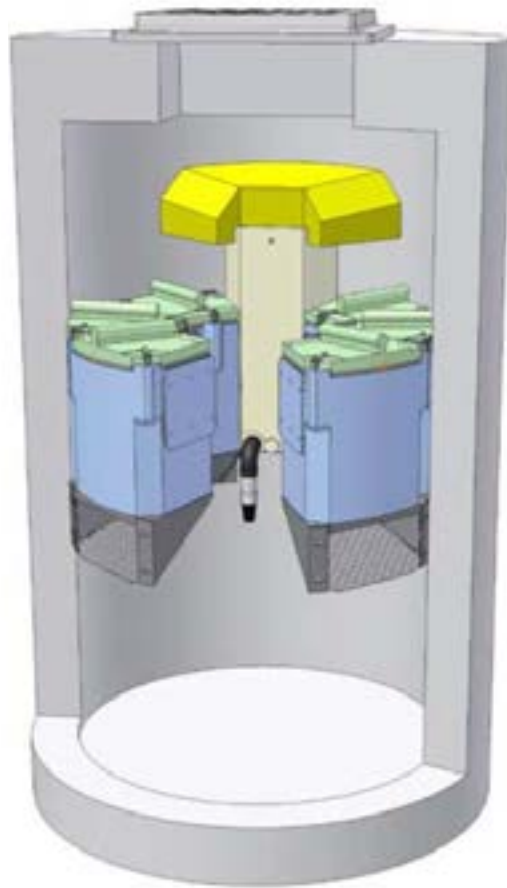


CIVILMART



Up-Flo™ Filter **STORMWATER TREATMENT SYSTEM**

OPERATION AND MAINTENANCE MANUAL



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1. Introduction

This document provides a review of the operation and maintenance requirements of the Civilmart Up-Flo™ Filter a Fluidized bed upflow filtration system.

The Up-Flo™ filter is manufactured exclusively by Civilmart for the Australian market under license from Hydro International plc. Hydro International is a world leader in the design of environmentally sustainable water treatment technology, with more than 30 years experience in the application of sustainable solutions for the control and treatment of stormwater and wastewater.

Further technical information is available from Civilmart Water Quality. All Up-Flo™ filter components comply generally with the following Australian Standards where relevant.

- AS3600-2001: Concrete Structures
- AS3996-1989: Loads on buried Concrete pipes
- AS3996-1992: Metal access covers, road grates and frames
- AS4058-1992: Precast concrete pipes (pressure and non-pressure)
- AS5100-2004: Bridge design, Part 2: Design loads
- AS5056-2005: Polyethylene and polypropylene pipes and fittings for drainage and sewer applications

1.1 Product Description

The Up-Flo™ filter is a modular high-rate stormwater filtration system targeting the removal of suspended solids, attached particulate pollutants, heavy metals, nutrients, hydrocarbons and gross pollutants.

The Up-Flo™ filter is a passive, modular proprietary up flow filtration system that incorporates multiple elements of a treatment train into a single, small-footprint device. The device uses a sedimentation sump and screening system to pre-treat stormwater runoff before it flows up through the filter media where final polishing via filtration occurs. A high-capacity, siphonic bypass safeguards against upstream flooding during high-flow events. The siphon also serves as a floatables baffle to prevent the escape of floatable gross pollutants from the Up-Flo™ chamber, refer to Figure 1.

UP-FLO FILTER COMPONENTS

1. Inlet Grate
2. Bypass Siphon with Floatables Baffle
3. Filter Module
4. Outlet Module
5. Media Pack
6. Angled Screen
7. Drain Down Assembly (not visible)
8. Sump

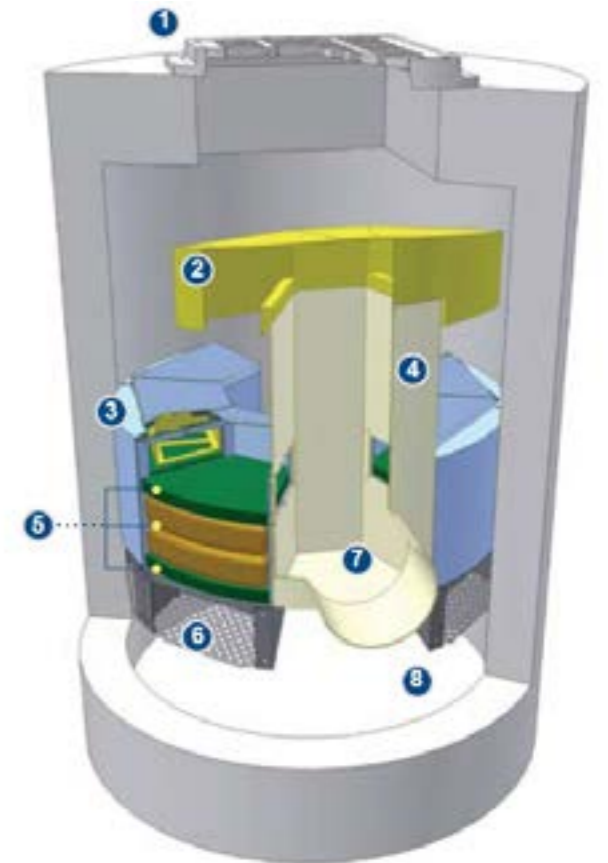


Figure 1: Up-Flo™ Filter Components

2.0 Operation

The Up-Flo™ filter operates on simple fluid dynamics it is self activating, having no moving parts, no external power requirements and is fabricated with durable non-corrosive components. Personnel are not required to operate the unit and maintenance is limited to periodic inspections, sedimentation and floatable removal.

The Up-Flo™ filter is designed to operate as a “treatment train” by incorporating multiple treatment technologies into a single device. Gross pollutants are removed by sedimentation and screening before they are introduced to the filter media. The Up-Flo™ filter is a wet sump device. Between storm events oils and floatables are stored on the water surface, see Figure 2. The high capacity bypass siphon acts as a floatable baffle to prevent washout of captured floatable pollutants during high-intensity events.

The Up-Flo™ filter has been designed to minimise the occurrence of clogging and blinding. The Up-Flo™ Filter employs a unique Drain Down design that allows the water level in the chamber to drop below the filter media between events. The Drain Down mechanism creates a reverse flow that flushes captured pollutants off the surface of the filter bag, helping to prevent blinding. By allowing the water to drain out, the Drain Down mechanism also reduces the weight of the filter bags. This makes the bag easier and safer to remove during maintenance.

The angled screens are designed to prevent clogging and blinding, the screens are situated below the filter modules, sheltering them from the direct flow path of the influent. Coarse pollutants settle in the sump before the runoff flows up through the screen, protecting them from blinding. In the unlikely event of a blockage, the high rate siphonic bypass is designed to convey high enough flow that large storm events will not create upstream flooding.

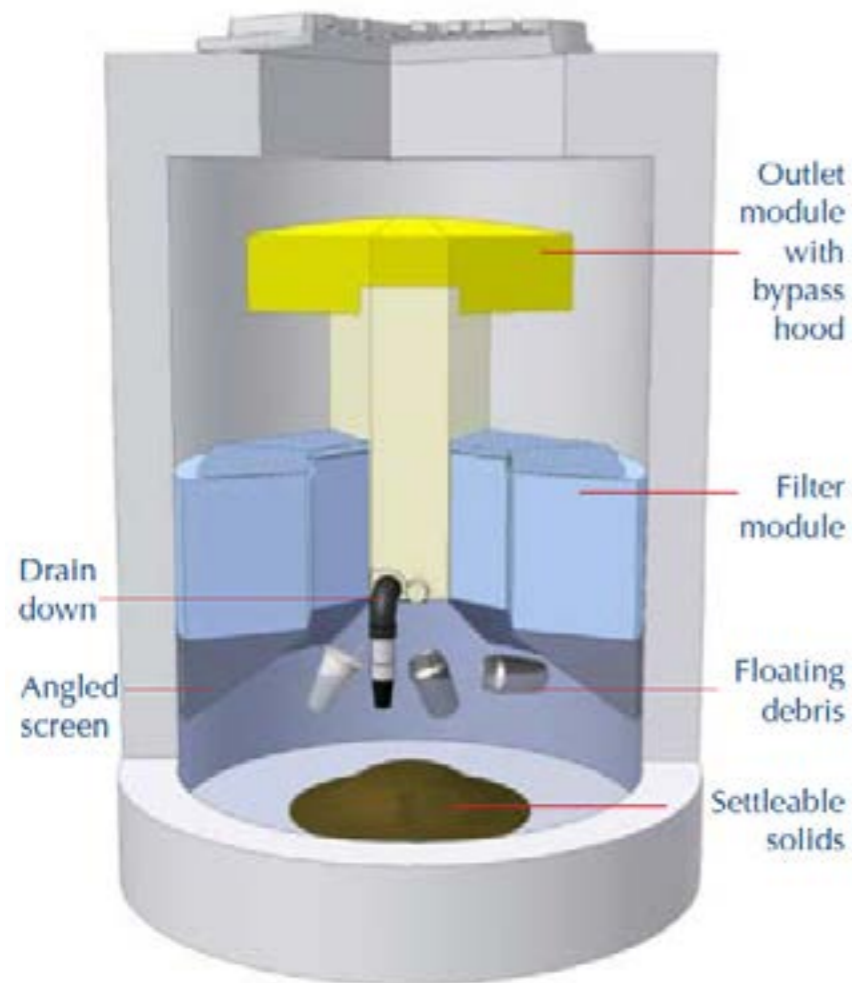


Figure 2: Captured pollutants in the Up-Flo™

3.0 Maintenance

3.1 Overview

The Up-Flo™ filter protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the proper functioning of the Up-Flo™ Filter.

The Up-Flo™ Filter design allows for easy and safe inspection, monitoring and clean out procedures. It has a wide central opening between the Filter Modules for easy and comfortable access to all of the components (refer figure 3). Completion of all the maintenance activates for a typical manhole filter takes less than an hour.

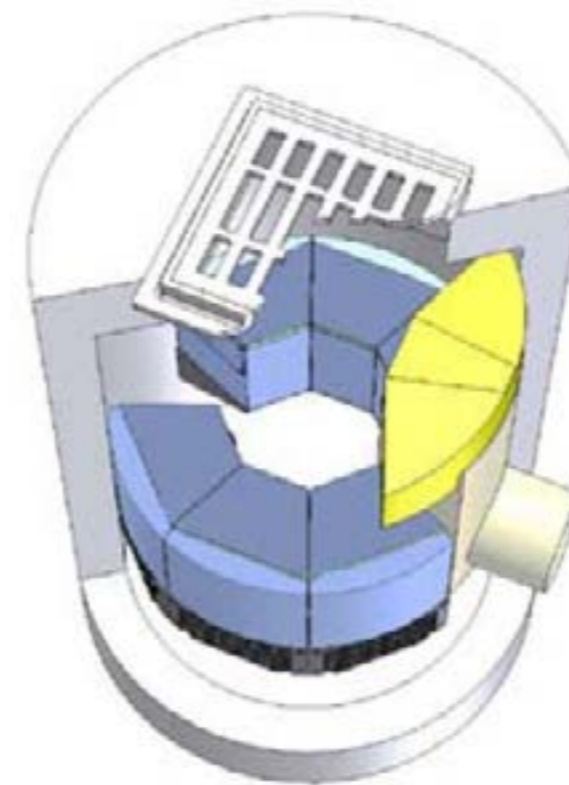


Figure 3: Captured pollutants in the Up-Flo™

Maintenance activities include inspection, floatable removal, oil removal, sediment removal, Media pack replacement, and Drain Down Filter replacement. Maintenance intervals are determined from monitoring the Up-Flo™ Filter during its first year of operation. Depending on the site, some maintenance activities may have to be performed on a more frequent basis than others. In the case of inspection and floatable removal, a suction truck is not required. Otherwise, a suction truck is normally required for oil removal, removal of sediment from the sump, and replacement of Media Packs and Drain Down Filter. In most cases, entry into the Up-Flo™ Filter chamber is required for replacement of Media Packs and Drain downs Filter, and OH&S Confined Space Entry procedures will have to be followed.

Media Packs should not be installed in the modules until construction activities are completed and site stabilization is effective.

3.2 First Year Monitoring

Civilmart recommend that inspections be performed at least every six months during the first year of operation. Use the following guidelines for determining maintenance intervals:

- Floatables and Oil Monitoring:** The water surface in the Up-Flo™ Filter should be monitored for accumulation of floatables and oil. Floatables should not be allowed to accumulate to the point where they completely cover the surface of the water. Oil should not be allowed to accumulate to the point where it has formed a measurable thickness on the surface of the water. The rate of floatables and oil accumulation can be established by dividing the surface area covered by floatables and oil by the number of months since the Up-Flo™ Filter was installed.
- Sediment monitoring:** A simple probe, such as the Sludge Judge®, should be used to determine the depth of sediment in the sump. The maximum allowable sediment depth in a typical 1200mm diameter Up-Flo™ Filter is 450mm (this may vary, refer to Project Specific Product Drawing). In any case, the sediment must be removed before it blocks the inlet to the Drain Down Filter. The rate of sediment accumulation can be estimated by dividing the measured depth of sediment by the number of months since the Up-Flo™ Filter was installed.
- Media Pack monitoring:** Filter Bags should be weighed to determine the amount of particles that have been captured in the bags. Filter bags from one or two modules should be weighed. Spent filter bags weigh approximately 20 kgs. The rate of filter bag clogging can be estimated by subtracting the wet weight of a new bag (approximately 10 kgs) from the measured wet weight of the bags being checked and dividing by the number of months since the bags were installed.
- Drain Down Filter Monitoring:** The water level in the Up-Flo™ Filter should be monitored to ensure that the Drain Down filter should be monitored to ensure that the Drain Down Filter is operating properly. One to two days after a significant rainfall the water level inside the vessel should have dropped to a point where it is equal with the base of the Filter Modules. If the water level has not reached that point, then the Drain Down Filter has either become clogged or blinded by pollutants. If there is no evidence of clogging around the Drain Down Filter inlet, then it has likely clogged with particles. The rate of Drain Down Filter clogging can be estimated by noting the number of months since the Up-Flo™ Filter was installed.

Civilmart recommends a maximum maintenance interval of one year for all maintenance activities but, based on the first year monitoring, a shorter maintenance interval for some maintenance activities may be appropriate.

3.3 Inspection

Inspection is a simple process that requires monitoring pollutant accumulations. Maintenance crews should be familiar with Up-Flo™ Filter and its components prior to inspection.

3.3.1 Scheduling

Inspection may be conducted year round but should occur shortly after a predicted rainfall to ensure components are operating properly.

3.3.2 Recommended Equipment

- Safety Equipment and Personnel Protective Equipment (traffic cones, work gloves, steel cap boots, etc.)
- Scale to measure the weight of filter bags
- Appropriate lifting equipment to remove lids (Gatic Lifters etc.)
- Pole with Skimmer or net
- Sediment probe (such as Sludge Judge®)
- Up-Flo Filter Maintenance Log
- Rubbish bags for removed floatables

3.3.3 Inspection Procedures

1. Set up necessary safety equipment (such as traffic cones) to provide access to the Up-Flo Filter. Safety equipment should notify pedestrians and road traffic that work is being done.
2. Remove the cover of grate to allow access to the chamber.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities, see Figure 4 for typical inspection view.

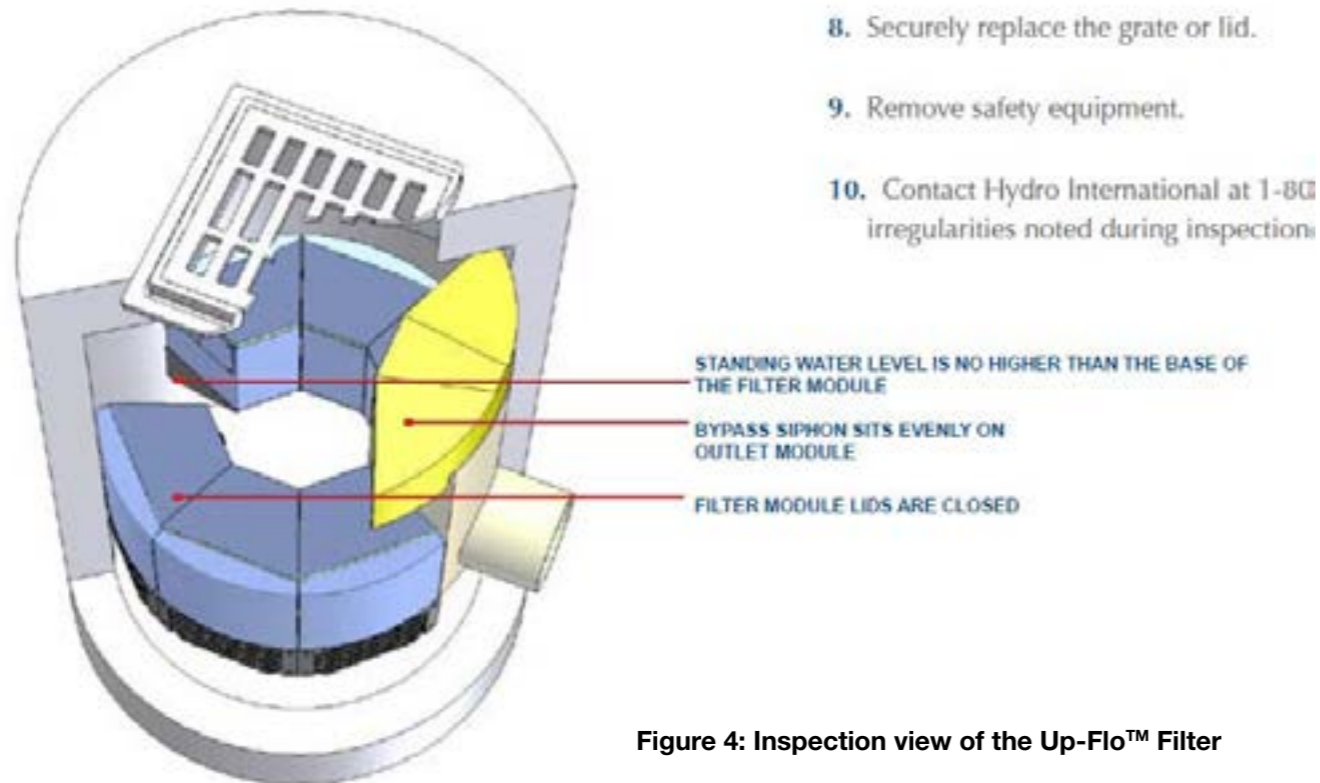


Figure 4: Inspection view of the Up-Flo™ Filter

4. Without entering the chamber, use the pole with skimmer net to remove floatables and loose debris from the chamber.
5. Using a sediment probe such as the Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel. Maximum depth of 450mm (this depth may vary, refer to project specific product drawings).
6. Remove the Filter Module lid by turning the Cam latches and remove the Filter Media Pack (refer to Replacement Procedures). Weigh the filter bags from one or two modules. Filter bags should be replaced if the wet weight exceeds 18 kgs.
7. On the maintenance log provided, record the date, unit location, estimated volume of floatables and gross pollutants removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or high standing water level (see Figure 4 for the standing water level).
8. Securely replace the grate or cover.
9. Remove safety equipment

3.4 Floatables, oil and Sump Cleanout

A vacuum induction truck is required for the removal of captured sediment, oil and floatables, refer to figure 5.

Floatables and loose debris can also be removed using a skimmer and pole as previously mentioned.

3.4.1 Scheduling

Floatables and sump cleanout may typically be done during any time of the year. Floatables and sump cleanout should occur as soon as possible following a contaminated spill in the contributing drainage area.

3.4.2 Recommended Equipment

- Safety Equipment and Personnel Protective Equipment (traffic cones, work gloves, steel cap boots, etc.)
- Appropriate lifting equipment to remove lids (Gatic Lifters etc.)
- Pole with Skimmer or net
- Sediment probe (such as Sludge Judge®)
- Vacuum Induction Truck with flexible hose connections
- Water pressure cleaning equipment or other screen cleaning devices
- Up-Flo™ Filter Maintenance Log
- Rubbish bags for removed floatables

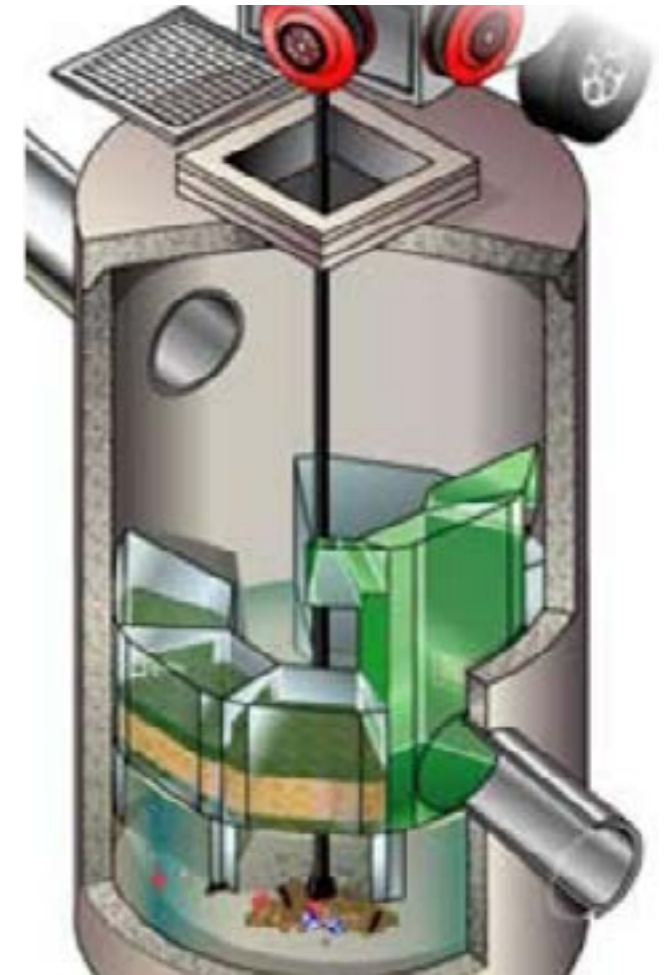


Figure 5: Sediment is removed via Vacuum Induction

3.4.3 Floatables, oil and Sump Cleaning Procedures

1. Set up necessary safety equipment (such as traffic cones) to provide access to the Up-Flo™ Filter. Safety equipment should notify pedestrians and road traffic that work is being done.
2. Remove the cover of grate to allow access to the chamber.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities, see Figure 4 for typical inspection view.
4. If the standing water level of the sump is above the base of the filter modules (see Figure 4), tug the Pull Chain(s) to release the Drain Down Plug(s). Allow the excess water to drain out of the chamber.
5. Use the skimmer pole to fit the Drain Down plug back into the open port.
6. Once all floatables and oil have been removed, drop the vacuum hose to the base of the sump. Vacuum out the sediment and gross pollutants from the sump floor. Approximately 1 m³ of sediment and water will be removed from a typical Up-Flo™ Filter chamber during this process.
7. Retract the Vacuum hose from the chamber.
8. Inspect the Angled Screen for blockages and ragging. If present, remove the obstruction or ragging materials from the surface using a hose or other screen cleaning devices.
9. On the maintenance log provided record the date, unit location, estimated volume of floatables, oils, and gross pollutants removed, and the depth of sediment measured. Note any apparent irregularities such as damaged components or blockages.
10. Securely replace the grate or cover.
11. Remove safety equipment
12. Dispose of sediment and gross pollutants at your local landfill, following local regulations.
13. Dispose of oil and sump water at a licensed water treatment facility, following local authorizes regulations

3.5 Replacement of Media Packs and Drain Down Filter

Unless the Up-Flo™ Filter has been installed as a very shallow unit, it is necessary to have an OH&S confined space entry trained person to enter the chamber to replace Media Packs.

3.5.1 Scheduling

Call Civilmart to order replacement Media Packs and Drain Down filter prior to scheduling maintenance. Because Media Pack replacement required entry into the Up-Flo™ chamber, maintenance events should be scheduled during dry weather. Media Pack replacement should occur immediately after a contaminated spill in the contributing drainage area.

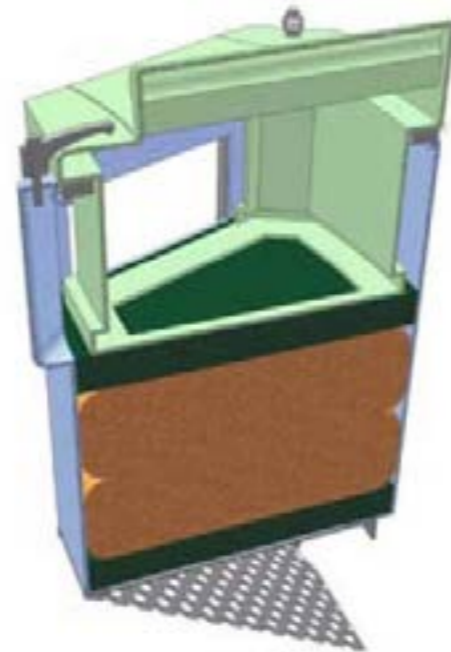


Figure 6: Cut-away view of the Filter Module

3.5.2 Recommended Equipment

- Safety Equipment and Personnel Protective Equipment (traffic cones, work gloves, steel cap boots, etc.)
- Appropriate lifting equipment to remove lids (Gatic Lifters etc.)
- Pole with Skimmer or net
- Sediment probe (such as Sludge Judge®)
- Vacuum Induction Truck with flexible hose connections
- OH&S Confined Space Entry Equipment
- Up-Flo™ Filter Replacement Media Packs (available from Civilmart)
- Replacement Drain Down Filter components supplied by Civilmart.
- Water pressure cleaning equipment or other screen cleaning devices
- Up-Flo™ Filter Maintenance Log
- Rubbish bags for removed floatables
- Screwdriver (flat head)

3.5.3 Media Pack and Drain Down Filter Replacement Procedures

1. Following Floatables and Sump Cleanout Procedures, Steps 1 to 10.
2. Following OH&S Confined Space Entry procedures, enter the Up-Flo™ Filter Chamber.
3. Open the Filter Modules by turning the three cam latches on the front and sides of the module. Remove the lid (1) to gain access to the Media Pack, refer Figure 6.
4. Remove and discard the spent Media Pack. The Media Pack contents include:
 - A top layer of green (2) Flow-Distributing Media.
 - Two (2) Media Bags (3) equipped with nylon handles.
 - A bottom layer of green (2) Flow-Distributing Media.

1. FILTER MODULE COVER AND MEDIA RESTRAINT
2. FLOW-DISTRIBUTING MEDIA
3. FILTER MEDIA BAGS
4. REPLACEABLE MEDIA PACK
5. CAM LATCH
6. CONVEYANCE CHANNEL
7. FILTER MODULE
8. SUPPORT BRACKET / ANGLED SCREEN

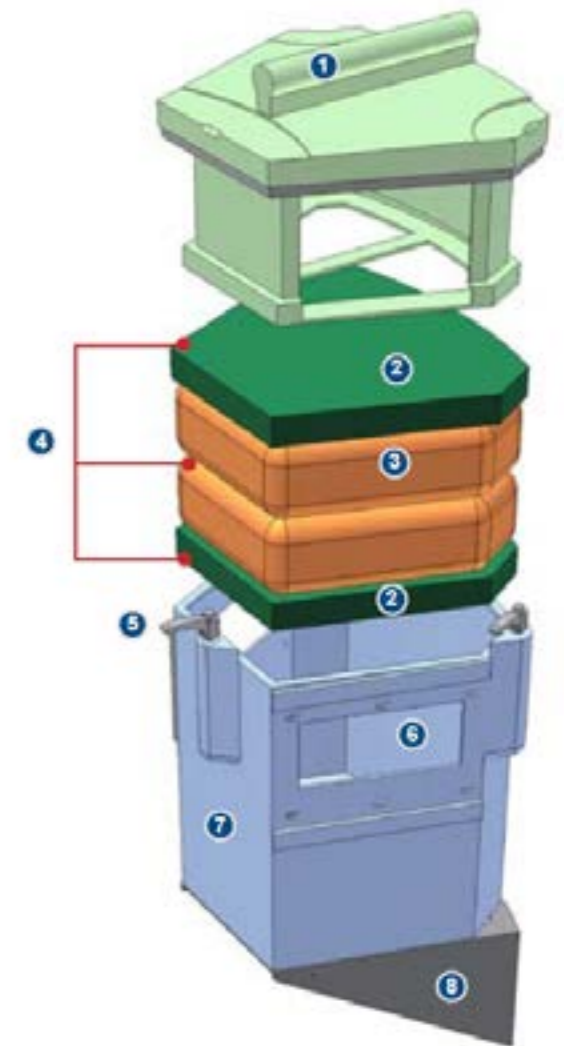


Figure 7: The Filter Module houses the Media Restraint and the Media Pack

4.0 Maintenance at a Glance

5. Insert a new Media Pack Supplied by Civilmart.
 - First, insert a bottom layer of green Flo-Distribution Media. Be sure that the media sits snugly and level at the bottom of the Filter Module.
 - Next, insert the first of two (2) replacement Media Bags, smooth the bag out with your hands to make sure that the bag extends snugly to the walls and corners of the Filter Module.
 - Insert the second Media Bag, following the same procedure.
 - Insert the top layer of green Flow Distribution Media. Be sure that the piece fits snugly against the walls and corners of the Filter Module.
 - Put the lid on and secure the three latches. Check to make sure that the latches are closed properly.
6. Use a screwdriver to unscrew the Drain Down from the face of the Outlet Module (see figure 8). DO NOT DISCARD THIS PIECE.
7. Install new Drain Down Filter supplied by Civilmart.
8. Exit the Up-Flo™ Filter chamber and securely replace the great of cover.
9. On the Maintenance Log Provided, record the date, unit location, estimated volume of floatables, oil and gross pollutants removed, and the depth of sediment measured. Note the number of filter Media Packs replaced. Note any irregularities such as damaged components or blockages.
10. Remove safety equipment
11. Dispose of spent Media Packs at your landfill, following local regulations.
12. Return the spent Drain Down Filter to Civilmart.
13. Contact Civilmart on 131 004 to discuss any irregularities noted during inspection.

ACTIVITY	FREQUENCY
Inspection	<ul style="list-style-type: none"> • Regularly during first year of installation • Every 6 months after the first year of installation
Floatables/Oils Removal	<ul style="list-style-type: none"> • Twice per year or as needed • Following a contaminated spill in the drainage area
Sediment Removal	<ul style="list-style-type: none"> • Twice per year or as needed • Following a contaminated spill in the drainage area
Media Pack Replacement	<ul style="list-style-type: none"> • Once per year or as needed • Following a contaminated spill in the drainage area
Drain Down Filter Replacement	<ul style="list-style-type: none"> • Once per year with Media Pack Replacement • As needed, in the event of continuous base flow conditions



1. DRAIN DOWN FILTER
2. DRAIN DOWN PLUG
3. PULL CHAIN FOR DRAIN DOWN

Figure 8: Drain Down Filter

5.0 Up-Flo Filter Installation Log

Civilmart Reference Number:		
Site Name:		
Site Location:		
Installation date:	Configuration:	Number of Up-Flo™ Filter Modules:
Owner:	Contractor:	
Contact Name:	Contact Name:	
Company Name:	Company Name:	
Address:	Address:	
Telephone:	Telephone:	
Fax:	Fax:	

6.0 Up-Flo™ Filter Inspection and Maintenance Log

Date	Initials	Area/Depth of Floatables and Oil	Sediment Depth	Volume of Sediment Removed	Number of Media Packs Replaced	Site Activities and Comments



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Civilmart Brisbane	07 3800 7855
Civilmart Gold Coast	07 5597 6966
Civilmart Toowoomba Tanks	07 4634 3860
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Civilmart CM Stapylton	07 3804 6622
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Civilmart Sydney	02 9612 5800
Civilmart Central Coast	02 4355 6300
Civilmart Mittagong	02 4889 6000
Civilmart Grafton	02 6640 1800

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Civilmart Geelong	03 5274 1126
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