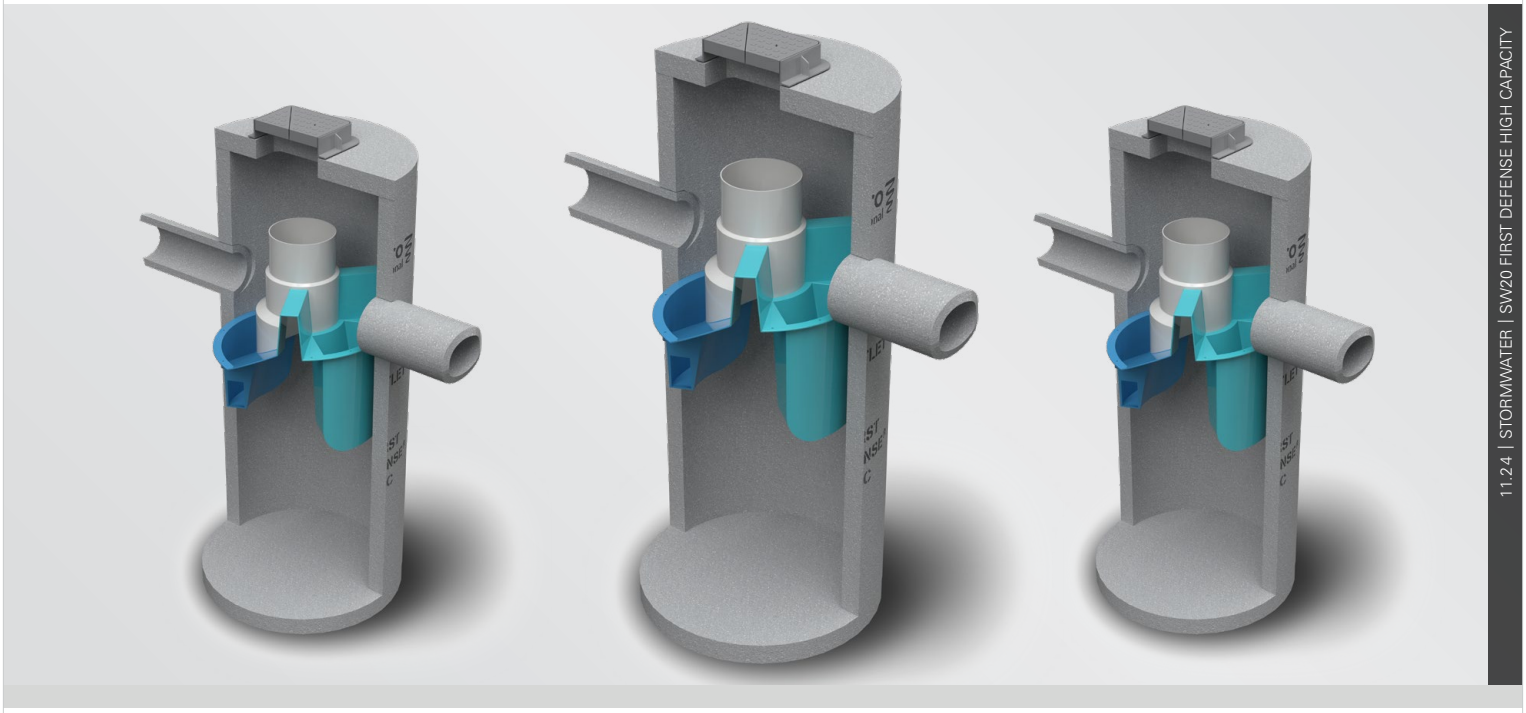
First Defense® High Capacity

(Stormwater Treatment)

Technical Guide SW 20

A simple solution for your trickiest sites



Applications

- Roads, carparks, commercial properties
- Ports, airports, construction sites
- Industrial and commercial facilities
- Offline and online treatment of existing stormwater reticulation

Product Attributes

- Removal efficiencies exceeding 80% on particulate contaminants down to 75 micron
- Low head requirements at treatment flow rate
- Easy to maintain

Approvals/Standards

- NJCAT
- NZS3109, Concrete Construction

Quality

- ISO 9001:2008 Quality Management Standard

We are the supply partner of choice for New Zealand's stormwater management and treatment solutions.

HYNDS STORMWATER

The First Defense® High Capacity is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment, total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants.

The First Defense® High Capacity is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

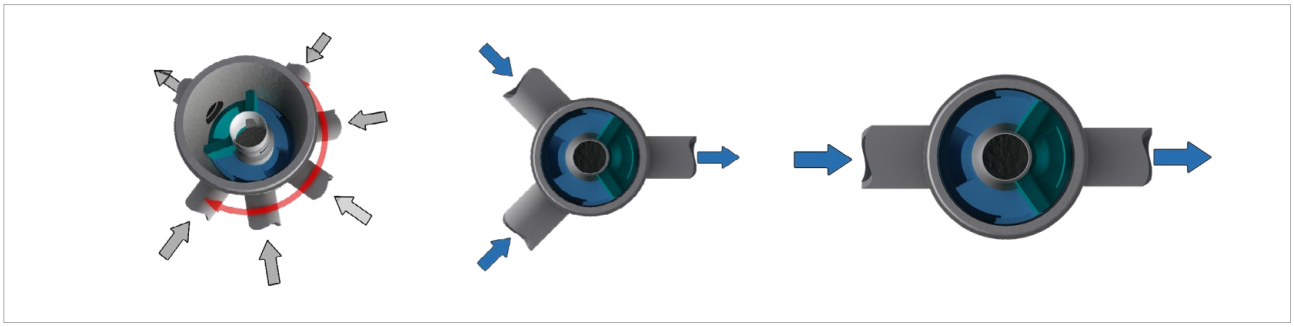


FIG. 1 The First Defense® High Capacity can have one or many inlets

TABLE 1 Design & sizing

Model Diameter (m)	**Typical Treatment Flow Rate** (L/s)	**Maximum online Flow Rate** (L/s)	**Head loss at Design Flow** (mm)	**Head Loss at Max Flow** (mm)	**Emergency Spill Containment** (L)	**Sediment Storage** (m3)
0.9	23.7	424	320	1594	473	0.3
1.2	42.4	510	280	920	723	0.5
1.8	95.7	906	274	1186	1878	1.2
2.5	169.9	1415	280	917	4239	2.1

Please note that FDHC0900 is only available in South Island.

Design and Sizing

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

How it works

The First Defense® High Capacity has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons. Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow. Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

TABLE 2 First Defense® High Capacity dimensions

Product	Chamber size (mm)	Lid Openings	Lid Thickness (mm)	Dimension (mm)					Max Pipe Diameter (mm)	Mass Total (T)	Shipped from
				A	B	C	D	E			
First Defense High Capacity 900	900	1	200	1329	1199	933	1199	933	300	2.2	Chch
First Defense High Capacity 1200	1200	1	200	1647	1701	1049	1701	1049	450	4.3	Auck / Chch
First Defense High Capacity 1800	1800	1	200	2307	2004	1346	2004	1346	750	9.0	Auck / Chch
First Defense High Capacity 2550	2550	1	225	3150	2569	1686	2569	1686	900	24.0	Auck

Note:
1.FDHC0900 is only available in South Island
2. Due to the high flexibility of FDHC, multiple inlets with larger diameters are adaptable.
Please contact Hynds for a customised design of FDHC

Applications

- Stormwater treatment at the point of entry into the drainage line.
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover.
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line.
- Pretreatment for filters, infiltration and storage.

Advantages

- Inlet options include surface grate or multiple inlet pipes.
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes.
- Proven to prevent pollutant washout at up to 450% of its treatment flow.
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling.
- Delivered to site pre-assembled and ready for installation.

TABLE 3 MAINTENANCE / SERVICING

The Frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge can be used to determine the level of accumulated solids stored in the sump.

Activity	Indicative frequency for mid level catchment area
Inspection	Regularly during the first year of installation. Every 6 months after the first year of installation
Oil and Floatables Removal	Once per year, with sediment removal Following a spill in the drainage area
Sediment Removal	Once per year or as needed Following a spill in the drainage area

Operation

The First Defense® operates on simple fluid hydraulics. It is selfactivating, has no moving parts, no external power requirement and the internals are fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® High Capacity have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume. The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® High Capacity retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events. Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

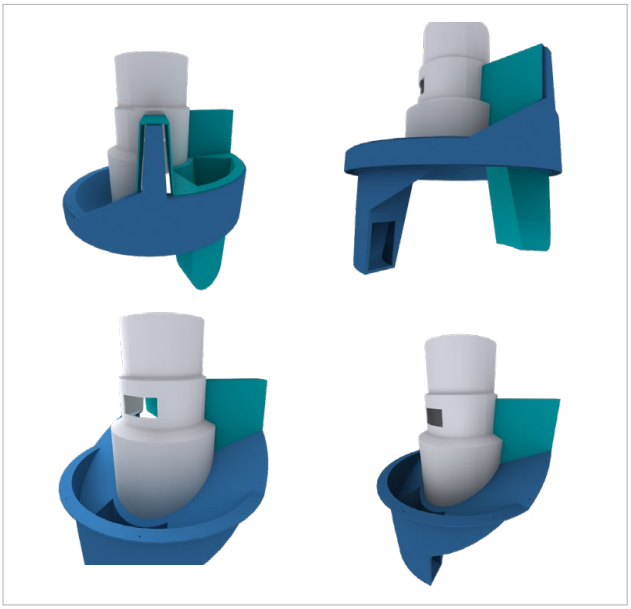


FIG. 2 The First Defense® High Capacity internals

Maintenance

Maintenance of the First Defense® High Capacity is simple, safe and cost-effective. Maintenance is carried out from the surface using a standard vacuum tanker and personnel are not required to enter the device.

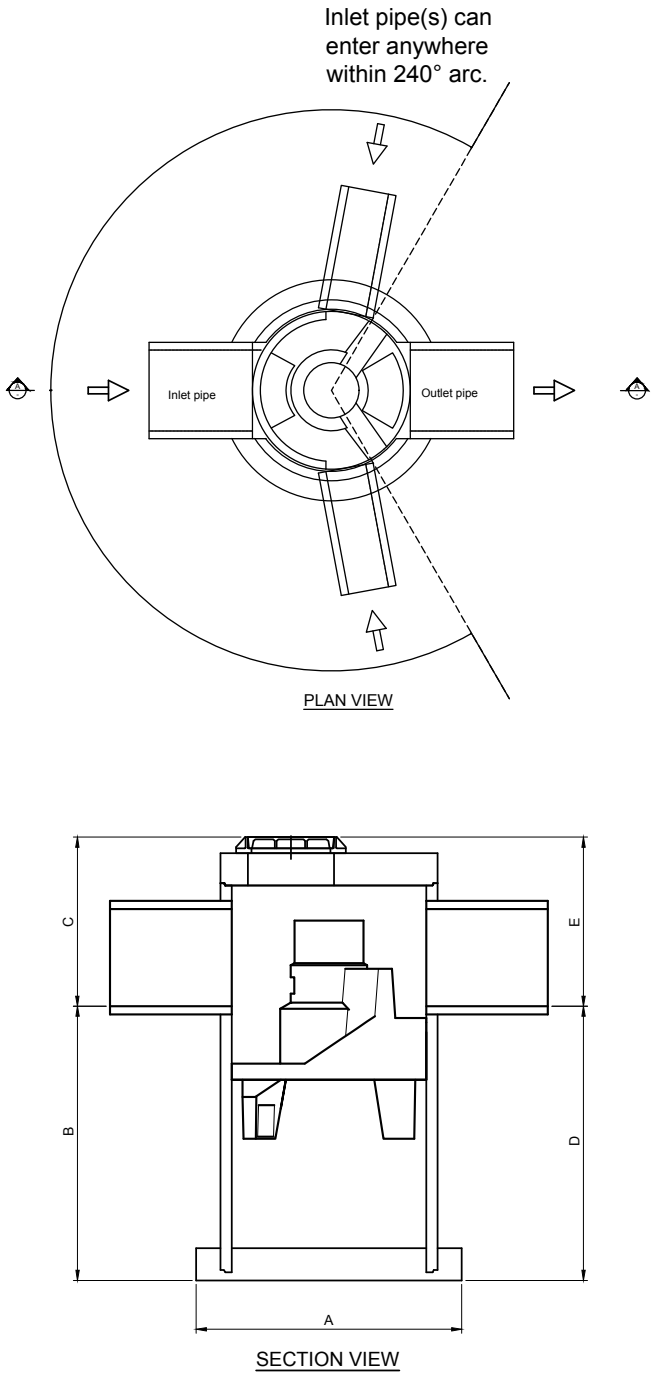


FIG. 3 General arrangement drawing

Lifting and Handling

All First Defense® High Capacity incorporate Swiftlift lifting anchors for safe lifting and must be used with the correct lifting clutch.

Hynds Pipe Systems has designed and manufactured First Defense® High Capacity with a minimum dynamic factor of 1.2. This dynamic factor requires that all the following conditions are observed when lifting, moving or placing the units:

1. Lifting with mobile plant *(such as an excavator or similar)* where equipment is specifically exempt from the requirements of the PECPR Regulations 1999, subject to the conditions outlined in the New Zealand Gazette, No. 104, September 2015 and
2. Lifting, travelling and placing over rough or uneven ground where anchor failure is not anticipated to cause harm or injury, by adopting procedures such as:
   a. Transporting the element as close as practical to ground level (300mm recommended)
   b. Establishing and maintaining exclusion zones
   c. Transporting only precast concrete elements that are unlikely to topple if they were to hit the ground
   d. Inspecting lifting anchors both after transportation and before final lifting into place
3. Hynds uses both Reids and Ancon lifting anchors which are both designed to *(Haeussler)* specifications and as such are compatible with Reid, Deha or Ancon anchors, clutches, and recess formers of the same load range.

Refer to "Safe work with precast concrete - Handling, transportation and erection of precast concrete elements" published by Worksafe New Zealand (October 2018)

Shock loads resulting from travelling with suspended First Defense® High Capacity over rough terrain and uneven ground may exceed design, dynamic and safety factors of the lifting systems. It is essential that care is taken during lifting and transporting as additional stresses could result in anchor failure.

Disclaimer: While every effort has been made to ensure that the information in this document is correct and accurate, users of Hynds product or information within this document must make their own assessment of suitability for their particular application. Product dimensions are nominal only, and should be verified if critical to a particular installation. No warranty is either expressed, implied, or statutory made by Hynds unless expressly stated in any sale and purchase agreement entered into between Hynds and the user.