TSS and TP; and EMC 645, 630, 622 for metals (see example in Figure 3 showing the 545 cartridge).

Figure 3: BayFilter Name Plate Media Type Photo



MDC 6. MAINTENANCE

Maintenance shall be performed per BaySaver Operation and Maintenance Instructions and performed by Certified Maintenance Providers.

The BayFilter Inspection and Maintenance Guide can be found at the following link:

http://www.baysaver.com/Working_With_Us/engineers/BayFilter/easy_inspection.html

or

http://www.ads-pipe.com/sites/default/files/BayFilter_Design_Manual%2C_08-17_LR.pdf

A local listing of certified maintenance providers can be found by contacting the local ADS representative 1-800-229-7283.