



Hydroworks[®] HydroFilter

Operations & Maintenance Manual

Version 1.0

Introduction

The HydroFilter is a stormwater management device designed to both treat and infiltrate stormwater.

Standard filters just treat stormwater contaminants (metals, TSS, oil, nutrients) but do nothing to maintain the hydrologic cycle during urbanization. Maintenance of the hydrologic cycle helps prevent flooding, erosion and promotes water quality by maintaining the stream geomorphology. Maintenance of the hydrologic cycle requires infiltration to reduce the additional stormwater volume and reduction in infiltration that occurs with standard development.

The requirement for infiltration is complicated by the fact that urbanization increases pollution and it would be detrimental to the environment to merely infiltrate this polluted water. Therefore, there is a need to pretreat the water that is to be infiltrated from urbanized areas such as roads and parking lots. HydroFilter provides the pretreatment and infiltration (recharge) in one device.

Many site infiltration practices try to infiltrate all the water and the low point of the site just prior to connection with the municipal storm drain system. This is not the same as predevelopment infiltration which is dispersed all over the site. Centralized infiltration can be problematic since the storm sewer is too deep, requiring an outlet control device to back up water upstream to get the required infiltration volume. Centralized infiltration can cause groundwater mounding and sealing of pores reducing infiltration capacity.

LID practices promote more infiltration at the source. HydroFilter can be considered an LID practice since the intention is to promote dispersed infiltration around the site at each inlet which is a more holistic approach to maintenance of the hydrologic cycle.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. This is especially true of any stormwater treatment practice that includes infiltration such as HydroFilter. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroFilter is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroFilter.

Hydroworks® HydroFilter Operation

The Hydroworks HydroFilter (HF) is a LID device since it promotes the maintenance of the hydrologic cycle. Unlike many infiltration systems however, HydroFilter was designed for dispersed infiltration around the site, such as inlets or catch basins.

Under normal or low flows, water enters the structure through a grate or inlet. Incoming water builds up around the filters and creates head to drive water radially into the filter cartridges from the outside through to the center of the cartridge. There is a 6" (150mm)



diameter open center that runs through the center of each cartridge. Water reaching the center opening falls by gravity into the base plug and is conveyed out of the structure by a pipe(s) into the surrounding ground to be exfiltrated (Figure 1). A solid cone with an air port is placed on top of the top filter cartridge to prevent incoming water from entering the 6" (150 mm) diameter opening without passing through the filter.

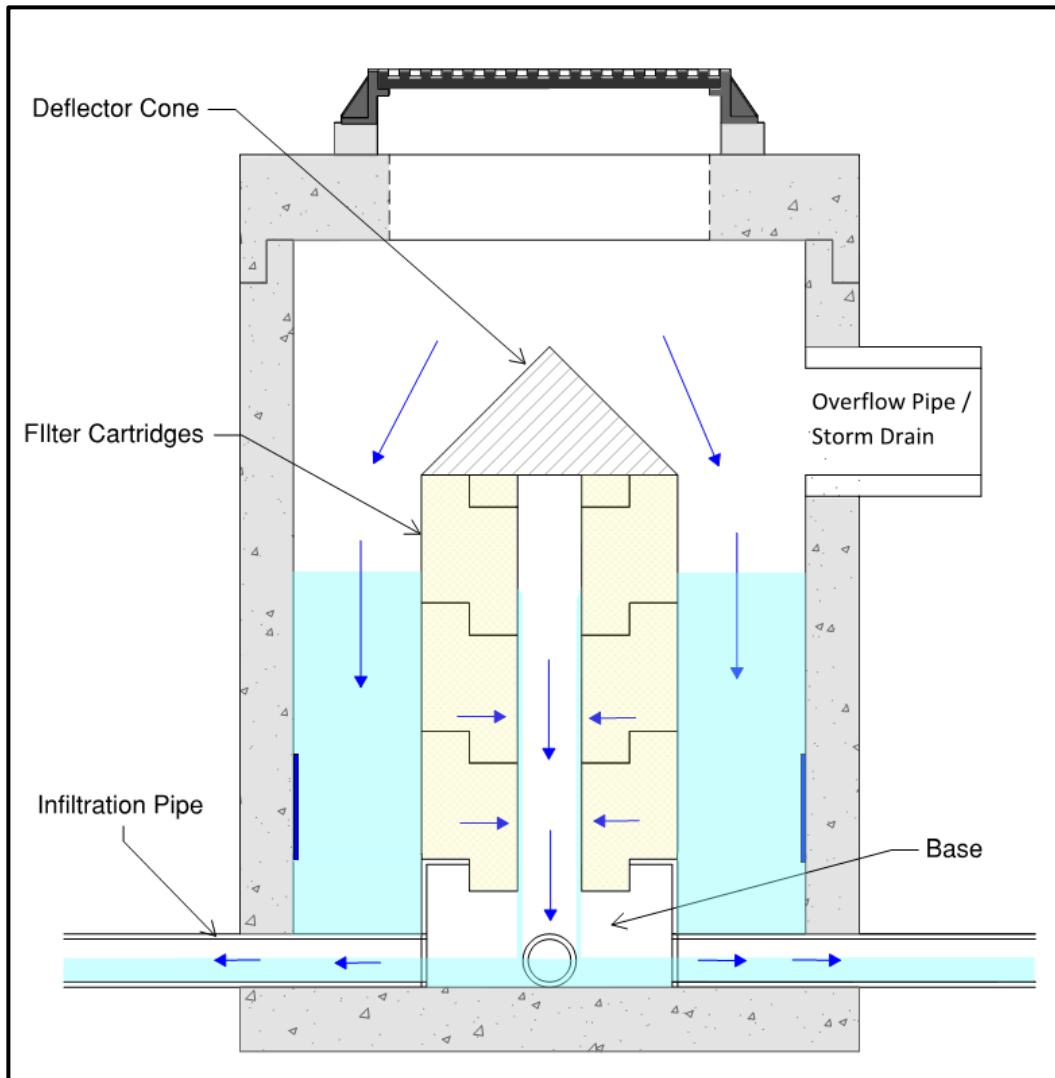


Figure 1. Hydroworks HydroFilter Operation – Low Flow

The exfiltration pipes can be surrounded by crushed stone to increase the volume of water to be exfiltrated back into the ground.

If the flow rate into the structure exceeds the flow capacity of the filter cartridges or infiltration storage capacity around the infiltration pipes water will overflow into the downstream storm drain.

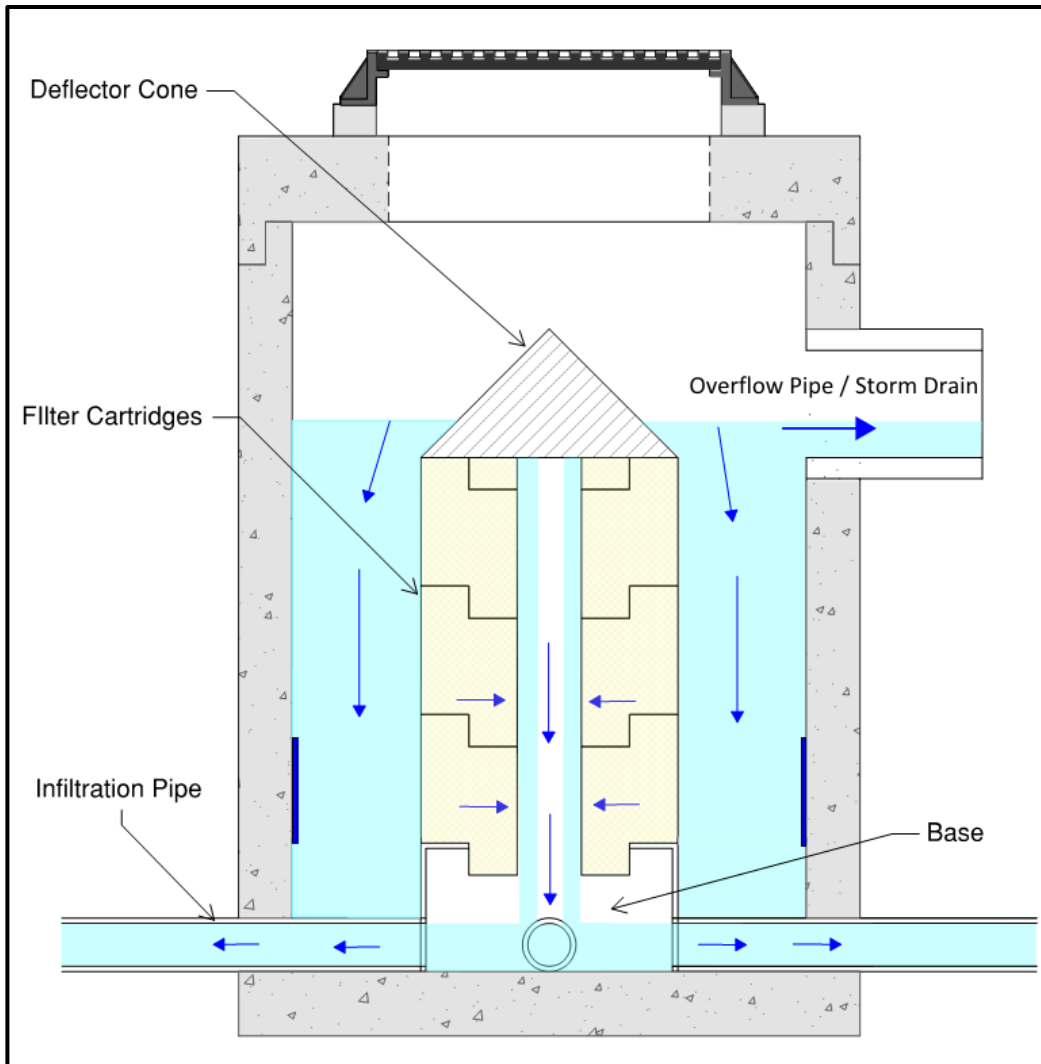


Figure 2. Hydroworks HydroFilter Operation – Bypass

It should be noted that the Hydrofilter can come in many configurations (round or square or rectangular structures) with one or two or more cartridges in a stack and one or more stacks per structure. Therefore, the configuration of the HydroFilter varies depending of the flow rate to be treated and volume of water to be infiltrated.

Inspection

Procedure

The HydroFilter should be inspected 24 hours after rainfall. Inspection within 6 hrs of rainfall may not provide useful information regarding maintenance since the unit may be draining down.

If the structure has not drained down to the base (bottom of lowest filter cartridge) within 24 h of the last rainfall, the HydroFilter likely requires maintenance.

In the event of standing water in the structure around the cartridges the cone should be removed from a stack of cartridges. If standing water is visible in the central core of the filter stack consistent with the level of water on the outside of the filter stack this is indicative of a high ground water or slow infiltration and not required filter maintenance.

However, if the water level in the central cartridge is below the bottom of the lowest filter cartridge with standing water around the filter cartridges then filter maintenance is required.

Frequency

Construction Period

The filter cartridges **should not** be installed in the HydroFilter during the construction period since construction sediment will prematurely plug the cartridges requiring excessive maintenance during the construction period. A plate is installed in the base for the construction period to remind the contractor that the cartridges should only be installed for post construction operation. This plate needs to be removed when the cartridges are installed for post development operation.

Post-Construction Period

The Hydroworks HydroFilter should be inspected twice during the first year of operation for normal stabilized sites (no exposed soil or materials storage). The initial inspections will indicate the required future frequency of inspection and maintenance if the unit was maintained and put into service (filters installed) after the construction period.

It is anticipated that the filter cartridges will need to be replaced annually. However, this will depend on pollutant loadings on the site and off-site activities (nearby construction, etc.). Filters are different from separators in that sediment levels at the bottom of a filter do not dictate maintenance frequency.



A filter does not need to be maintained until it's rated treatment rate decreases to the point where it can no longer provide the required annual percentage of pollutant removal. This is a hydraulic requirement that will depend on the hydrology (rainfall intensity distribution) and characteristics of the site (imperviousness, area, pollutant loading) being designed. That is why the frequency of cleaning is based on the presence of water after a storm since the flow rate is reduced indicating maintenance is required.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

1. Water/Sediment Removal

Maintenance involves removing the water and replacing the filter cartridges. In both cases, sediment that has been collected around the filter cartridges in the sump of the device must be removed. This is typically done by vacuum truck.

It is important to remove all sediment and water from the structure before trying to remove and replace the filter cartridges.

2. Filter Cartridge Replacement

Replacement of filter cartridges is made easy due to the modular nature of each cartridge. The cartridges are stacked vertically on top of each other. Each cartridge has a bell and spigot such that they fit together.



A lifting bar is located in the center of the 6" hollow center of each cartridge near the top of the cartridge. The top cone has a lifting ring on the top of it. Vertical stacks of filters should have an access opening in the structure directly above them or close to being directly above them.

A winch with a hook is lowered down to hook on to the cone lifting ring and the cone is winched out of the structure. Similarly, the winch is hooked under the lifting bar of each successive filter cartridge and they are winched out of the structure.

Fresh cartridges are similarly winched in stacking them as required ending each stack with a cone.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning if there is standing water around the cartridges. Disposal of the water will depend on local requirements. Disposal options for the decanted water may include:

1. Discharge into a nearby sanitary sewer manhole
2. Discharge into a nearby LID practice (grassed swale, bioretention)
3. Discharge through a filter bag into a downstream storm drain connection

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Disposal of the sediment/water removed from the structure will depend on local requirements.

Filter Cartridge Replenishment

Small HydroFilters with single stacks may be able to be replenished without replacement. Once the top cone is removed an inflatable pipe plug can be lowered through the central core created by the connected filters to the base and expanded at the bottom to seal the vertical core.

This vertical core or pipe can then be filled with clean water to backflush the filter forcing it to flow from the central core opening back through the filter to the outside of each filter cartridge. This backflush water can then be pumped or vacuumed from the structure with the central core still being full of water.



HYDROFILTER INSPECTION SHEET

Date _____
 Date of Last Inspection _____

Site _____
 City _____
 State _____
 Owner _____

GPS Coordinates _____

Date of last rainfall _____
 Depth of rainfall (last 24h) _____

Site Characteristics	Yes	No
Soil erosion evident	<input type="checkbox"/>	<input type="checkbox"/>
Exposed material storage on site	<input type="checkbox"/>	<input type="checkbox"/>
Large exposure to leaf litter (lots of trees)	<input type="checkbox"/>	<input type="checkbox"/>
High traffic (vehicle) area	<input type="checkbox"/>	<input type="checkbox"/>

HydroFilter	Yes	No
Standing water (above 12" base)	<input type="checkbox"/> *	<input type="checkbox"/>
Missing internal components	<input type="checkbox"/> **	<input type="checkbox"/>
Internal component damage (cracked, broken, loose pieces)	<input type="checkbox"/> **	<input type="checkbox"/>
Floating debris in the structure (oil, leaves, trash)	<input type="checkbox"/>	<input type="checkbox"/>
Concrete cracks/deficiencies	<input type="checkbox"/> ***	<input type="checkbox"/>
Exposed rebar	<input type="checkbox"/> **	<input type="checkbox"/>

* Maintenance required
 ** Repairs required
 *** Further investigation is required

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.





Hydroworks® HydroFilter

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroFilter to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the filter has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 257 Cox St., Roselle, NJ 07203 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroFilter are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroFilter, or the cost of other goods or services related to the purchase and installation of the HydroFilter. For this Limited Warranty to apply, the HydroFilter must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroFilter arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroFilter, whether the claim is based upon contract, tort, or other legal basis.