

DO NOT SCALE OFF THIS DRAWING

NOTES

1. The contractor is responsible for verifying all size & setting out dimensions before commencing work.
2. This drawing is to be used in conjunction with all relevant Architectural and M&E drawings.
3. All dimensions in millimetres unless stated otherwise.

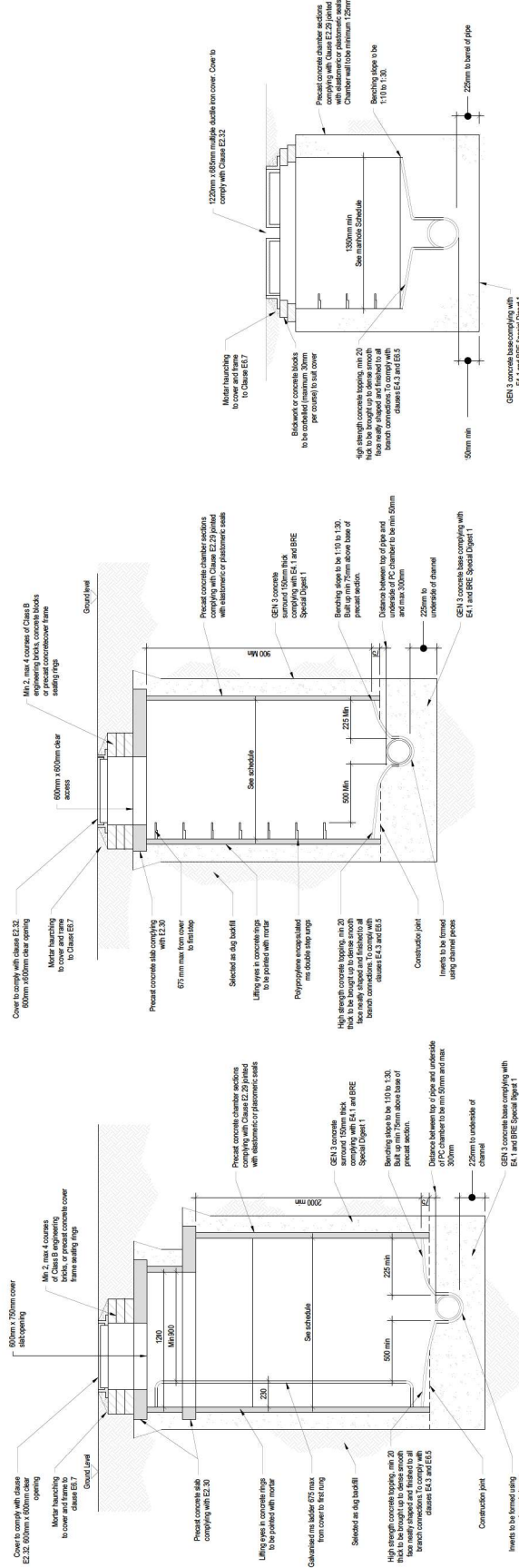


FIG B 24 - TYPE A1 MANHOLE - SECTION

FIG B 10 - TYPE B MANHOLE - SECTION

FIG B 15 - TYPE C MANHOLE - SECTION

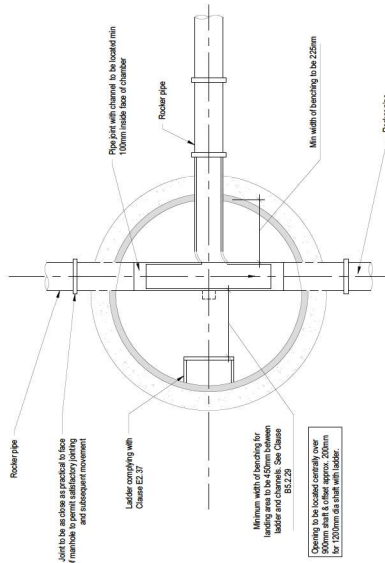


FIG B 24 - TYPE A1 MANHOLE - PLAN
DEPTH TO SOFFIT: 3.0m to 6.0m
SEE SCHEDULE FOR DIMENSIONS AND GA FOR CONNECTIONS

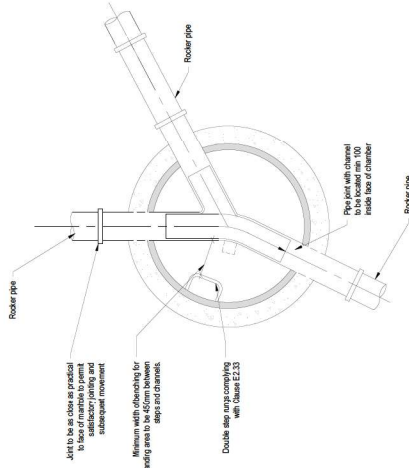


FIG B 10 - TYPE B MANHOLE - PLAN
DEPTH TO SOFFIT: 1.5m to 3.0m
SEE SCHEDULE FOR DIMENSIONS AND GA FOR CONNECTIONS

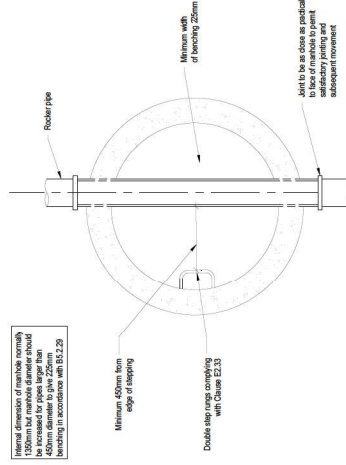


FIG B 15 - TYPE C MANHOLE - PLAN
DEPTH TO SOFFIT: LESS THAN 1.5m
SEE SCHEDULE FOR DIMENSIONS AND GA FOR CONNECTIONS

No	Comment	Revision No	By	Check	Date
1	ISSUED FOR APPROVAL	1	18	19	19/05/2020

APPROVAL

BELLWAY SOUTH LONDON

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Project
CLOVER FIELDS

Drawing Title
PROPOSED DRAINAGE DETAILS

SHEET 1

RWCL Internal Register reference: 0601-002
Scale: @ A1
5005-A01

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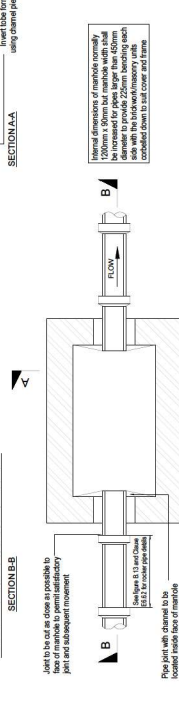
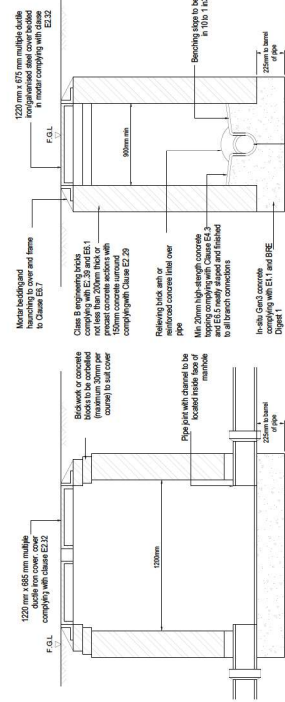
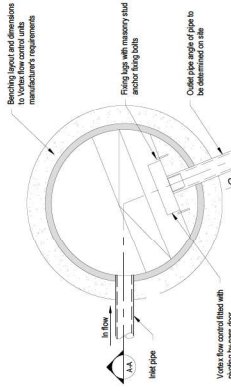


FIG B33 - ALTERNATIVE TYPE C MANHOLE - PLAN

DEPTH TO SOFFIT: LESS THAN 1.5m

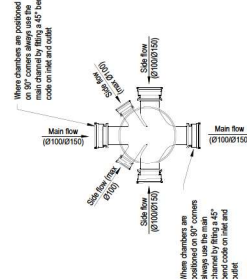
FLOW CONTROL CHAMBER - SECTION A-A

To manufacturer's requirements



FLOW CONTROL CHAMBER - PLAN VIEW

Scale: 1:20



Ø450 PPIC PLAN
Ø750 MAIN CHANNEL MAX 2 NO. (Ø700 & Ø150)
SIDE CONNECTIONS ON EACH SIDE
(Please state height for all branch connections)

FIGURE B42 - TYPE E - TYPICAL INSPECTION CHAMBER DETAIL

For 450mm diameter chambers in depth from cover level to soffit of pipe up to 2m flexible material construction

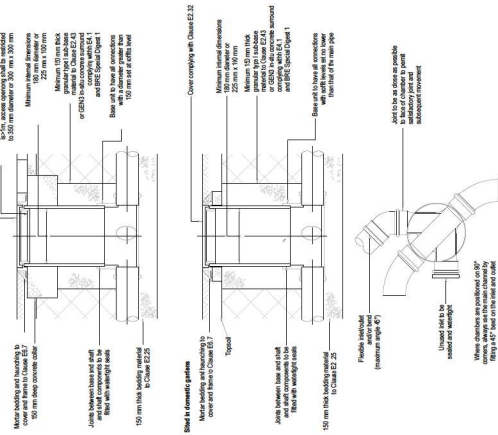
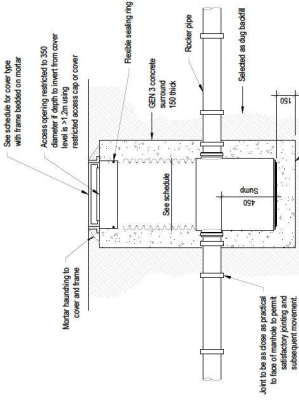


FIGURE B42 - TYPE E - TYPICAL INSPECTION CHAMBER DETAIL

For 450mm diameter chambers in depth from cover level to soffit of pipe up to 2m flexible material construction



TYPICAL PRECAST CONCRETE CATCHPIT DETAIL

TYPICAL PLASTIC INSPECTION CHAMBER - CATCHPIT

Scale: 1:20

Downloaded from heavy traffic areas only. Max. 10m.

GEN 3 concrete base minimum 150mm thick and 150mm deep. Place chamber in position and level in order that it takes the shape of the chamber case.

Joint to be as close as possible to face of manhole to permit satisfactory pointing and subsequent movement.

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Hydro-Brake® Vortex Flow Control

Reduce Storage Needs by Controlling Flow.

Product Profile

The Hydro-Brake® Vortex Flow Control is a versatile, self-activating device with a unique geometry designed to harness the energy of vortex flow.

The Hydro-Brake® is used to maximize savings on new construction projects by minimizing stormwater detention volumes. Also an economical retrofit solution, the Hydro-Brake® can be installed in over-discharging ponds and catch basins to restrict the outflow without requiring the construction of additional detention volumes.

With large openings that guard against blockages and an installation base upwards of 25,000 units, the Hydro-Brake® is a trusted and proven solution used to reduce the rate of stormwater runoff.

How it Works

The Hydro-Brake® operates on simple fluid hydraulics. Flow enters the volute tangentially through the inlet. Under low flow conditions, the Hydro-Brake® acts as a large orifice and water passes directly from the inlet to the outlet (Fig.1a).

As flow increases and reaches the Flush-Flo™ point, high peripheral velocities initiate the throttling action. As head increases, the valve approaches the Switch-Flo™ and Kick-Flo™ points and an air-filled core starts to form in the volute. As head continues to increase, the air core fully stabilizes and the valve discharge is throttled to that of a smaller orifice (Fig.1b).

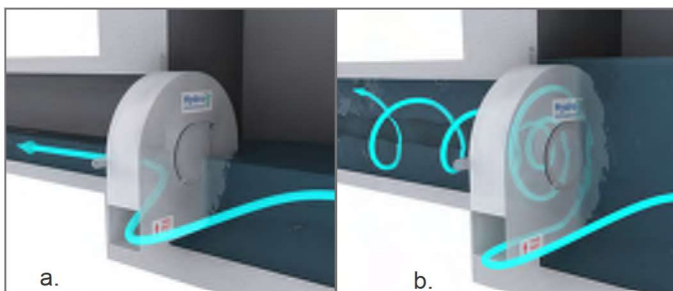


Fig.1 The Hydro-Brake® operates like (a) a large orifice under low flow conditions, and (b) a small orifice under higher flow / higher head conditions when a vortex air core forms within the device and throttles the flow.

Applications

- Outlet flow control for stormwater detention
- Outlet flow control for dams and flood reservoirs
- Reduction of runoff volume from sites
- “Blue roof” stormwater detention schemes
- Erosion control and energy dissipation

Advantages

- Reduced stormwater storage volumes by up to 40%
- Up to 50% savings in project storage costs
- Self-activating with no moving parts or power requirements
- Available in wall-mounted or floor-mounted geometries
- Area of opening is 3-6 times larger than the equivalent orifice
- Virtually maintenance free
- Proven performance with over 25,000 installations worldwide

The Hydro-Brake® Vortex Flow Control optimizes flow control to allow for higher discharge rates at lower heads than conventional flow control options. The head/discharge curves shown below illustrate the behavior of a Hydro-Brake® Vortex Flow Control compared to an orifice (Fig.2).

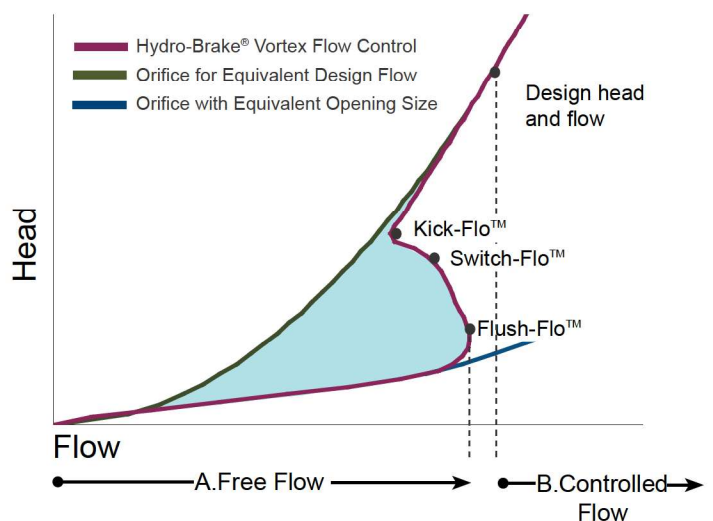


Fig.2 The characteristic of the Hydro-Brake® vs. an equivalent orifice.

Hydro-Brake® Vortex Flow Control

Sizing & Design

Three series of Hydro-Brake® Vortex Flow Controls are available to suit various applications and design constraints. Refer to the Hydro-Brake® Design Chart for typical sizing guidelines (Table 1).

Table 1. Hydro-Brake® Vortex Flow Control design chart.

Series	S Series	V Series	C Series
Typical Geometry			
Models	SH STH SXH SMH SMXH	SV SXV SMV	C CX CH
Typical Applications	- Flow control at the inlet of the storm drain system - Outlet flow control for stormwater detention systems	- Erosion control & energy dissipation - Roof runoff control for "Blue Roof" detention schemes	- Outlet flow control for flood dams and levees - Outlet flow control for stormwater detention systems
Typical Mount Style	Wall Mount	Downspout/Roof Mount Floor Mount Pipe Mount	Floor Mount
Typical Diameter Range*	2 - 16 in (5 - 41 cm)	2 - 16 in (5 - 41 cm)	3 - 20 in (7.5 - 51 cm)
Typical Flow Range**	0.05 - 5.6 cfs (1 - 157 L/s)	0.05 - 6.0 cfs (1 - 174 L/s)	0.18 - 14.3 cfs (5.3 - 405 L/s)

*Listed diameter ranges are typical guidelines only. Hydro-Brake® Vortex Flow Controls can be manufactured to any specified diameter up to 6'.

**Flow ranges listed are for 4' - 6.5' of head.

Contact Hydro International for site-specific sizing and design requirements.

Optional Design Accessories

Pivoting Bypass Door



For maintenance access to the outlet pipe.

Curved Backplate



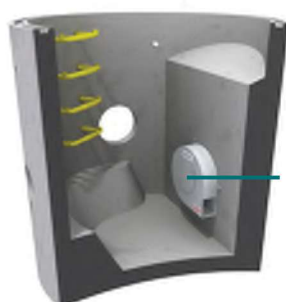
To allow for flush-mounting to the wall of a round manhole.

Vortex Suppressor Pipe

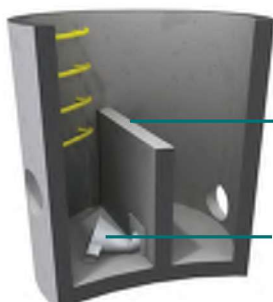


To eliminate air core for emergency bypass.

Typical Chamber Configurations



Wall Mounted SXH Model for Catch Basin Inlet Control



Large Storm Bypass Weir
Floor Mounted CH Model for Small Storm Flow Control



Pipe Mounted SXV Model for Energy & Velocity Dissipation

Hydro International Warranty, Maintenance and COSHH Statement

This statement covers all Hydro International Hydro-Brake® Optimum, Hydro-Brake® and S-Type Vortex Flow Control units (hereafter referred to as “Flow Control”).

Defects Liability Period Warranty

The standard Hydro International warranty covers products for one year from date of purchase and will only be considered for those defects or faults reported directly to Hydro International in writing. Warranties will not be considered for defects or faults caused by accident, acts of vandalism or unauthorised repair/rectification. Please Contact Hydro International for product specific details.

Maintenance

Normally, little maintenance is required as there are no moving parts within the Flow Control. Experience has shown that if blockages occur they do so at the intake, and the cause on such occasions has been due to a lack of attention to engineering detail such as approach velocities being too low, inadequate benching, or the use of units below the minimum recommended size. The Flow Control (where applicable) is fitted with a pivoting bypass door, which allows the manhole chamber to be drained down should blockage occur. The smaller conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

Following installation of the Flow Control it is vitally important that any extraneous material ie. building materials are removed from the unit and the chamber. After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. If problems are experienced, please do not hesitate to contact the company so that an investigation may be made.

All Flow Control units are typically manufactured from grade 304 Stainless Steel, and if required they can also be manufactured in grade 316 Stainless Steel. Both materials have an estimated life span in excess of the design life of drainage systems.

COSHH

Flow Control units are manufactured from Stainless Steel, which is not regarded as hazardous to health and exhibits no chemical hazard when used under normal circumstances for the stated applications.

Manual Handling

The handling of Flow Control units should be in accordance with the current legislation and regulations:

- The Health and Safety at Work Act 1972
- The Management of Health and Safety at Work Regulations 1999
- The Manual Handling Operations Regulations 1992. All published and printed by the Health and Safety Executive.

Downstream Defender® Advanced Hydrodynamic Vortex Separator

The Downstream Defender® is an advanced hydrodynamic vortex separator for the effective and reliable removal of fine particles, oils and other floatable debris from surface water runoff.

Its innovative design delivers high efficiency across a wide range of flows in a much smaller footprint than conventional or other swirl-type devices and it is the perfect choice for any catchment likely to convey high quantities of contamination.

1. Access for removal of floatables and sediments.
2. Inlet pipe.
3. Inlet chute.
4. Centre shaft.
5. Dip plate.
6. Centre cone.
7. Benching skirt.
8. Floatables and oil storage.
9. Isolated sediment storage zone.
10. Outlet pipe.

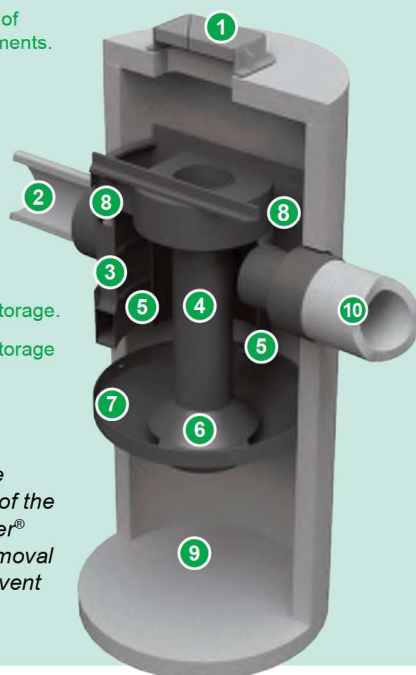


Figure 1 - The unique internal components of the Downstream Defender® enhance pollutant removal performance and prevent wash out.

Unique Flow Modifying Components

The Downstream Defender® consists of a choice of concrete or HDPE chamber with unique flow modifying internal components. It is these internal components that differentiate the Downstream Defender® from catchpits, sedimentation basins or sedimentation sumps. They facilitate advanced hydrodynamic vortex separation by reducing turbulence, lengthening the flow path to increase chamber residence time and introducing shear planes.

The internal components also ensure that the pollutant storage zones are isolated and protected from high flows that could cause pollutant re-entrainment or wash out.

Compared to devices that have poorly designed internal components, the Downstream Defender® captures and retains more of the annual pollutant load.

Watch a short video showing the Downstream Defender® components and operation at:

<http://www.hydro-int.com/en-gb/products/downstream-defender-0>



Repeatable, reliable performance

The Downstream Defender® delivers high removal of pollutants through advanced, hydrodynamic separation across a wide range of flows. The device has a proven track record of tackling an assortment of pollutants including:

Sediment (or Total Suspended Solids)



The Downstream Defender® is a highly effective sediment/TSS removal device. It can be sized in a number of ways to suit the application and level of protection required (see Table 1).

Gross Pollutants



100% removal of floatable debris, such as food wrappers, Styrofoam cups and drinks cartons

Liquid Hydrocarbons



Effective spill containment device that meets the BS EN 858-1:2002 Class I and Class II effluent targets at low flow rates. Note these systems are not considered oil separators according to the BS EN 858-1 and must not be used in applications where full certification is required.

Sediment Bound Hydrocarbons (including Polycyclic Aromatic Hydrocarbons - PAHs)



PAHs have low solubility in water and are readily adsorbed onto sediment particles. Effective removal of sediment particles will also ensure the removal of many PAHs.

Sediment Bound Heavy Metals and Nutrients



As an efficient device for removal of fine sediment, the Downstream Defender® is also effective for the removal of sediment bound pollutants.



No Risk of Pollutant Wash Out

The Downstream Defender® has been specially designed to isolate the pollutant storage zones and is proven to prevent pollutant wash out.

The Simple Index Approach (SIA)

The Simple Index Approach outlined in CIRIA C753 The SuDS Manual is a water quality design method for sites with a low to medium risk pollution hazard level. Sites with a high risk pollution hazard level should consider a more precautionary approach.

The approach assigns pollution hazard indices to the given land use for three pollutant groups, total suspended solids (TSS), metals and hydrocarbons. SuDS components are then selected until their combined pollution mitigation index score is greater than the pollution hazard index for each pollutant group.

Downstream Defender® SuDS Mitigation Indices		
Total Suspended Solids (TSS)	Metals	Hydrocarbons
0.5	0.4	0.8
Notes: (a) All mitigation indices supplied by Hydro International Ltd are independently verified and calculated using the methods laid out in the British Water How To Guide: Applying the CIRIA SuDS Manual Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices. Performance declarations are available on request or on the British Water website.		

Table 1 - SuDS Mitigation Indices for Downstream Defender®.

Sizing

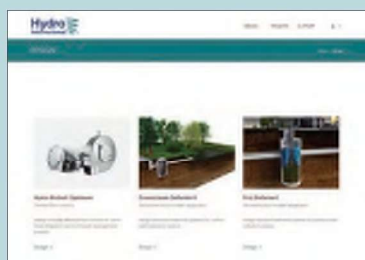
The Downstream Defender® can be sized for different treatment goals and objectives. For design purposes, the selected model's Treatment Flow Rate should be greater than or equal to the site's Water Quality Flow Rate.

The hydraulic capacity of the selected model should be considered with respect to the peak discharge flow rate from the site.

If there is no treatment objective, just betterment, do not use a treatment flow rate and only compare the hydraulic capacity to the peak discharge flow rate.

Model Diameter (m)	Treatment Flow Rate - Fine ^{(a)(b)} (l/s)	Hydraulic Capacity ^(c) (l/s)	Minimum Oil Storage Capacity (l)	Minimum Sediment Storage Capacity ^(d) (m³)	Maximum Headloss at Treatment Flow Rate (mm)
1.2	30	120	283	0.39	150
1.8	69	270	1356	0.73	225
2.55	138	542	2535	2.89	300
3.0	190	750	4693	3.10	375
Notes: (a) Treatment Flow Rate - Fine is based on an annualised removal efficiency of >50% of all particles up to 1000 microns with a mass-median particle size (D50) of 75 microns and a specific gravity of 2.65. The test procedure is WRc approved and in line with the British Water Code of Practice. (b) Alternative sizing based on different sediment grades available on request. (c) Maximum flow rate that can pass through the chamber with a maximum headloss of 500mm. (d) Additional sediment storage capacity can be provided to extend maintenance intervals if required.					

Table 2 - Downstream Defender® design information.



Design a Downstream Defender® with our Online Design Tool

Our online design tool now enables you to design your own Downstream Defender® or First Defense® stormwater treatment separators as well as Hydro-Brake® Optimum.

The tool also allows you to save project designs and submit them to our expert technical team for a free design review.

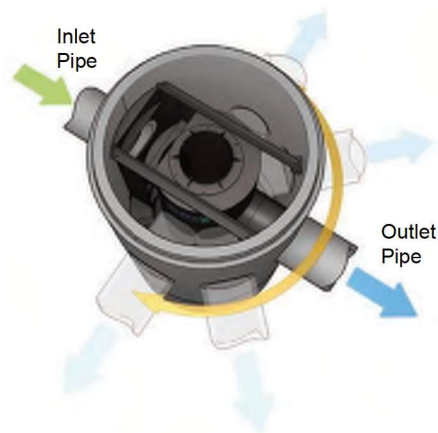
hydro-int.design

Setting out

The Downstream Defender® can accommodate a change in pipe direction to suit site specific requirements. Combined with the high rate internal bypass, this helps to avoid the need for additional manholes on site. Head loss across the chamber is kept to a minimum (see Table 2). The inlet and outlet pipes should be sized in accordance with Table 3 (opposite), and a minimum of 90 degrees between inlet and outlet is required.

Inlet and outlet pipe connections are at the same invert level.

Additional manhole sections can be provided to extend the chamber to meet site cover and invert levels or provide additional pollutant storage where required.



Dimensions and weights

General arrangement drawings of all units are available for download from:

<http://www.hydro-int.com/en-gb/products/downstream-defender-0>

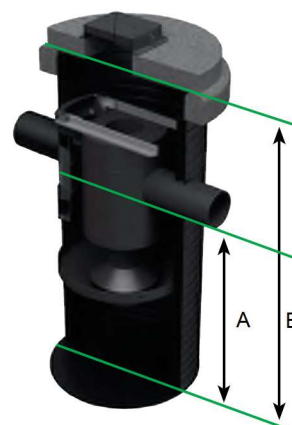
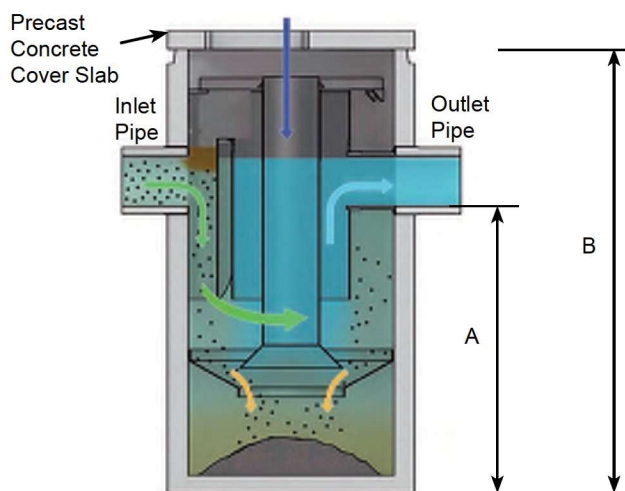
Model	Material	Chamber Diameter - Internal (mm)	Chamber Diameter - External (mm)	Inlet and Outlet ID (mm)	Depth to invert (m) (A) ⁽¹⁾	Chamber Depth (m) (B) ⁽²⁾	Maximum Component Lift Weight (kg)
PQL1320.1000	Concrete	1200	1460	300	1.916	2.830	2200
PQL1320.1030	Concrete	1800	2160	450	2.495	4.029	5450
PQL1320.1060	Concrete	2550	2850	600	2.95	4.95	8700
PQL1320.1090	Concrete	3000	3350	750	3.12	5.20	12100
PQL1320.1020	HDPE Single Wall	1188	1200	300	1.55	2.3	140
PQL1320.1051	HDPE Single Wall	1776	1812	500	2.11	3.41	460
PQL1320.1081	HDPE Single Wall	2530	2570	600	2.94	4.8	900
PQL1320.1111	HDPE Single Wall	2974	3000	800	3.13	5.3	1300
PQL1320.1025	HDPE Twin Wall	1200	1300	300	1.56	2.22	400
PQL1320.1055	HDPE Twin Wall	1800	2200	560	2.467	3.75	1100

Notes:

1) Minimum depth to invert shown. Depth to invert can be increased if required.

2) Minimum chamber depth shown. Additional sediment storage capacity or increased depth to invert can be provided if required.

Table 3 - Downstream Defender® unit types, dimensions and weights.



Easy to install

The Downstream Defender® is delivered to site as a near finished manhole with internal components already installed. Installation is therefore similar to any other manhole installation on site. Full installation guidelines are available.

We can provide structural concrete systems for simple plug-and-play installation or choice of lightweight single and twin wall plastic chambers.

Simple, safe and cost-effective maintenance

Maintenance is carried out from the surface, using a standard vacuum tanker and personnel are not required to enter the device.

With a large capacity to store sediments and oils (see Table 2), and with a proven ability to prevent wash out, maintenance intervals can be years rather than months - depending on site conditions. The unit can also be fitted with a [Hydro-Logic® Smart Monitoring](#) system to alert the site operator when maintenance is required and provide peace of mind that the unit is operating normally at other times.

Additional pollutant storage can be built into the chamber to extend maintenance intervals if required.



Make it Smart

Add Hydro-Logic® Smart Monitoring and your Downstream Defender® will let you know when it needs maintenance

Get monitoring maintenance alerts from your Downstream Defender®
Save time and money by only visiting your Downstream Defender® when it actually needs emptying.



Our full range of surface water treatment devices

The Downstream Defender® is one of a range of surface water treatment devices. Each device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific needs of a site or combined to provide higher levels of treatment. They can be used alongside natural SuDS features to protect, enable or enhance them.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodynamic
Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow
Filtration System



Hydro Biofilter™
Biofiltration System

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Downstream Defender® Design Data P/0222