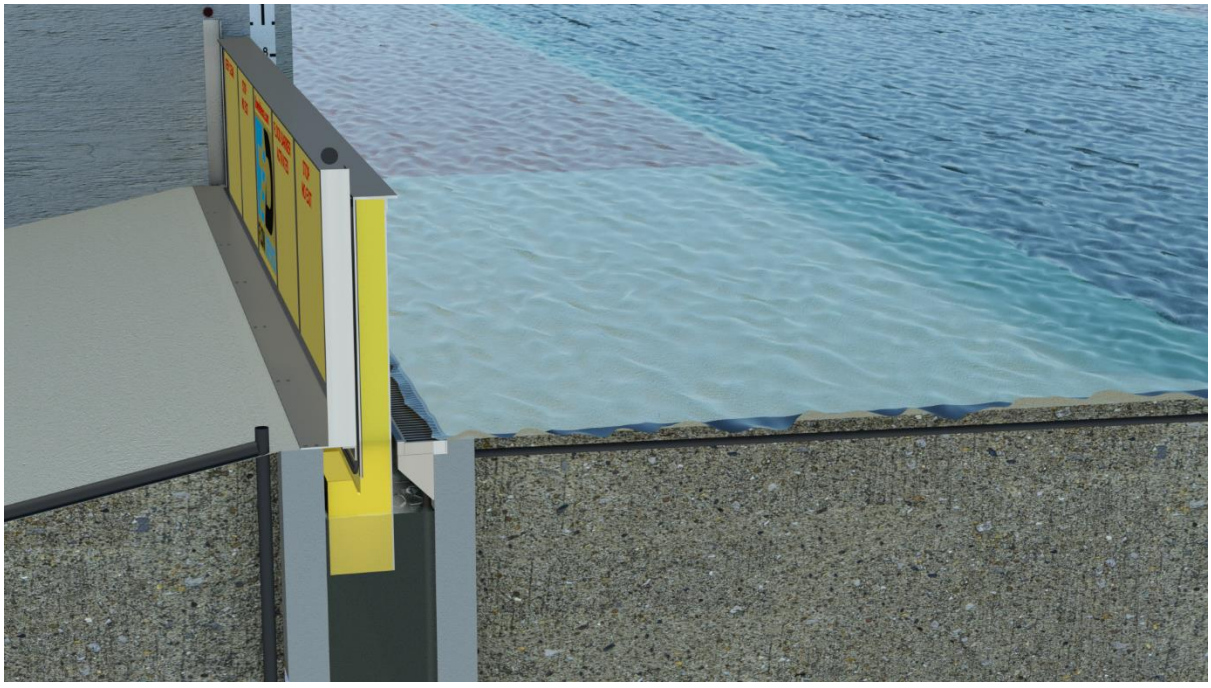
FLOW DEFENCE™

Passive Flood Barrier

Issued Date	Approved By

Operation Manual



Intellectual Property:

Hydrostatic Fluid Containment System

WO/2015/120516, AU 2015218181 & US 14902550

FD Operation Manual January 2025
Flow Defence Pty Ltd ABN 26 167 859 967

Table of Contents

1 Product Information

The Hydrostatic Fluid Containment System (HFCS) is a passive hidden flood barrier designed to not open prematurely and restrict access of vehicles or pedestrians, **Figure 1** and **Figure 2**.

The HFCS intercepts and collects flow within the same channel that the barrier is contained. This means no external collection pits or regrading of existing surfaces are required which reduces the required surface area for installation and avoids conflicts with underground services.

Intercepting flows at the surface which is to be protected avoids the barrier from activating prematurely and minimizes the interruption of vehicles and pedestrian traffic.

Since the barrier locks and seals from only the downstream side of the device, the upstream side of the channel remains open for easy access during cleaning and maintenance. Prescreening baskets can also be installed within the open part of the channel to reduce maintenance costs when removing debris.

Should the barrier need to be removed, the open channel on the upstream side of the device provides enough room so no dismantling of the sealing mechanisms are required.

Figure 1 - Typical Flow Defence Hidden Flood Barrier (retracted)

Figure 2 - Typical Flow Defence Hidden Flood Barrier (activated)

1.1 Principles of Operation

- The barrier does not require electricity to operate, it is fully activated by rising floodwater being captured within the interception chamber.
- The chamber has removable grates, this prevents any large debris from entering the chamber and also allows access into the chamber for routine maintenance.
- A submersible pump is located inside the chamber, this will lower the barrier after a flood event but it will also ensure that if only a small amount of water enters the chamber, the barrier will not raise up and just sit slightly above the ground surface level. The barrier will only raise when more water enters the chamber than can be pumped out.
- There is a sump below the barrier that can store any particles that sink to the bottom of the chamber, these can be removed with a vacuum truck during standard maintenance or after the barrier has been activated.
- The sealing mechanism is mounted to the barrier and cannot be tampered with while the barrier is retracted below ground level.
- The seal on the barrier is mounted in such a way that it is always above the water level within the chamber, this way when it raises into position the seal will not be prevented from compressing by floating debris.
- The barrier has been designed to have additional buoyancy in case a tree branch or other such object falls over the top of the barrier during a storm before it activates. This additional buoyancy is dependent on the barrier size but it equates to about 200kg of lifting force.

1.2 Barrier Sizes

Flow Defence (FD) flood barriers are available in heights between 300mm to 2400mm above ground surface level and can be ordered in 100mm increments

The length of the flood barriers are sized to suit the application.

1.2.1 Flow Defence Naming Convention

A typical Flow Defence product name would be FD height x length

Example: FD0.5x7.0m = 0.5m high and 7.0m wide, **Figure 3** and **Figure 4**.

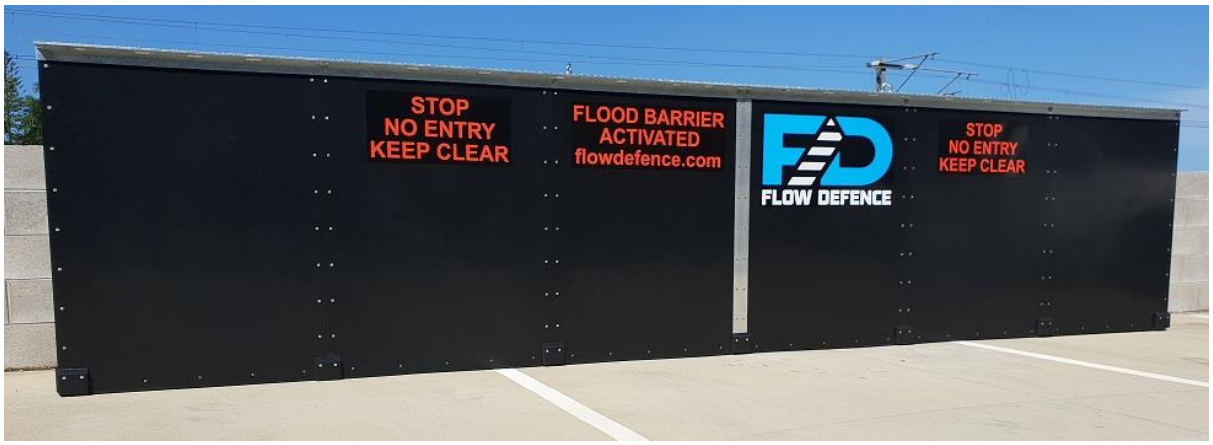


Figure 3 - Example FD0.5x7.0 Upstream (wet side)

Figure 4 - Example FD0.5x7.0 Downstream (dry side)

1.3 Installation Location

The FD flood barriers are designed to be installed at the driveway crest between a basement car park and property boundary, **Figure 5**.

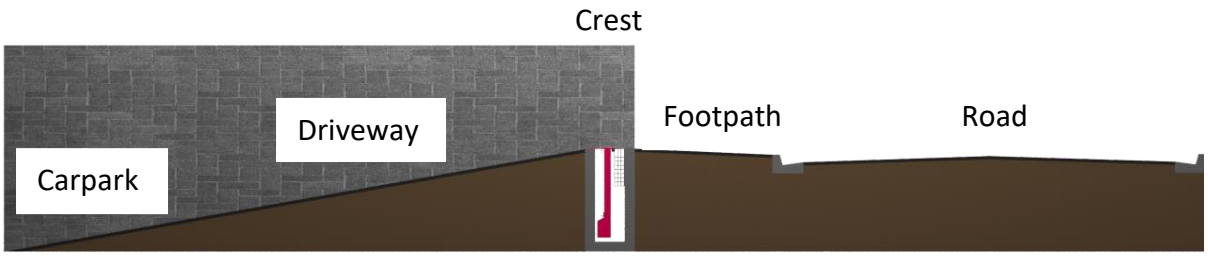


Figure 5 - Driveway Cross Section

FD products are passive flood barriers which require no human intervention to activate. The flood barrier will rise into position from buoyant forces by intercepting flood water at the crest of the driveway and storing it in an underground channel before water can enter the underground carpark.

FD flood barriers intercept floodwater only when it reaches the crest of the driveway and will therefore not open prematurely. With 30mm of water depth over the 6000mm wide grated inlet, the interception chamber will fill in around 90seconds raising the barrier whilst filling, **Figure 6**.

1.4 Activation Warnings

Optional warning light/audio beacon is mounted on the side of the barrier which will illuminate and flash during operation, **Figure 7**.

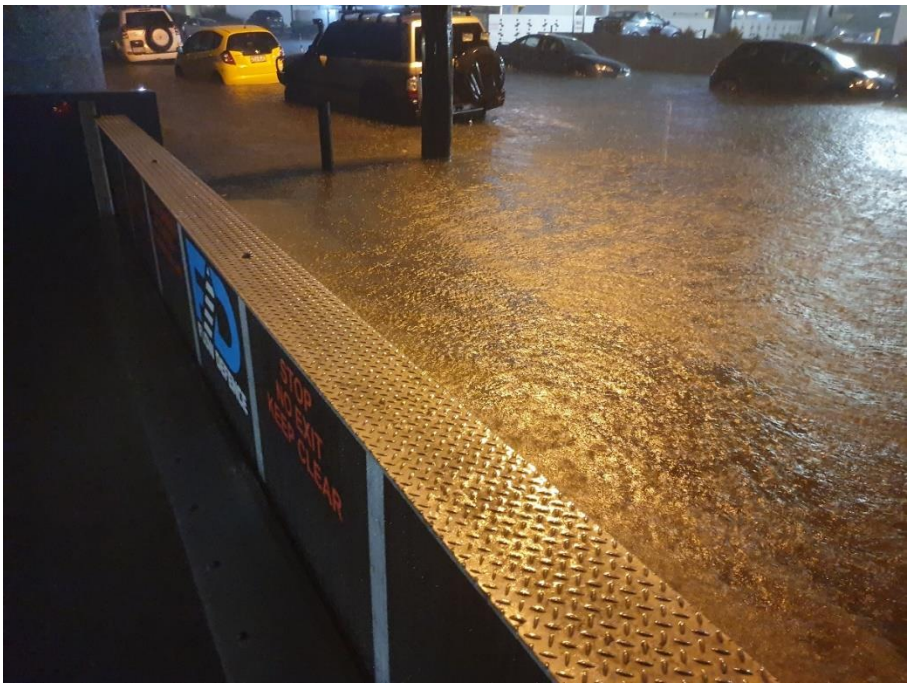


Figure 6 - FD Barrier Intercepting Flood Water

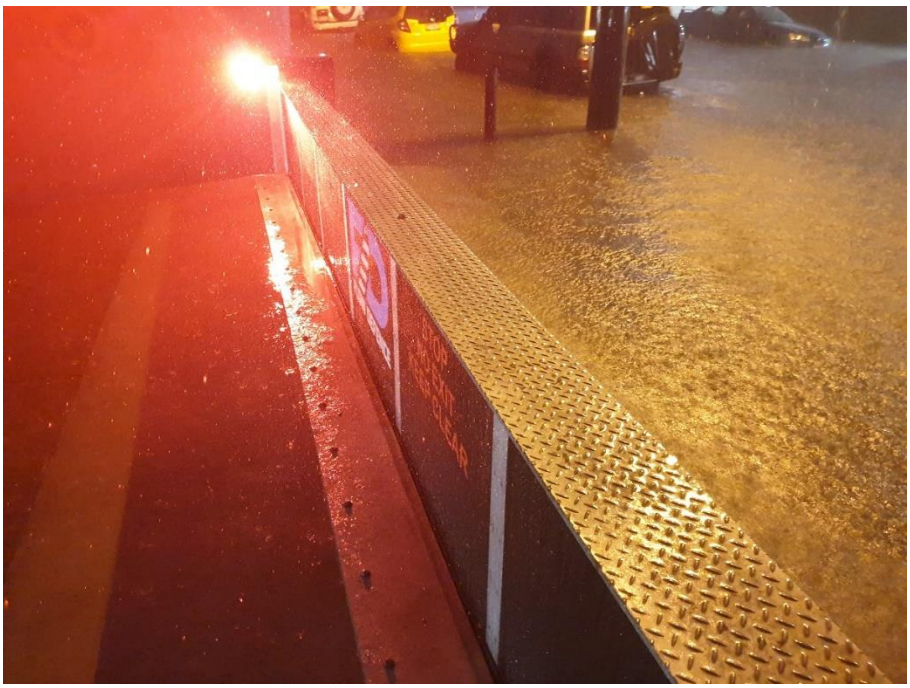


Figure 7 - Illuminated Warning Light

1.5 Sealing Mechanism

The FD flood barrier is a self-contained unit where the collection channel also houses the barrier.

The barriers sealing operation is all done from the downstream side of the channel which allows full unrestricted access to the upstream side of the barrier for maintenance where optional pre-screening baskets can also be installed.

The seals remain above water level as the barrier is displaced and the sealing mechanism becomes watertight before floating debris can be caught between the barrier and sealing frame, **Figure 8**.

Figure 8 - FD Sealing Mechanism (Below Ground Level)

A key feature of the design are angled lugs that guide the seals during compression and act as a canter lever point by providing a fixed connection between vertical barrier supports and the concrete chamber. This configuration reduces barrier deflection from hydrostatic forces.

1.6 Detained Flood Water

The FD barrier will remain in the upright position until flood waters recede and the collection channel is drained, **Figure 9**.

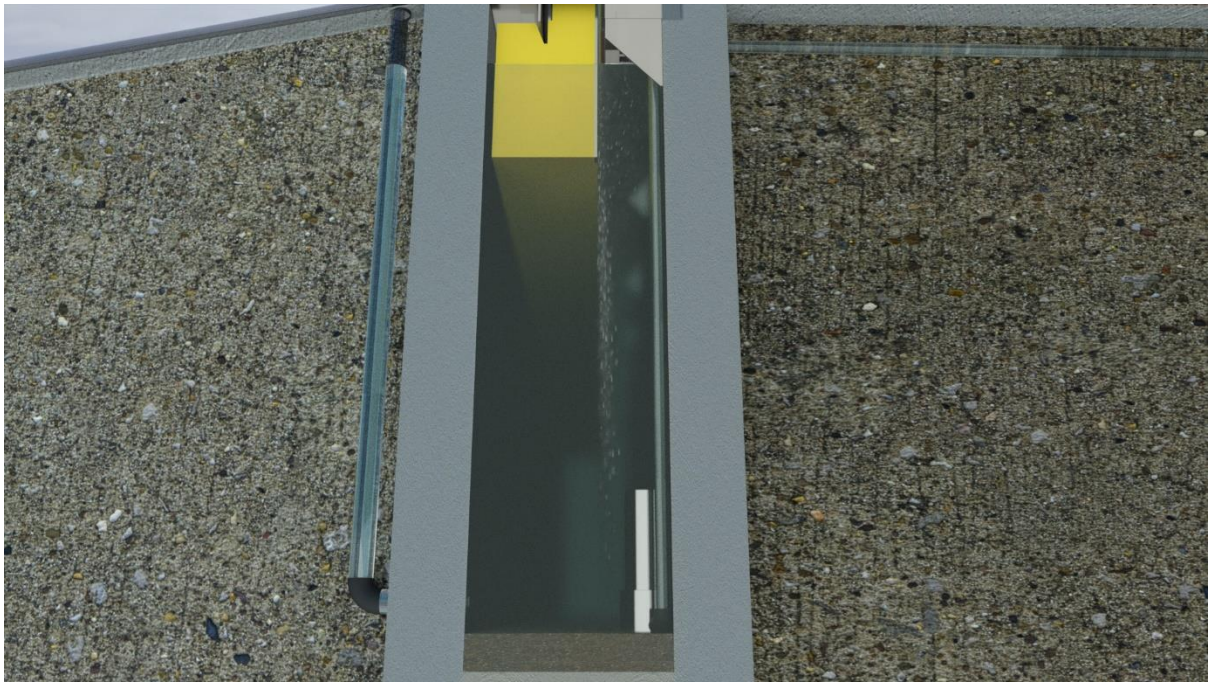


Figure 9 - FD Barrier Retaining Flood Water

The barrier can be lowered using one of three methods:

- Submersible pump installed within the FD channel collection sump. This is activated by a float switch, draining the pit automatically and lowering the barrier provided power is still available to the site during a flood event.
- The optional self-siphon system will prime when flood water fills the collection channel. A tamper proof valve (valve with no handle) can be opened after flood water recedes. The retained water captured by the FD interception channel will then be drained into the underground carpark lowering the barrier at the same time.
- Any pump on a maintenance vehicle with a suction hose can access the FD interception channel by removing access grates from the property boundary at ground level. Water in the collection chamber can then be discharged to the street kerb or landscaped area while lowering the barrier.

2 Maintenance Procedures

Flow Defence flood barriers can be cleaned using an educator truck as required to control accumulated debris in the collection sump, **Figure 10**. The barrier is not required to be removed during maintenance. The sealing mechanisms are located below ground level and are out of direct sunlight minimizing any environmental or impact hazards.

- Advise all concerned parties of the proposed date and time of cleaning.
- Obtain approvals from the appropriate authorities.
- Prepare necessary Safe Work Method Statements.
- Provide barricades in working areas and signs to prevent injuries to public or staff.
- Remove inlet grates.
- Lower vacuum hose, remove debris and sediment while cleaning all components with a high pressure hose (most Wet Vac combination trucks have this facility).
- Remove vacuum hose and replace inlet grates.
- Record site location, date and time of clean and duration of clean.

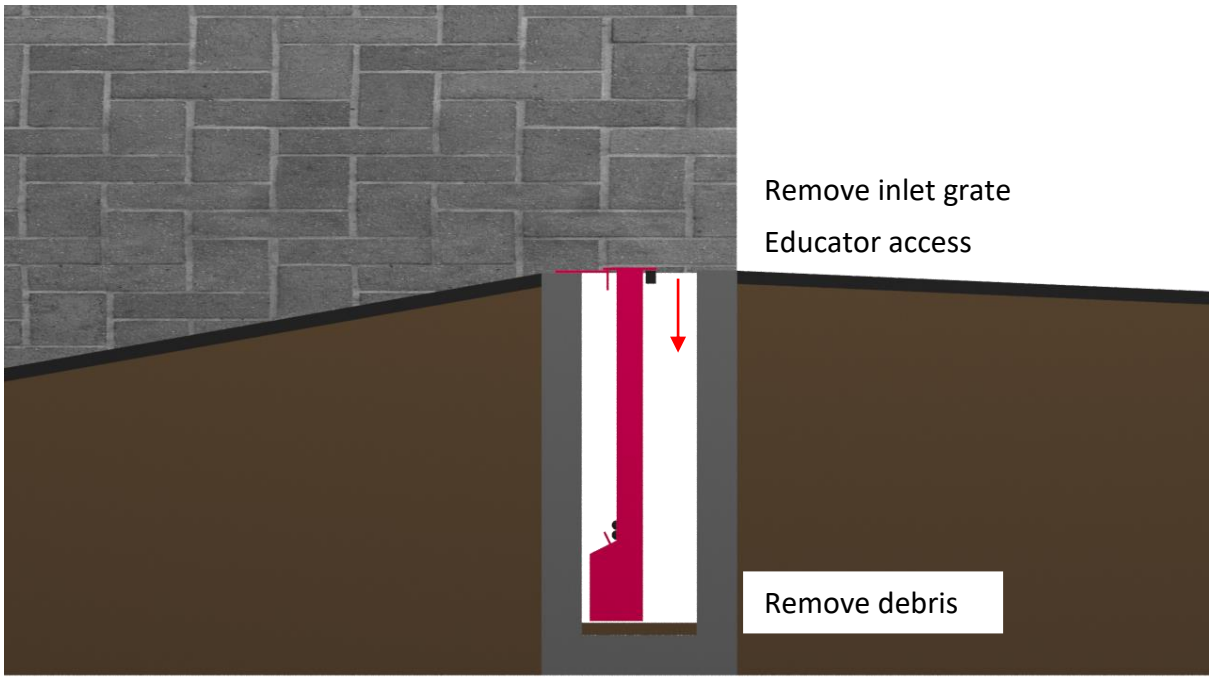


Figure 10 - FD Flood Barrier Maintenance

3 Inspections

We believe that the unit life will be enhanced significantly by using Flow Defence staff to monitor and maintain the flood barrier.

Flow Defence flood barriers should be inspected annually to ensure they are clean and free from material buildup.

12 Month Inspection:

- Interception channel sump inspected for material build up (water, sediment or debris).
- Flexible seal and guide frame inspection.
- Submersible pump float activation (lift float)
- Determine if cleaning is required.

Cleaning After Unit Operation:

- Remove inlet grates.
- Remove sludge and sediment using Vac Truck.
- Clean components with high pressure spray.
- Flexible seal and guide frame inspection.
- Full cleaning report.

4 Service and Repairs

Most service and repairs can be performed without removing the flood barrier. Should the barrier need to be removed for any reason:

- Remove inlet grates and frame.
- Remove submersible pump.
- Remove barrier using hiab.
- Alternatively for minor repairs and detailed inspection, the collection chamber can be filled with water raising the barrier above ground level for access.

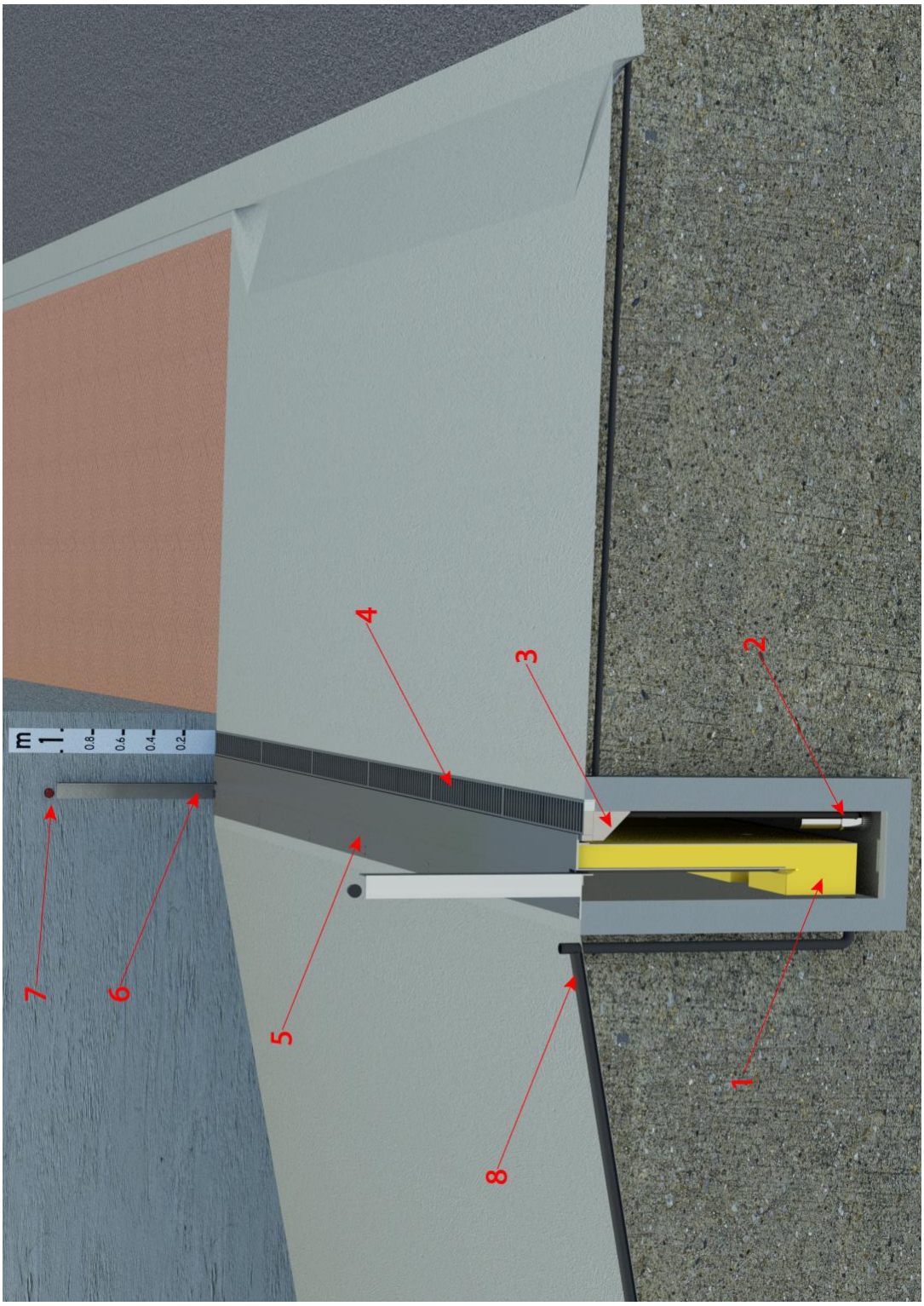
Flow Defence flood barriers have a 10 year warranty covering all flood barrier components and 2 year warranty on electric pumps. However damage caused by vandalism and outside parties is not covered by the warranty.

5 Product Specification

5.1 Materials

Material	Description	Components
Concrete	**C1 Concrete** exposure class for brackish, saltwater, marine applications and potential acid sulphate soil (PASS) and acid sulphate soil (ASS) environments in permanently submerged or zones subject to repeated wetting or drying.	Interception chamber body
HDPE	**High Density Polyethylene (HDPE)** plastic is a ridged high tensile strength sheet. The material is sturdy and resists vigorous handling, stabilised against ultraviolet light, is resistant to both hot and cold extremes and is used in the mining, oil/gas, agriculture, marine and chemical storage industries.	Buoyant barrier surfaces
Aluminium	**6082 Aluminium** is light weight, has excellent corrosion resistance and is the highest strength of the 6000 series structural alloys used in highly stressed applications such as bridges, cranes and marine environments.	Buoyant barrier internal frame
Stainless Steel	**316 Stainless Steel** is a chromium-nickel-molybdenum austenitic stainless steel with good strength and excellent corrosion resistance, as supplied in the annealed condition with a typical brinell hardness of 175.Characterised by high corrosion resistance in marine and industrial atmospheres. The addition of 2% to 3% of molybdenum increases its resistance to pitting corrosion and improves its creep resistance at elevated temperatures.	Buoyant barrier internal frame fasteners
Hot-Dip Galvanising	**Galvanising** provides outstanding corrosion performance in a wide variety of environments. The galvanising process creates a durable, abrasion-resistant coating of metallic zinc and zinc-iron alloy layers which are bonded metallurgically to the steel and completely covers the item providing a number of significant advantages. It provides outstanding toughness, resistance to mechanical damage and slows corrosion to about one sixteenth that of steel.	Interception chamber grates, frames and fasteners
Polyurethane Foam	**Polyurethane Foam** has a closed cell structure and has better insulation properties then many other insulation materials. Polyurethane foam is widely used for marine buoyancy. One cubic metre of 35kg/M³ polyurethane foam would have a positive buoyancy of 965kg.	Buoyant barrier core

5.2 Component Diagram



5.3 Component List

1. Flood Barrier:
    a. 10mm high density polyethylene sheet outer casing
    b. 6082 aluminium internal support frame
    c. AUSTHANE AUE 276 Rigid Low Density Polyurethane internal foam core
    d. 316 stainless steel barrier fasteners
    e. 8mm GR250 HDG floor plate (top capping)
    f. Continuous rubber PSEAL29 seal
2. Discharge:
    a. 2x BAV-550 high volume non-clogging pumps
    b. 2x 50mm brass check valves
    c. 2x 50mm PVC pressure discharge lines
    d. 20A isolator
3. Grate Frame:
    a. 200x75mm Grade 300 HDG steel channels
    b. 45x45x5mm HDG angle
    c. 40x40x4mm HDG RHS
    d. 75x50x8mm Grade 300 HDG steel angle
4. Removable Grates:
    a. 1000x230x40 Class D HDG grates
5. Horizontal Seal Plate:
    a. 10mm GR250 HDG steel plate
6. Vertical Seal Plates:
    a. 100x100x8mm Grade 300 250 HDG steel angle
7. Warning Light (optional):
    a. 104mm UV stabilised IP65 rated Amber MOFLASH X195 Series Xenon Beacon
8. Siphon (optional):
    a. Optional self-siphon

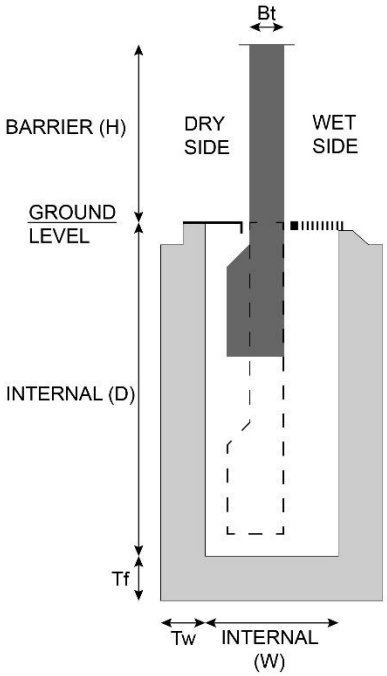
5.4 Commissioning and Warranty

Barrier components tested during installation commissioning:

- Final barrier mass to confirm buoyancy calculations
- Barrier guide frames.
- Pump float activation.
- Warning light activation.
- Grate removal and replacement.
- Seal inspection.
- Life expectancy of the reinforced concrete is 50 years, the internal high density polyethylene and stainless steel components have a life expectancy of between 10-15 years. Suppliers of these materials often quote much longer life expectancies.
- **The Flow Defence flood barrier is covered by a 10 year warranty covering all flood barrier components and 2 year warranty on electric pumps.**
- No additional allowances have been included for debris impact loads or wave loads, unless specifically detailed in additional documentation provided.
- All water pressure loads, impact loads, and operating loads are transferred to the building structure. Building structure design, capacity to accept loads from flood barriers, and evaluation of loads to structure is by others.
- If the water height exceeds the level of water protective design height, leakage will occur.

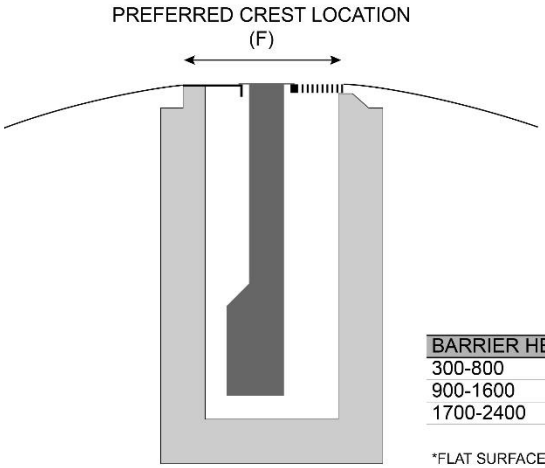
Note: Flow Defence reserves the right to amend this product specification based on continuous, on-going development and will advise all clients of any proposed modifications to the design that may effect this product specification.

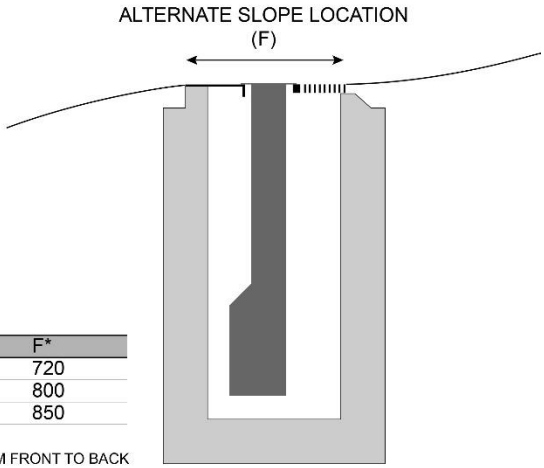
5.5 Typical Dimensions



H	Bt	D*	Tf	W	Tw
300	120	870	200	540	200
400	120	980	200	540	200
500	120	1080	200	540	200
600	120	1215	200	540	200
700	120	1340	200	540	200
800	120	1450	200	540	200
900	170	1560	225	620	225
1000	170	1670	225	620	225
1100	170	1765	225	620	225
1200	170	1960	225	620	225
1300	170	2085	225	620	225
1400	170	2200	225	620	225
1500	170	2290	225	620	225
1600	170	2400	225	620	225
1700	220	2550	250	670	250
1800	220	2705	250	670	250
1900	220	2815	250	670	250
2000	220	2890	250	670	250
2100	220	3000	250	670	250
2200	220	3110	250	670	250
2300	220	3215	250	670	250
2400	220	3335	250	670	250

*REFER TO CONSTRUCTION DRAWINGS FOR EXACT DEPTH
Bt - Barrier thickness (above ground)
Tf - floor thickness
Tw - wall thickness

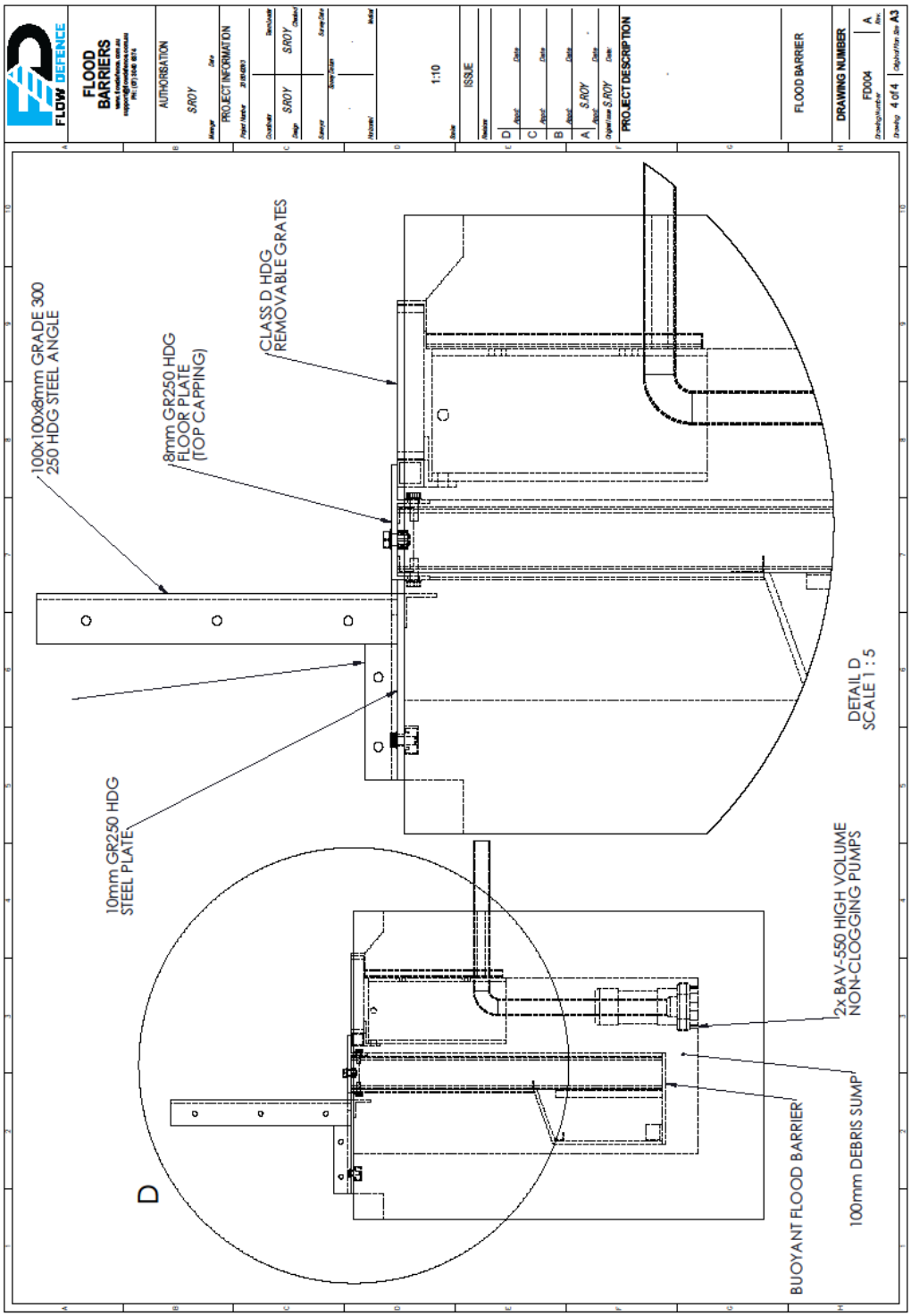




BARRIER HEIGHT	F*
300-800	720
900-1600	800
1700-2400	850

*FLAT SURFACE DISTANCE FROM FRONT TO BACK

6 Typical Flow Defence General Arrangement

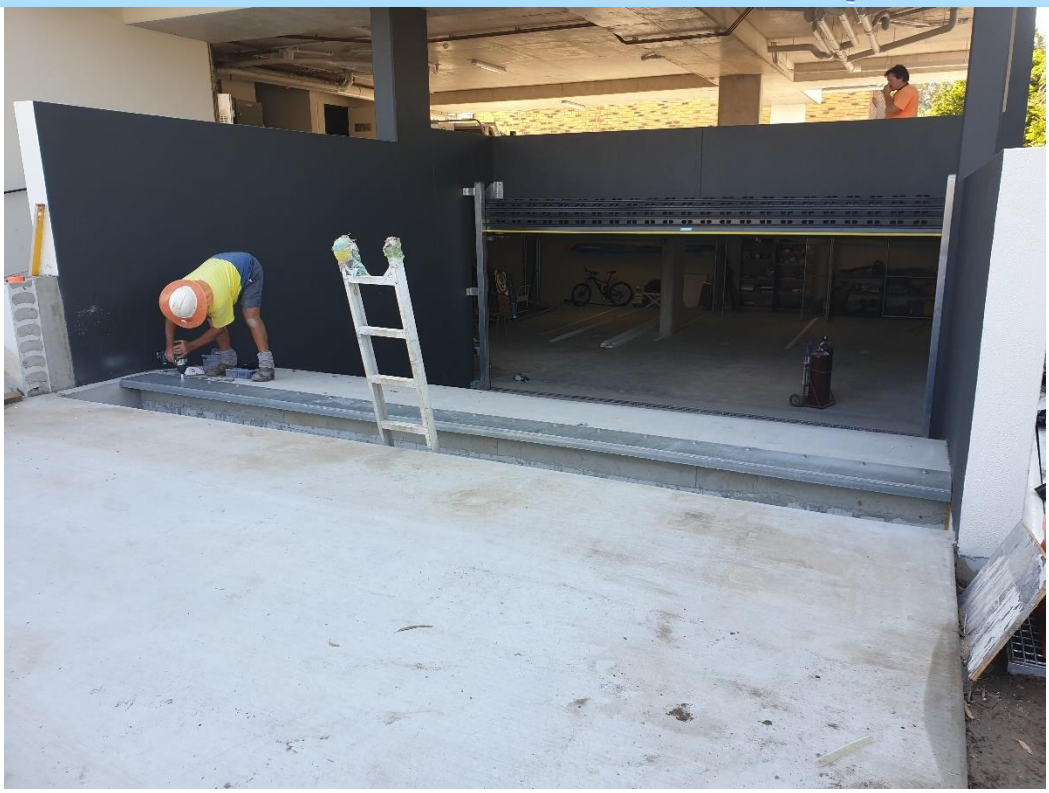


7 Project Details

Client	Example
Location	Example
Flood Barrier Type	FD1.13x5.8m
Barrier Weight	630kg
Chamber Weight	Cast insitu
Chamber Volume	6.94m^3

Weir (inflow)				
Weir Width	**5.8**	m		
Flow Rate at 30mm	**51**	L/s		
Pumps (outflow)				
Pump Flow Rate	**5**	L/s	300 L/m @ 3m head	
Pump Quantity	**2**	unit		
Total Flow Rate	**10**	L/s		
Inflow-Outflow	**41**	L/s		
Chamber Size				
Length	**5.800**	m		
Width	**0.620**	m		
Depth	**1.930**	m		
Volume	**6.940**	m3		
Barrier Toe				
Length	**5.800**	m		
Width	**0.350**	m		
Depth	**0.550**	m		
Volume	**1.117**	m3		
Chamber-Barrier	**5.824**	m3		
Barrier Rise Time	**142**	sec	**2.4**	min
Barrier Lower Time	**582**	sec	**9.7**	min

8 Project Drawings and Images

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If you require further information or details about our competitive inspection, cleaning and reporting service please contact Scott Roy on 0409 940 922.

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