Client: **Lidl Ireland GmbH**

Project: **PROPOSED DEVELOPMENT OF NEW LIDL STORE AT MAIN STREET UPPER, NEWCASTLE, DUBLIN, CO. DUBLIN**

Document Title: **SERVICES DESIGN REPORT**

PROJECT NO: **22058**

Date: **NOVEMBER 2022**

REV. 03

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Document Title Sheet:

Client:	Lidl Ireland GmbH, Main Road, Tallaght, Dublin 24, D24 PW6K & Lidl RDC (Regional Distribution Centre), Robinstown (Levinge), Mullingar, Co. Westmeath, N91 P921
Project:	Permission for development at Main Street Upper, Newcastle, Co. Dublin, principally consisting of the construction of a Discount Foodstore Supermarket with ancillary off-licence sales. The proposed development comprises: 1) The construction of a single storey Discount Foodstore Supermarket with ancillary off-licence use (with mono-pitch roof and overall building height of c. 6.74m) measuring c. 2,207m^2 gross floor space with a net retail sales area of c. 1,410m^2; 2) Construction of a vehicular access point to Main Street Upper and associated works to carriageway and including partial removal of boundary wall / façade, modification of existing footpaths / public realm and associated and ancillary works including proposed entrance plaza area; 3) Demolition of part of an existing rear / southern single storey residential extension (and related alterations to remaining structure) of 'Kelly Estates' building. The original 'Kelly Estates' building (a protected structure - Eircode: D22 Y9H7) will not be modified; 4) Demolition of detached single storey accommodation / residential structure and ancillary wall / fence demolitions to rear of existing 'Kelly Estates' building; 5) Demolition of existing single storey (stable) building along Main Street and construction of single storey retail / café unit on an extended footprint measuring c. 118m^2 and associated alterations to existing Main Street boundary façade; 6) Renovation and change of use of existing (vacant) two storey vernacular townhouse structure to Main Street, and single storey extension to rear, for retail / commercial use (single level throughout) totalling c. 62m^2; 7) Repair and renewal of existing Western and Eastern 'burgage plot' tree and hedgerow site boundaries; and, 8) Provision of associated car parking, cycle parking (and staff cycle parking shelter), pedestrian access routes and (ramp and stair) structures (to / through the southern and western site boundaries to facilitate connections to potential future development), free standing and building mounted signage, free standing trolley bay cover / enclosure, refrigeration and air conditioning plant and equipment, roof mounted solar panels, public lighting, hard and soft landscaping, boundary treatments and divisions, retaining wall structures, drainage infrastructure and connections to services / utilities, electricity Substation and all other associated and ancillary development and works above and below ground level including within the curtilage of a protected structure.
Project. No.	22058

Disclaimer:

Document Control Sheet:

PROJECT No:	22058				
PROJECT NAME:	Proposed Replacement Lidl Store at Main Street Upper, Newcastle, Dublin, Co. Dublin				
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1 INSTRUCTION

In conjunction with the appointed multi-disciplinary design team, SDS (Structural Design Solutions) Ltd., Design Engineers, have been requested by Lidl Ireland GmbH, Main Street Upper, Newcastle, Co. Dublin, to prepare the "Services Design Report" for the proposed development on the site of the new Lidl Discount Foodstore Supermarket at Main Street Upper, Newcastle, Co. Dublin.

2 PROJECT DETAILS

Permission for development at Main Street Upper, Newcastle, Co. Dublin, principally consisting of the construction of a Discount Foodstore Supermarket with ancillary off-licence sales. The proposed development comprises:

1) The construction of a single storey Discount Foodstore Supermarket with ancillary off-licence use (with mono-pitch roof and overall building height of c. 6.74m) measuring c. 2,207m^2 gross floor space with a net retail sales area of c. 1,410m^2;

2) Construction of a vehicular access point to Main Street Upper and associated works to carriageway and including partial removal of boundary wall / façade, modification of existing footpaths / public realm and associated and ancillary works including proposed entrance plaza area;

3) Demolition of part of an existing rear / southern single storey residential extension (and related alterations to remaining structure) of 'Kelly Estates' building. The original 'Kelly Estates' building (a protected structure - Eircode: D22 Y9H7) will not be modified;

4) Demolition of detached single storey accommodation / residential structure and ancillary wall / fence demolitions to rear of existing 'Kelly Estates' building;

5) Demolition of existing single storey (stable) building along Main Street and construction of single storey retail / café unit on an extended footprint measuring c. 118m^2 and associated alterations to existing Main Street boundary façade;

6) Renovation and change of use of existing (vacant) two storey vernacular townhouse structure to Main Street, and single storey extension to rear, for retail / commercial use (single level throughout) totalling c. 62m^2;

7) Repair and renewal of existing Western and Eastern 'burgage plot' tree and hedgerow site boundaries; and,

8) Provision of associated car parking, cycle parking (and staff cycle parking shelter), pedestrian access routes and (ramp and stair) structures (to / through the southern and western site boundaries to facilitate connections to potential future development), free standing and building mounted signage, free standing trolley bay cover / enclosure, refrigeration and air conditioning plant and equipment, roof mounted solar panels, public lighting, hard and soft landscaping, boundary treatments and divisions, retaining wall structures, drainage infrastructure and connections to services / utilities, electricity Substation and all other associated and ancillary development and works above and below ground level including within the curtilage of a protected structure

LOCATION, SIZE AND SCALE OF DEVELOPMENT

The application site is 1.04 hectares and is located on the site of the new Lidl Discount Foodstore at Main Street Upper, Newcastle, Dublin (see Figures 2.1 to 2.3 below). The site itself is bordered along the northern side with Kelly Estates, and along the eastern side with Choice Childcare Newcastle. St. Fintan's Church of Ireland is also located to the east of the site.

The existing site currently comprises a derelict single storey building, which is to be demolished, with a new single-storey Lidl store to be constructed on these grounds. The store is to have a mono-pitch roof and an overall floor space of 2,207m^2.

Figure 2.1 – Site Location *(image courtesy of Google Maps)*

Figure 2.2 – Site location in Newcastle, Co. Dublin

Figure 2.3 – Aerial image of the proposed development site *(image courtesy of Google Maps)*

3 LOCAL AUTHORITY

South Dublin County Council will be provided with the relevant drawings and the associated design calculations for the services proposed for this development for consideration.

4 SURFACE WATER

The following section outlines the hierarchy of options when considering the removal and disposal of surface water from site, before outlining a host of potential sustainable drainage system (SuDS) techniques considered when designing the surface water collection system for the proposed site.

4.1 HIERARCHY OF DISPOSAL

Generally, when designing a proposed surface water collection system, the philosophy of the design should be to prioritise the below methods of discharging surface water run off as much as reasonably practicable, from 1 (most desirable) to 4 (least desirable).

1. into the ground (infiltration),
2. To a surface waterbody,
3. To a surface water sewer, highway drain, or other drainage systems,
4. To a combined sewer.

4.1.1 INFILTRATION

Infiltration testing to BRE 365 was not carried out on site as a result of findings gathered from the Flood Risk Assessment carried out by JBA consulting. These findings, including the groundwater vulnerability on site, are discussed further in Section 4.4.

4.1.2 SURFACE WATERBODY

The nearest watercourse is not within close proximity of this site.

4.1.3 SURFACE WATER SEWER / COMBINED SEWER

Currently, there is no existing surface water system serving the proposed site, with the only hydrological feature on site being an existing dry ditch located along the western site boundary. The proposed surface water network is to be connected into an existing surface water network running along the northern boundary of the site. Similarly, there is also no existing foul sewer network on site, with the proposed foul sewer network to be connected into an existing foul sewer network, also running just inside the northern site boundary.

4.2 SUSTAINABLE DRAINAGE

The following section outlines the potential SuDS techniques considered for the proposed site, with proposals such as green roofs, swales, and modular systems all being discussed herein.

4.2.1 RAINWATER HARVESTING

Rainwater harvesting (RWH) is the collection of rainwater runoff for use. Runoff can be collected from roofs and other impermeable areas, stored, treated (where required) and then used as a supply water for domestic, commercial and/or institutional properties. Rainwater harvesting will be disproportionate in terms of cost and function in regard to the proposed development features (Toilet, sinks etc.) Therefore, rainwater harvesting has been disregarded for this design.

4.2.2 GREEN ROOFS

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover, over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of run-off and attenuating peak flows. To assist in treating surface water at source, a green roof has been designed for the proposed Lidl Discount Foodstore, which will also provide an additional amount of surface water storage volume for the proposed development. Approximately 50% of the roof area will be designated as green, with the remaining area covered by photovoltaic panels.

4.2.3 SOAKAWAYS

Soakaways are square or circular excavations either filled with rubble or lined with brickwork, precast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. They can be grouped and linked together to drain large areas including highways. The supporting structure and backfill can be substituted by modular geo-cellular units. Soakaways provide storm water attenuation, storm water treatment and groundwater recharge. Soakaways have been disregarded due to the encountered poor infiltration rates of the existing ground.

4.2.4 SWALES

Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. They should promote low flow velocities to allow much of the suspended particulate load in the storm water runoff to settle out, thus providing effective pollutant removal. Due to the nature of the development, there is not sufficient space to incorporate a swale on this proposed site.

4.2.5 TREE PITS

Tree pits are beneficial for bioretention as they intercept precipitation, allow water to evaporate from relief surfaces, facilitate infiltration and groundwater recharge due to their root systems, provide shade, and provide further amenity and biodiversity benefits. Due to these aforementioned benefits, tree pits are provided within this design proposal.

4.2.6 PERVIOUS PAVEMENTS

Pervious pavements provide a pavement suitable for pedestrian and/or vehicular traffic while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored between infiltration to the ground, reuse or discharge to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment. When permeable paving for car parking bays is used, the stone sub-base not only stores and slows down the rate of discharge, but also raises the water quality. It should not be used in the loading yard areas, due to the impact of the heavily loaded HGVs on the long-term durability of the pavement finish. Due to maintenance and the high cost involved, pervious pavements were initially discounted. However, in keeping with local policy, they have been adopted to treat the surface water run off at source and improve water quality.

4.2.7 GEO-CELLULAR / MODULAR SYSTEMS

Modular plastic geo-cellular systems with a high void ratio can be used to create a below ground storage structure. Modular tanks can be used for runoff attenuation but require silt trap protection and a suitable means of access for cleaning and inspection. A Geo-cellular system has been adopted on the proposed strategy. Water quality will be raised by providing a full retention interceptor prior to entry to the Geo-cellular storage structure.

4.2.8 PONDS / RAIN GARDENS / INFILTRATION BASINS

Ponds can provide both storm water attenuation and treatment. They are designed to support emergent and submerged aquatic vegetation along their shoreline. Runoff from each rain event is detained and treated in the pool. The retention time promotes removal of silt through sedimentation and the opportunity for biological uptake mechanisms to reduce nutrient concentrations. Rain gardens have been provided in numerous locations throughout the site, as indicated on drawing 22092-1025-PL5.

4.3 EXISTING SURFACE WATER SYSTEM

There is no existing surface water system serving the proposed Lidl site. The only hydrological feature in the area is an existing dry ditch running from south to north along the western boundary. This ditch is culverted by an existing 300mm diameter pipe that is collecting runoff from the existing spring along the western boundary and the ditch to the south, discharging to the drain to the north west of the site along Main Street Upper. The spring will be retained along with the existing dry ditch, which is to be retained in its entirety. As mentioned previously, the existing spring and its connection to the culvert will be maintained within the proposed development.

4.4 PROPOSED SURFACE WATER COLLECTION SYSTEM

The proposal for this development is to provide a new surface water collection network, collecting surface water run-off through roof gutters/downpipes and a network of permeable (pervious) tarmac areas, rainwater gardens, gullies, and stockholm tree pits located around the site to the design levels proposed for the finished car park layout. Please see drawing no. 22058-1025-PL5 for details of the proposed collection network. These rainwater gardens and permeable tarmac areas are both to incorporate a 550mm deep clean stone sub-base with a 30% void ratio, along with a 225mm perforated pipe wrapped in permeable geotextile membrane, which is laid within this sub-base. A green roof, equipped with a DSE 40 drainage and protection layer, is also to be included on the roof of the proposed Lidl Discount Foodstore,

which will have a surface area of approximately 1,047m^{2}and a subsequent storage volume of 14m^3. All surface water collected from areas accessible to vehicle traffic will be cleansed by an inline Bypass Fuel/Oil Separator. At car park level, surface water will be initially collected by the aforementioned rainwater gardens and permeable tarmac areas, providing 348m^2 and 162m^2 of storage volume respectively, before subsequently being routed to and held in the proposed attenuation tank, providing a storage volume of 80m^3. In total, all SuDS features on site equate to a cumulative storage volume of 604m^3.The outflow from the site will be limited by a HydroBrake, restricting the surface water discharge from the site to a flow of 2.06l/s. See below for a more detailed description of the attenuation systems and outflow control from this site. The surface water collection network will be constructed in accordance with the following:

- BS EN 752:2008 – Drain & Sewer Systems Outside Buildings;
- Building Regulations - TGD Part H – Drainage and Wastewater Disposal,
- Newcastle LAP and SDCC County Development Plan 2022-2028,
- SDCC SuDS Explanatory Design Evaluation Guide.

The SuDS design has been developed in collaboration with Austen Associates, landscape architects targeting a green space factor of 0.5. Austen Associates drawings and reports should be read in conjunction with this report.

OUTFLOW FROM SITE

In the Flood Risk Assessment carried out by JBA Consulting, the associated groundwater vulnerability is classified as 'Extreme' for the proposed site which indicates a significant risk to the groundwater under the site and a bedrock depth of between 0m and 3m. The groundwater vulnerability for the additional land to the south is classified as 'High', which indicates a high risk to the groundwater under the site and a bedrock depth of between 3m and 5m. These classifications are based on relevant hydrogeological characteristics of the underlying geological materials. This consequently makes infiltration unviable for the surface water treatment of the proposed development, therefore making controlled discharge and storage the proposed option.

The outflow from the site will be limited to the pre-development greenfield runoff rate of 2.00 l/s/ha. This practice is in accordance GDSDS requirements and SDCC SuDS Explanatory Design and Evaluation Guide. As the site area is 1.04 ha, the outflow from the site will be restricted to 2.06 l/s. A HydroBrake Optimum by Hydro International (or similar equivalent) will be provided within the last manhole within the site to limit the outflow as above. Subsequently, the discharge from this development is proposed via the existing surface water pipeline running along the northern boundary of the site, illustrated on drawing 22058-1025-PL5.

SURFACE WATER ATTENUATION SYSTEM

An attenuation tank, a green roof, permeable tarmac areas, and rainwater gardens have been designed to provide storage for the surface water generated during a 1 in 100-year rainfall event. The rainfall generated by such an event will be increased by an allowance of 20% to cater for predicted climate change due to global warming. The required storage volume of the cumulative surface water attenuation system has been calculated as 604m^3. This will be divided between the permeable surface (rainwater gardens and permeable tarmac areas) subbase, providing a storage volume of 510m^3, the green roof, which provides a

storage capacity of 14m^3, and the attenuation tank, providing 80m^3 of storage. Please refer to Appendix A for surface water attenuation design calculations.

SUDS ELEMENTS PROPOSED

In accordance with the SDCC SuDS Explanatory, Design and Evaluation guide, the following are proposed:

- Green Roof
  - The proposed green roof will assist significantly in treating surface water at source.
- Rain Garden
  - The proposed rain gardens shall promote biodiversity.
- Permeable Tarmac
  - The proposed permeable surfacing and clean stone subbase will assist with water quality
- Attenuation Tank
  - The proposed attenuation storage shall assist with water quantity.

5 FOUL EFFLUENT

The following section comprises a brief description of the existing foul sewer system situated on the proposed site, before discussing the design of the proposed foul sewer system.

5.1 EXISTING FOUL SEWER SYSTEM

The existing foul sewer service is to be removed and a new foul sewer pipeline is proposed to be provided to service the facilities in the proposed new store. There is an existing public foul sewer located in the access road to the store that the new foul sewer will connect to again.

5.2 PROPOSED FOUL SEWER SYSTEM

A new foul sewer system will be constructed within the site in accordance with the following:

- BS EN 752:2008 – Drain & Sewer Systems Outside Buildings,
- Building Regulations - TGD Part H – Drainage and Wastewater Disposal.

The effluent generated by the proposed building is outlined in the following table:

Table 3: Recommended Wastewater Loading Rate

Building	Type	Loading[1] (l/day)	No.	Avg. Flow (l/s)[2]	Peak Flow[4] (l/s)
Cafe	Staff	60	3	0.0042	0.0252
	Visitor	15	1003	0.0347	0.2082
Retail Unit	Staff	60	3	0.0042	0.0252
	Visitor	15	503	0.0174	0.1044
Licensed Discount Food Store	Staff	60	8[5]	0.0111	0.067
	Visitor	15	250[3]	0.0868	0.521
TOTAL FLOW				**0.1584**	**0.951**

[1] Based on EPA's Treatment Systems for Small Communities, Business, Leisure Centres and Hotels –

[2] Food Store and Retail Units are open 12 hours day, so average flow is spread over 12 hours.

[3] Based on 25% of Visitors per day. Store/Retail Unit open 12 hours day.

[4] Peak flow = 6 times average flow.

[5] Number of staff on duty at any one time. Total staff to be 20-25.

The overall daily wastewater loading is 6843 litres/day or 6.843m^3/day. The proposed foul sewer system will be connected to an existing foul sewer network within the site. A new connection will be made to the existing public foul sewer along the adjacent public road along the northern boundary of the application site.

6 WATERMAINS

The proposed development will be connected to the existing public watermain along the adjacent public road along the northern boundary of the application site. Allowing for a drinking water requirement of 2 l/day/person and the wastewater daily loading of 6.843m^3/day, the proposed development will require in the order of 6.903m^3 of potable water per day. The proposed connection for the new store will be made in accordance with Irish Water Standard Details for Non-Mechanical Meter Chamber (40mm to 250mm in diameter): Ref. STD-W-26-Rev 03. Please refer to drawing 22058-1026-PL5 for the location and details of the proposed new watermains network and fire hydrants proposed for this new site layout.

7 EXISTING SERVICES

All existing foul sewer, surface water pipeline, gullies and watermains have been identified on site and are shown on the topographic survey. All existing services will be removed from the site and the proposed new systems will be provided.

8 SUMMARY AND CONCLUSIONS

Surface Water

The proposed surface water network on site will be served by a bypass fuel/oil separator, a green roof, permeable tarmac and rainwater gardens throughout the site, both incorporating a clean stone subbase with 30% void ratio (non-infiltration), and an attenuation tank. The provision of an attenuation tank and subbase storage with HydroBrake flow control device will restrict the outflow from the site to the equivalent of 2.06 l/s. This proposed design achieves compliance with all aforementioned regulations whilst considering the constraints of the site.

Foul Water

The wastewater loading from the site will be 6.843m^3 day, with a peak flow of 0.951 l/s.

Watermains

The volume of water required by the proposed development will be 6.903m^3 day.

9 APPENDIX A – SURFACE WATER ATTENUATION DESIGN

Structual & Civil Engineers Unit 9, N5 Business Park, Ca... Co. Mayo, Mayo, Ireland	LIDL Ireland GmbH Newcastle, Dublin - Surface Water Attenuation Design
Date 27/10/2022 File 1 IN 100 YR +20 STORAGE...	Designed by SG Checked by MM
Innovyze	Source Control 2020.1

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 2663 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	7.741	0.241	0.0	1.8	1.8	145.8	O K
30 min Summer	7.830	0.330	0.0	1.8	1.8	199.1	O K
60 min Summer	7.920	0.420	0.0	1.8	1.8	254.0	O K
120 min Summer	8.019	0.519	0.0	1.8	1.8	313.3	O K
180 min Summer	8.079	0.579	0.0	1.8	1.8	349.6	O K
240 min Summer	8.123	0.623	0.0	1.8	1.8	376.2	O K
360 min Summer	8.184	0.684	0.0	1.8	1.8	413.3	O K
480 min Summer	8.226	0.726	0.0	1.9	1.9	438.9	O K
600 min Summer	8.258	0.758	0.0	1.9	1.9	457.7	O K
720 min Summer	8.281	0.781	0.0	1.9	1.9	472.0	O K
960 min Summer	8.314	0.814	0.0	2.0	2.0	491.5	O K
1440 min Summer	8.343	0.843	0.0	2.0	2.0	509.6	O K
2160 min Summer	8.344	0.844	0.0	2.0	2.0	509.7	O K
2880 min Summer	8.331	0.831	0.0	2.0	2.0	502.0	O K
15 min Winter	7.771	0.271	0.0	1.8	1.8	163.7	O K
30 min Winter	7.870	0.370	0.0	1.8	1.8	223.6	O K
60 min Winter	7.972	0.472	0.0	1.8	1.8	285.4	O K
120 min Winter	8.084	0.584	0.0	1.8	1.8	352.7	O K
180 min Winter	8.152	0.652	0.0	1.8	1.8	394.2	O K
240 min Winter	8.203	0.703	0.0	1.9	1.9	424.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	89.992	0.0	147.8	27
30 min Summer	61.591	0.0	137.8	42
60 min Summer	39.558	0.0	260.8	72
120 min Summer	24.745	0.0	278.7	130
180 min Summer	18.646	0.0	278.6	190
240 min Summer	15.231	0.0	280.4	250
360 min Summer	11.417	0.0	287.3	368
480 min Summer	9.294	0.0	295.0	488
600 min Summer	7.918	0.0	300.8	608
720 min Summer	6.945	0.0	305.3	726
960 min Summer	5.644	0.0	311.6	964
1440 min Summer	4.212	0.0	318.2	1442
2160 min Summer	3.143	0.0	604.6	2060
2880 min Summer	2.551	0.0	612.7	2404
15 min Winter	89.992	0.0	144.7	27
30 min Winter	61.591	0.0	134.8	41
60 min Winter	39.558	0.0	280.4	70
120 min Winter	24.745	0.0	278.4	128
180 min Winter	18.646	0.0	281.6	188
240 min Winter	15.231	0.0	287.3	246

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
360 min Winter	8.275	0.775	0.0	1.9	1.9	468.1	O K
480 min Winter	8.325	0.825	0.0	2.0	2.0	498.5	O K
600 min Winter	8.363	0.863	0.0	2.0	2.0	521.2	O K
720 min Winter	8.392	0.892	0.0	2.0	2.0	538.9	O K
960 min Winter	8.434	0.934	0.0	2.0	2.0	564.2	O K
1440 min Winter	8.479	0.979	0.0	2.1	2.1	591.8	O K
2160 min Winter	8.499	0.999	0.0	2.1	2.1	603.8	O K
2880 min Winter	8.490	0.990	0.0	2.1	2.1	598.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	11.417	0.0	298.7	362
480 min Winter	9.294	0.0	306.6	480
600 min Winter	7.918	0.0	312.4	598
720 min Winter	6.945	0.0	316.7	714
960 min Winter	5.644	0.0	322.6	946
1440 min Winter	4.212	0.0	327.5	1402
2160 min Winter	3.143	0.0	628.6	2064
2880 min Winter	2.551	0.0	636.6	2688

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.800	Shortest Storm (mins)	15
Ratio R	0.292	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.880

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.293	4	8	0.293	8	12	0.293

Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 7.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	636.0	0.0	1.001	0.0	0.0
1.000	636.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0065-2100-1300-2100
Design Head (m)	1.300
Design Flow (l/s)	2.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	65
Invert Level (m)	7.200
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

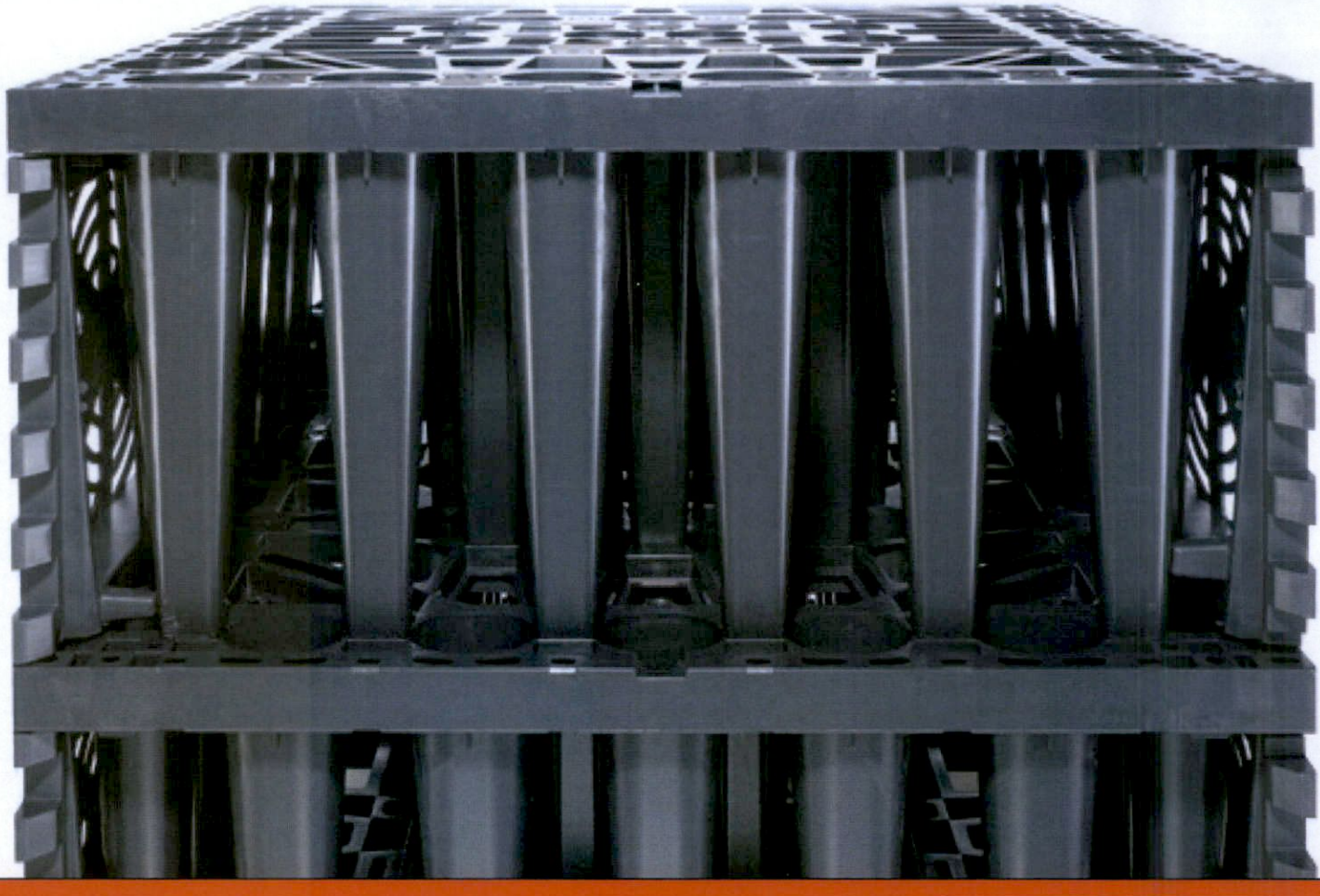
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	2.1
Flush-Flo™	0.286	1.8
Kick-Flo®	0.577	1.5
Mean Flow over Head Range	-	1.7

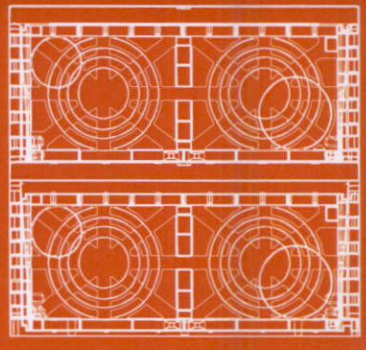
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	1.200	2.0	3.000	3.1	7.000	4.6
0.200	1.7	1.400	2.2	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.9
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.6	5.000	3.9	9.000	5.2
0.600	1.5	2.200	2.7	5.500	4.1	9.500	5.3
0.800	1.7	2.400	2.8	6.000	4.3		
1.000	1.9	2.600	2.9	6.500	4.4		

10 APPENDIX B – GRAFF ECO BLOCK SYSTEM AND PERMEABLE TARMAC

EcoBloc System
Stormwater management





EN Salesfolder EcoBloc System
950431 – 35-2

GRAF – Setting standards in quality

Otto Graf GmbH has been supplying high-quality plastic products to its customers for 50 years. In 1974, GRAF developed its first pioneering range of rainwater harvesting products. Today we are market leader in numerous countries for Rainwater Harvesting Systems.

High Quality Manufacturing

Graf continuously invests in the expansion of its headquarters in Teningen, near Freiburg (Breisgau). The facility has now an approximate area of 155,000 m² and is one of the most modern production facilities for plastic products in the world.
Our choice of Germany for the new production site was easy. On the one hand, we feel an obligation to the site because of our history. On the other, we would like to offer our customers products of the highest quality.

Where quality comes first

To ensure consistent high product quality, you need optimised production processes and outstanding quality management. Every individual tank at the new production site in Teningen is checked for dimensional accuracy, wall thickness and weight.
All production parameters, e.g. material composition, machine settings and the staff involved in the production process, are documented for each individual product.

Our goal: your satisfaction

More than 100,000 satisfied customers already benefit from the advantages of GRAF products.

Manufacturing certified according to ISO 9001

Manufacturing certified according to ISO 50001

Internationally proven: GRAF infiltration technology


Warehouse, Kent (UK)


Housing development, Singapur (SG)


Energy supplier, Warwick (UK)


Daycare centre, Lörrach (DE)


University of Agriculture, Prague (CZ)


Industrial building, Tumeltsham (AT)

EcoBloc
Stormwater management system

Various applications

- ✓ Rainwater infiltration
- ✓ Stormwater attenuation
- ✓ Rainwater harvesting

100 % RECYCLING

CO_2

No tools required

Fully integrated shaft

The Vario 800 flex shaft system (page 12) can be directly installed in an EcoBloc infiltration or infiltration/attenuation system. The connection surfaces of the inspection channels in the Vario 800 flex shaft system are accurately matched to the EcoBloc system.

load ★★★★★
logistics ★★★
EcoBloc Inspect flex

load ★★
logistics ★★★★★
EcoBloc light

load ★★★★★
logistics ★★★★
EcoBloc maxx

Optimum connection positions

Optimum connection positions ensure full use of infiltration ditch volume.

Lorry-bearing up to 60 tons

The GRAF EcoBloc Inspect flex has a heavy-duty lorry-bearing capacity of 60 tons with an 800 mm (2' 7.5") earth covering.

High pressure jetting possible

GRAF EcoBloc Inspect flex can easily resist high pressure jetting.

Easy to inspect

The standard inspection channel allows the entire infiltration/attenuation system to be monitored effectively. The EcoBloc Inspect flex allows access by commercially available inspection cameras. This has been confirmed by several independent testing authorities.

High storage volume

GRAF infiltration modules have three times the storage volume of a standard gravel infiltration ditch. One module therefore takes the place of around 1300 kg (1,4 tons) of gravel or a 50 m (164') drainage pipe. Since you don't have to excavate so much soil and enjoy great value for money compared with a standard gravel infiltration ditch, the GRAF modules save you hard-earned cash!

Service life of over 50 years

A durable product design ensures sustainability. The GRAF EcoBloc system and the Vario 800 flex shaft system is designed for a service life of over 50 years.

Easy to install

The modules are fitted simply, at speed and in various ways. They can be installed without heavy machinery – one EcoBloc Inspect flex module weighs just 8 kg (17.6 lbs), even only 7 kg (15.4 lbs) for one EcoBloc light

Up to 97 % reservoir volume

The GRAF EcoBloc light has a gross volume of 225 litres (59.4 US gal.) and a reservoir volume of 219 litres (57.9 US gal.). With a reservoir volume in excess up to 97 %, it is a market-leading product. The EcoBloc variants maxx and Inspect flex still offer a reservoir coefficient of 96 % despite their high load-bearing capacity.

Installation depth of up to 5 metres (16' 4.8")

Even under very heavy loads, GRAF EcoBloc Inspect flex modules can be installed at a depth of up to 5 metres (16' 4.8"). This means that up to 14 layers are possible. Please consult GRAF when the installation depth is greater than 5 metres.

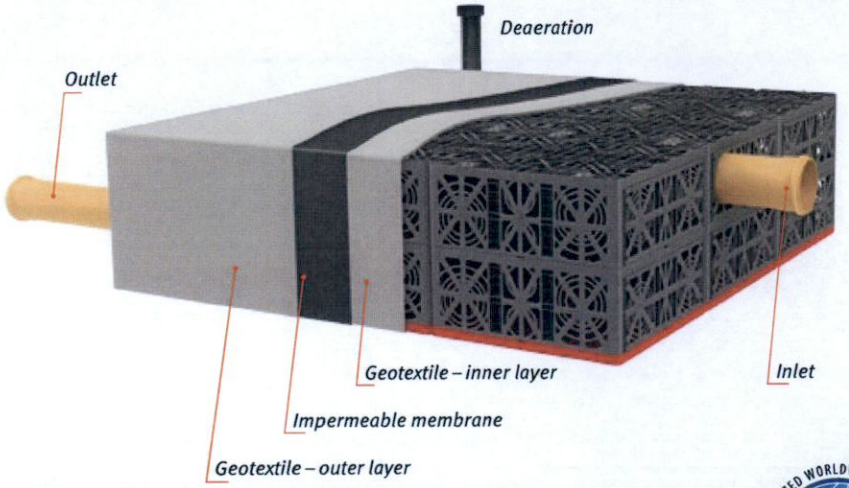
GRAF EcoBloc Configurator

Please ask your GRAF sales consultant for your login account information to the GRAF EcoBloc Configurator.

Application and logistics

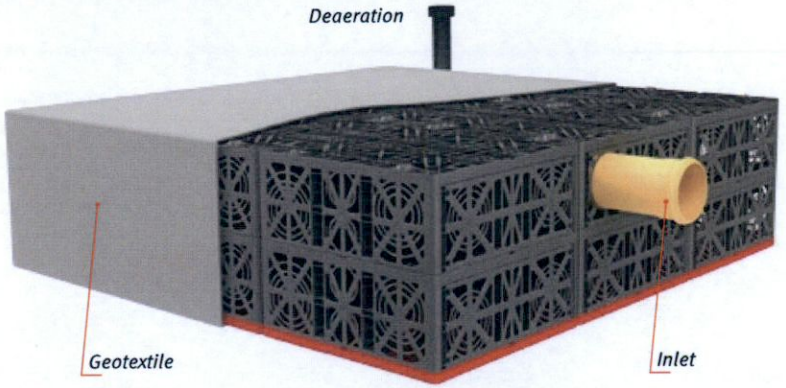
Stormwater attenuation

The controlled discharge of rainwater is increasingly important during heavy rain. The GRAF EcoBloc modules can be also surrounded by an impermeable membrane, which prevents water from escaping from the system unchecked. Restricted outflow allows the water to be discharged into the sewage system in a controlled manner.

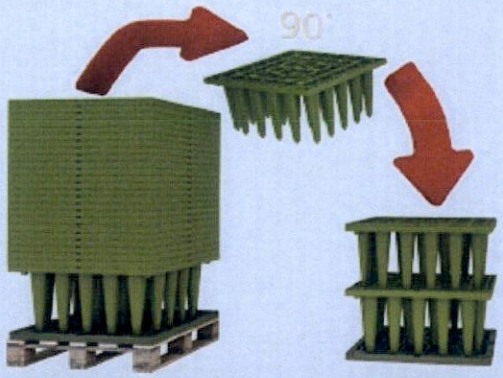


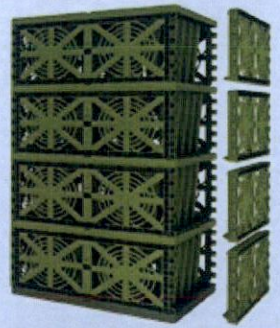
Rainwater infiltration

Local infiltration of rainwater is gaining in importance. As we cover over more and more ground with concrete, we are interrupting the natural water cycle. The GRAF EcoBloc modules combine environmental management of rainwater with the opportunity to protect against flooding. It stores rainwater and gradually releases it back into groundwater reserves.



OPTIMIZED WORLDWIDE SHIPPING





1. Stackable

To save space during transport, the EcoBloc maxx and EcoBloc light modules are stacked into each other. This minimizes transport costs, storage space in stock and CO_2 emissions.

2. Easy installation

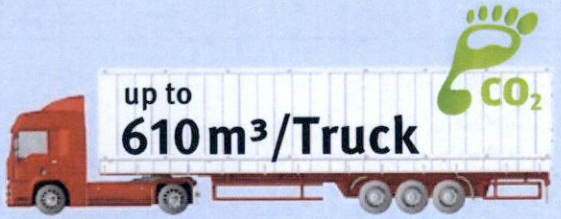
The EcoBloc base plate forms the foundations of each EcoBloc system. Up to 14 EcoBloc modules can be fitted on one base plate.

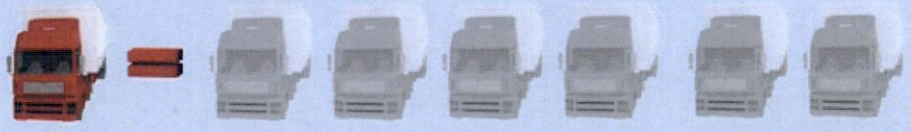
3. Ready

The side faces are sealed with EcoBloc end plates. The EcoBloc system can be adapted to match individual requirements.

Eco-friendly product – green logistics

One lorry can transport up to 2700 EcoBloc light units. That corresponds to a volume of 610 m³ (161,145 US gal.). This reduces carbon emissions during transport by 85 %!





The system at a glance

EcoBloc Inspect flex

- Lorry-bearing 60 tons/HS-25
- 150 m³ (39,625 US gal.)/Truck
- Inspectable
- High pressure jetting possible

Load ★★★★★
Logistics ★★★

DIBt Z-42.1-526 certification

EcoBloc Inspect flex
DN 100 (4")/150 (6")/200 (8") connecting surfaces

Volume	Length	Width	Height	Weight	Colour	Order no.
205 l (54.2 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	320 mm (12.6")	8 kg (17.6 lbs)	grey	402005

Webcode G4107

EcoBloc Inspect flex base plate
Forms the foundation of the EcoBloc Inspect flex system

Volume	Length	Width	Height	Weight	Colour	Order no.
25 l (6.6 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	40 mm (1.6")	4 kg (8.8 lbs)	grey	402006

EcoBloc Inspect flex end plates
The front ends of an EcoBloc Inspect flex system are sealed by end plates with DN 100 (4")/150 (6")/200 (8") contact surfaces

Item	Colour	Order no.
EcoBloc Inspect flex end plates (Set 2 units)	grey	402002

EcoBloc maxx

- Lorry-bearing 40 tons/HS-20
- 410 m³ (108,310 US gal.)/Truck

Load ★★★★
Logistics ★★★★

EcoBloc maxx
Connecting surfaces on EcoBloc maxx end plates

Volume	Length	Width	Height	Weight	Colour	Order no.
225 l (59.4 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	350 mm (13.8")	9 kg (19.8 lbs)	grey	402200

Webcode G4108

EcoBloc maxx base plate
Forms the foundation of the EcoBloc maxx system

Volume	Length	Width	Height	Weight	Colour	Order no.
25 l (6.6 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	40 mm (1.6")	4 kg (8.8 lbs)	grey	402201

EcoBloc maxx end plates
The outside surface of an EcoBloc maxx system is sealed by end plates with contact surfaces DN 100 (4") / 150 (6") / 200 (8") / 250 (10")

Item	Colour	Order no.
EcoBloc maxx end plates (Set 2 units)	grey	402203

EcoBloc light

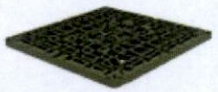
- Lorry-bearing 12 tons
- 610 m³ (161,145 US gal.)/ Truck

Load ★★
Logistics ★★★★★

EcoBloc light
Connecting surfaces on EcoBloc light end plates

Volume	Length	Width	Height	Weight	Colour	Order no.
225 l (59.4 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	350 mm (13.8")	7 kg (15.4 lbs)	green	402300

Webcode G4109



EcoBloc light base plate
Forms the foundation of the EcoBloc light system

Volume	Length	Width	Height	Weight	Colour	Order no.
25 l (6.6 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	40 mm (1.6")	4 kg (8.8 lbs)	green	402301

EcoBloc light end plates
The outside surface of an EcoBloc light system is sealed by end plates with contact surfaces DN 100 (4") / 150 (6") / 200 (8") / 250 (10")

Item	Colour	Order no.
EcoBloc light end plates (Set 2 units)	green	402303

EcoBloc System accessories

EcoBloc connectors
For horizontal connection

Order no. 402015	Set 10 units
Order no. 402018	Set 25 units
Order no. 402020	Set 50 units
Order no. 402025	Set 200 units

Deaeration end
DN 100 (4")
Order no. 369017

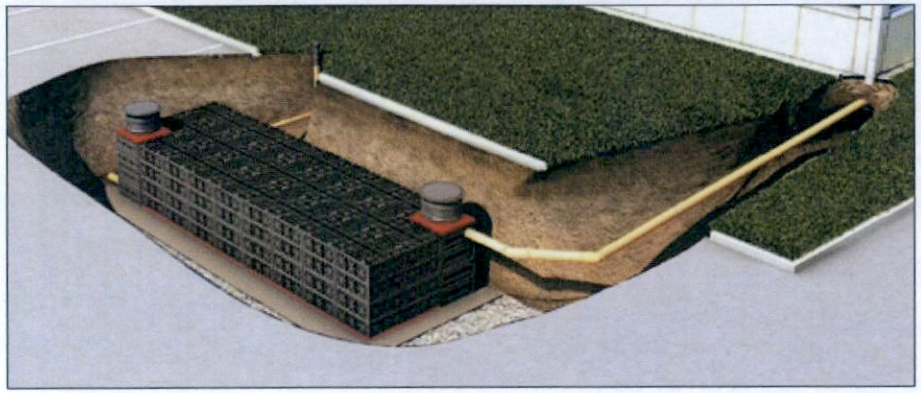
Adaptor plate

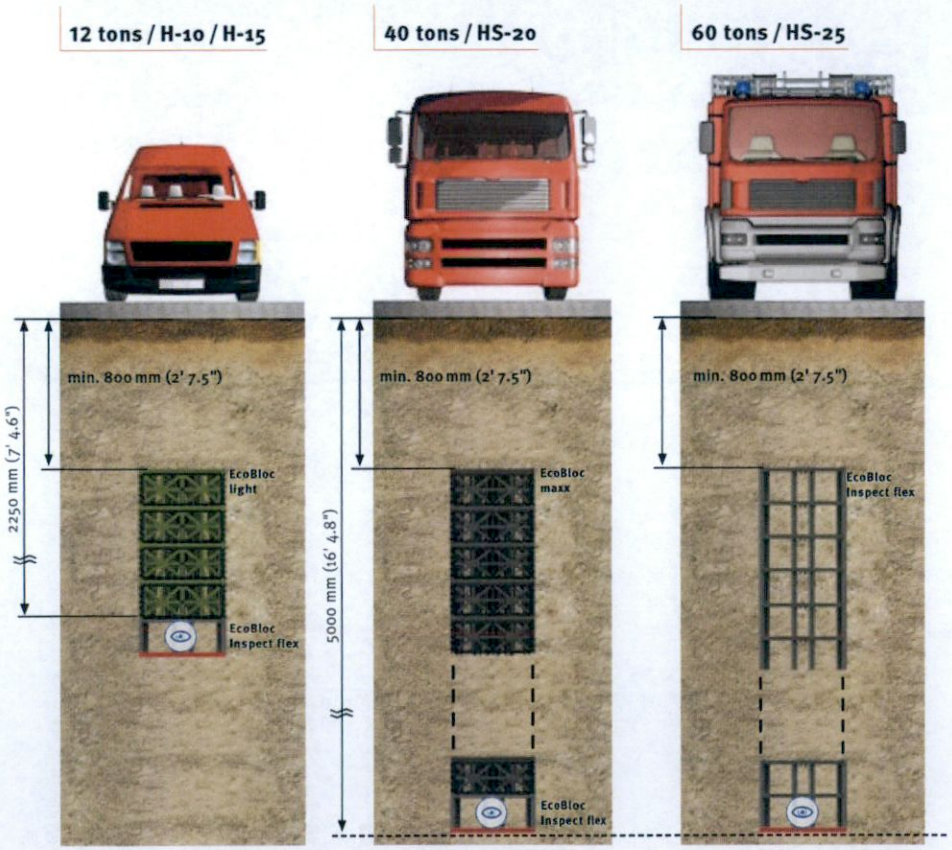
Order no. 402030	DN 300 (12")
Order no. 402031	DN 400 (16")
Order no. 402032	DN 500 (20")

GRAF-Tex geotextile
size of 2.50 x 2.50 m (8' 2.4" x 8' 2.4")
Order no. 231006

Sold by the metre, roll width 5 m (16' 4.8")
Order no. 231002

Applications and loads





Technical data sheet



Infiltration module		EcoBloc Inspect flex	EcoBloc maxx	EcoBloc light
Gross volume		205 l (54.2 US gal.)	225 l (59.4 US gal.)	225 l (59.4 US gal.)
Net volume		195 l (51.5 US gal.)	217 l (57.3 US gal.)	219 l (57.9 US gal.)
Storage coefficient		96 %	96 %	97 %
Inspectable		•		
High pressure jetting possible		•		
Load				
Load	Short-term	max. 100 kN/m²	max. 100 kN/m²	max. 75 kN/m²
	Long-term	max. 59 kN/m²	max. 59 kN/m²	max. 35 kN/m²
Without traffic load	min. earth covering	250 mm (9.8")	250 mm / 500 mm [1] (9.8") / (1' 7.7") [1]	250 mm [2] (9.8") [2]
	max. earth covering	2750 mm (9')	2750 mm / 2000 mm [1] (9') / (6' 6.7") [1]	1500 mm / 1250 mm [2] (4' 11") / (4' 1.2") [2]
	max. installation depth	5000 mm (16' 4.8")	5000 mm (16' 4.8")	2500 mm (8' 2.4")
	max. number of layers	14	13	6
Vehicle	min. earth covering	250 mm (9.8")	250 mm / 500 mm [1] (9.8") / (1' 7.7") [1]	500 mm / o.r. [2] (1' 7.7") / o.r. [2]
	max. earth covering	2750 mm (9')	2750 mm / 2000 mm [1] (9') / (6' 6.7") [1]	1250 mm / o.r. [2] (4' 1.2") / o.r. [2]
	max. installation depth	5000 mm (16' 4.8")	5000 mm (16' 4.8")	2250 mm (7' 4.6")
	max. number of layers	14	13	4
Lorry 12/H-10/H-15	min. earth covering	500 mm (1' 7.7")	500 mm / 800 mm [1] (1' 7.7") / (2' 7.5") [1]	800 mm / o.r. [2] (2' 7.5") / o.r. [2]
	max. earth covering	2750 mm (9')	2750 mm / 2000 mm [1] (9') / (6' 6.7") [1]	1000 mm / o.r. [2] (3' 3.3") / o.r. [2]
	max. installation depth	5000 mm (16' 4.8")	5000 mm (16' 4.8")	2250 mm (7' 4.6")
	max. number of layers	13	12	4
Lorry 30	min. earth covering	500 mm (1' 7.7")	500 mm / 800 mm [1] (1' 7.7") / (2' 7.5") [1]	
	max. earth covering	2500 mm (8' 2.4")	2500 mm / 1750 mm [1] (8' 2.4") / (5' 8.9") [1]	
	max. installation depth	5000 mm (16' 4.8")	5000 mm (16' 4.8")	
	max. number of layers	13	12	
Lorry 40/HS-20	min. earth covering	500 mm (1' 7.7")	800 mm (2' 7.5") [1]	
	max. earth covering	2250 mm (7' 4.5")	2250 mm / 1500 mm [1] (7' 4.5") / (4' 11") [1]	
	max. installation depth	5000 mm (16' 4.8")	5000 mm (16' 4.8")	
	max. number of layers	13	11	
Lorry 60/HS-25	min. earth covering	800 mm (2' 7.5")		
	max. earth covering	2000 mm (7' 4.5")		
	max. installation depth	5000 mm (16' 4.8")		
	max. number of layers	13		
Connections				
DN 100 (4")		•	•	•
DN 150 (6")		•	•	•
DN 200 (8")		•	•	•
DN 250 (10")		–	•	•
DN 300 (12")		• [3),4)]	• [3),4)]	• [3),4)]
DN 400 (16")		• [3),4)]	• [3),4)]	• [3),4)]
DN 500 (20")		• [4)]	• [4)]	• [4)]
Measurements				
Length		800 mm (2' 7.5")	800 mm (2' 7.5")	800 mm (2' 7.5")
Width		800 mm (2' 7.5")	800 mm (2' 7.5")	800 mm (2' 7.5")
Height		320 mm (12.6")	350 mm (13.8")	350 mm (13.8")
Weight		8 kg (17.6 lbs)	9 kg (19.8 lbs)	7 kg (15.4 lbs)

[1] When combined with EcoBloc Inspect flex

[2] Values on request when combined with EcoBloc Inspect flex

[3] Optionally available with Vario shaft (page 12)

[4] Optionally available with adaptor plates (page 9)

Vario 800 flex shaft system

Flexible use

The GRAF Vario 800 shaft provides easy access to all EcoBloc modules. It can be used in many different ways:

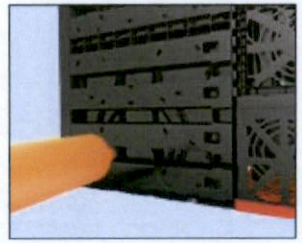
- ✓ As an inspection shaft
- ✓ As an inlet shaft
- ✓ As a filter shaft
- ✓ As a flow control shaft

Easy to inspect

The Vario 800 shaft allows easy access to the EcoBloc system by commercially available inspection cameras. This has been confirmed by several independent testing authorities.

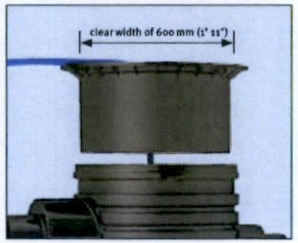
Lorry-bearing up to 60 tons

The GRAF Vario 800 shaft has a heavy-duty lorry-bearing capacity of 60 tons with an 800 mm (2' 7.5") earth covering. The fibreglass reinforced material gives the shaft extra strength.



Connection surfaces up to DN 400 (16")

The Vario 800 comes with DN 200 (8"), DN 300 (12") and DN 400 (16") connection surfaces. The optional, freely rotating inlet module can be connected to pipes of sizes DN 150 (6"), DN 200 (8"), DN 250 (10") and DN 300 (12").

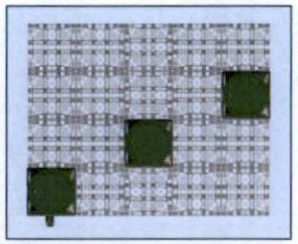


Wide access

The Vario 800 is terminated at the top by GRAF telescopic dome shafts. With a clear width of 600 mm, it gives easy access to the shaft. The base of the shaft itself is 800 x 800 mm (2' 7.5") x (2' 7.5") in size, providing sufficient space for all possible applications.

No additional excavation

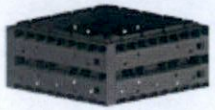
The Vario 800 flex shaft system can be directly installed in an EcoBloc infiltration or detention system. The connection surfaces of the inspection channels in the Vario 800 flex shaft system are accurately matched to the EcoBloc system.



Can be positioned in any location

The dimensions of the Vario 800 shaft enable free positioning within the EcoBloc system. The corner position enables the connection of large pipe diameters of up to DN 400 (16") on the two side panels. The central position offers ideal access to the inspection camera from all directions. Using the optional inlet module, a connection of up to DN 300 (12") can be made with a freely defined angle.

Vario 800 flex shaft system



Vario 800 flex, type 1
shaft body for one or more layer of EcoBloc system

Volume	Length	Width	Height	Weight	Colour	Order no.
230 l (60.7 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	355 mm (1' 2")	16 kg (35.3 lbs)	grey	450050

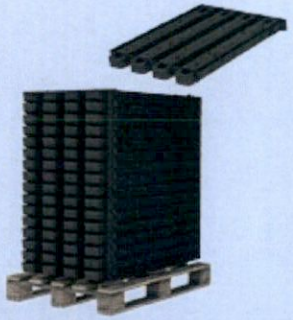
Webcode G9303

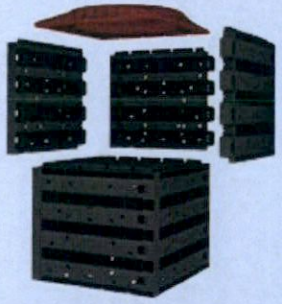
Vario 800 flex, type 2
shaft body for two or more layer of EcoBloc system

Volume	Length	Width	Height	Weight	Colour	Order no.
420 l (113.5 US gal.)	800 mm (2' 7.5")	800 mm (2' 7.5")	660 mm (2' 2")	27 kg (59.5 lbs)	grey	450051

Vario 800 flex, base/cover set
base- and cover for Vario 800 flex shaft

Item	Colour	Order no.
set consisting out of Vario base- and cover plate	grey	450052





1. Stackable

To save space during transport and storage, the parts of the Vario 800 are stacked into each other. This minimizes transport costs and CO_2 emissions.

2. Easy installation

Groups of four wall elements are connected in a few simple steps and without tools to form a single height unit of the Vario 800. The height can be easily adjusted to the EcoBloc tank depth. A shaft cover and base plate complete the element.

3. Ready

GRAF accessory components can now be added to the Vario 800 shaft as required.

Accessories

Shaft components

Infiltration filter strainer DN 600 (24")
Made entirely from stainless steel,
mesh width 0.75 mm (0.03")
Order no. 340523

Infiltration inlet module DN 600 (24")
Incl. profile seal for telescopic dome shaft;
DN 150 (6")/ DN 200 (8")/ DN 250 (10")/ DN 300 (12") connections
Order no. 330360

Infiltration connecting piece 1000 DN 600 (24")
With DN 200 (8") contact surface, incl. profile seal,
length 1000 mm (3' 3.3"), 750 mm (2' 5.5"), 500 mm (1' 7.7")
Order no. 371015

Infiltration connecting piece 1000 DN 600 (24")
With DN 200 (8") pipe connections, incl. profile seal,
length 1000 mm (3' 3.3"), 750 mm (2' 5.5"), 500 mm (1' 7.7")
Order no. 371016

Retention accessories

Choke drain DN 100 (4")
Incl. emergency overflow and DN 100 (4")
connector seal; flow rate of
1.0 l (0.26 US gal.)/sec. up to 6.5 l (1.72 US gal.)/sec.
Order no. 330547

Choke drain DN 150 (6")
Incl. emergency overflow and DN 150 (6")
connector seal; flow rate of
2.0 l (0.53 US gal)/sec. up to 16 l (4.22 US gal.)/sec.
Order no. 330598

Tank Covers

Mini telescopic dome shaft
Suitable for pedestrian loading,
height adjustable from 140 – 340 mm (5.5" – 13.4")
Order no. 371010

Maxi telescopic dome shaft
Suitable for pedestrian loading,
height adjustable from 140 – 440 mm (5.5" – 17.3")
Order no. 371011

Cast iron telescopic dome shaft
Suitable for vehicle loading,
height adjustable from 140 – 440 mm (5.5" – 17.3")
Order no. 371020

Telescopic dome shaft lorry
Suitable for lorry-bearing loading,
height adjustable from 140 – 440 mm (5.5" – 17.3")
Order no. 371021

Your expert specialist dealer:

Rainwater harvesting solutions
For more information about our rainwater harvesting solutions, ask for our catalogue.

Prices:
A price list with our export conditions is available on request.

Warranty clause:
The warranty mentioned in this brochure only refers to the tank in question and not to the accessories. Within the warranty period we grant free replacement of the material. Further benefits are excluded. Pre-condition for warranty benefits are proper handling, assembly and installation according to the mounting guidelines.

N.B. Protect tanks from frost when installed above ground! In case of groundwater installation, please contact us for further information prior to purchase!

For all dimensions and abstracts provided in this brochure, we reserve a tolerance of +/- 3%. Depending on the connection type, the useful volume of the underground tanks may be up to 10% below the tank capacity.

Subject to technical modifications and errors. Design details, methods and standards of individual products may change as a result of technical advancements and environmental regulations.

For all our offers and conclusions of contract, only our General Terms and Conditions of Business dated 01/10/2012 shall apply, which we will send to you on request.

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Item no. 950431/EN

11 APPENDIX C – BYPASS PETROL / OIL INTERCEPTORPETROL / OIL INTERCEPTOR

SEPARATORS

A RANGE OF FUEL/OIL SEPARATORS
FOR PEACE OF MIND

Kingspan

Klargester

60 YEARS OF
1955–2015 Expertise & Innovation

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

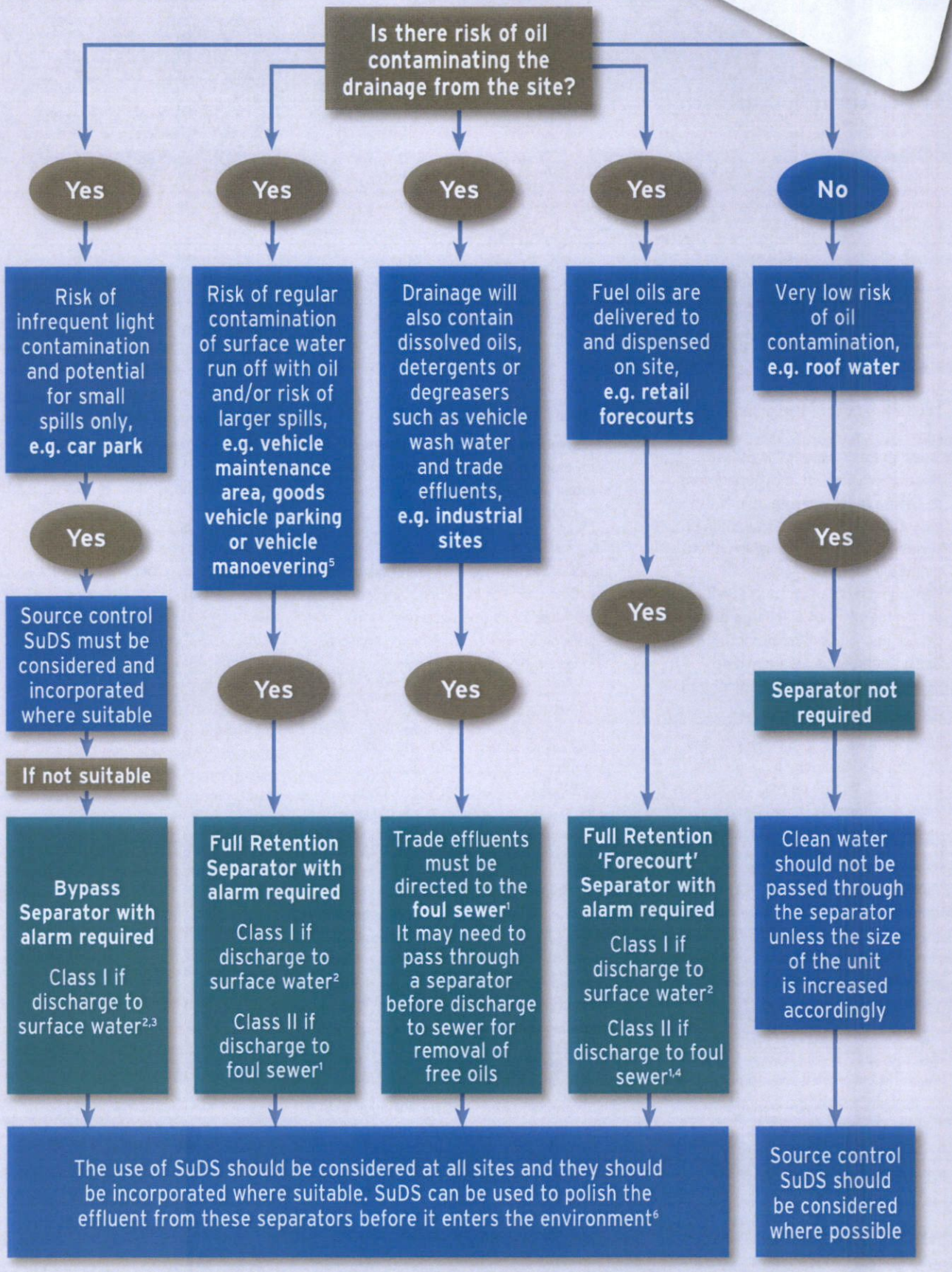
Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Kingspan Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.



1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.
2 You must seek prior permission from the relevant environmental body before you decide which separator to install.
3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.
5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.
6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

Bypass NSB RANGE

APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Oil storage volume.
- Silt storage capacity.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction GRP chamber construction * Some units have more than one access shaft – diameter of largest shown.

Full Retention NSF RANGE

APPLICATION

Full retention separators are used in high risk spillage areas such as:

- Fuel distribution depots.
- Vehicle workshops.
- Scrap Yards

PERFORMANCE

Kingspan Klargester were the first UK manufacturer to have the required range (3-30 l/sec) certified to EN 858-1 in the UK. The NSF number denotes the flow at which the separator operates.

The British Standards Institute (BSI) have witnessed the performance tests of the required range of separators and have certified their performance, in relation to their flow and process performance to ensure that they met the effluent quality requirements of EN 858-1. Larger separator designs have been determined using the formulas extrapolated from the test range.

Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Automatic closure device.
- Oil storage volume.
- Coalescer (Class I units only).

Klargester full retention separators treat the whole of the specified flow.

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- 3-30 l/sec range independently tested and performance sampled, certified by the BSI.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.

- Oil alarm system available.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size full retention separator, the following information is needed:-

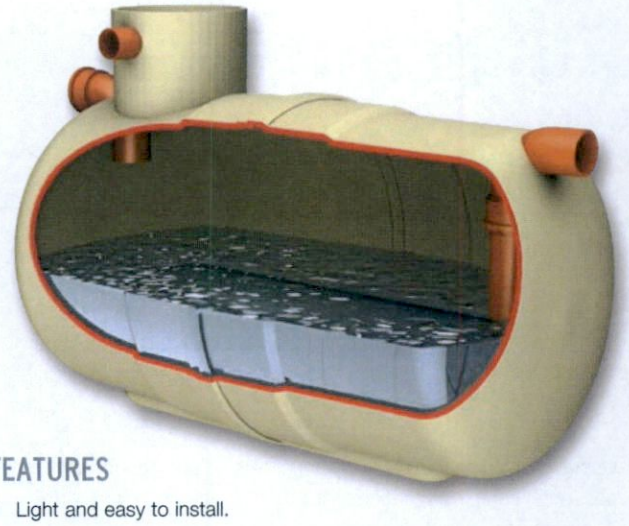
- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the influent is not pumped.
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	DRAINAGE AREA (m^2) PPG-3 (0.018)	STORAGE CAPACITY (litres)		UNIT LENGTH (mm)	UNIT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	MIN. INLET INLET (mm)	STANDARD PIPEWORK DIA. (mm)
			SILT	OIL						
NSFP003	3	170	300	30	1700	1350	1420	1345	500	160
NSFP006	6	335	600	60	1700	1350	1420	1345	500	160
NSFA010	10	555	1000	100	2610	1225	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	1050	1000	500	200
NSFA020	20	1115	2000	200	3200	2010	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	1810	1760	1000	315
NSFA065	65	3610	6500	650	6850	2010	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	2500	2450	1000	300
NSFA100	100	5560	10000	1000	6200	2820	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	2550	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	2550	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	2550	2450	1000	600

Rotomoulded chamber construction GRP chamber construction

Washdown & Silt



APPLICATION

This unit can be used in areas such as car wash and other cleaning facilities that discharge directly into a foul drain, which feeds to a municipal treatment facility.

If emulsifiers are present the discharge must not be allowed to enter an NS Class I or Class II unit.

- Car wash.
- Tool hire depots.
- Truck cleansing.
- Construction compounds cleansing points.

PERFORMANCE

Such wash down facilities must not be allowed to discharge directly into surface water but must be directed to a foul connection leading to a municipal treatment works as they utilise emulsifiers, soaps and detergents, which can dissolve and disperse the oils.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.

SIZES AND SPECIFICATIONS

REF.	TOTAL CAPACITY (litres)	MAX. REC. SILT	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STANDARD FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA. (mm)	APPROX EMPTY (kg)
W1/010	1000	500	3	1123	1225	460	1150	1100	50	500	160	60
W1/020	2000	1000	5	2074	1225	460	1150	1100	50	500	160	120
W1/030	3000	1500	8	2952	1225	460	1150	1100	50	500	160	150
W1/040	4000	2000	11	3898	1225	460	1150	1100	50	500	160	180
W1/060	6000	3000	16	4530	1440	600	1360	1310	50	500	160	320
W1/080	8000	4000	22	3200	2020	600	2005	1955	50	500	160	585
W1/100	10000	5000	27	3915	2020	600	2005	1955	50	500	160	680
W1/120	12000	6000	33	4640	2020	600	2005	1955	50	500	160	770
W1/150	15000	7500	41	5435	2075	600	1940	1890	50	500	160	965
W1/190	19000	9500	52	6865	2075	600	1940	1890	50	500	160	1200

Car Wash Silt Trap

APPLICATION

Car Wash silt trap is designed for use before a separator in car wash applications to ensure effective silt removal.

FEATURES

- FACTA Class B covers.
- Light and easy to install.
- Maintenance from ground level.

Forecourt

APPLICATION

The forecourt separator is designed for installation in petrol filling station forecourts and similar applications. The function of the separator is to intercept hydrocarbon pollutants such as petroleum and oil and prevent their entry to the drainage system, thus protecting the environment against hydrocarbon contaminated surface water run-off and gross spillage.

PERFORMANCE

Operation ensures that the flow cannot exit the unit without first passing through the coalescer assembly.

In normal operation, the forecourt separator has sufficient capacity to provide storage for separated pollutants within the main chamber, but is also able to contain up to 7,600 litres of pollutant arising from the spillage of a fuel delivery tanker compartment on the petrol forecourt. The separator has been designed to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- Class I and Class II design.
- Oil storage volume.
- Coalescer (Class I unit only).
- Automatic closure device.
- Oil alarm system available.

INSTALLATION

The unit should be installed on a suitable concrete base slab and surrounded with concrete or pea gravel backfill. See sales drawing for installation.

If the separator is to be installed within a trafficked area, then a suitable cover slab must be designed to ensure that loads are not transmitted to the unit.

The separator should be installed and vented in accordance with Health and Safety Guidance Note HS(G)41 for filling stations, subject to Local Authority requirements.

SIZES AND SPECIFICATIONS

ENVIROCEPTOR CLASS	TOTAL CAP. (litres)	DRAINAGE AREA (m^2)	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STD. FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STD. PIPEWORK (mm)	EMPTY WEIGHT (kg)
I	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
II	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
I	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500
II	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500

Alarm Systems

British European Standard EN 858-1 and Environment Agency Pollution Prevention Guideline PPG3 requires that all separators are to be fitted with an oil level alarm system and that it should be installed and calibrated by a suitably qualified technician so that it will respond to an alarm condition when the separator requires emptying.

- Easily fitted to existing tanks.
- Excellent operational range.
- Visual and audible alarm.
- Additional telemetry option.

PROFESSIONAL INSTALLERS

Kingspan Klargester Accredited Installers
Experience shows that correct installation is a prerequisite for the long-lasting and successful operation of any wastewater treatment product. This is why using an installer with the experience and expertise to install your product is highly recommended.

Services include :

- Site survey to establish ground conditions and soil types
- Advice on system design and product selection
- Assistance on gaining environmental consents and building approvals
- Tank and drainage system installation
- Connection to discharge point and electrical networks
- Waste emptying and disposal

Discover more about the Accredited Installers and locate your local expert online.

www.kingspanenviro.com/klargester

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- BELOW GROUND STORAGE TANKS
- GREASE & SILT TRAPS

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CIBSE CPD

Issue No. 21: September 2015

12 APPENDIX D – HYDROBRAKE INFORMATION

Design Data

Hydro-Brake® Optimum

Vortex Flow Control

Inspired by nature and engineered to deliver the perfect curve, the Hydro-Brake® Optimum is the most advanced vortex flow control available. There is no equivalent to the Hydro-Brake® Optimum when it comes to delivering the best possible hydraulic performance with a passive flow control.

With a wide range of configurations and options available, the Hydro-Brake® Optimum is able to provide precision flow control to suit the vast majority of applications.

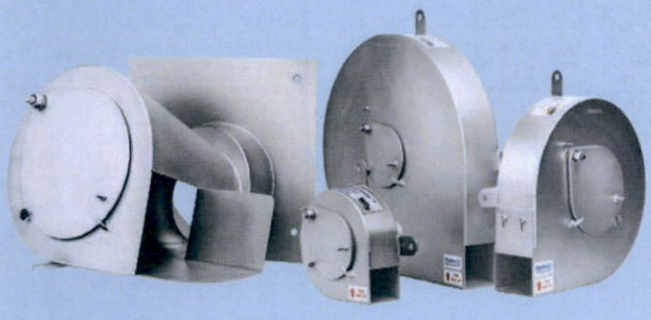


Figure 1 - The Hydro-Brake® Optimum is designed and manufactured to deliver precise, repeatable flow control.

Precision Engineered Vortex Flow Controls

Each Hydro-Brake® Optimum is custom configured to suit the application and is manufactured under strict quality assurance procedures to deliver precise flow control to exacting requirements.

Every unit is backed by significant R&D investment to fine-tune the performance, meaning that the Hydro-Brake® Optimum is the only vortex flow control to have been independently certified by the BBA and WRc.

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 08/4596

wrc approved
PT/409/0417

Benefits

- Manufactured from high grade stainless steel.
- Future proof – adjustable or replaceable inlet plates available to alter flow rates post-installation.
- Configurations available to suit a wide variety of installations.
- Large cross sectional area at all heads.
- Simple installation.
- Self-activating.
- No moving parts or external power requirement.

Versatile and Flexible

At Hydro International, we pride ourselves on providing solutions that meet your requirements, rather than providing a standard solution and asking you to compromise on your project needs.

The Hydro-Brake® Optimum offers designers options to precision-engineer a vortex flow control to:

- Minimise upstream storage volumes.
- Maximise internal (inlet & outlet) cross sectional areas to prevent blockages.
- Build-in a climate change factor to allow for future changes in flow rate.

Furthermore, if you need to retrofit a flow control, our dedicated team of engineers can assist with providing a customised Hydro-Brake® Optimum suitable for installation into existing drainage infrastructure.

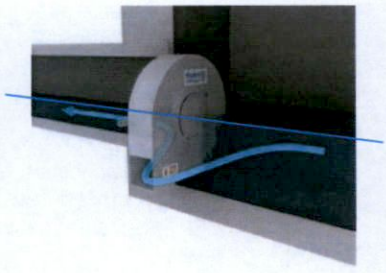
Design Data
Hydro-Brake® Optimum
Vortex Flow Control

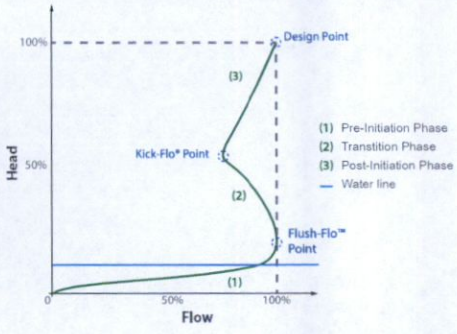
Operating Principles

The hydraulic behaviour of the Hydro-Brake® Optimum is described by its hydraulic characteristic curve, which relates the discharge flow from the unit to the hydraulic head acting upon that unit.

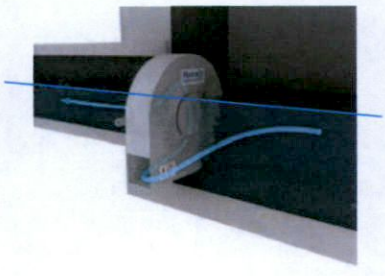
The hydraulic characteristic curve consists of three distinct sections, each corresponding to a different governing flow control regime:

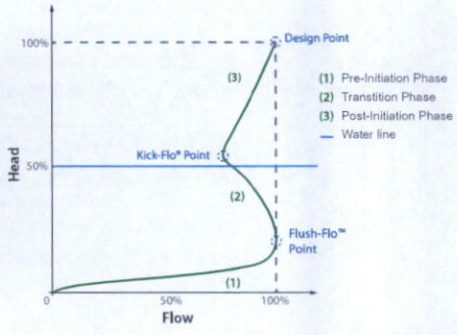
1. The pre-initiation phase – governed by orifice flow and defined on the characteristic curve as the region between the origin and the point at which the vortex begins to have a throttling effect (Flush-Flo™ point). In this region, the depth of water is below the soffit of the outlet orifice of the Hydro-Brake® Optimum.



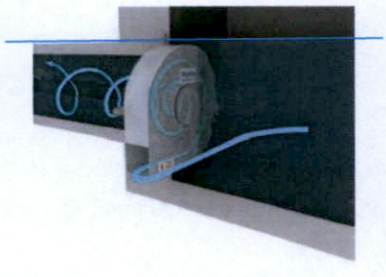


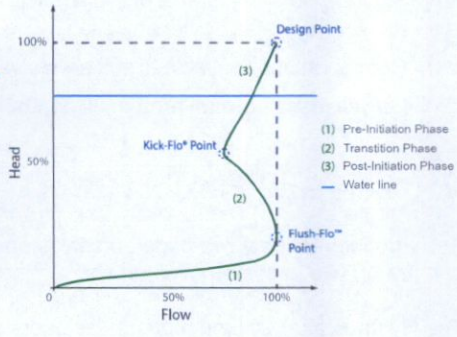
2. The transition phase – governed by vortex formation and defined on the characteristic curve as the region between the Flush-Flo™ and the point at which the vortex has fully initiated (Kick-Flo® point). In this region the vortex will continually form and collapse. A trapped volume of air inside the Hydro-Brake® Optimum will exert a backpressure and cause the discharge rate to reduce even though the hydraulic head continues to increase.





3. The post-initiation phase – governed by stable vortex flow and defined on the characteristic curve as the region above the Kick-Flo® point. A stable vortex is formed and sustained. An air filled core at the centre of the vortex acts as a pseudo-physical flow restriction by reducing the cross sectional area available for the passage of water.





Design Flexibility

It is possible for the Design Point to be achieved using a number of different flow control configurations, each with a different hydraulic response or characteristic curve.

An in-depth understanding of the flow regimes and interactions at each stage of the hydraulic characteristic curve allows custom configuration of the Hydro-Brake® Optimum to achieve the hydraulic profile best suited to the site requirements.

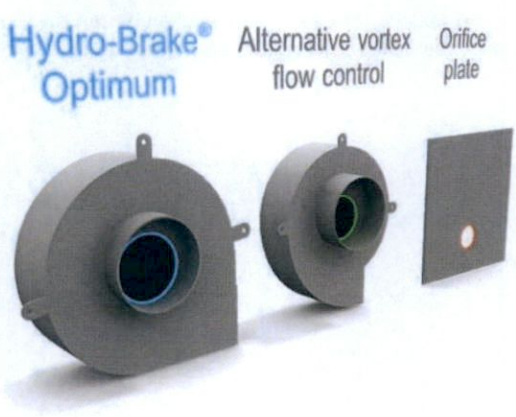
Hydro-Brake® Flow Control Series
Hydro-Brake® Hotline: 01275 337937
stormwater@hydro-int.com

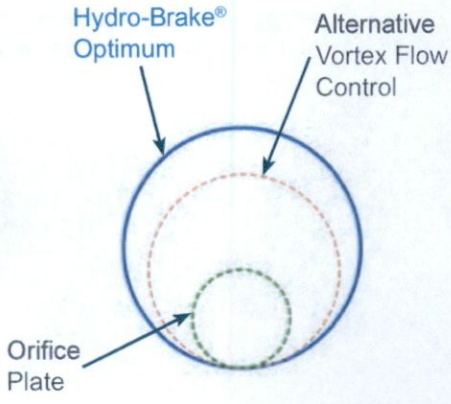
Design Data
Hydro-Brake® Optimum
Vortex Flow Control

Resilience by Design

Hydro-Brake® Optimum has outlets (clearances) up to 20% larger than competitor products to minimise the risk of blockages. All units are fitted with a pivoting bypass door to enable full access to the internal chamber and the outlet structure in the event that a blockage does occur.

All Hydro-Brake® Optimum units can also be supplied with an adjustable or replaceable inlet to future-proof the device, allowing flows to be altered post-installation, to account for site expansion or climate change.





Expert Design Support Services

Hydro International's professional engineers work with you to provide expert technical and aftersales support to ensure your projects meet exacting design requirements and deliver the very best hydraulic controls for your site.

With over 35 years' experience of flow control knowledge and experience, Hydro International's design support team is available to advise on any aspect of water flow management, including detailed modelling of vortex flow controls and composite outlet structures.

Call the Hydro-Brake® Hotline on: 01275 337937 or email stormwater@hydro-int.com

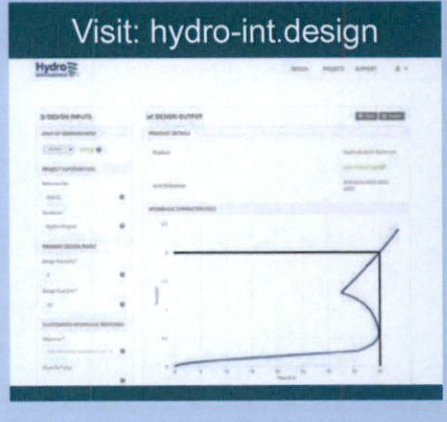
Online Design Tool

Engineers have the flexibility to try out any number of flow control iterations and explore their impact on hydraulic performance.

Our Online Design Tool allows you to quickly and easily compare a number of different flow control options for your site to develop the most robust and sustainable drainage solution possible.

The new tool now also has the added options to size and design the First Defense® and Downstream Defender® stormwater treatment separators, alongside the existing functionality to size and design Hydro-Brake® Optimum flow controls.

hydro-int.design



Full MicroDrainage® Compatibility

Engineers can carry out sizing and flow rate calculations and conduct hydraulic modelling of drainage networks containing Hydro-Brake® Optimum units using the industry-standard drainage design software, MicroDrainage®.

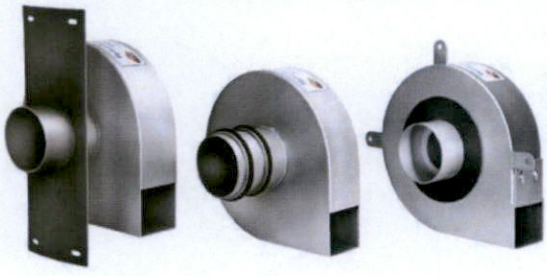
XP solutions

Micro Drainage

Design Data
Hydro-Brake® Optimum
Vortex Flow Control

Easy to Install

Hydro-Brake® Optimum has a range of mounting options for ease of installation or can be supplied ready fitted into a manhole chamber (with or without a weir wall) for simple plug-and-play installation. There are no set-up or commissioning requirements.



The Hydro-Brake® Flow Control Series

As a brand leader for vortex flow controls for more than 30 years, Hydro International continues to set the standard in flow control management technologies. The Hydro-Brake® Flow Control Series is a comprehensive and versatile toolbox of precision-engineered devices for flow attenuation and control that can help deliver compliant schemes with scaleable, precision flow control performance.

Every device in the series is tested and manufactured to exacting standards and wherever possible, independently accredited to provide the reassurance of reliable, repeatable through-life operation.

Hydro-Brake® Orifice

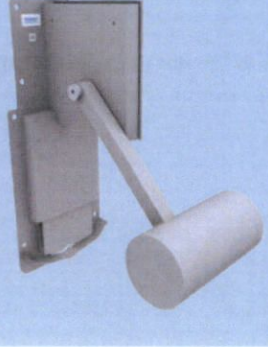
The low-cost option for unconstrainted sites (shown with optional screen).

Hydro-Brake® Optimum

The vortex flow control with no equvalent, delivering Nature's Perfect Cuve with no moving parts and independently verified by the BBA and WRc.

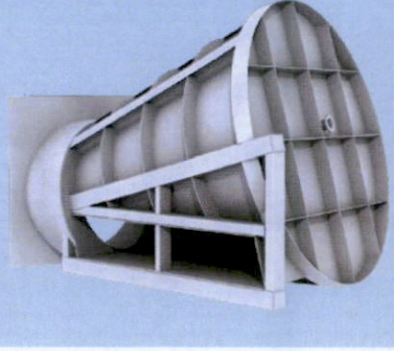
Hydro-Brake® Agile

Precision engineered flow control for highly constrained applications.



Hydro-Brake® Flood Alleviation

The vortex controlled solution to watercourse flooding.



Patent: www.hydro-int.com/patents

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