CP1273 Central Dublin Substation Project

Engineering Services Report

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1 Introduction

1.1 Project Description and Site Location

EirGrid, as the Transmission System Operator (TSO) of Ireland, and ESB Networks, as the Distribution System Operator (DSO) and Transmission Asset Owner (TAO) of Ireland, work collaboratively to ensure that the needs of transmission and distribution connected customers are met. This includes planning the development of transmission interface stations. A transmission interface station or transmission substation is a point of connection between the transmission and distribution system. A primary function of these stations is to facilitate power flows between the transmission and distribution systems to enable power to be distributed to where it is needed.
As part of feedback collected during the 'Shaping our Electricity Future' consultation, the DSO has highlighted to EirGrid emerging needs for additional capacity at transmission interface stations in the Dublin area. This capacity is needed to accommodate forecast growth of electricity demand in the distribution network. This projected demand growth is driven by several factors including residential, electrification of heat and transport and growth in commercial sectors.

The significant electricity demand growth in the distribution system also leads to a significant pressure on the transmission system, particularly at existing transmission substations and the associated transmission circuits. The existing transmission substations and the associated transmission circuits are at risk of reaching their capacity limits and as a result the existing infrastructure will not be capable to supply sufficient power to where it is needed. To address this need, new infrastructure is required. Since publication of the 'Shaping Our Electricity Future v1.0 Roadmap' in 2021, the emerging needs have translated into connection requests made by the DSO to the TSO. Currently there are three projects underway to deliver new transmission substations, one each in North County Dublin (CP1214 Fingal East Meath Grid Reinforcement), West County Dublin (CP1226 Kildare Dublin Grid Reinforcement), and Central Dublin (CP1273). This report relates to Capital Project 1273, Central Dublin Reinforcement Project.

At the Central Dublin Substation a need was identified for two substation buildings.

1 no. 2-storey 220kV Gas Insulated Switchgear (GIS) substation building occupying an area of c. 51.78m x 22.2m and 20m in height to include the GIS switchgear comprising of insulated circuit breakers, disconnectors and other high voltage equipment, all necessary welfare facilities, office spaces, and monitoring and control equipment required for the operation and maintenance of the substation.

1 no. 2-storey 110kV GIS substation building occupying an area of c. 51m x 15.9m and 16.5m in height to include the GIS switchgear comprising of insulated circuit breakers, disconnectors and other high voltage equipment, all necessary welfare facilities, office spaces, and monitoring and control equipment required for the operation and maintenance of the substations

The site covered by this application covers an area of 1.124 hectares. The site is currently in use as a temporary surface car park for ESB Networks staff with an adjacent vacant brownfield site. The security-controlled surface car park has been in operation at the location since 2016, as permitted by DCC (under Planning Reference 3052/16 and 2766/21) and will expire in August 2026.

The site is currently accessible from the East Wall Road (R131) and the residential area of East Wall is located immediately to the southwest of the site and comprises two storey residential dwellings. The site is bounded to the west by the Portside Business Centre, to the east by a Dublin Port Company (DPC) Storage Site, to the north by the M50 and Port Tunnel Control building and Tolling facility.

The Eastpoint Business Park lies immediately to the north of the M50 and Port Tunnel which consists of numerous office buildings with access to the Business Park from two security-controlled access points from Alfie Byrne Road and Bond Road. Further afield to the northwest of the application site,

the River Tolka flows out into the Dublin Bay Estuary. The M50 crosses the river near the estuary before entering the port tunnel.

The location is approximately 50m south from the Belcamp – Shellybanks 220 kV circuit which currently runs on the northern side of the M50. The proposed substation will connect into this 220 kV circuit via a trenchless crossing of the M50. The grid connection and associated works will not form part of this planning application. It will be subject to a separate consenting process. The grid connection is an integral part of the proposed development to ensure that the project will have the necessary electricity supply for testing and operation and as such it is described in Section

Figure 1-1: CP1273 Site Location

1.2 Topography

A detailed topographical survey of the existing site was carried out. The topographical survey for the proposed substation site is show on drawing number CP1273-RPS-03-PL-SL-D-C-2102. On the western side of the site the levels are generally at 4.0mOD (Malin Head) with a minor variation of +/- 150mm for surface drainage. The eastern part of the site is at approximately 3.60mOD with similar variations for surface drainage. There is one site entrance/exit point, this is located on the southern boundary to/from East Wall Road. There is a fall at the entrance from 3.84mOD in the site to +3.3mOD on East Wall Road.

1.3 Proposed substation site infrastructure

This section outlines the proposed site infrastructure for the substation. The proposed site layout is on Drawing No. CP1273-RPS-03-PL-SL-D-C-2103 prepared by RPS as part of the SID application pack, with further details of the development described elsewhere in this report.

Below is a schedule of the key infrastructure elements that will comprise the proposed substation:

- Gas Insulated Switchgear substation (GIS),
- Transformers,
- Access routes, parking areas, and hardstanding areas,
- Surface Water Infrastructure,
- Foul Water Infrastructure,
- Potable Water Supply,
- Internal underground utilities, such as power, telecoms,
- Landscaping Features,
- Security fencing and anti-ram barrier

1.3.1 Site Security

It is essential to prevent unauthorised access to the site, especially to the compound and buildings, as such access could lead to property damage, loss of life, and/or disruption of supply from this strategic asset.

The site security measures designed to prevent unauthorised entry to the substation consist of:

- one vehicle security gate and two side pedestrian gates to the compound located at the main entrance. The vehicular gates are 2.6 metres high and will be secured meshed panels and anti-ram barriers.
- existing walls on the northern, eastern and western boundaries. The walls are generally constructed using modular concrete blocks and are between 3.0m and 5.0m in height.
- a palisade fence along the southern boundary, except at the site entrance, consisting of a 2.6m and 3.0m high palisade panels as shown on Drawing No. CP1273-RPS-03-PL-SL-D-C-2103 ;
- an additional decorative 2.6m and 3.0m high fence between the palisade fence and East Wall Road.
- a CCTV system to monitor the substation entrance;
- anti-intruder alarms will be installed in all lockable buildings.

1.3.2 Gas Insulated Switchgear (GIS) Buildings

A 220kV and 110kV GIS 2 storey buildings are proposed as part of the development. These buildings will accommodate all necessary welfare facilities, office spaces, and the monitoring and control equipment required for the operation and maintenance of the substation. It is anticipated that both buildings will feature steel frames, precast concrete floors, and an insulated cladding system.

Each of the two main buildings is expected to have a ground floor and a first floor, incorporating the areas as shown on Drawings No. CP1273-RPS-03-PL-SL-D-E-2131 and CP1273-RPS-03-PL-SL-D-E-2132:

- Cable room,
- Control room,
- Battery room,
- Toilets and showers, and
- Loading platforms.

The main buildings are designed to include all necessary features for the safe operation and maintenance of the substation, meeting all applicable health, safety, and welfare legislation as well as other legal obligations.

1.3.3 Water Supply

Water requirements are for minor domestic needs and firefighting requirements. A number of watermain spurs connecting into the site have been identified from Uisce Éireann records entering the site at the southeastern corner. One 600mm CI main is shown crossing the site and terminating with a meter at the boundary between this site and the TII offices to the north. The site's potable water supply is proposed to be sourced from this existing Uisce Éireann main. The 600mm main on the site will cut short at the southern boundary and removed appropriately. The new network will connect at this point. Any existing connection located on site to TII or any other 3rd party will be integrated into the new system as shown on Drawing No. CP1273-RPS-03-PL-D-C-2120.

The connection will be routed in a loop around both buildings under the access roads and will include sluice valves as needed for isolation. A water meter will be installed outside the site boundary and in accordance with Uisce Éireann requirements. Fire hydrants will be installed in compliance with the Building Regulations (Technical Guidance Document B) to support firefighting requirements.

Further details of Water Supply are provided in Section 4 of this report.

1.3.4 Surface Water and Foul Water Infrastructure

The existing surface water network on the site currently discharges to the existing 300mm public surface water gravity sewer located to the East Wall Road, parallel to the southern boundary of the site.

As part of the Proposed Development, a new storm water drainage system is be provided to effectively manage runoff from hardstanding areas, building roofs, internal access roads, and car parking within the substation compound. The proposed drainage network will consist of a series of strategically placed gullies and channel drains that collect surface water from all impermeable and semi-permeable areas and discharge to an existing gravity network. Collected surface water runoff will pass through an oil/petrol interceptor to remove hydrocarbons and other potential contaminants before entering an underground attention system., which has been designed to regulate the outflow from the Proposed Development. The attenuation discharge rate has been designed on the basis of a 1 in 100-year return period critical storm with 20% climate change allowance. The discharge rate will be limited to a maximum of 5l/s during a 1 in 100 Year storm, in accordance with local authority requirements to prevent downstream flooding and protect the receiving network. The attenuated discharge will exit the site via a controlled outfall and connect to the public surface water drainage system.

All surface water drainage design and construction will be carried out in compliance with The Greater Dublin Strategic Drainage Study (GDSDS), CIRIA The SuDS Manual and Building Regulations 2010 Part H.

Details of the proposed surface water drainage system, including layout and specifications are shown on CP1273-RPS-03-PL-SL-D-C-2111 prepared by RPS enclosed as part of the SID application pack.

Sustainable Urban Drainage System (SuDS) measures are proposed to be provided within the Proposed Development, to mitigate the adverse effects of urban stormwater drainage by replicating the natural predevelopment catchment characteristics of the site. Based on the requirements of the Proposed development and particular constraints of the site, a number of potential SuDS measures are not feasible as part of the development. Further details on the SuDS requirements and demonstration of compliance with DCC's Sustainable Drainage Design and Evaluation Guide (2021) is provided in Section 5.2 of this report.

The foul drainage is a gravity system that discharges into an existing combined Uisce Éireann manhole located on East Wall Road.

Additional details about water supply, surface water, and foul drainage infrastructure are provided in Sections 4, 5, and 6 of this report.

1.4 Buildings

1.4.1 Structural Form

The locations of the buildings at the proposed substation are shown on Drawing No.CP1273-RPS-03-PL-SL-D-C-2103 prepared by RPS enclosed as part of the SID application pack.

The buildings are designed as steel framed structures, with a proprietary cladding, constructed on reinforced concrete floor slabs. It is envisaged that the floor slabs will be piled. The buildings shall be constructed in accordance with the building regulations and to the levels and details provided in the planning application drawings.

1.4.2 Building Heights

The building heights will conform to the specifications outlined in the planning application. The heights of the different structures are detailed in the corresponding planning application drawings. The maximum height of buildings on site is 20m.

1.5 Accompanying Information

This report is accompanied by Appendices 1 to 3 and the Planning Drawings, which include the information specified below.

Table 1-1: Appendices

Appendix Name	Appendix Contents
Appendix 1	Surface Water Design
Appendix 2	Klargester Product Guide

Table 1-2:Planning Drawings (Civil)

Drawing No.	Drawing Title
CP1273-RPS-03-PL-SL-D-C-2102	Existing Site Topographical survey
CP1273-RPS-03-PL-SL-D-C-2103	Proposed Site Levels
CP1273-RPS-03-PL-SL-D-C-2104	Proposed Site Cross Sections
CP1273-RPS-03-PL-SL-D-C-2105	Proposed Vehicle Tracking

CP1273-RPS-03-PL-SL-D-C-2106	Proposed Site Entrance Layout
CP1273-RPS-03-PL-SL-D-C-2107	Proposed Road Cross Sections
CP1273-RPS-03-PL-SL-D-C-2108	Proposed Road Details
CP1273-RPS-03-PL-SL-D-C-2110	Existing utility layout
CP1273-RPS-03-PL-SL-D-C-2111	Proposed Drainage Layout (Foul & Surface Water)
CP1273-RPS-03-PL-SL-D-C-2112	Proposed longitudinal sections (F&SW) Sheet 1 of 2
CP1273-RPS-03-PL-SL-D-C-2113	Proposed longitudinal sections (F&SW) Sheet 2 of 2
CP1273-RPS-03-PL-SL-D-C-2114	Drainage Details Sheet 1
CP1273-RPS-03-PL-SL-D-C-2120	Proposed Watermain Layout
CP1273-RPS-03-PL-SL-D-C-2121	Watermain Details Sheet 1 of 2
CP1273-RPS-03-PL-SL-D-C-2122	Watermain Details Sheet 2 of 2
CP1273-RPS-03-PL-SL-D-C-2123	Proposed longitudinal section watermain
CP1273-RPS-03-PL-SL-D-C-2128	Proposed contractor compound & storage areas
CP1273-RPS-03-PL-SL-D-C-2129	Proposed Cut and Fill Analysis
CP1273-RPS-03-PL-SL-D-C-2130	Internal Road- Proposed Details

Table 1-3:Planning Drawings (Electrical)

Drawing No.	**Drawing Title**
CP1273-RPS-03-PL-SL-D-E-2130	Cable Arrangement Site Layout
CP1273-RPS-03-PL-SL-D-E-2133	Lightening Protection Layout
CP1273-RPS-03-PL-SL-D-E-2134	Compound Earthing Layout

Table 1-4:Planning Drawings (Landscape Architecture)

Drawing No.	**Drawing Title**
CP1273-RPS-03-PL-SL-D-A-2150	Landscape Master Plan
CP1273-RPS-03-PL-SL-D-A-2151	Landscape Details Sheet 1 of 1

Table 1-5:Planning Drawings (Architecture)

Drawing No.	**Drawing Title**
CP1273-BDA-03-PL-SL-D-A-2160	Site Location Map (OS Based)
CP1273-BDA-03-PL-SL-D-A-2161	Existing Site layout
CP1273-BDA-03-PL-SL-D-A-2162	Existing contiguous elevations / sections
CP1273-BDA-03-PL-SL-D-A-2163	Existing Plan / Elevations
CP1273-BDA-03-PL-SL-D-A-2164	Proposed Site Layout
CP1273-BDA-03-PL-SL-D-A-2165	Proposed contiguous elevations / sections
CP1273-BDA-03-PL-SL-D-A-2170	Proposed Roof Plan (220kV GIS Buidling)
CP1273-BDA-03-PL-SL-D-A-2171	Proposed Plans (220kV GIS Buidling)
CP1273-BDA-03-PL-SL-D-A-2172	Proposed Elevations (220kV GIS Buidling)

CP1273-BDA-03-PL-SL-D-A-2173	Proposed Roof Plan (110kV GIS Buidling)
CP1273-BDA-03-PL-SL-D-A-2174	Proposed Plans (110kV GIS Buidling)
CP1273-BDA-03-PL-SL-D-A-2175	Proposed Elevations (110kV GIS Buidling)
CP1273-BDA-03-PL-SL-D-A-2176	Proposed Sections
CP1273-BDA-03-PL-SL-D-A-2180	Proposed Front Boundary Wall

2 ACCESS AND ROAD LAYOUT

2.1 Site Entrance

Access to site will be provided from East Wall Road/R131.The substation access site lines have been designed in accordance with The Design Manual for Urban Roads & Streets (DEMURS); Design speed 50km/h, SSD Standard 49m, refer below for an extract from the DEMURS.

SSD STANDARDS

Design Speed (km/h)	SSD Standard (metres)
10	7
20	14
30	23
40	33
50	45
60	59

Forward Visibility

Design Speed (km/h)	SSD Standard (metres)
10	8
20	15
30	24
40	36
50	49
60	65

Forward Visibility on Bus Routes

Table 4.2: Reduced SSD standards for application within cities towns and villages. Reduced forward visibility increases driver caution and reduces vehicle speeds.

Figure 2-1 DEMURS extract

The entrance junction layout has been designed in accordance with the Traffic signs Manual Chapter 7. It is similar to the layout of the existing site entrance with a ramp, tactile paving and stop required. The site entrance plan is indicated on Drawing No. CP1273-RPS-03-PL-D-C-2106 prepared by RPS enclosed as part of the SID application pack.

2.2 Internal Road Layout

The internal roads have been designed to allow access around the perimeter of both buildings. The use of verges and internal paths has been reduced in order to maximise the area available for vehicle access and set down areas on the site.

Internal circulation of a HGV and a Pumped Appliance has been designed using Autotrack software to ensure adequate turning space and as shown on Drawing No. CP1273-RPS-03-PL-D-C-2105 prepared by RPS enclosed as part of the SID application pack.

Road construction details and kerbing details to provide road edge restraint will be as shown on CP1273-RPS-03-PL-SL-D-C-2107 and CP1273-RPS-03-PL-SL-D-C-2108. Road drainage will be provided as part of the overall site drainage design and as shown on CP1273-RPS-03-PL-SL-D-C-2111.

3 EARTHWORKS

3.1 Site regrading and materials

There are minimal falls across the site. 4.0 mOD (Mailin Head) at the northern to 3.8 mOD at the southern boundary. At the eastern boundary 3.9 mOD and 3.6mOD in the west.

A flood risk assessment was completed, and the building floor levels are set at 4.5m. Due to the relatively constrained nature of the site and the large building footprints the building ground floor levels will dictate the earthworks strategy for the site.

The existing car park surfacing, and subgrades will be removed and disposed of at a suitable waste management facility. It is intended to make the maximum use of the material on site to reduce the import and export from site. Suitable material will be imported to achieve the levels required. A cut fill balance was completed and the import of approximately 6,000m^3 will be required to achieve design levels and provide surfacing etc. This is shown on Drawing No. CP1273-RPS-03-PL-D-C-2129.

If pockets of unsuitable or contaminated material are found during the construction, it will be removed (dealt with appropriately by disposal to licensed waste management facilities) and an equivalent amount of fill material imported.

4 WATER SUPPLY

The proposed development is an unmanned substation with occasional access for operation, inspection and maintenance

- Potable water for domestic use,
- Firefighting

The proposed watermain size is 110mm. The potable water on site is expected to be low. To prevent issues such as stagnation in the water supply line and its associated problems, there will be a continuous water demand of 24 litres per week from automatically flushing WC's within the station. A water meter will be installed on the public side east of the substation entrance.

The watermain layout, including the locations of valves, hydrants, and other components, is shown on Drawing No. CP1273-RPS-03-PL-SL-D-C-2120.

4.1 Potable Water Supply

The potable water supply for the site is planned to be sourced from the Uisce Éireann watermain, as shown on Drawing No. CP1273-RPS-03-PL-SL-D-C-2120 prepared by RPS as part of the SID application pack.

A combined watermain will be used to serve both domestic and firefighting needs. The distribution main will consist of 110 mm diameter pipes and is designed in compliance with Uisce Éireann Code of Practice for Domestic Supply

The estimated domestic potable water demand for the development is approximately 1 m³ per day

The proposed water demand for the Proposed Development are outlined in Table 5 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC	6	1	6	0.85
WHB	1	1	1	0.15
Total			**7**	**1**

Table 6 – Average Water Daily Demand

The proposed development has a daily flow of 1l/day. The daily water usage for the Proposed Development is negligible.

5 SURFACE WATER

5.1 General

The existing surface water network on the site currently discharges to the existing 300mm public surface water gravity sewer located to the East Wall Road, parallel to the southern boundary of the site.

As part of the Proposed Development, a new storm water drainage system is be provided to effectively manage runoff from hardstanding areas, building roofs, internal access roads, and car parking within the substation compound. The proposed drainage network will consist of a series of strategically placed gullies and channel drains that collect surface water from all impermeable and semi-permeable areas and discharge to an existing gravity network. Collected surface water runoff will pass through an oil/petrol interceptor to remove hydrocarbons and other potential contaminants before entering an underground attention system, which has been designed to regulate the outflow from the Proposed Development to match the greenfield runoff from the site (without development). The attenuation discharge rate has been designed on the basis of a 1 in 100-year return period critical storm with 20% climate change allowance.

The discharge rate will be limited to the maximum of Qbar or 2l/sec/ha, in accordance with DCC requirements. A site area of 1.02hec yields an equivalent allowable outflow of 2.04l/s, based on 2l/s/hec. The Greenfield runoff rate estimation tool on the Uk SuDS website yields a Qbar value for the site of 5.1l/s. Therefore, as no long-term storage has been provided, the outflow from the site will be restricted to 5l/s during a 1 in 100 Year storm, in accordance with local authority requirements to prevent downstream flooding and protect the receiving network. The attenuated discharge will exit the site via a controlled outfall and connect to the public surface water drainage system.

All surface water drainage design and construction will be carried out in compliance with The Greater Dublin Strategic Drainage Study (GDSDS), CIRIA The SuDS Manual and Building Regulations 2010 Part H.

5.2 SuDS Measures

Sustainable Urban Drainage System (SuDS) measures are proposed to be provided within the Proposed Development, to mitigate the adverse effects of urban stormwater drainage by replicating the natural predevelopment catchment characteristics of the site.

The provision of SuDS measures within developments offer multiple benefits when compared to traditional drainage systems. SuDs measures reduce the developments stormwater runoff rates, volumes, frequencies and pollutant concentrations while often enhancing the developments biodiversity, aesthetics and amenities.

As the Proposed Development contains 2no. substation buildings, consideration for the incorporation of green and blue roofs proposals into the design has been made. However, the Proposed Development is an unmanned electrical substation housing critical electrical infrastructure on a physically constrained site. Therefore, the use of green / blue roofs as a nature based drainage solution is not considered to be a feasible SuDS measure due to significant electrical safety concerns, and other technical and engineering constraints. It is therefore proposed that an exemption to the Dublin City Council (DCC) Green & Blue Roof Policy should be provided for this development.

The DCC Green Blue Roof Policy states that *"Exemptions will only be granted by DCC where it is demonstrated that suitable provision is made for SuDS measures (in accordance with Dublin City Council Sustainable Drainage Design and Evaluation Guide (2021) and all other planning requirements) and that appropriate sustainable drainage measures can be delivered on the site without the use of a green blue roof."* Therefore, the proposed stormwater drainage design will contain appropriate sustainable drainage measures that can be delivered on site, taking account of the site

specific constraints. Furthermore, the reductions in outflow to that of greenfield rate of runoff can be delivered on the subject site, without the need for green or blue roof infrastructure.

Based on the requirements of the Proposed Development and particular constraints of the site, a number of potential SuDS measures are not feasible as part of the development, such as:

- Tree pits / infiltration planters: No trees or other planting is proposed within the substation compound, due to the presence of significant underground services and ducting.
- Permeable paving: The Proposed Development contains large electrical equipment including large external transformers and internal GIS Switchgear. HGV's and other specialist equipment is required to install, maintain and operate this type of equipment. Consideration has also been given to the replacement of the equipment at end of life. Due to the loads and forces expected to be imparted on the road surfaces permeable paving is not deemed suitable for this site.

Appendix 12, Technical Summary of Dublin City Council Sustainable Drainage Design & Evaluation Guide (2021) of the Dublin City Development Plan 2022-2028 identifies a series of SuDS requirements to be considered within the assessment of a planning application. In order to demonstrate compliance with these DCC SuDS requirements, the following SuDS approach has been taken:

5.2.1 SuDS Requirement 1 – Runoff Destination

In considering the *Runoff Destination* requirements for the Proposed Development, the following method for utilising or releasing rainfall run-off have been incorporated:

- *Where appropriate, infiltrate run-off into the ground:*

  Following a desktop study of the existing site ground condition, it has been determined that the current site area typically consists of made ground. Therefore, the preliminary design has assumed no infiltration capacity of the soil for both the proposed SuDS features and geocellular attenuation.

  However, notwithstanding this, the proposed design includes the installation of lined, gravel-filled infiltration trenches with an impermeable liner. These structures will serve as filter drains that provide temporary subsurface storage and attenuation of surface water runoff. These trenches are intended to slow the time of concentration during critical storm events by reducing runoff velocity and volume while preventing infiltration into the underlying soils. A perforated pipe near the base will collect and convey filtered water to downstream drainage components. These trenches will enhance pollutant removal and safely manage high return period storm flows, minimizing the risk of system overload or damage.

  While the desktop study of existing ground conditions would suggest that infiltration properties of the subsoil will be poor, the provision of such infiltration trenches will ultimately allow for a measure of infiltration of surface water into the soil area, should it be found to be existing. It is envisaged that the infiltration trenches will be suitable to cater for low intensity, short duration storm events, and allow for no surface water to exit the site in such scenarios. The design conservatively assumes that there is no infiltration capacity in the subsoil, so other measures are also provided to aide in surface water management.

- *Discharge to a piped surface water drainage system:*

  While the order of preference is to provide for infiltration into the subsoil, as the infiltration properties of the subsoil is known to be poor based on desktop study, a piped drainage system will also be provided to ensure that there is a suitable route for surface water to be collected via, for when surface water exits the infiltration trenches.

5.2.2 SuDS Requirement 2 – Hydraulic Control

The following approach in relation to *Hydraulic Control* for the Proposed Development has been utilised:

- *Criterion 1 – River Quality Protection*

  Interception storage will be provided within the infiltration trenches as incorporated within the drainage design for Proposed Development. The interception volume associated with these SuDS feature comprises the water volume that can seep into the ground, the portion that will evaporate into the atmosphere, and what can be released through plants and vegetation.

- *Criterion 2 – River Regime Protection*

  The discharge from the Proposed Developed site will be restricted in accordance with the requirements of sub-criterion 2.1 and 2.2 as set out in Table 1: SuDS requirement within Appendix 12 of the Development Plan, by way of the provision of an underground attenuation structure, fitted with a HydroBrake type flow restrictor.

- *Criterion 3 – Level of Service (Flooding) for the Site*

  The proposed surface water system for the Proposed Developed site will meet with the requirements of sub-criterion 3.1, 3.2, 3.3 and 3.4 as set out in Table 1: SuDS requirement within Appendix 12 of the Development Plan by way of design.

- *Criterion 4 – River Flood Protection*

  The proposed surface water system for the Proposed Developed site will meet with the requirements of sub-criterion 4.3 as set out in Table 1: SuDS requirement within Appendix 12 of the Development Plan by way of design. The proposed outflow from the site has been restricted to Qbar (as calculated for the site using the HR Wallingford Greenfield Runoff Rate Estimation Tool), with no growth factors applied.

  A geo-cellular attenuation system of modular construction for storage, designed for the 1 in 100-year critical storm with 20% climate change, has been provided for in the design. Currently only online storage is accounted for with no infiltration capacity assumed within the design, and the outflow is controlled via HydroBrake fitted in a separate manhole.

5.2.3 SuDS Requirement 3 – Water Quality

The following approach in relation to *Water Quality* for the Proposed Development has been utilised:

The Proposed Development will consist of the provision of 3 no. transformers within the substation compound, which are contained within a bunded sump. As part of the proposed drainage design for this bunded area, a full retention oil interceptor has been provided and is dedicated to the transformer bund for direct spill containment, ensuring complete on-site oil retention.

In addition, a bypass oil interceptor is proposed to be installed upstream of the public storm sewer connection to treat site-wide runoff, primarily from parking areas and incidental spills, allowing high flows to bypass during storm events.

This proposed dual system optimizes pollutant control by segregating high-risk spill areas and managing overall site discharge effectively.

A catchment manhole is also to be collected upstream of the geocellular storage tank. This catchpit will collect silt and debris from the surface water drainage system. This will aide in preventing blockages and help ensure proper function and reduced maintenance of conveyance and storage systems downstream. It will also help to reduce the discharge of silt to the downstream receiving network. The catchpit manhole will be easily accessible and simple to clean.

5.2.4 SuDS Requirement 4 – Amenity

The Proposed Development is a high voltage electrical substation development which will be operated and maintained by ESB once operational. Ensuring electrical substation safety is crucial to prevent accidents, protect personnel and ensure uninterrupted power supply and maintaining the reliability of supply. As such, access will be restricted to relevant ESB staff. To ensure public safety and safe operation of the substation there will be no access by the public. Therefore no amenity measures within the substation compound have been incorporated into the design.

5.2.5 SuDS Requirement 5 – Biodiversity

As noted above in **Section 5.2.4** above, the Proposed Development is a high voltage electrical substation development, with the majority of the site consisting of either building or hardstanding. The Proposed Development will be unmanned during the operational phase and will house critical electrical infrastructure within the substation compound and therefore the use of green / blue roofs is not considered to be a feasible SuDS measure due to significant electrical safety concerns. As such, there is limited opportunity to incorporate biodiversity measures within the substation compound due to various technical, engineering and safety requirements.

Opportunities for biodiversity enhancement have been considered as part of the Boundary Treatment and Landscaping proposals for the Proposed Development.

6 FOUL WATER

6.1 General

The Proposed Development is an unmanned substation with occasional access for operation, inspection and maintenance. The foul drainage design is designed in accordance with the Uisce Éireann Code of Practice for Wastewater Infrastructure and will accommodate the wastewater produced by the welfare facilities within the proposed development. These facilities include a small canteen, toilet, and wash hand basin in each of the two buildings.

The proposed foul water network is illustrated on Drawing No. CP1273-RPS-03-PL-SL-D-C-2111. The foul water collection system will operate by gravity, as the site's slope is sufficient to allow gravity discharge to the existing Uisce Éireann combined manhole on East Wall Road.

.

6.2 Sanitary Wastewater

Sanitary wastewater, including effluent from toilets, washing facilities, and the canteen, will be collected within each building and conveyed to the existing public foul sewer through a foul water collection network. The estimated sanitary wastewater discharge to the sewer is up to 0.32 m³ per day.

The minimum pipe diameter is 225mm which will provide sufficient capacity for the expected flows. Due to the low level of flow and the station being unmanned it is not possible to achieve the required self-cleansing velocities.

If the facilities become unmanned, resulting in significantly reduced foul loading, a common issue is odour buildup in the toilets. To address this, self-flushing toilets are proposed for the station, which will automatically flush twice weekly.

The existing connection from the TII offices at the Eastern boundary will be incorporated into the proposed design as shown on Drawing No. CP1273-RPS-03-PL-SL-D-C-2111 prepared by RPS enclosed as part of the SID application pack.

The proposed foul water flows from the development are outlined in Table 6 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC	6	1	6	0.85
WHB	1	1	1	0.15
Total			**7**	**1**

Table 7 – Average Foul Water Daily Demand

The average daily foul water demand of 1 litre per day represents a negligible volume.

7 SUSTAINABILITY

Sustainability has been a primary focus in the design and planning of the proposed substation. The design incorporates the following key elements to support this goal.

7.1 Sustainable Urban Drainage (SUDS)

The principles of Sustainable Urban Drainage Systems (SuDS), as outlined in the Greater Dublin Strategic Drainage Study, have been incorporated into the design of this substation; for further details, refer to Section 5 of this report. The following specific measures have been included to reduce runoff volume and enhance runoff quality:

- A full retention oil interceptor has been provided and is dedicated to the transformer bund for direct spill containment, ensuring complete on-site oil retention.
- A bypass oil interceptor is proposed to be installed upstream of the public storm sewer connection to treat site-wide runoff, primarily from parking areas and incidental spills, allowing high flows to bypass during storm events.
- Surface water collection systems designed to pass through oil interceptors and bund guards.

7.2 Materials Reuse

It is anticipated that materials on site will be tested and reused wherever feasible. Topsoil and subsoil will be repurposed, where possible, for landscaping or fill in other areas. Material from any road planings to be brought to waste recycling.

- By using recycled construction products the need to extract virgin materials is reduced, helping conserve natural resources and minimise the environmental impact of resource extraction in addition to energy savings and pollution reduction.
- A minimum amount of excavation is required as part of the proposed development (car park surfacing and upgrades). Less digging minimises requirement for excavation, truck movements, soil removal, disposal, and transportation in addition to disruption at the construction stage.

7.3 Low Carbon Concrete

Opportunity to use low-carbon concrete (e.g. high GGBS content) where possible. GGBS replaces a portion of traditional concrete, whose production is highly carbon intensive. By using GGBS, the overall CO_2 emissions associated with concrete production are significantly lowered.

- GGBS is a by-product of the steel industry. It's use in concrete diverts industrial waste from landfills and provides a valuable second life, supporting circularity, resource efficiency and waste minimisation.
- The use of GGBS concrete can help projects earn points toward green building certifications such as BREEAM.
- GGBS production emits approx. 10% of the CO_2 compared to traditional concrete production. For every tonne of traditional concrete replaced by GGBS approx. 800 kg of CO_2 emissions are avoided.

7.4 Biodiversity

The use of green / blue roofs is not considered due to significant electrical safety concerns. As such, there is limited opportunity to incorporate biodiversity measures within the substation compound due to various technical, engineering and safety requirements.

Opportunities for biodiversity enhancement have been considered as part of the Boundary Treatment and Landscaping proposals for the Proposed Development.

8 CONSTRUCTION QUALITY ASSURANCE

To ensure the substation is built in accordance with the intended design and technical specifications, a comprehensive Construction Quality Assurance (CQA) plan will be implemented during the construction phase.

The CQA plan will include Construction Quality Control (CQC) procedures to ensure that materials and workmanship comply with the established specifications.

9 HEALTH AND SAFETY

9.1 General

RPS, A Tetra Tech Company, has complied with the requirements set forth in the Safety, Health, and Welfare at Work Construction Regulations 2013. Principles of Prevention have been considered, and a design risk assessment has been conducted for the site development elements of the works. Hazards have been identified and, where feasible, engineered out. Where elimination was not possible, appropriate mitigation measures have been incorporated. A record of any remaining risks will be maintained and communicated to the contractor through the preliminary Health and Safety Plan before the construction phase begins.

APPENDIX 1 – Surface Water Design

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

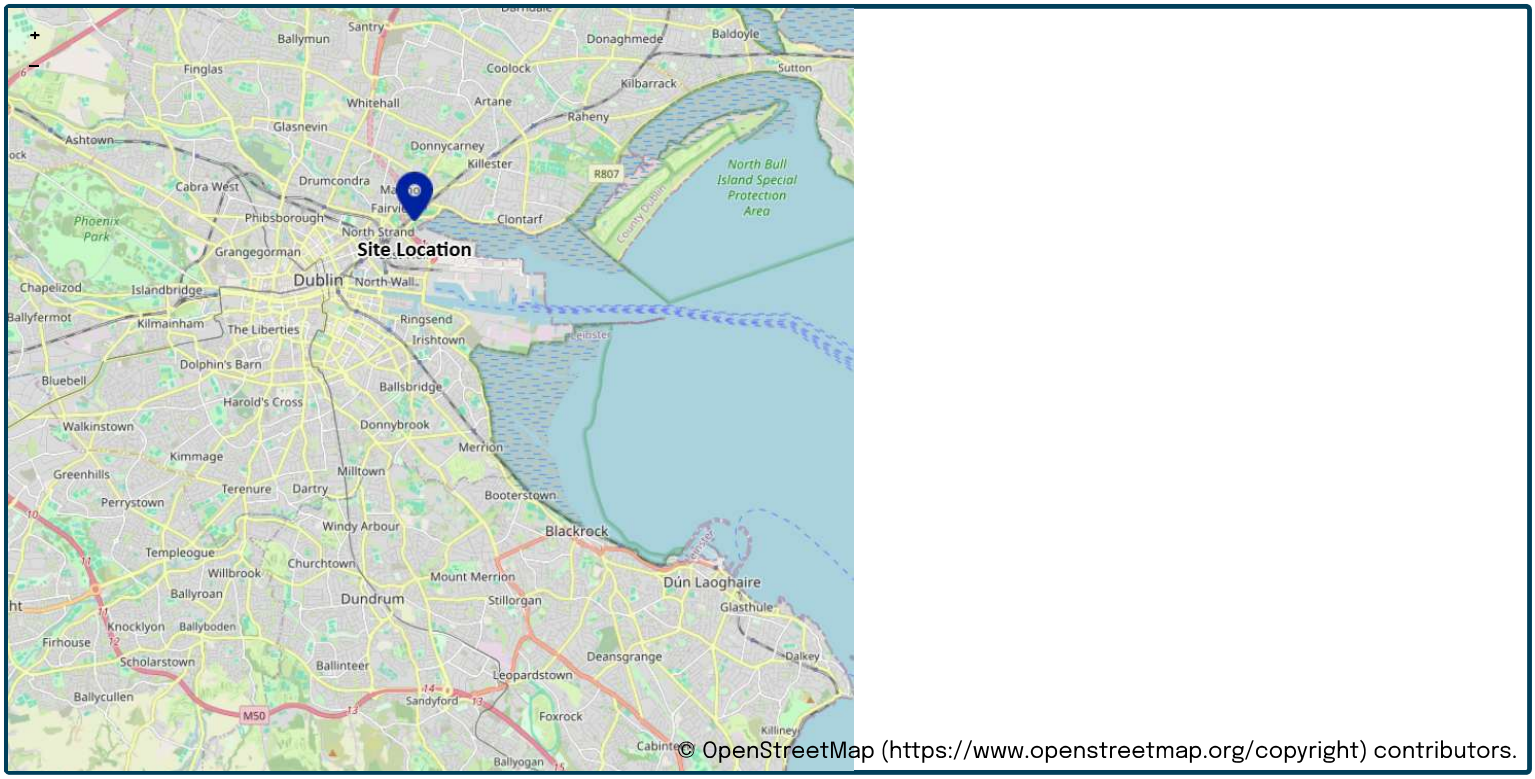
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	26/06/2025
Calculated by	Tomasz Krawczyk
Reference	Dublin Bulk Supply
Model version	2.0.1

Location

Site name	Dublin B.S.P
Site location	E Wall Rd, East Wall, Dublin 3



Site easting	118618
Site northing	392714

Site details

Total site area (ha)	1.06 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	693 mm		858
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	5.1 l/s		

Growth curve factors

	My value		Map value
Hydrological region	12		12
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.72		
30 year growth factor	2.13		
100 year growth factor	2.61		
200 year growth factor	2.86		

Results

Method	IH124
Flow rate 1 year (l/s)	4.3 l/s
Flow rate 2 year (l/s)	4.8 l/s
Flow rate 10 years (l/s)	8.7 l/s
Flow rate 30 years (l/s)	10.8 l/s
Flow rate 100 years (l/s)	13.2 l/s
Flow rate 200 years (l/s)	14.5 l/s

Disclaimer

Innishmore
Ballincollig
Co. Cork

Date 27/06/2025 09:59 | Designed by TOMASZ.KRAWCZYK
File Final Network Model.MDX | Checked by
Micro Drainage | Network 2020.1.3

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	IC1A	3.900	2.900	0.775	Open Manhole	1200
1.001	o	225	IC1B	3.850	2.700	0.925	Junction	
1.002	o	150	G.I.C Tank 1	3.800	2.500	1.150	Open Manhole	1200
2.000	o	225	MH 12	4.350	2.950	1.175	Open Manhole	1200
2.001	o	225	MH 11	4.250	2.550	1.475	Open Manhole	1200
2.002	o	225	Petrol IC . Junc	4.250	2.480	1.545	Junction	
1.003	o	225	MH 10	4.200	2.450	1.525	Open Manhole	1200
3.000	o	150	IC2A	4.500	3.500	0.850	Open Manhole	1200
3.001	o	150	IC2B	4.650	3.300	1.200	Junction	
3.002	o	150	G.I.C tank 2	4.470	3.120	1.200	Open Manhole	1200
1.004	o	225	MH 9	4.450	2.280	1.945	Open Manhole	1200
1.005	o	300	MH 8	4.250	2.080	1.870	Open Manhole	1200
1.006	o	300	MH 7	4.400	1.950	2.150	Open Manhole	1200
1.007	o	300	Tank 3 Junc	4.200	1.880	2.020	Junction	
1.008	o	225	G.I.C Tank 3	4.200	1.850	2.125	Open Manhole	1200
1.009	o	225	MH 2.1.1	4.400	1.810	2.365	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	27.813	139.1	IC1B	3.850	2.700	0.925	Junction	
1.001	29.717	148.6	G.I.C Tank 1	3.800	2.500	1.075	Open Manhole	1200
1.002	9.518	190.4	MH 10	4.200	2.450	1.600	Open Manhole	1200
2.000	39.904	99.8	MH 11	4.250	2.550	1.475	Open Manhole	1200
2.001	4.283	214.2	Petrol IC . Junc	4.250	2.530	1.495	Junction	
2.002	6.607	220.2	MH 10	4.200	2.450	1.525	Open Manhole	1200
1.003	24.955	146.8	MH 9	4.450	2.280	1.945	Open Manhole	1200
3.000	25.576	127.9	IC2B	4.650	3.300	1.200	Junction	
3.001	25.474	141.5	G.I.C tank 2	4.470	3.120	1.200	Open Manhole	1200
3.002	3.912	130.4	MH 9	4.450	3.090	1.210	Open Manhole	1200
1.004	29.366	146.8	MH 8	4.250	2.080	1.945	Open Manhole	1200
1.005	17.431	134.1	MH 7	4.400	1.950	2.150	Open Manhole	1200
1.006	13.352	190.7	Tank 3 Junc	4.200	1.880	2.020	Junction	
1.007	6.181	206.0	G.I.C Tank 3	4.200	1.850	2.050	Open Manhole	1200
1.008	5.503	137.6	MH 2.1.1	4.400	1.810	2.365	Open Manhole	1200
1.009	13.808	153.4	MH 2	4.350	1.720	2.405	Open Manhole	1350

Innishmore
Ballincollig
Co. Cork

Date 27/06/2025 09:59 | Designed by TOMASZ.KRAWCZYK
File Final Network Model.MDX | Checked by
Micro Drainage | Network 2020.1.3

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.000	o	225	MH 2.2	4.250	2.920	1.105	Open Manhole	1200
4.001	o	225	MH 2.1	4.350	2.760	1.365	Open Manhole	1200
5.000	o	225	MH 6	4.150	2.800	1.125	Open Manhole	1200
5.001	o	225	MH 5	4.200	2.390	1.585	Open Manhole	1200
6.000	o	225	MH 4.2	4.180	2.480	1.475	Open Manhole	1200
6.001	o	225	MH 4.1	4.050	2.350	1.475	Open Manhole	1200
5.002	o	225	MH 4	4.100	2.280	1.595	Open Manhole	1200
7.000	o	225	IC New	3.900	2.720	0.955	Open Manhole	1200
7.001	o	150	I.C 6 Tank 4	3.900	2.700	1.050	Junction	
5.003	o	300	MH 3	3.950	2.160	1.490	Open Manhole	1200
1.010	o	450	MH 2	4.350	1.720	2.180	Open Manhole	1350
1.011	o	450	Cellular tank Junc	4.350	1.700	2.200	Junction	
1.012	o	225	MH 1	4.300	1.660	2.415	Open Manhole	1350
1.013	o	225	Bypass In Junc	4.300	1.610	2.465	Junction	

Downstream Manhole

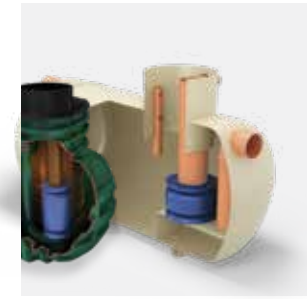
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.000	23.635	147.7	MH 2.1	4.350	2.760	1.365	Open Manhole	1200
4.001	7.767	155.3	MH 2	4.350	2.710	1.415	Open Manhole	1350
5.000	62.176	151.6	MH 5	4.200	2.390	1.585	Open Manhole	1200
5.001	16.782	152.6	MH 4	4.100	2.280	1.595	Open Manhole	1200
6.000	19.393	149.2	MH 4.1	4.050	2.350	1.475	Open Manhole	1200
6.001	9.494	135.6	MH 4	4.100	2.280	1.595	Open Manhole	1200
5.002	17.642	147.0	MH 3	3.950	2.160	1.565	Open Manhole	1200
7.000	3.000	150.0	I.C 6 Tank 4	3.900	2.700	0.975	Junction	
7.001	5.301	106.0	MH 3	3.950	2.650	1.150	Open Manhole	1200
5.003	37.149	148.6	MH 2	4.350	1.910	2.140	Open Manhole	1350
1.010	5.689	284.5	Cellular tank Junc	4.350	1.700	2.200	Junction	
1.011	8.705	217.6	MH 1	4.300	1.660	2.190	Open Manhole	1350
1.012	3.240	162.0	Bypass In Junc	4.300	1.640	2.435	Junction	
1.013	10.076	112.0		3.400	1.520	1.655	Open Manhole	1200

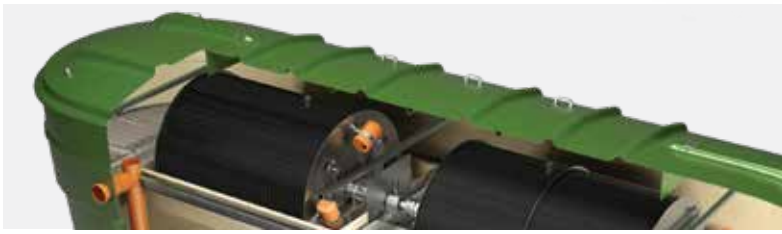
APPENDIX 2 – Data Sheets

Water Management Solutions

Klargester
Product Guide

The Klargester range of fully integrated wastewater management, surface water and rainwater harvesting solutions





kingspan.co.uk/klargester

Kingspan

About Kingspan

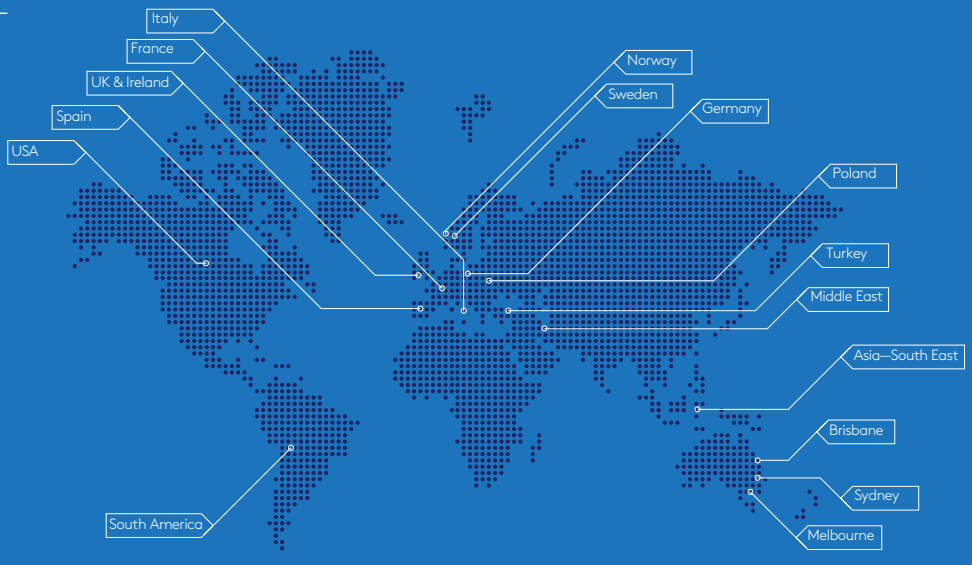
Operating in over 85 countries worldwide, we offer a global distribution network backed by experienced local sales and technical teams.

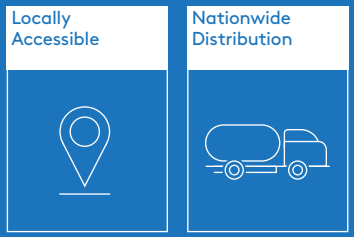
Trusted Water Management Solutions

Kingspan, manufacturers of the Klargester Product Range, are the water management experts with over 60 years of innovation and knowledge. We design and manufacture tried and tested water management solutions on a global scale for the leisure, public, hospitality, transport and domestic sectors whilst offering one of the largest and most technologically advanced wastewater ranges available.

Our technical support teams provide focused customer service from delivery scheduling to consultancy and installation guidance. We give you the confidence of support over the lifetime of the product and beyond, in your local area.

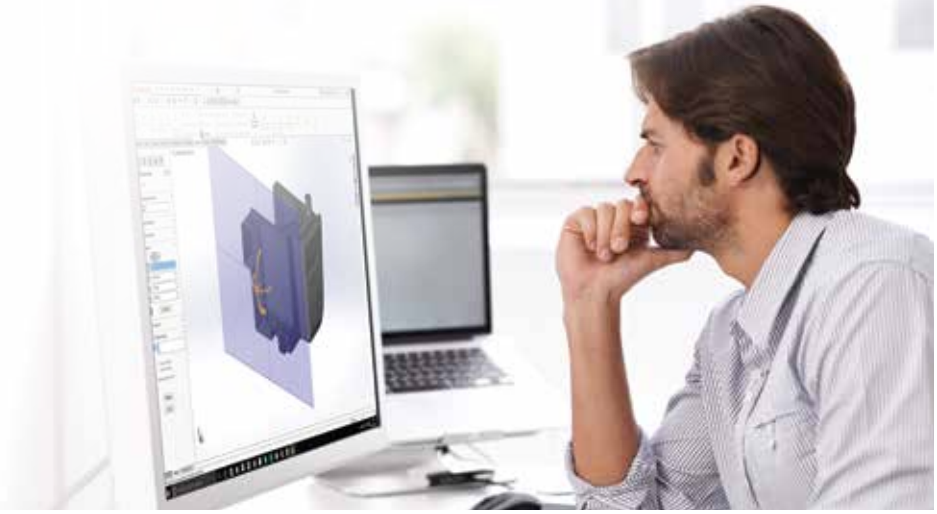
Global Reach





Expert Technical Support

Kingspan's support doesn't stop once you have purchased the product. Our expert team are here to help you with technical, sales and delivery enquiries. We are dedicated to our customers and pride ourselves on top class customer service.



We stand by the quality and performance of Kingspan water management solutions and our support doesn't stop once your tank is installed.

Our world class design consultancy is complemented by engineering expertise and advice as well as service throughout your commercial or industrial water management project.

We use the latest design technology to produce drawings of extremely high quality. Our project management process is a step-by-step one, to ensure the very best experience and results. It covers everything from system sizing, product selection and system design to calculations, manufacturing, installation and delivery.

Our advice also spans water management specification, design, product application and integration with building regulations, code compliance and site work installation practices to meet the most demanding effluent qualities, flow rates and discharge consents.

Contact our technical team today for expert advice and information on any of our water management solutions.

Email: **water@kingspan.com**

Regional Installations

Manufactured in the UK and Ireland, the Klargester Product Range is supported by our nationwide network of dedicated external Area Sales Managers.

We offer free site visits to discuss project specific requirements and provide a detailed written report and specification to recommend the best water management solution for your project.

We also provide on-site installation assistance when required and help you with formal discussions with Building Control, Local Planning departments, The Environment Agency/SEPA, architects and consultants.

To arrange your free site survey contact us now on **01296 633033** or email **water@kingspan.com**

Kingspan operates in over 85 countries worldwide, with currently over 5 million water management system installations. Take a look at a selection of our case studies for the Klargester Product Range.

Thanet Earth
Kent, England

UK

Four vertical pumping stations to aid water management for a complex green house development.

Elite Office Furniture
Goole, England

UK

Surface water separators, foul, effluent and crude sewage pump stations, grease trap and BioFicient commercial system.

Everton FC (Training Ground)
Liverpool, England

UK

Modular BioFicient commercial system including fuel/oil separators for a complete waste water management solution.

Manchester City FC
Manchester, England

UK

Oil separators for its all-important surface water drainage system.

The Castlefields Inn
Clifford, England

UK

BioDisc Commercial sewage treatment plant providing an efficient water management solution.

Primark Distribution Centre
Kettering, England

UK

Modular BioFicient commercial system for multi-million pound distribution centre.

Barn Conversion
Wing, England

UK

Domestic BioDisc sewage treatment plant, ensuring a safe, odour-free environment.

Supermarket Carpark
London, England

UK

Bypass separator, NSBE50, to assist in decontamination of surface water drainage.

Multi-Housing Development
Dundee, Scotland

UK

A complex sewage treatment and surface pumping solution to meet the varying needs of multiple housing.

Social Housing Installation
Co. Louth, Ireland

IRE

Rainwater harvesting solution used to flush the WCs in each home. The system is fully integrated with the main plumbing, easing demand on the mains supply.

Marble Arch Caves
Co. Fermanagh, N. Ireland

IRE

Grease separator and BioDisc sewage treatment plant work together giving optimum performance and extremely low running costs.

Klargester BioDisc® Domestic Sewage Treatment Plant

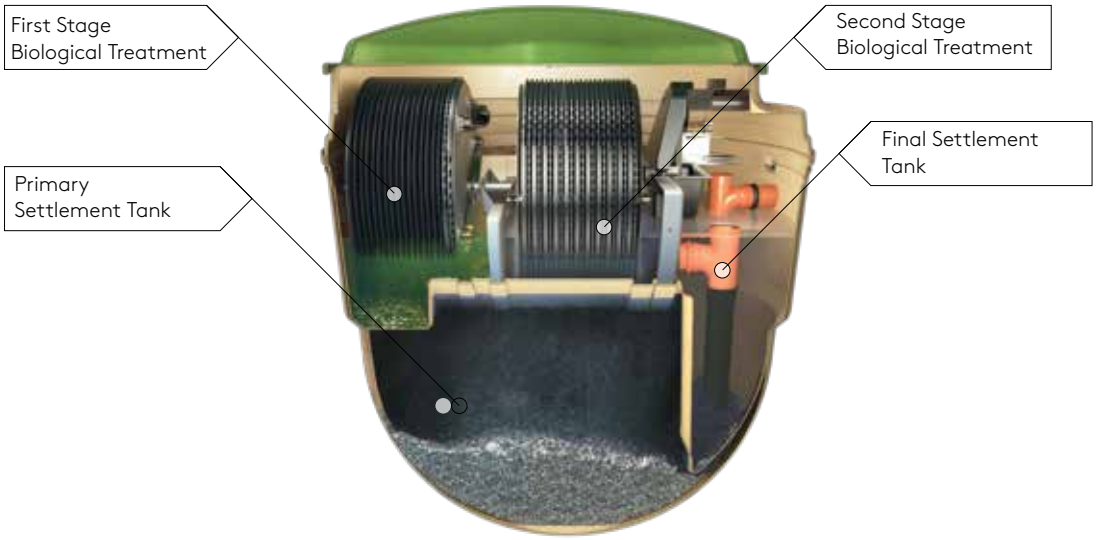
The Klargester Domestic BioDisc® is engineered to treat wastewater to the highest level of standards and offers one of the lowest lifetime costs compared to other treatment processes.

Product Benefits

- Utilises Rotating Biological Contactor technology.
- Low running costs.
- Low level visibility with a lockable child-proof cover – safe for children and pets.
- Delivers better than 95% pollution removal.
- 10 year warranty options available when purchased with a service and maintenance plan.
- Supplied with a control panel and alarm.
- Managed Flow System.
- Totally silent in operation.
- The most stable process in the market.
- Controls the discharge volume.

The Rotational Biological Contactor

The RBC is central to the operation of each Klargester BioDisc®. It supports a biologically active film or biomass onto which aerobic micro-organisms, naturally found in sewage, become established. Natural breakdown of sewage can then occur as described below.



01

Primary Settlement Tank

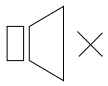
Wastewater and sewage flows into the primary settlement tank where the large solids are retained for future removal.

02

First Stage Biological Treatment

The liquor and fine solids then flow into the Biological Treatment Zone 1 where the first stage of treatment occurs.

Noise Free



Technical Specifications

Model Reference	BA	BA-X	BB	BC
Population Equivalent (Std Flow)	6	9	12	18
Maximum Daily BOD (kg)	0.36	0.54	0.72	1.08
Maximum Daily Flow (m3)	1.2	1.8	2.4	3.6
Ø/Width (mm)	Ø1995	Ø1995	Ø1995	Ø2450
Length (mm)	-	-	-	-
Inlet Invert depth (mm)	450/750/1250	450/750/1250	450/750/1250	600/1100
Depth Below Inlet Invert (mm)	1400	1400	1400	1820
Outlet Invert Depth (mm)	1315	1315	1315	1735
Overall Height (mm)	2160/2460/2960	2160/2460/2960	2160/2460/2960	2825/3325
Height to Rim of Cover (mm)	1945/2245/2745	1945/2245/2745	1945/2245/2745	2485/2985
Empty Weight (kg)	310/325/380	310/325/380	335/350/405	650/750
Standard Power Supply	1 phase	1 phase	1 phase	1 phase
Motor Rating - 1 Phase (Watts)	50	50	50	75
Full Load Current 1 Phase (amps)	0.51	0.51	0.51	1.1
Optional Power Supply	N/A	N/A	N/A	3 phase
Motor Rating - 3 Phase (Watts)	N/A	N/A	N/A	90
Full Load Current 3 Phase (amps)	N/A	N/A	N/A	0.38
Sludge Return Pump Rating (watts)	250	250	250	250

Pumped Outlet Available on BA, BA-X, BB models.

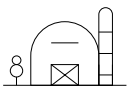
Performance and Compliance

- Certified to European Standard BS EN 12566 Part 3.
- Performance certified to achieve 10mg/l BOD, 15mg/l SS and 3.8mg/l ammonia.
- Fully marked in line with the CPR 2013.

Applications:

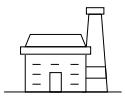
The Klargester Domestic BioDisc® BA–BC range is suitable for a range of applications including:

Single & Multiple Homes



Barn Conversions

Small Offices



Light Industrial Premises

Farms

03

Second Stage Biological Treatment

The liquor is then fed forward at a controlled rate into Biological Treatment Zone 2 for further cleaning.

04

Final Settlement Tank

The clean liquid passes into the final settlement tank where it can be discharged to ground or water course.

Klargester BioFicient® Domestic Sewage Treatment Plant

The Klargester BioFicient® treatment plant provides a reliable and effective solution for domestic applications without access to mains drainage. Suitable for homes with up to 30 people, the BioFicient is manufactured from high quality materials and uses the latest treatment technology to deliver a high level of water discharge quality.

Product Benefits

- Shallow Dig.
- New low energy compressor.
- Low level visibility with a lockable child-proof cover – safe for children and pets.
- Suitable for installation in traffic areas (structural advice required).
- Supplied with a control panel and alarm.
- Easy to set up and operate.
- Integral pump option available for BioFicient 1-4.

Performance and Compliance

- BS EN 12566 Part 3 tested and approved.
- Industry leading NH4 (ammonia) removal.
- Fully CE marked in line with the CPR 2013.

01

Primary Chamber

Raw sewage gravitates to the unit where it is received in the primary settlement zone. Here, gross solids and other social debris settle to the bottom of the tank where they remain until the tank requires desludging. Settled sewage is displaced from primary zone and enters the first of two sequential moving aerated media reactors.

Control Panel Included

Technical Specifications

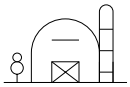
Model Reference	BioFicient 1	BioFicient 2	BioFicient +2	BioFicient 3	BioFicient 4	BioFicient 5	BioFicient 6
Population Equivalent	6	8	10	10	15	20	30
Overall Diameter (mm)	1,540	1,420	2,010	1,420	1,920	1,920	1,920
Length (mm)	2,500	3,760	3,189	3,760	3,230	4,390	6,220
Depth (mm)	1,794-2,104	1,830/2,330/ 2,830	2,785	1,830/2,330/ 2830	2,300/2,800/ 3,300	2,300/2,800/ 3,300	2,300/2,800/ 3,300
Inlet Invert (mm)*	500-810/ 500-810*	500/1,000/ 1,500	700-1,500	500/1,000/ 1,500	500/1,000/ 1,500	500/1,000/ 1,500	5,00/1,000/ 1,500
Outlet Invert (mm)	600-910/ 555-865*	600/1,100/ 1,600*	800-1600	600/1,100/ 1,600*	630/1,130/ 1,630*	630/1,130/ 1,630	630/1,130/ 1,630
Material	MDPE	GRP	MDPE	GRP	GRP	GRP	GRP
Blower Ratings	50W	95W	95W	95W	115W	180W	225W
Cover sizes	700	1,500/900	700	1,500/900	1,500/900+600**	1,500/900+600**	1,500/900+ 600**

Note: *Optional inlet depth down to 1800mm*
**BioFicient IPS models only (Outlet Depth 320mm) | **BioFicient 4, 5, 6 has two shafts.*

Applications:

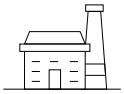
The Klargester Domestic BioFicient® 1–6 range is suitable for use across the following applications:

Single & Multiple Homes



Barn Conversions

Small Offices



Light Industrial Premises

Farms

02

Biozone 1 & 2

Solids are broken down by air agitated media in the Biozone. Media and liquid circulation in the Biozone is achieved through the use of a compressor and diffuser, which introduces fresh air into each compartment. The liquor is constantly re-circulated and contacts the moving media and as it does so, it is purified by the micro organisms growing on the surface of the media and within the moving liquor. Excess growth of biomass is shed as solid particles into the liquor.

03

Final Settlement Tank

Where fine solids are settled out. The Final effluent is discharged via either gravity outlet or IPS (Integral Pump System) chamber. With regulatory approval, it is suitable for discharge to a watercourse or drainage field.

Klargester BioTec®
Domestic Sewage Treatment Plant

The Klargester BioTec® sewage treatment system is ideal for single/ multiple houses and employs the well proven aerobic biological trickling filter process for the treatment of sewage.

Product Benefits

- No mechanical or electrical components within the plant – low running and maintenance costs.
- Low level visibility with a lockable child-proof duty cover – safe for children and pets.
- Easy to install and maintain with annual desludging.
- PPFDS and HLA Alarms as standard.
- Control Panel
- Beacon

Performance and Compliance

› Certified to BS EN 12566 Part 3.

› Assured performance of 20mg/l BOD, 30mg/l S.S., 20mg/l Ammonia.

› Fully CE marked in line with the CPR 2013.

*Blower is externally mounted.

01

Incorporating the well-proven aerobic biological process, the BioTec® sewage treatment plant has a three-stage process.

Coarse solids are filtered and retained for gradual breakdown.

02

The resulting liquid is continuously distributed over a plastic suspended filter by an integral lift, powered by a remotely sited blower.

Easy to Install

Technical Specifications

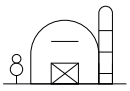
Model Reference	BioTec® 1	BioTec® 1 IPS	BioTec® 2	BioTec® 2 IPS	BioTec® 3	BioTec® 3 IPS	BioTec® 4	BioTec® 4 IPS
Population Equivalent	6	6	12	12	18	18	25	25
Outside Diameter (m)	1.9	1.9	1.9	1.9	2.7	2.7	2.7	2.7
BOD Load (kg/day)	0.36	0.36	0.72	0.72	1.1	1.1	1.5	1.5
Weight Empty (kg)	195	220	217	260	445	471	470	495
Depth (m)	2.2	2.2	2.7	2.7	2.6	2.6	2.6	2.6
Inlet Invert (m)	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
Inlet Invert to Base (m)	1.2	1.2	1.7	1.7	1.6	1.6	1.6	1.6
Outlet Invert (m)	1.1	0.605	1.1	0.605	1.1	0.605	1.1	0.655
Motor Rating (watts)	60	60	60	60	150	150	150	150

** There are two depths of inlet in the range 1.0m and 1.5m.*
IPS - Integral Pump System

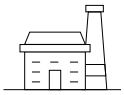
Applications:

The Klargester Domestic BioTec® Range is suitable for a range of applications, including:

Single & Multiple Homes

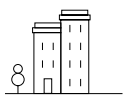


Barn Conversions



Light Industrial Premises

Farms



Small Offices

Economy Version Available

The Klargester Domestic BioTec® Economy Range is available for requirements of up to 18PE and features the following Product Benefits:

Product Benefits

- No mechanical or electrical components within the plant – low running and maintenance costs.
- Low level visibility with a lockable child-proof duty cover – safe for children and pets.
- Easy to install and maintain with annual desludging.

03

The solids are allowed to settle and under normal domestic conditions, effluent of 20mg/l BOD, 30mg/l S.S., 20mg/l Ammonia can be achieved.

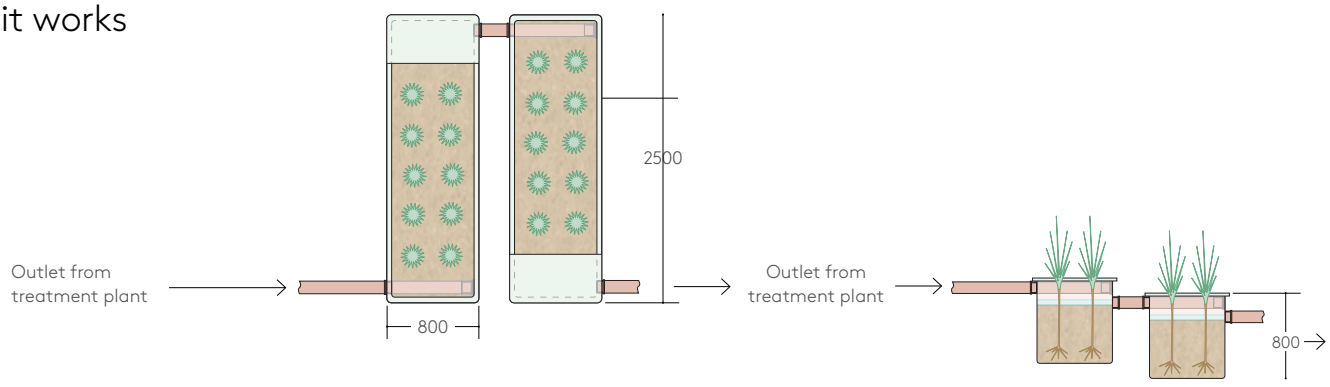
Klargester Reed Beds

A reed bed is a filtration process used in conjunction with a Klargester sewage treatment system to further enhance the quality of the effluent migrating into a drainage field or surrounding watercourse.

Product Benefits

- Tertiary treatment for new applications with tight discharge consents.
- Satisfies new building regulations.
- Improved effluent quality for existing works.
- Very low maintenance.
- Aesthetically pleasing and environmentally friendly.
- Easy to install and maintain.
- Effluent discharge is typically improved by at least 50% providing reduced BOD and suspended solids.

How it works



Technical Specifications

Model Reference	Population Equivalent	Length (mm)	Width (mm)	Depth (mm)	No. Required	Outlet Size (mm)
HRB006	6	2500	800	800	2	110
HRB012	12	2500	800	800	4	110

Selecting the Correct Solution

Regulations Compliant

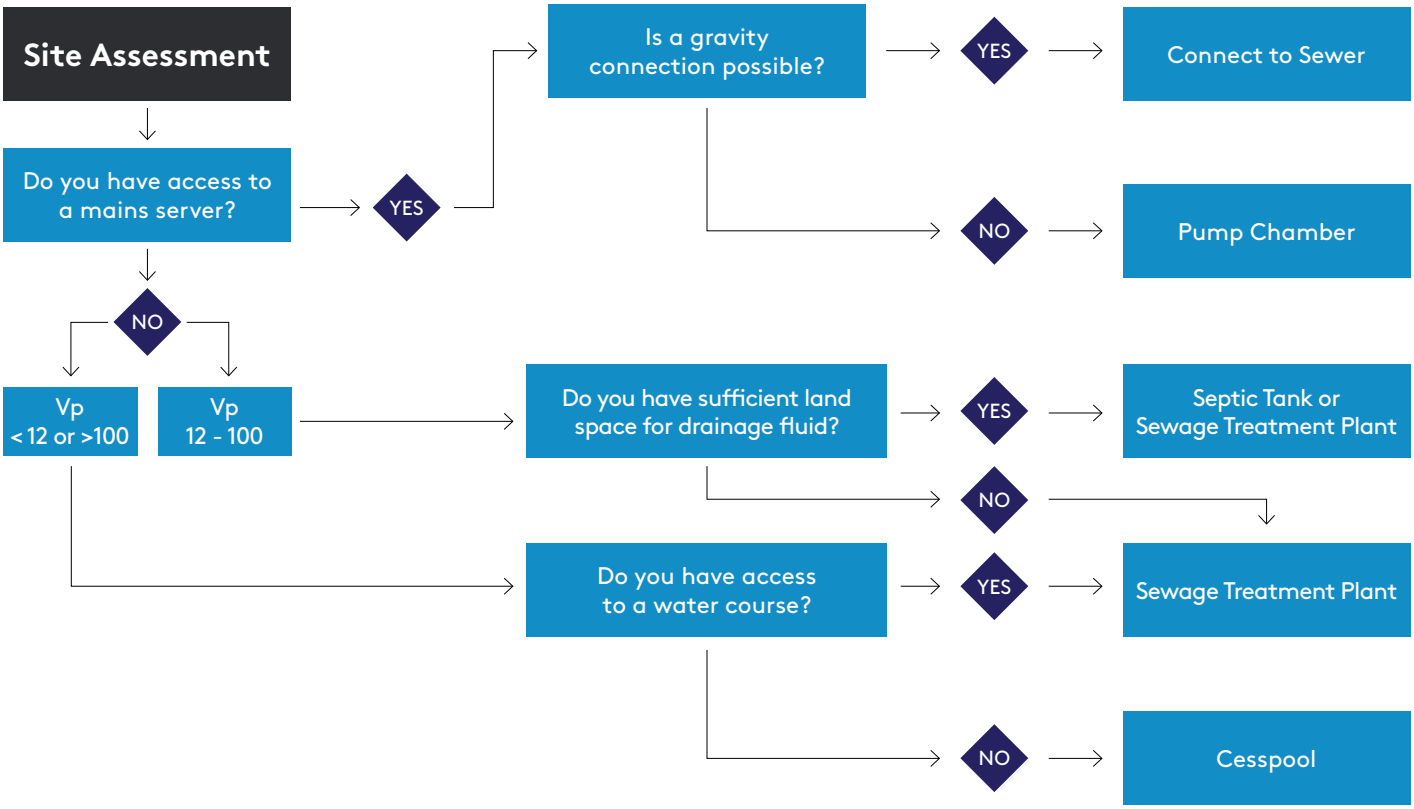
To ensure selection of the correct sewage treatment and disposal method to meet your requirements, expert advice should be sought. In all instances a sewage treatment plant should be considered as the first option.

Environmental Regulators and British Water have developed the system selection process below, to help in guiding you through the process to choose the correct system to meet your requirements.

Did you know?

If you have a septic tank that discharges directly to a surface water you will need to replace or upgrade your treatment system by 1 January 2020, or when you sell your property if before this date.

Environment Agency — General Binding Rules



Klargester Alpha Septic Tank

Klargester Alpha tanks provide a reliable and economic solution for homes not connected to mains drainage.

Did you know?

If you have a septic tank that discharges directly to a surface water you will need to replace or upgrade your treatment system by 1 January 2020, or when you sell your property if before this date.

Environment Agency — General Binding Rules

Basic septic tanks only retain solids and discharge effluent of low quality. The installation will not contaminate any ditch, stream or other watercourse. However, many authorities in the UK prohibit their use. In all instances a sewage treatment system should be considered as a first option.

Septic tanks may be installed, subject to consent, in applications where:

- Soil is of suitable porosity.
- Installation complies with Building Regulations (Approved Document H).
- The installation will not contaminate any ditch,stream or other watercourse.

—

Product Benefits

- Made from composite GRP - strong, light, and watertight.
- Press moulded shape provides wide, squat, form which makes the tank easy to install and handle.
- Stable base for storage.
- Lifting eyes are provided for lifting and positioning within the excavation.

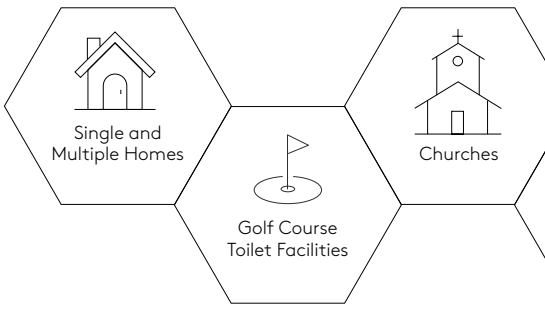
Performance & Compliance

› Performance tested to BS EN 12566 Part 1 requirements.

› Fully CE marked in line with the CPR 2013.

Applications

The Klargester Alpha and Gamma septic tank ranges, each comprise three sizes and are typically suitable for applications not connected to mains drainage including:



Technical Specifications

Model Reference	Volume (L)	No. People (150 Ltrs/head/day)	Overall Diameter (mm)	Height (mm)	Standard Inlet Invert (mm)	Standard Outlet Invert (mm)
STS02810	2800	5	2075	2599/3099	1000/1500	1050/1550
STS03810	3800	12	2075	2810/3310	1000/1500	1050/1550
STS04610	4600	17	2084	2984/3484	1000/1500	1050/1550

Klargester Gamma Septic Tank

The Klargester Gamma tank is an affordable solution for domestic applications with an efficiency rating of 99.97% – an industry benchmark.

Manufactured from tough polyethylene, the tank is robust and lightweight which makes it easy to handle and install.

Due to its design features, the Gamma tank is the perfect solution where a shallow dig installation is required, reducing installation time and costs.

—

Product Benefits

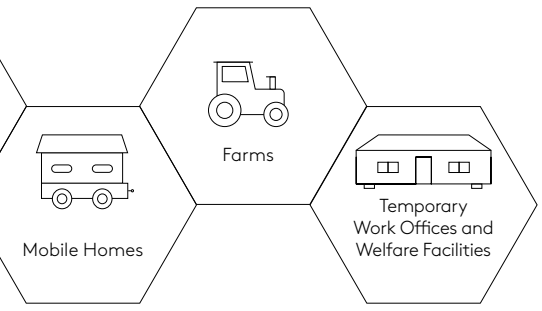
- Manufactured from robust, impact resistant, high quality polyethylene.
- Strong, easy to move and simple to install.
- Less excavation costs, less soil disposal and less backfill material.
- Wide neck for easy access for annual desludging.
- Trimmable neck to suit site.

Performance & Compliance

› 99.97% efficiency rating.

› BS EN 12566 Part 1 approved.

› Fully CE marked in line with the CPR 2013.



Technical Specifications

Model Reference	Volume (L)	No. People (150 Ltrs/head/day)	Width (mm)	Length (mm)	Height (mm)	Standard Inlet Invert (mm)	Standard Outlet Invert (mm)	Depth (mm)
GST028	2800	5	1130	2480	1755 - 2255	550-1050	550-1050	2255
GST035	3500	10	1180	3000	1755 - 2255	550-1050	550-1050	2255
GST040	4000	13	1215	3360	1755 - 2255	550-1050	550-1050	2255

Klargester Sigma Septic Tank

The Klargester Sigma shallow dig septic tank is designed to reduce both installation time and cost. The range is available in various sizes suitable for properties with dig height restrictions.

Product Benefits

- Made from GRP - strong and durable for ultimate reliability.
- Robust and simple to install, reducing on site installation time.
- Less excavation costs, less soil disposal and less backfill material required.
- Light, watertight and chemically resistant.
- Robust, weather proof for guaranteed durability, giving you value for money.

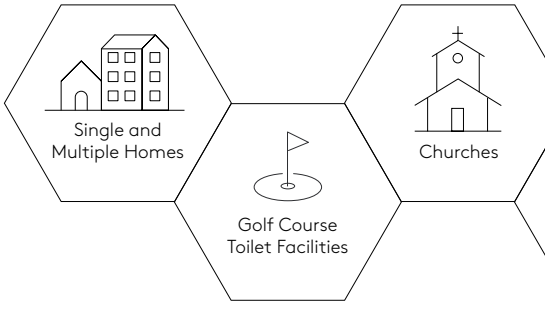
Performance and Compliance

› Certified to BS EN 12566 Part 1

› Fully CE marked in line with the CPR 2013.

Applications

Klargester Sigma septic tanks and below ground water storage tanks and cesspools, offer a solution for applications not connected to mains drainage including:



Technical Specifications

Model Reference	Volume (L)	No. People (150 Ltrs/head/day)	Overall Diameter (mm)	Length (mm)	Standard Inlet Invert (mm)	Standard Outlet Invert (mm)	Depth (mm)
STH028	2800	5	1225	2955	500	530	1627/1587*
STH038	3800	12	1225	3895	500	530	1617/1577*
STH057	5700	24	1425	4275	500	530	1826/1786*
STH071	7150	34	1920	3225	500	550	2290
STH091	9150	47	1920	3960	500	550	2290

**110mm diameter pipework/ 160mm diameter pipework*

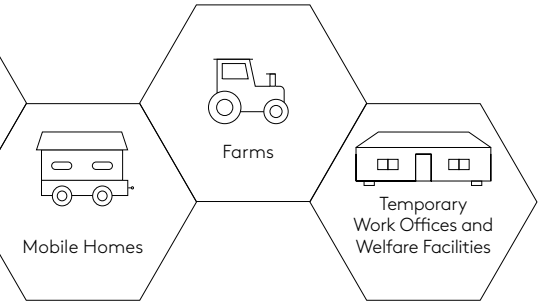
Klargester Below Ground Water Storage Tanks and Cesspools

The range of Klargester below ground storage tanks provide a reliable solution for the collection and retention of sewage (cesspool), surface water, veterinary / animal waste, firefighting reservoirs and rainwater harvesting reservoirs.

The advanced design of the Klargester below-ground storage tanks ensures consistent high performance, even in the toughest environmental conditions.

Product Benefits

- Easy to install with minimal on site installation time.
- Designed in accordance with BS6297, ensuring that you meet all building regulations.
- High level alarm available for complete peace of mind.
- Lockable manhole cover for ultimate security.



Technical Specifications

Nominal Litres	Capacity (Gallons)	Length (mm)	Diameter (mm)
18,000	3960	4317	2620
22,000	4889	5073	2620
26,000	5720	5837	2620
34,000	7480	7376	2620
46,000	10,120	9684	2620
54,000	11,880	11,222	2620
59,000	12,968	11,991	2620
63,000	13,860	12,760	2620
71,000	15,620	14,295	2620
79,000	17,380	15,833	2620

Klargester BioDisc® Commercial Sewage Treatment Plant

Delivered as a single, packaged system, the Klargester BioDisc® RBC range (up to 300PE), offers low running costs due to its unique design and operational efficiencies.

Product Benefits

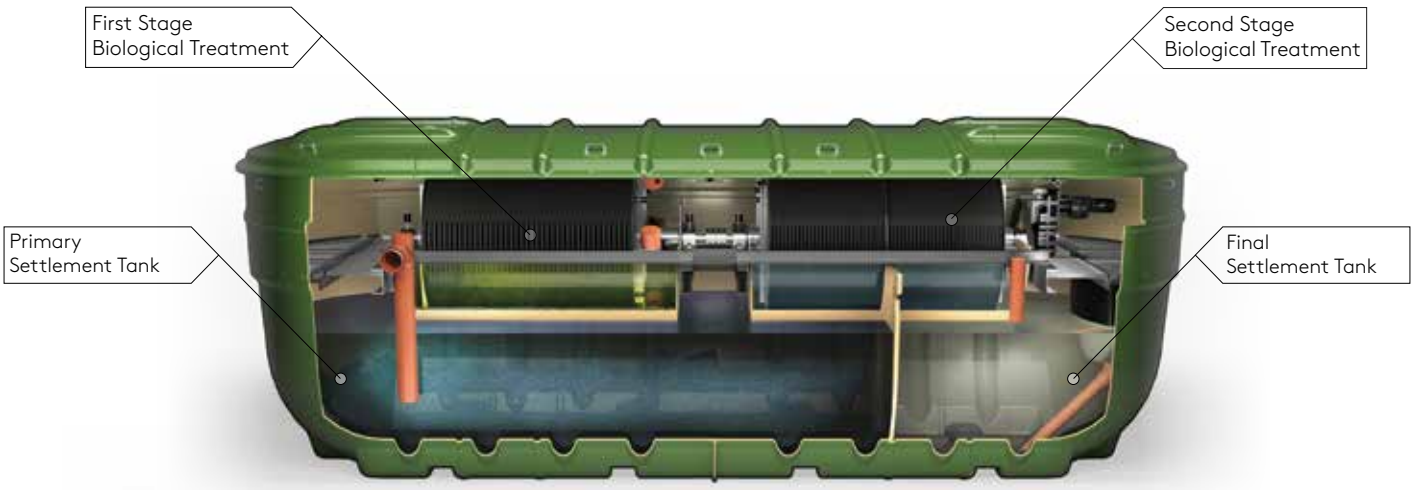
- Unique RBC technology.
- Tried and tested technology, offers robust and efficient water management treatment.
- Low running costs.
- Noise free.
- Fully removable lid for easy desludging.
- Fully packaged system, delivered direct on site.
- Bespoke technical support offered from our in-house technical teams.

Performance & Compliance

› Odour free – tested and fully approved in accordance with BSEN13725.

› Designed for applications selected in compliance with British Water Code of Practice Flows and Loads.

› 100% compliance with industry requirements across commercial sectors, including national and international regulations such as BS EN12255 and EN12566-3 (up to 50 PE).



01

Primary Settlement Tank

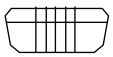
This is the initial stage of treatment and simply involves the retention of coarse solids present in raw sewage and wastewater for subsequent gradual breakdown. BioDisc® features one chamber to ensure efficient operation with a flow balancing facility.

02

First Stage Biological Treatment

The liquor and fine solids then flow into the first stage of Biological Treatment. A unique managed flow system ensures peak performance by smoothing variable loads.

Single Piece System



Technical Specifications

Model Reference	BD	BE	BF	BG	BH	BJ	BK	BL	BM	BN
Maximum Daily BOD (kg)	1.5	2.1	3	4.2	4.5	6	7.5	9	13.5	18
Maximum Daily Flow (m3)	5	7	10	14	15	20	25	30	45	60
Ø/Width (mm)	2450	2450	2450	2450	2450	2450	2450	2450	2450	2450
Length (mm)	3340	3340	4345	5235	7755	7755	7755	7755	10420	13100
Inlet Invert depth (mm)	600/1100	600/1100	600/1100	600/1100	600/1000	600/1000	600/1000	600/1000	600/1000	600/1000
Depth Below Inlet Invert (mm)	1820	1820	1820	1820	1790	1790	1790	1790	1790	1790
Outlet Invert Depth (mm)	1735	1735	1720	1720	1640	1640	1640	1640	1640	1640
Overall Height (mm)	2825/3325	2825/3325	2825/3325	2825/3325	2830/3230	2830/3230	2830/3230	2830/3230	2830/3230	2830/3230
Height to Rim of Cover (mm)	2485/2985	2485/2985	2485/2985	2485/2985	2490/2890	2490/2890	2490/2890	2490/2890	2490/2890	2490/2890
Empty Weight (kg)	1100/1200	1200/1300	1315/1465	1660/1810	3000/3020	3100/3120	3200/3220	3300/3320	4200/4250	5500/5650
Standard Power Supply	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase
Motor Rating - 1 Phase (Watts)	75	75	120	180	250	250	370	370	550	2 x 370
Full Load Current 1 Phase (amps)	1.1	1.1	1.3	1.6	1.5	1.5	2.35	2.35	2.8	2 x 2.35
Optional Power Supply	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase
Motor Rating - 3 Phase (Watts)	90	90	120	180	250	250	370	370	550	2 x 370
Full Load Current 3 Phase (amps)	0.38	0.38	0.42	0.63	0.88	0.88	1.35	1.35	2.8	2 x 1.35
Sludge Return Pump Rating (watts)	250	250	250	250	250	250	250	250	250	250

03

Second Stage Biological Treatment

The liquor is then fed forward at a controlled rate into Biological Treatment stage 2 for further cleaning. This process ensures the whole media area available is utilised ensuring maximum efficiency.

04

Final Settlement Tank

The surplus micro-organisms continuously slough off the discs and are carried forward to the final settlement where they settle out as a humus sludge, leaving a clear treated effluent to be discharged to ground or water course. The settled humus sludge is returned to the Primary Settlement Tank by the sludge return pump under timer control. The sludge return pump also removes any floating scum which helps to keep the final settlement tank working efficiently.

Klargester Modular BioDisc®
Sewage Treatment Plant

The new Klargester Modular BioDisc® containerised sewage treatment plant range, is designed with scalability in mind for populations of between 300PE and 2500PE.

A Brand New Solution for 2018

The Klargester modular RBC system is designed for applications with higher populations.

The RBC comprises of a complete modular system containing the RBC units along with primary and final settlement tanks.

Both RBC units and tanks can be increased in numbers or size to make a flexible system for an expanding or phased population growth.

Each unit is supplied as a 250PE unit and further units supplied depending on population requirements.

Primary and final settlement tanks can be sized for the intended end population or additional tanks can be supplied in the future and fed into the system.

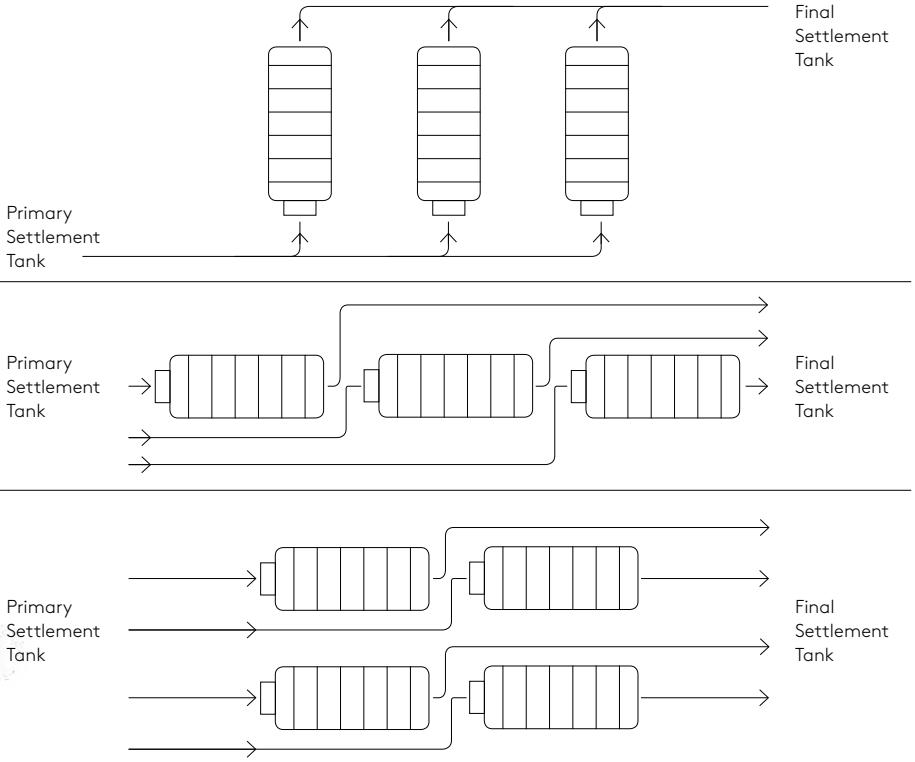
Each of the units can be linked to create a complete sewage treatment system. The feed to each RBC can be controlled independently to give further flexibility.

The RBC unit measures 6.7 metres long x 2.2 metres wide x 2.4 metres high. The size of primary and final settlement tanks will vary with each customer application and site location.

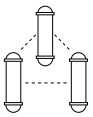
Modular BioDisc®

A flexible engineered solution, for above or below ground installation, the Modular BioDisc solution is ideal for off-mains sites with seasonal loads due to its unique flow management activity.

Total flexibility with a unique modular RBC system



Available in our Modular System



Technical Specifications

Model Reference	Daily Flow (l/day)	Daily Load (kg/BOD/day)	Length(mm)	Width(mm)	Height(mm)	Weight(kg)	Motor Power
Modular BioDisc 250PE	50,000	15	6,700	2,210	2,400	5,000	1.1 Kw/400v

Max daily flow based on 200 L/Person/Day, system PE will vary by site flow rate per person.

More Savings

Kingspan's unique to market solar back up option is the ideal solution for customers in remote locations. Our solar panels can cater for up to 100% of the used energy on any site, offering a potential payback of three years on a typical BioDisc commercial system.

More Scalability

The commercial BioDisc range offers a totally scalable solution. For applications larger than 300PE, we offer a brand new containerised Modular solution, with flexibility to suit sites with populations up to 2500PE.

More Efficiency

Our unique flow management system delivers an improved biological process and overall treatment efficiency, by catering for seasonal changes to flows and loads. Adaptive forward feed management allows for total flexibility for seasonally fluctuating sites.

More Control

Featuring local alarms and Kingspan's intelligent SmartServ remote monitoring solution, the challenges associated with remote performance monitoring are greatly reduced. Our fully integrated connectivity package allows for greater control over your assets, saving time and money when it comes to servicing your treatment plant.

Klargester BioFicient® Commercial Sewage Treatment Plant

The Klargester BioFicient commercial sewage treatment plant is designed with efficiency in mind. It offers reliable performance using tried and tested technology to ensure consistently high effluent quality.

Product Benefits

- Adaptable to specific consent requirements including 'Total Nitrogen'.
- Low head loss.
- Minimal footprint area and visual impact.
- Variable invert options (0.5 - 2.0 m).
- May be installed in trafficked areas (subject to loading).
- Low maintenance.
- Alarm protected.

Performance and Compliance

› Compliant with EN-12255 and EN12566-3 (up to 50 PE).

› Designed and sized in accordance with British Water Code of Practice Flows and Loads but can be sized to suit local site conditions.

Applications:

The BioFicient range is suitable for a range of applications including:

Public sector

Leisure

Transport

Hospitality

Campsites

Offices

Multi-housing developments

2.6 diameter BioFicient is also available as an alternative model.

01

Primary Settlement Chamber

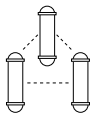
This is the initial stage of treatment and simply involves the retention of coarse solids present in raw sewage and wastewater for subsequent gradual breakdown. BioFicient features two chambers to ensure efficient operation with a flow balancing facility.

02

Biozone 1

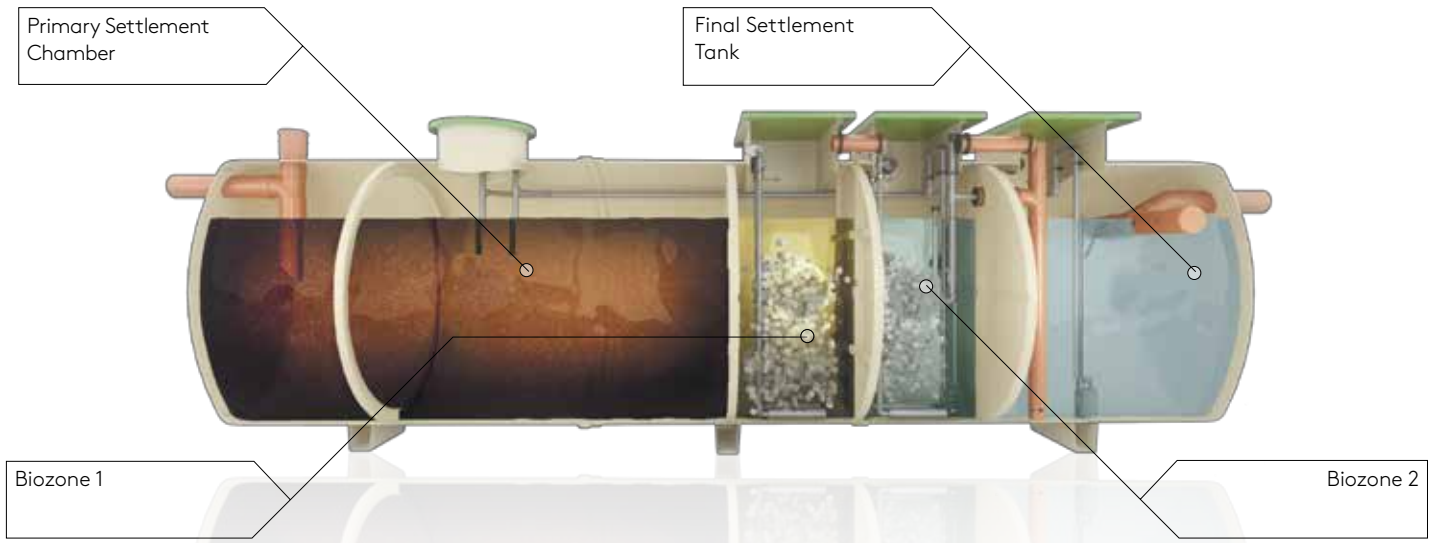
The liquor enters the first stage of Biological treatment where the active bacteria within the fluidized bed begin to break down organic solids, majority of BOD removal occurs here.

Available in our Modular System



Technical Specifications

Model Reference	17H	23H	34H	38H	42H	47H	55H	67H	80H
A Overall Length (m)	7.4	9.3	7.4	8.1	8.9	9.7	11.2	13.5	15.8
B Overall Width (m)	1.9	1.9	1.9	1.9	1.9	2.8	2.8	2.8	2.8
C Height (m)									
560mm Inlet / 860mm Outlet Invert*	2.28	2.28	3.02	3.02	3.02	3.02	3.02	3.02	3.02
1060mm Inlet / 1360mm Outlet Invert*	2.78	2.78	3.52	3.52	3.52	3.52	3.52	3.52	3.52
1560mm Inlet / 1860mm Outlet Invert*	3.28	3.28	4.02	4.02	4.02	4.02	4.02	4.02	4.02
2060mm Inlet / 2360mm Outlet Invert*	3.78	3.78	4.52	4.52	4.52	4.52	4.52	4.52	4.52
D Diameter (m)	1.8	1.8	1.8	1.8	1.8	2.6	2.6	2.6	2.6
Volume (m3)	17	23	34	38	42	47	55	67	80
Weight Approx (kg)	1200	1450	3000	3200	3400	3800	4200	4700	5400
Inlet / Outlet Diameter (mm)	160	160	160	160	160	160	160	160	160
Maximum Flow (m3/day) Models	8	11	15	20	25	30	40	50	60
Retention Time (hrs)	76	66	51	43	39	35	31	31	30



03

Biozone 2

Within the second stage of Biological treatment the second fluidized bed continues to clean the liquor giving further BOD reduction along with removal of nitrogen.

04

Final Settlement Tank

A natural by-product of biological treatment is humus sludge and this is separated for further treatment. The treated effluent is discharged via the outlet or to disinfection stage.

Choosing the Right Separator

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

The chart below 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.

Is there a risk of oil contaminating the drainage from the site?

YES

Risk of infrequent light contamination and potential for small spills only, e.g. car park

YES

Source control SuDS must be considered and incorporated where suitable

If not suitable

Bypass separator with alarm required

Class I if discharge to surface water[2,3]

YES

Risk of regular contamination of surface water runoff with oil and/or risk of larger spills, e.g. vehicle maintenance area, goods vehicle parking or vehicle manoeuvring[5]

YES

Full retention separator with alarm required

Class I if discharge to surface water[2]

Class II if discharge to foul sewer[1]

YES

Drainage will also contain dissolved oils, detergents or degreasers such as vehicle wash water and trade effluents, e.g. industrial sites

YES

Trade effluents must be directed to the foul sewer[1]

It may need to pass through a separator before discharge to sewer for removal of free oils

YES

Fuel oils are delivered to and dispensed on site, e.g. retail forecourts

YES

Full retention 'forecourt' separator with alarm required

Class I if discharge to surface water[2]

Class II if discharge to foul sewer[1,4]

NO

Very low risk of oil contamination, e.g. roof water

YES

Separator not required

Clean water should not be passed through the separator unless the size of the unit is increased accordingly

The use of SuDS should be considered at all sites and they should be incorporated where suitable. SuDS can be used to polish the effluent from these separators before it enters the environment[6]

Source control SuDS should be considered where possible

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.

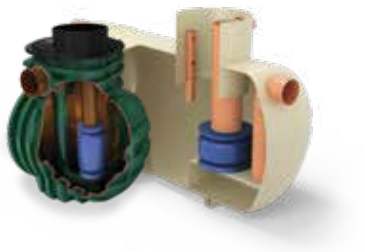
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.

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.

Klargester Full Retention Separators

NSF RANGE



Full Alarm Range Available

Full retention separators are used in high risk spillage areas such as fuel distribution depots, vehicle workshops and scrap metal recycling yards.

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

- Oil separation capacity
- Oil storage volume
- Silt storage capacity
- Coalescer (Class 1 units only)
- Automatic closure device

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

Performance and Compliance

› Kingspan were one of the first UK manufacturers to have the required range certified to EN 858-1 in the UK.

› The NSF number denotes the flow at which the separator operates.

› Approved by The British Standards Institute (BSI) in relation to flow and process performance, meeting effluent quality requirements of EN 858-1.

Technical Specifications

Model Reference	Flow (l/s)	Drainage Area (m2) PPG-3 (0.018)	Storage Capacity (Ltrs)		Length (mm)	Diameter (mm)	Manhole Cover Dimensions (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)
			Silt	Oil							
Polyethylene Chamber Construction											
NSFP003	3	170	300	30	1700	1350	600	1410	1335	550	160
NSFP006	6	335	600	60	1700	1350	600	1410	1335	550	160
GRP Chamber Construction											
NSFA010	10	555	1000	100	2610	1225	600	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	600	1050	1000	1000	200
NSFA020	20	1115	2000	200	3200	2010	600	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	600	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	600	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	600	1810	1760	1000	315
NSFA065	65	3160	6500	650	6850	2010	600	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	600	2500	2450	1000	315
NSFA100	100	5560	10000	1000	6200	2820	600	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	600	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	600	2500	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	600	2500	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	600	2500	2450	1000	600
NSFA210	210	11667	21000	2100	11991	2820	600	2550	2450	1000	600
NSFA225	225	12500	22500	2250	12760	2820	600	2550	2450	1000	600
NSFA240	240	13333	24000	2400	13527	2820	600	2550	2450	1000	600
NSFA255	255	14167	25500	2550	14295	2820	600	2550	2450	1000	600
NSFA270	270	15000	27000	2700	15065	2820	600	2550	2450	1000	600
NSFA285	285	15833	28500	2850	15833	2820	600	2550	2450	1000	600

** Some units have more than one access shaft – diameter of largest shown.*

Klargester Bypass Separators

NSB RANGE

Concentration Less Than

5 MG/L

Bypass separators are used when it is considered an acceptable risk to not provide full treatment for very high flows, such as, where the risk of a large spillage and heavy rainfall occurring at the same time is small. Typical applications include surface carparks, roadways and lightly contaminated commercial areas.

Product Benefits

- 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 polyethylene construction (subject to model).

Performance & Compliance

› Fully compliant and tested to EN 858-1.

› Bypass separators are tested by British standards institute (BSI).

› Certified flow and process performance assessing effluent qualities to the requirements of EN 858-1.

› The unit is designed to treat the 'first flush' - 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).

› Class I separators are designed to achieve a concentration of less than 5mg per litre.

Technical Specifications

Model Reference	Flow (l/s)	Peak Flow Rate (l/s)	Drainage Area(M2) Based on UK rainwater flow	Storage Capacity (Ltrs)		Length (mm)	Diameter (mm)	Access Shaft Diameter (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Standard Fall Across (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)**
				Silt	Oil								
Polyethylene Chamber Construction													
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
GRP Chamber Construction													
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

** Some units have more than one access shaft – diameter of largest shown | ** Larger pipework available on request.*

† Achieves concentration of less than 5MG/L

Klargester Forecourt Separators

Expert Technical Advice

Forecourt separators are used to intercept hydrocarbon pollutants such as petroleum and oil to prevent their entry to the drainage system. Typical applications include petrol filling station forecourts and car breaker yards.

Performance and Compliance

- 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 with an automatic closure device to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

Installation

- The unit should be installed on a suitable concrete base slab and surrounded with concrete or pea gravel backfill.
- 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.

Technical Specifications

Separator Class	Backfill Type	Total Capacity (Ltrs)	Drainage Area (m2)	Peak Flow Rate (l/s)	Length (mm)	Diameter (mm)	Access Shaft Diameter (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Standard Fall Across (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)	Empty Weight (kg)
I	Concrete	10000	720	15	3915	2020	600	2180	2130	50	600	160	620
I	Concrete	10000	115	20	3915	2020	600	2180	2130	50	600	200	620

Fuel & Oil Separator Alarms

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. 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.

Product Benefits

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

Klargester Grease Separators

Easy to Install

Klargester Grease Separators are an effective and hygienic method of separating fat and grease from wastewater flow. Grease Separators are designed for restaurants, hotels, public houses, canteens and similar applications.

Key Standard Features

- Greatly reduces drain blockages, for maximum operational efficiency.
- Helps improve performance of septic tanks and field drains and achieve best results.
- Prevents contamination of small sewage treatment plants, reducing risk of breakdown.
- Protects mains drainage system from grease blockages.

How it works

Grease separators allow fats and grease to naturally separate out from water, allowing their removal prior to the wastewater reaching the drainage system. The separator should be installed close to the source of contamination before any foul waste can enter the drainage flow and to suit the expected liquid temperature.

Grease Range Sizing Table

Meals Per Day	Standard Meal	Fast Food	Fine Cuisine
40	NSG01	NSG01	NSG02
60	NSG02	NSG02	NSG02
80	NSG02	NSG02	NSG04
100	NSG02	NSG04	NSG04
200	NSG04	NSG06	NSG09
300	NSG06	NSG09	NSG14
500	NSG09	NSG14	NSG18
700	NSG14	NSG18	NSG24
900	NSG18	NSG24	–
1,300	NSG24	–	–

Technical Specifications

Model Reference	Dimensions (mm)		Flow Rates	Shipping Height (mm)	Capacity (L)	Approx Weight (Kg)		Fall Across The Unit (mm)
	Length	Width				Empty	Full	
NSG01	1320	750	1LPS	1100	500	70	570	75
NSG02	1620	1100	2LPS	1175	1000	90	1090	75
NSG04	2072	1224	4LPS	1570	2000	120	1860	70
NSG06	3018	1224	6LPS	1570	3000	160	2820	70
NSG09	3895	1224	9LPS	1570	4000	190	3760	70
NSG14	4418	1422	14LPS	1745	6000	215	5535	70
NSG18	3231	1917	18LPS	2120	8000	300	7162	70
NSG24	4386	1917	24LPS	2120	11000	380	9885	70

Klargester Washdown and Silt Units

Klargester Washdown and Silt units 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.

How it works

As contaminated water passes through the separation chamber, it is retained long enough to allow solids to sink to the bottom of the unit. Our design uses a maximum of 6 minutes hydraulic retention time, at the flow rate given. The separator water is then able to discharge safely.

The nature of the silt varies depending on either the ground or surface receiving the flow. These aspects should be considered when selecting the size of the unit in relation to the flow being treated.

If emulsifiers are present, the discharge must not be allowed to enter an NS unit.

Applications

These units can be used to serve vehicle wash down areas and car wash facilities, although it should be noted that the prime function of such separators is for the removal of silt. Typical locations using wash down separators are: car wash, tool hire depots, truck cleansing, construction compounds cleansing points.

Locations requiring silt separators are: highly silted sites where NS separators are used, i.e. works constructions sites and temporary work compounds.

Our Washdown and Silt Separators are manufactured from durable, rot and corrosion proof glass reinforced polyester combining lightweight with outstanding strength. The units are delivered complete with inlet and outlet pipework as well as factory fitted access shafts to ensure quick and easy installation on site.

Technical Specifications

Model Ref	Total Capacity (Ltrs)	Max.rec. Silt (Ltrs)	Max. Flow Rate (L/S)	Length (MM)	Diameter (MM)	Access Shaft Diameter (MM)	Base Inlet Invert (MM)	Base To Outlet Invert (MM)	Standard Fall Across (MM)	Min Inlet Invert (MM)	Standard Pipework Diameter (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

Klargester Compact Pumping Stations

Our proven range of compact pump stations can be used for effluent or sewage and are easy to install.

Quick to install and easy to maintain, Klargester pump stations are the ideal solution for outbuildings and extensions, cellars, pool houses and external WCs. They can be used for effluent or sewage, depending on the pump, distance and height.

Product Benefits

- Non-return valves and outlet pipe compression coupling as standard.
- 3 pump options; effluent low head, effluent high head and sewage vortex.
- Service and maintenance plans available to prolong the life of the pump systems.
- Complete pre-fabricated solution ready for installation.
- Fully automatic.

Technical Specifications

Chamber Size (mm)	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
610 x 700	200	GRP	N/A	Optional	Single
560 x 1,650	400	GRP	N/A	Optional	Single

Selecting the Correct Pumping Station System

All Klargester pumping stations are suitable for pumping waste water effluent and sewage in accordance with BS 756-2.

They are also designed in line with Building Regulations for Foul Drainage. Your system size will depend on the type of waste you need to manage, your distance from the sewer and the difference in levels.

For expert advice, to help you select the correct system, please contact our specialist team on **01296 633033**

The key factors to size your system are as follows:

- Application: domestic, residential or commercial.
- Material application: sewage, effluent or surface water.
- Inlet depth (below ground level).
- Pumping distance and lift.
- Electrical supply.

Klargester Domestic and Domestic+ Pumping Stations

Our domestic pumping stations are ideal for homes or properties with up to 13 people.

Quick and simple to install, they require minimal maintenance. They come with single or twin pumps, and are suitable for sewage, surface water and effluent. Appropriate for 24 Hour storage requirements.

Product Benefits

- Made with super-tough, low maintenance GRP and high quality polyethylene for guaranteed durability.
- Comes with options of remote monitoring systems.
- Designed with easy access features for maintenance.
- Choose from either 110mm or 160mm inlet connections.
- Lockable covers for optimum security.
- Quick connection outlet couplings.

Technical Specifications - Domestic

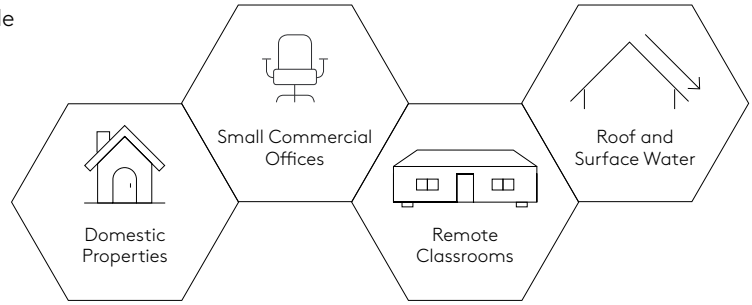
Chamber Size	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
900 x 2580	1,600	GRP	Included	Optional	Single/Twin
900 x 2080	1,250	GRP	Included	Optional	Single/Twin

Technical Specifications - Domestic+

Chamber Size	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
1000 x 2000	1,450	Polyethylene	Included	Standard	Single/Twin
1000 x 2500	2,200	Polyethylene	Included	Standard	Single/Twin

Applications

Suitable for a wide range of applications, the Compact and Domestic range of Klargester Pumping Stations are suitable for the following types of applications and many more:



Klargester Vertical Pumping Stations

Our Pumpstor Commercial pumping systems are ideal for developments and premises where drainage by gravity isn't an option.

Tanks and pumps come in a range of sizes and dimensions and have a 24-hour storage capacity for foul waste to comply with Building Regulations. A wide range of surface water pumps are available for such applications from small roof run offs, to large SUDS schemes, delivering up to 70 litres/second.

Pumpstor Commercial pumping stations are made from robust GRP. They are designed as a single-piece chamber, ready for installation with no man-entry required.

Product Benefits

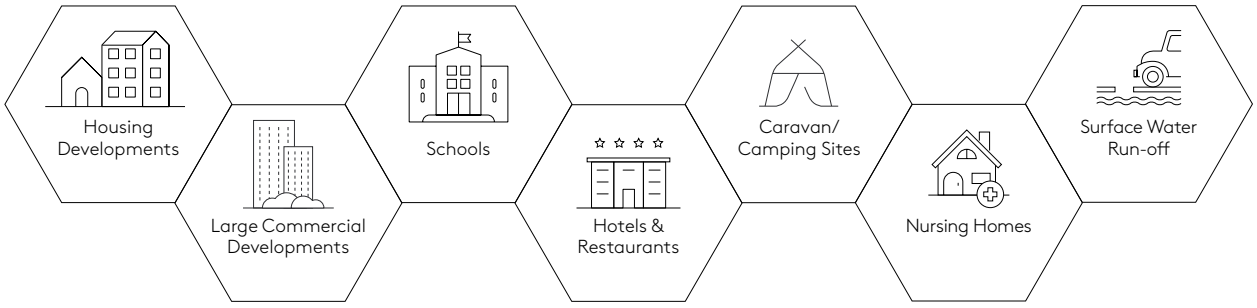
- High-level alarm.
- Internal lifting chains and guide rails (as specified).
- Wide range of pump options including macerators/vortex.
- Range of emergency overflow tanks, if required.
- Inlet connection sizes to suit site.
- Various invert depths and positions.
- GRP chambers with internal pipework in plastic, galvanised or cast iron.
- Optional kiosks with warning beacons and optional telemetry systems.
- Service and maintenance plans available to prolong the life of the pump systems.

Technical Specifications

Vertical Tank Size (mm)	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
1250 Diameter	Up to 4,800	GRP	Included	Standard	Single/Twin
1800 Diameter	Up to 10,000	GRP	Included	Standard	Single/Twin
2600 Diameter	Up to 22,000	GRP	Included	Standard	Single/Twin

Applications

Designed for easy installation and available in many sizes to meet an extensive range of customer requirements, the Klargester range of Horizontal and Vertical Pumping Stations are typically used in applications including:



Klargester Horizontal Pumping Stations

If power supplies fail, Pumpstor Commercial responds instantly, separating liquids and solids into a separate chamber and storing waste for up to 24 hours. Once power is restored, the pumps will work normally again without further maintenance.

Product Benefits

- Single-tank installation up to 79m^3 (multiple tank systems available).
- Multiple valve chamber location and invert options.
- Weir screen features innovative removable filters, so there's no need to access the chamber during maintenance.
- High-level alarm.
- Totally sealed system.
- One-piece tank chamber for easy installation.
- Minimal on-site assembly.
- Less cranage and shallower excavation than concrete pumping stations.
- On-site Health & Safety issues are minimised – no requirement for personnel to enter the tank.

Commercial Pump Systems are made from GRP. It is designed as a single piece chamber with two separate sections. one for normal operation and one for emergency storage.

Technical Specifications

Tank Size (mm)	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
2,600 Diameter	18000-79000	GRP	Included	Standard	Single/Twin

Klargester Adoptable and High Specification Pump Systems

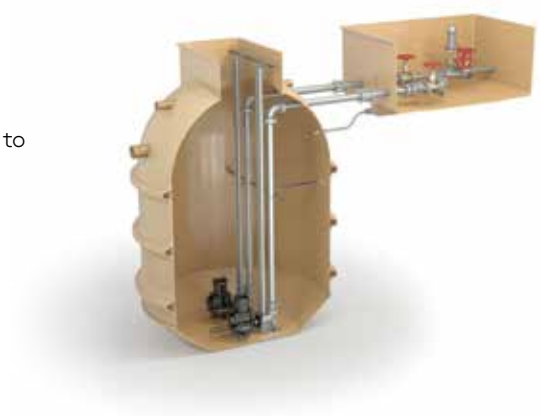
The adoptable and high specification pump stations are designed to meet the requirements of 'Sewers for Adoption 7th Edition' and the 'Water Industry Standard' (WIS).

For expert advice, please contact our specialist team on **01296 633033**

Manufactured as a ready to install pre-fabricated unit for Type 1 and Type 2 installations for up to 20 dwellings.

Product Benefits

- GRP single piece wet well delivered to site ready to install.
- Pre-fitted internal pipework, pump guide rails and overflow filters.
- Approved control panel and kiosk.
- All necessary drawings supplied.



Klargester Gamma
Fully Integrated Rainwater Harvesting System

The Klargester Gamma rainwater harvesting system is designed as an intelligent rainwater harvesting system, tailor made for your home.

Typical Applications Include:

- WC Flushing
- Garden and Landscape Watering
- Domestic Laundry
- Vehicle Washing

With a technologically advanced finish, Gamma is suitable for both self build projects and residential developments.

It works by taking the rain from your roof gutters, filtering out leaves and debris and storing the water in an underground tank.

Manufactured from tough polyethylene, the tank is robust and lightweight, which makes it easy to handle and install. Its fuss free design offers high functionality, making it the perfect choice for your home or garden.

Automatic in operation, the Gamma rainwater harvesting system offers powerful features for complete peace of mind in your home. The intelligent system ensures an automatic supply of harvested rainwater for your home and garden.

For home and garden use, the Gamma is available in capacities between 2,350-4,600 litres.

Model Reference	Tank Dimensions					
	Capacity	Standard Overall Height	Standard Inlet Invert*	Standard Outlet Invert*	Length	Width
Gravity System						
GRW080	2,350 Ltrs	1,770mm	720mm	750mm	3,000mm	1,180mm
GRW110	3,100 Ltrs	2,260mm	720mm	750mm	2,480mm	1,130mm
GRW160	4,600 Ltrs	2,260mm	720mm	750mm	3,360mm	1,215mm
Direct System						
GRW080	2,350 Ltrs	1,768mm	720mm	750mm	3,000mm	1,180mm
GRW110	3,100 Ltrs	2,260mm	720mm	750mm	2,480mm	1,130mm
GRW160	4,600 Ltrs	2,260mm	720mm	750mm	3,360mm	1,215mm

* Includes tank neck - adjustable to suit required invert.

01 The Gravity System

The Gravity System uses an elevated header tank to store filtered water after the main tank.

02 The Direct System

The Direct System pumps water from the main storage tank and is used where a header tank is impractical.

Home and Garden

1 Water main
2 Storage tank
3 Header tank (optional extra)
4 Pressure Vessel (not supplied)
5 In-line filter 120 microns
6 Internal rainwater filter
7 Grundfos Intelligent Pump—SBA 3-23M
8 Adjustable tank neck
9 External tap (not supplied)
10 Roof rainwater feed
11 Filtered rainwater feed

Reduces Water Consumption

Regulations Compliant

Offers Fast Payback

Advisory Consultants

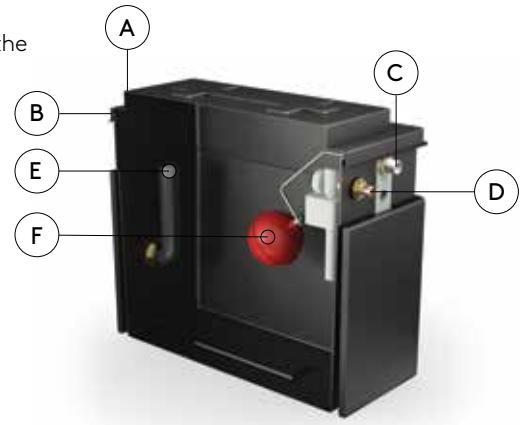
Features and Benefits

- Can reduce water consumption in domestic applications by up to 50%.
- Easy to install and simple to maintain.
- 'Fit and Forget' system, ensuring an automatic supply of harvested rainwater.
- Shallow Dig—the Gamma is designed with easy, affordable installation in mind.
- Pea shingle backfill available—no costly excavation and soil disposal necessary (dependent upon site conditions).
- Fully compliant—Gamma is tested in accordance with BS 8515:2009. standards.

Optional Extra - Header Tank

When ordering your system, to make the Gravity System complete you will require a header tank. Klargester offers a header tank with weir, ballcock and float valve which allows the switch over to mains, the weir provides the mandatory air gap.

A Mains Input
B Rainwater Input
C Water Regulations Compliant Mandatory Air Gap
D Overflow Point
E Rainwater Level Control
F Mains Level Control



Klargester Aquabank®
Rainwater Harvesting Range

Overview

The Klargester Aquabank rainwater harvesting system is designed with simplicity in mind.

Applications:

Vehicle Washing

Garden Watering

WC Flushing

Domestic Laundry

Aquabank is suitable for single residential applications. It uses cohesive design with the system controlled by a pump, with options for either direct or gravity fed applications. It's a highly intuitive system – easy to use with no need for a control panel, display panel or depth sensor.

Manufactured from strong GRP material, Aquabank is a complete 'kit in a box' – easy to install and the smart choice for your home's rainwater harvesting needs. For home and garden use, the Aquabank is available in capacities between 1,000 and 6,000 litres.

—

Features and Benefits

- Easy to install.
- Simplified system designed for rapid installation.
- Quick start set up procedure.
- 'Kit in a box' set of key components.
- Easy conversion to gravity system with header tank.
- Minimal energy use in operation.
- Fully compliant - designed in accordance with BS EN8515.

Benefits of Installing Klargester Domestic Rainwater Systems

SAVE UP TO 50% On water consumption in domestic applications with Klargester Rainwater Harvesting solutions

The system that pays for itself — money saved through reduced water bills means aquabank can pay back its purchase costs

Assists Planning Application — Authorities increasingly expect applications to demonstrate Sustainable Drainage (SUDS)

How it works

01

Rainwater is stored in underground tank

02

Rainwater is pumped at a constant pressure to an elevated header tank

03

Water is pumped to a garden sprinkler or hose as required

Model	Capacity (Ltrs)	Standard Overall Height	Standard Inlet Invert	Standard Outlet Invert	Diameter / Width	Length
Gravity & Direct System						
AQB010	1,000	2,140mm	500-800mm	530-830mm	1,225mm	1,125mm
AQB028	2,800	2,582mm	500-1000mm	530-1030mm	2,070mm	—
AQB038	3,800	2,811mm	500-1000mm	530-1030mm	2,070mm	—
AQB046	4,600	2,961mm	500-1000mm	530-1030mm	2,070mm	—
AQB060	6,000	2,365mm	500-800mm	530-830mm	1,424mm	4,275mm

—

Klargester RainTrap®
Rainwater Storage and Delivery System

Easy to Install

Overview

An economical rainwater harvesting system designed to make garden watering simple. The Klargester RainTrap system comprises of a filter, an underground storage tank and a pump. Rainwater runs down the roof and into the guttering and downpipes in the normal way before passing through the filter, which removes any leaves or debris. Rainwater is stored in the underground tank from which it is pumped at a constant pressure to an outside tap as required.

The RainTrap has many advantages over traditional garden waterbutts. In addition to being able to store far larger quantities of water, it removes the need to carry water around and does not flood when full, since the excess water exits via a soakaway or surface water drain.

Features and Benefits

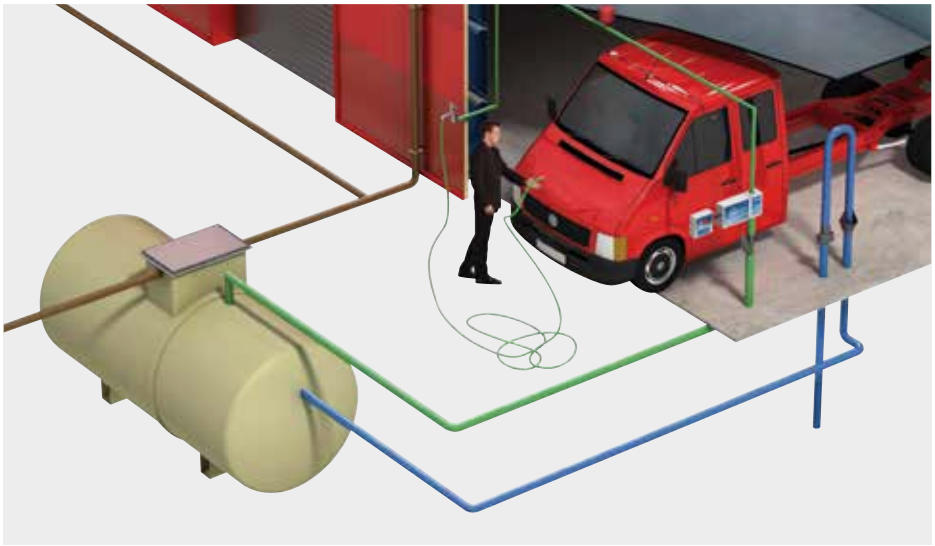
- Easy to install.
- Inexpensive.
- Simple on/off operation.
- Suitable for existing and new homes.
- Available in sizes from 1,000 — 6,000 litres.
- Automatic rainwater diversion when tank reaches full capacity.
- Internal leaf filter.
- Designed and manufactured in the UK.

Technical Specifications – RainTrap

Model Reference	Capacity (Ltrs)	Diameter (mm)	Height Base to Outlet (mm)
RT2800	2,800	2,070	1,540
RT3800	3,800	2,070	1,760
RT4600	4,600	2,080	1,925

Klargester Commercial Below Ground Rainwater Harvesting System

The Klargester commercial range is a fully integrated, intelligent rainwater harvesting solution suitable for such applications as commercial vehicle washdown areas, garden centres and golf courses.



The commercial range provides a secure solution for any size of building project from 6,000 litres up to 79,000 litres of water in a single tank. For larger capacities, multiple tanks may be connected together to meet storage requirements.

It is available as either a gravity or direct system, depending on specific site requirements.

Large installations are carefully sized and selected, taking into consideration the following factors:

- Roof water yield.
- Projected water consumption.
- Groundwork criteria (prevailing water table, soil conditions, requirements or traffic access).
- Suitable filters and pumps to match system specifications, ensuring the water is kept at an optimum level of clarity and supply pressure).

Features

- Capacities from 6,000 to 79,000 litres within a single tank.
- Multiple tanks can be joined to cater for larger volumes.
- Can be installed under trafficked areas (with reinforced concrete support).
- Complete packaged units delivered directly to site.

Technical Specifications

Single Pump Model Reference	Twin Pump Model Reference	Capacity (Ltrs)	Diameter(m)
ENV0200SKSW	ENV0200TKSW	6000	1.4
ENV0275SKSW	ENV0275TKSW	8000	1.8
ENV0350SKSW	ENV0350TKSW	10000	1.8
ENV0485SKSW	ENV0485TKSW	14000	1.8
ENV0625SKSW	ENV0625TKSW	18000	2.6
ENV0765SKSW	ENV0765TKSW	22000	2.6
ENV0900SKSW	ENV0900TKSW	26000	2.6
ENV1040SKSW	ENV1040TKSW	30000	2.6
ENV1320SKSW	ENV1320TKSW	38000	2.6
ENV1460SKSW	ENV1460TKSW	42000	2.6
ENV1735SKSW	ENV1735TKSW	50000	2.6
ENV2050SKSW	ENV2050TKSW	59000	2.6
ENV2325SKSW	ENV2325TKSW	67000	2.6
ENV2745SKSW	ENV2745TKSW	79000	2.6

After Sales Service and Support

We recognise the importance of after sales service and support and are proud of our nationwide Kingspan Service network, which comprises our Kingspan in-house Service team and Accredited Installer network in support of the Klargester Product Range.

Together we are working to provide first class service across a range of sectors, including domestic, commercial, industrial, leisure, hospitality and many more.

With expertise across the Klargester range of waste water and drainage solutions, pumping stations, separators and rainwater harvesting, our dedicated support network offers the following offers the after sales service and support you would expect from a global organisation.

- First class technical engineering expertise across a range of off-mains sewage and wastewater applications.
- Day to day technical support.
- 24 hour breakdown repair.
- Preventative maintenance plans.
- Installation and commissioning.
- Asset monitoring.
- Consultancy and advice.

To speak with us about any aspect of installation, commissioning or service simply contact:

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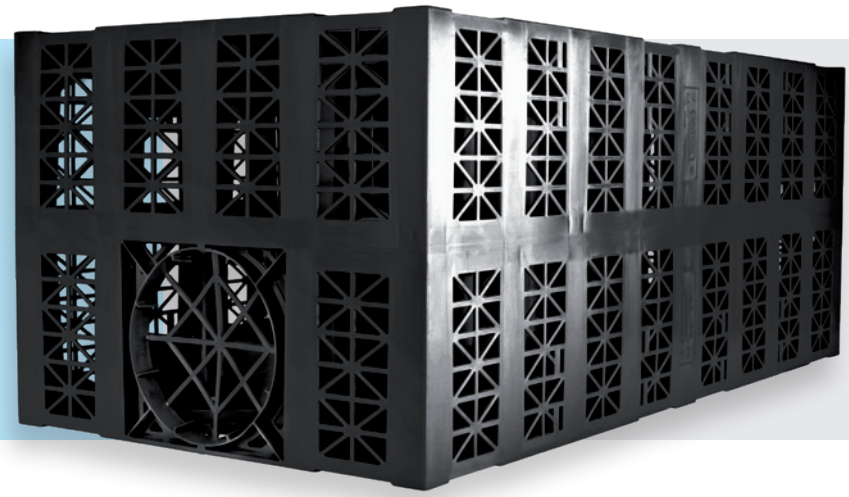
Product Datasheet

AquaCell Core-R



Product description

AquaCell Core-R has been designed for use in deep applications, subject to regular and heavy traffic loadings, e.g. cars and HGV's. AquaCell Core-R can also be used in both landscaped and deep soakaway applications.

Technical specification

Product code / SAP code	6LB150 / 4064830	**Void ratio**	95%
Colour	Black	**Material**	Recycled PP
Dimensions	1m x 0.5m x 0.4m	**Vertical loading**	66.9 tonnes/m^2 (669 kN/m^2)
Weight	11.5kg	**Lateral loading**	12.3 tonnes/m^2 (123 kN/m^2)
Storage volume	190 litres	**BBA approval**	Certificate 03/4018

Maximum installation depths

Typical soil type	**Maximum depth of installation – to base of units (m)[1]**				
	Soil weight kN/m^3	**Angle of internal friction φ (degrees)[2, 3]**	**Landscaped areas**	**Vehicle mass <9 tonnes[4, 5]**	**Vehicle mass <44 tonnes**
Over consolidated stiff clay	20	24	3.85	3.61	3.36
Silty sandy clay	19	26	4.35	4.09	3.83
Loose sand and gravel	18	30	5.34	5.06	4.78
Medium dense sand and gravel	19	34	5.94	5.68	5.41
Dense sand and gravel	20	38	6.68	6.43	6.18

Minimum cover depths

	Landscaped areas	**Car parks with vehicle mass <3 tonnes[5]**	**Car parks with vehicle mass <9 tonnes**	**Car parks with vehicle mass <12 tonnes**	**Low speed roads with vehicle mass <60 tonnes**
Minimum cover depth (m)	0.30	0.50	0.60	0.70	1.11

1. Without groundwater present below base of units – AquaCell Core-R may be used where groundwater is present, contact Wavin for technical advice.
2. Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.
3. The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
4. Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
5. This category should be used when considering landscaped areas that may be trafficked by ride on mowers.

Assumptions made:

- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil

Source: BBA

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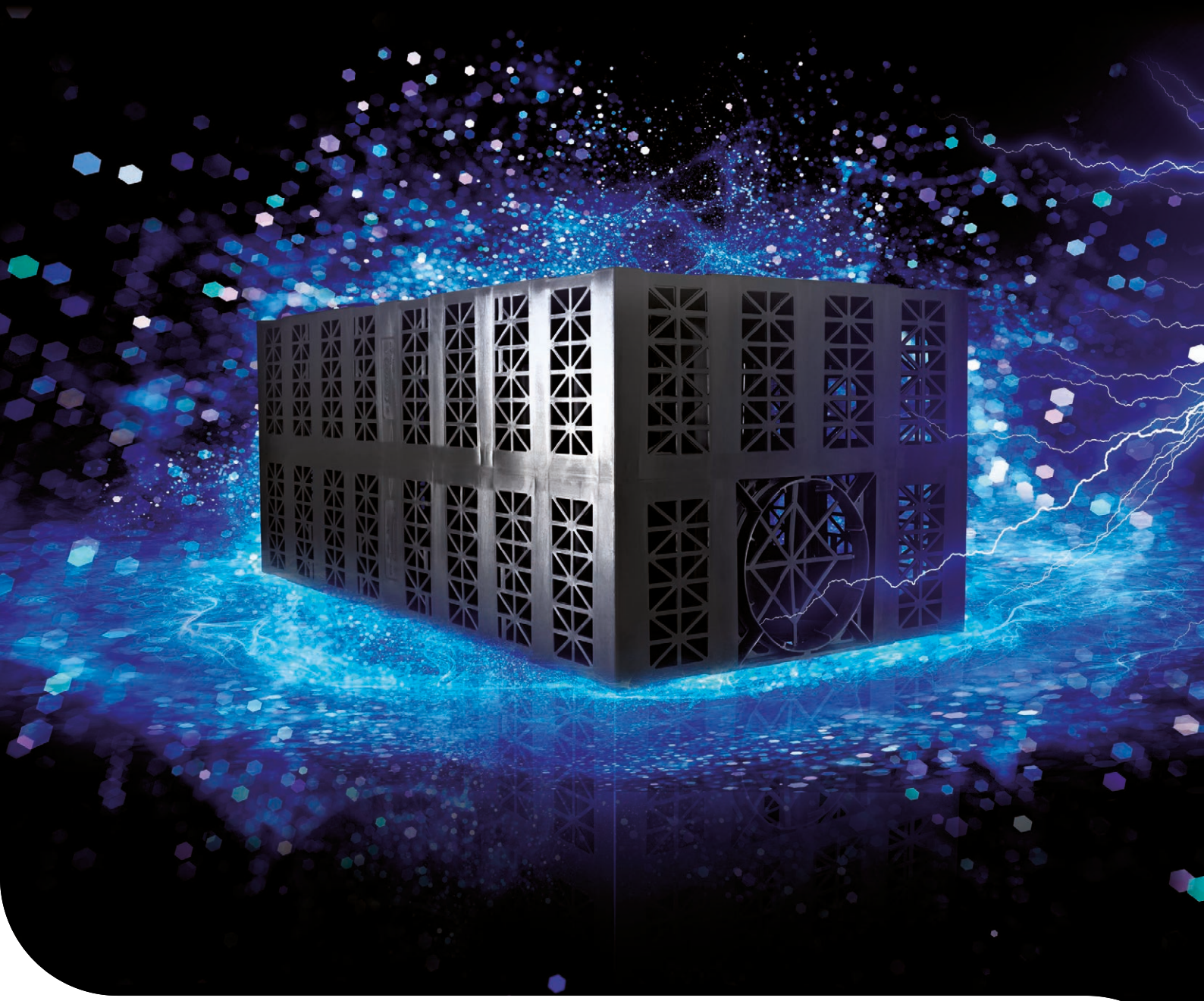
June 2021

WATER MANAGEMENT

AquaCell systems

Product and installation manual



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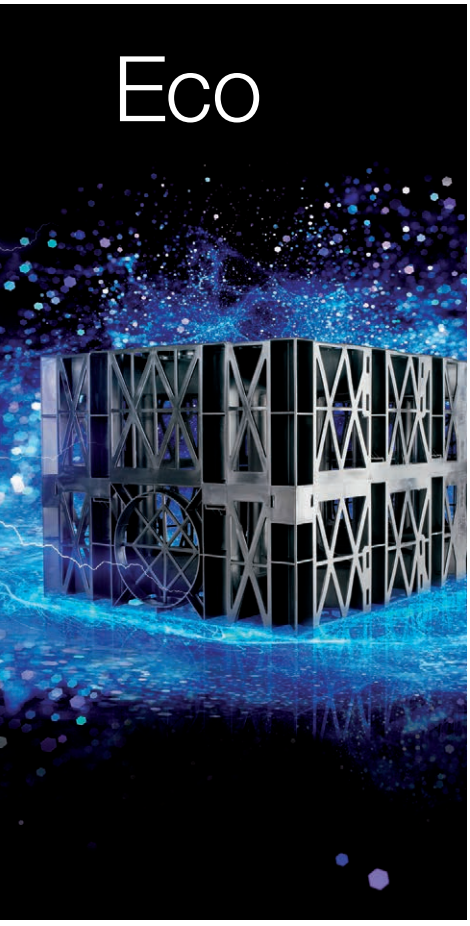
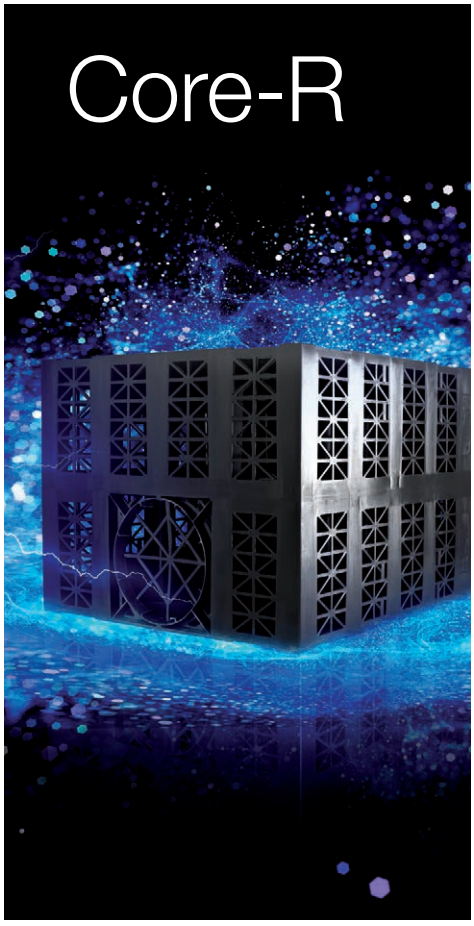




Introduction to SuDS

Continuing urban development, a changing climate and the consequences of increased rainfall are all increasingly prominent issues on the political and environmental agenda and all drive the need to actively manage excessive rainfall across new and existing developments through the use of Sustainable Drainage Systems (SuDS).
Designed correctly drainage systems can assist in delivering sustainable development whilst improving the spaces where we live, work and play.
The SuDS approach to managing water takes account not just of how water quantity is managed but also considers how improvements to water quality can be delivered as well as the creation of habitats promoting biodiversity and amenity for the community.
Good SuDS aim to mimic nature and manage rainfall close to where it falls. They are designed to move and attenuate water within the development before it is released into water courses. Water is stored within the development where is allowed to infiltrate into the ground or is released at a controlled rate to prevent issues downstream.
The CIRIA SuDS Manual gives guidance on all areas of SuDS and focuses on the cost-effective planning, design, construction, operation and maintenance of SuDS.

Which SuDS components are best?

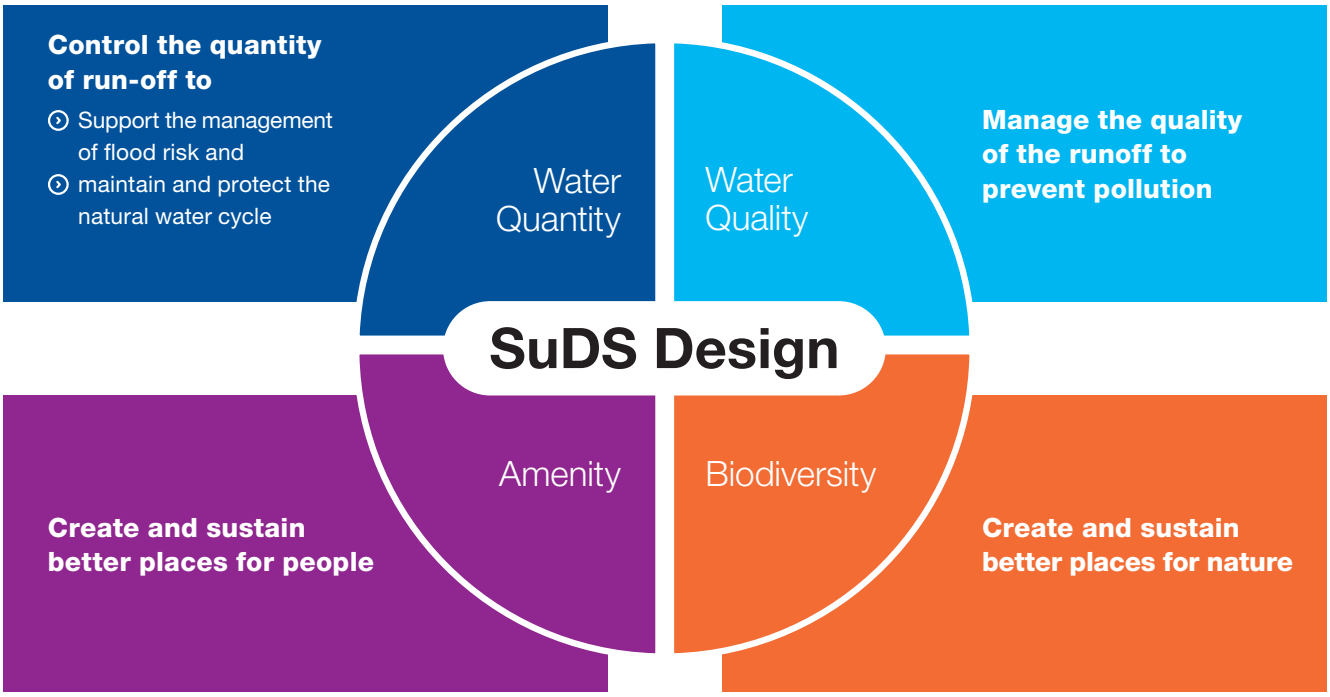
SuDS should help maximise amenity and biodiversity, whilst also delivering key objectives to manage flood risk and water quality For any given site, SuDS should be considered as sequence of components designed to efficiently drain surface water whilst minimising pollution.
Selection of which SuDS components is best for each development is dependent on the site specific requirements.

How can Wavin help with SuDS projects?

Wavin is well qualified to advise on how to comply with current and emerging regulation. We can aid specifiers, developers and contractors in responding to legislative demands as they pertain to flooding, sewage, urban drainage and sustainable resources use.
In particular, the proven qualities and performance of AquaCell systems not only support the achievement of SuDS, they can also help reinforce and enhance planning applications and enable development to proceed.

CIRIA SuDS Design

Source: The SuDS Manual (CIRIA)



Keeping you on top of legislation

Flood and Water Management Act 2010

The Flood and Water Management Act was designed to reduce the risk of flooding and its consequences by providing for better, more comprehensive and co-ordinated water management, embracing groundwater, surface water and coastal erosion risk. Schedule 3 of the act gives DEFRA responsibility for establishing national standards for sustainable drainage and empowers local authorities to manage local flood risk by adopting and maintaining sustainable drainage schemes. In January 2019 Schedule 3 was implemented by the Welsh Government. This legislation effectively makes the use of SuDS mandatory on new developments with the aim of reducing flood risk and improving water quality. The new standards for Wales support the 'four pillars' of SuDS.

Sewers for Adoption

In England the framework for the delivery of SuDS in the absence of Schedule 3 is through a revision to Sewers for Adoption to include some SuDS components as adoptable by the Water and Sewage Companies. The document, currently with Ofwat for approval, is expected to be introduced early 2020. When it comes into force it will be the only guide to the standards that sewers must meet if they are to be adoptable by WaSCs in England. The new document will, for the first time, offer guidance on SuDS components (although not all) that can be adopted by Water and Sewerage Companies with standards on the flood risk performance that is expected.

The Water Environment and Water Services (WEWS) (Scotland) Act 2003

In Scotland WEWS makes Scottish Water responsible for SuDS that deal with the run-off from roofs and any paved ground surface within the property boundary. In order to deliver this SuDS need to be designed to Scottish Water's specifications as set out in their manual, Sewers for Scotland v4.0. In addition, the law makes the use of SuDS obligatory when dealing with surface water drainage from all new developments.

The EU Water Framework Directive

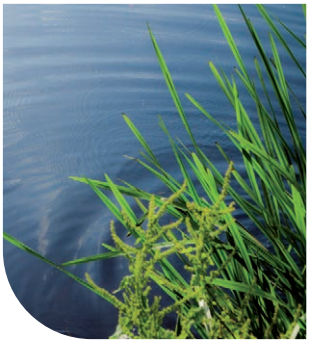
Nearly half the EU population lives in 'water-stressed' countries, caused by high extraction from freshwater sources, and demand is growing all the time. The EU Water Framework Directive introduces a new legislative approach designed to better manage and protect water resources, based not on national orpolitical boundaries but on the natural catchment of river basins.

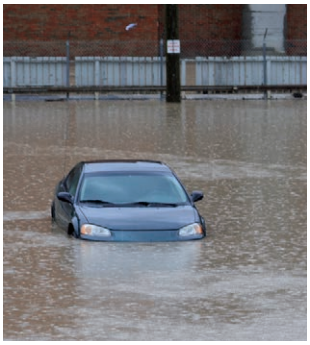
Building Regulation Part H (Drainage and Waste Disposal)

Building Regulation Part H embraces the guidelines for drainage and waste disposal that must be met in the UK. Although Part H extends to rainwater drainage and solid waste storage, waste drainage issues are to the fore. The Building Regulations are designed to ensure that all foul water is properly disposed of to maintain a decent level of sanitation, promoting both personal and environmental health. The regulations also highlight the importance of pollution prevention, working sewage infrastructure and sewage maintenance. With regards to stormwater, Building Regulations Approved Document H3 stipulates that adequate provision should be made for rainwater to be carried from the roof of a building to either a soakaway, water course or sewer.

National Planning Policy Framework

Section 14 of the National Planning Policy Framework sets out policy to ensure that flood risk is taken into account at all stages of the planning process and that inappropriate development in areas at risk of flooding is avoided. The policy directs development away from areas of highest risk and where new development is, exceptionally necessary in such areas, aims to make it safe without creating an increase in flood risk elsewhere and, where possible, reduce flood risk overall. It also states developments should only be allowed in an area of flood risk if it incorporates sustainable drainage systems, unless there is clear evidence that these would be inappropriate.





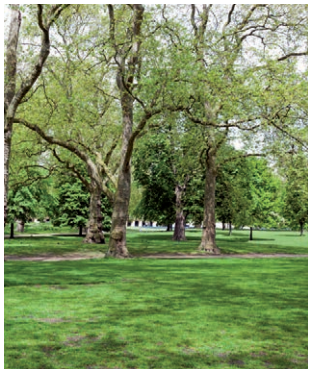
Overview

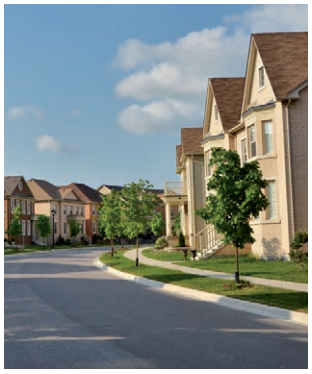
The AquaCell range of geocellular systems are a fully tried and tested, BBA approved, modular technique for managing excessive rainfall.

Applications

The AquaCell range can be used as either a temporary storage tank or as a soakaway, and is suitable for applications including:

- Landscaped areas
- Parks
- Domestic gardens
- Residential developments
- Car parks & roads
- Industrial/commercial areas





The AquaCell range

There are three types of AquaCell unit. Each can be used as a standalone system or different unit types can be mixed and matched together in layers to value engineer the most cost effective solution.

All AquaCell units have identical dimensions (1m x 0.5m x 0.4m), but they are manufactured to perform differently. The type of unit, or combination of units required will depend on factors such as the load application, overall installation depth and site conditions.

Features and benefits

The following are applicable to all AquaCell units:

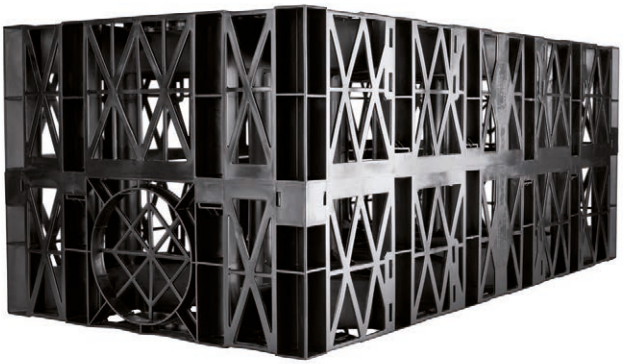
- BBA Approved – certificate No. 03/4018
- Modular, lightweight and versatile
- Easy to handle and quick to install
- Proven clip and peg connection system
- 95% void (each unit holds 190 litres of water)
- Can be brick-bonded for extra stability
- Units can be mixed and matched together for optimum performance
- Full range of ancillaries
- Can be used as integral part of a SuDS scheme

Environmental benefits

In addition, the AquaCell range can also offer the following environmental benefits:

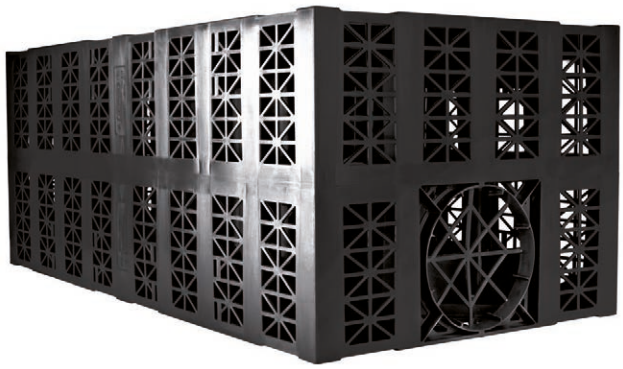
- Reduced flooding risk
- Controlled release of stormwater into watercourses or, where permitted, existing sewer systems
- Recharging of local groundwater (if infiltration/soakaway application)
- Aerobic purification to improve water run-off quality
- Sustainable, cost effective management of the water environment

Eco



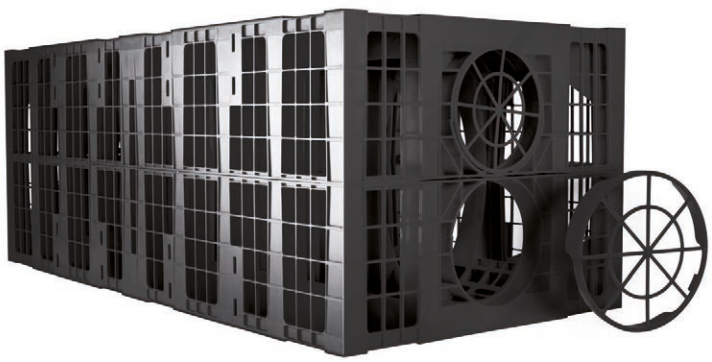
Eco is manufactured from specially reformulated, recycled material and has been designed for shallow, non-trafficked, landscape applications.

Core-R



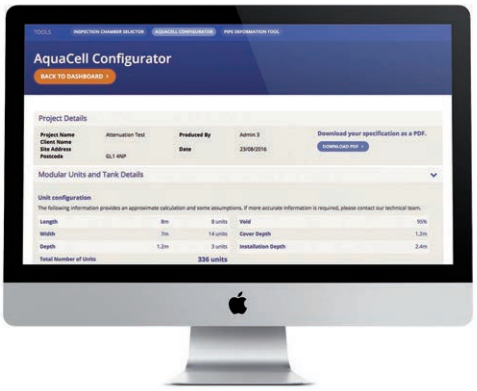
Core-R has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's.

Plus-R



Plus-R has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas including HGV.

AquaCell Configurator Tool



Optimise tank and soakaway designs with the AquaCell Configurator Tool

The AquaCell Configurator tool aids and speeds the efficient design of stormwater tank or soakaway solutions. The tool guides users through a step-by-step specification process and, based on responses, will recommend the optimum design, based on the loadings, depths and site conditions of each project.

The tool generates a PDF of the design for easy download and can store the data online for future reference. To start using the tool or to learn more visit: **myportal.wavin.co.uk/tools**

AquaCell Eco

Application

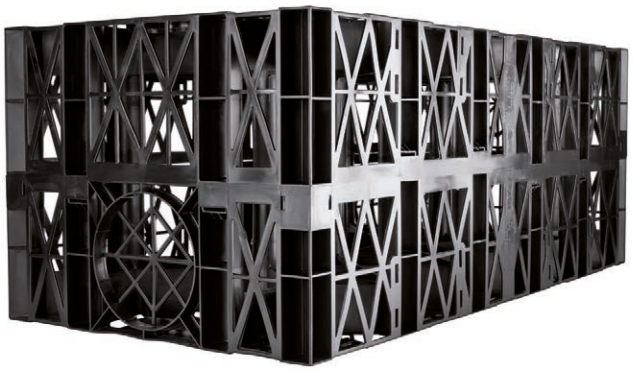
AquaCell Eco is manufactured from specially reformulated, recycled material and has been specifically designed for shallow, non-trafficked, landscaped applications. AquaCell Eco is **NOT** suitable for locations subject to high water tables.

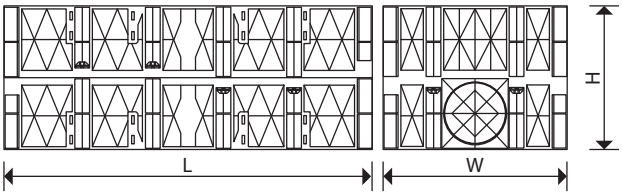
AquaCell Eco is typically suitable for installations to a maximum depth of 2.68 metres, to the base of the units from ground level, with a minimum cover depth of 0.3 metres, (CIRIA's recommendation, is to allow a cover depth of 0.5 metres in applications where a ride on mower may be used).

Any installation using AquaCell Eco must **NOT** be subjected to additional loading at any time. Trafficking by construction plant on site, including mechanical equipment, must be avoided.

If trafficking of the buried tank by construction plant or, other vehicles is unavoidable, the installation should be constructed using AquaCell Core-R units (see page 9).

The width of an AquaCell Eco installation should not exceed 12 metres to allow for mechanical backfilling without loading. There is no limit to the length of the installation.



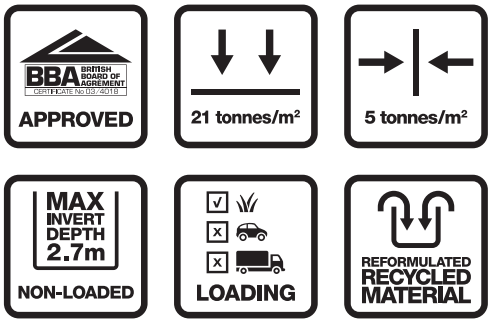


Material: Reformulated polypropylene

Nominal size (mm)	Part number	Dimensions (mm)		
		W	H	L
160	6LB025	500	400	1000

Features and benefits

- Manufactured from specially reformulated, recycled material
- Suitable for both soakaway and attenuation applications
- Proven vertical loading capacity of: 21.3 tonnes/m² (213kN/m²)
- Proven lateral loading capacity of: 5.2 tonnes/m² (52kN/m²)
- Integral "hand holds" for ease of carrying/handling
- BBA approved – Certificate No 03/4018



Maximum installation depths – to base of units (m)[1]

Typical soil type	Soil weight kN/m³	Angle of internal friction φ (degrees)[2, 3]	Landscaped areas
Over-consolidated stiff clay	20	24	1.53
Silty sandy clay	19	26	1.68
Loose sand and gravel	18	30	2.08
Medium dense sand and gravel	19	34	2.35
Dense sand and gravel	20	38	2.68

(1) These values relate to installations where the groundwater is a minimum of one metre below the base of the excavation.
(2) AquaCell Eco units should not be used where groundwater is present.
(3) 0.5m cover is required where a ride-on mower may be used.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil.

Source: BBA

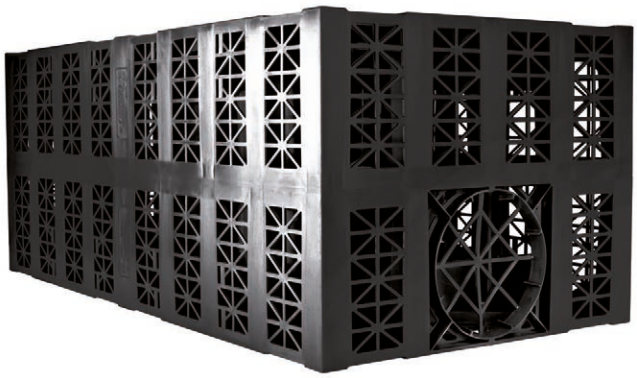
AquaCell Core-R

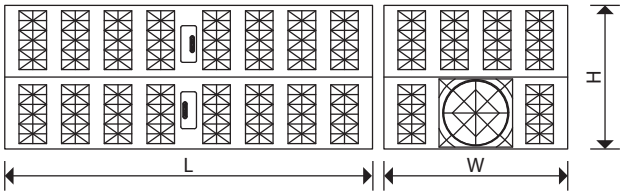
Application

AquaCell Core-R has been designed for use in deep applications, subject to regular and heavy traffic loadings, e.g. cars and HGV's. AquaCell Core-R can also be used for deep soakaways and landscaped applications.

Typically for use down to depths of 6.68m in landscaped areas (6.43m trafficked by cars) to the base of the units from ground level, in best soil conditions.

Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 1.11 metres is in place.

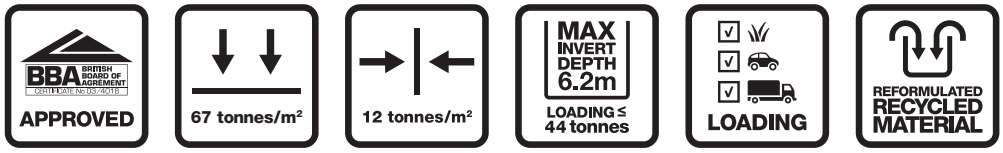




Features and benefits

- Suitable for regular and heavy traffic loadings
- Proven vertical loading capacity of: 66.9 tonnes/m² (669 kN/m²)
- Proven lateral loading capacity of: 12.3 tonnes/m² (123kN/m²)
- BBA approved – Certificate No 03/4018
- Ideal for all types of shallow and deep projects including major attenuation and infiltration schemes

Nominal size (mm)	Part number	Dimensions (mm)		
		W	H	L
160	6LB150	500	400	1000



Maximum installation depths – to base of units (m)[1]

Typical soil type	Soil weight kN/m³	Angle of internal friction φ (degrees)[2, 3]	Landscaped areas	Vehicle mass <9 tonnes[4, 5]	Vehicle mass <44 tonnes
Over-consolidated stiff clay	20	24	3.85	3.61	3.36
Silty sandy clay	19	26	4.35	4.09	3.83
Loose sand and gravel	18	30	5.34	5.06	4.78
Medium dense sand and gravel	19	34	5.94	5.68	5.41
Dense sand and gravel	20	38	6.68	6.43	6.18

(1) Without groundwater present below base of units – AquaCell Core-R may be used where groundwater is present, contact Wavin for technical advice.
(2) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.
(3) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
(4) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
(5) This category should be used when considering landscaped areas that may be trafficked by ride on mowers.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil.

Source: BBA

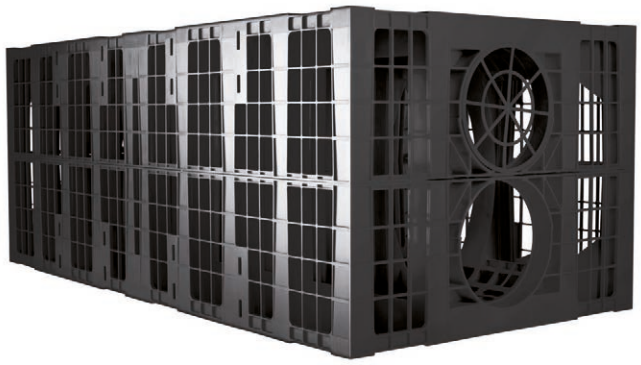
AquaCell Plus-R

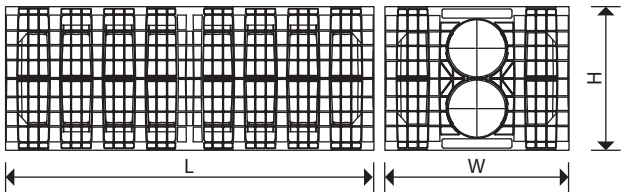
Application

AquaCell Plus-R has been designed primarily for use in applications where inspection is required. It is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes). The units can be used in combination with AquaCell Core-R (and Eco if there is at least one layer of Core-R in between the Plus-R and Eco layer).

Extra lateral loading capacity allows installation at greater depths. Integral inspection channels in each unit combine to create viewing channels for the full length of the installed structure.

Typically for use down to depths of 7.82m in landscaped areas (7.57m trafficked by cars and 7.3m trafficked by HGV's) to the base of the units from ground level, in best soil conditions. Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 1.30 metres is in place.



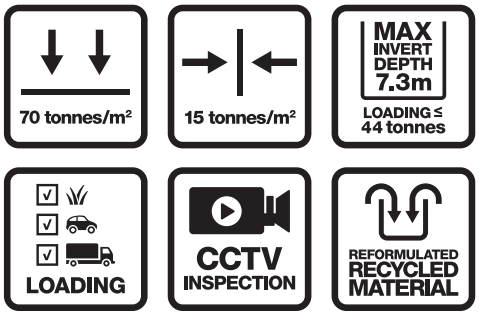


Material: Polypropylene

Nominal size (mm)	Part number	Dimensions (mm)		
		W	H	L
160	6LB200	500	400	1000

Features and benefits

- Suitable for extra deep installations
- Inspectable (supplied with end cap for use when an inspection channel is not required)
- Proven vertical loading capacity of: 70.2 tonnes/m² (702 kN/m²)
- Proven lateral loading capacity of: 15.1 tonnes/m² (151 kN/m²)



Maximum installation depths – to base of units (m)[1]

Typical soil type	Soil weight kN/m³	Angle of internal friction φ (degrees)[2,3]	Landscaped areas	Vehicle mass <9 tonnes[4,5]	Vehicle mass <44 tonnes
Over-consolidated stiff clay	20	24	4.67	4.42	4.17
Silty sandy clay	19	26	5.03	4.78	4.53
Loose sand and gravel	18	30	5.86	5.61	5.36
Medium dense sand and gravel	19	34	6.87	6.62	6.37
Dense sand and gravel	20	38	7.82	7.57	7.30

(1) Without groundwater present below base of units – AquaCell Plus-R may be used where groundwater is present, contact Wavin for technical advice.
(2) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.
(3) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
(4) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
(5) This category should be used when considering landscaped areas that may be trafficked by ride on mowers.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil.

AquaCell Plus-R: for inspectability

By aligning AquaCell Plus-R units end-to-end, full length viewing channels can be created – allowing for CCTV inspection if required. These are created in the bottom layer of an AquaCell tank installation.

The units can be used in combination with AquaCell Core-R (and with Eco if there is at least one layer of AquaCell Core-R in between the Plus-R and Eco layer).

NOTE: For any AquaCell Plus-R units on the perimeter of a structure that are NOT required for inspection access, the open ends of the integral inspection tunnels should be fitted with the end caps provided.

Inspection chambers

An inspection chamber should precede the inlet pipework for the AquaCell structure.

A silt trap or hydro-dynamic separator prior to the inspection chamber is also recommended.

For on-line installations the following Chambers are recommended:
- Down to 3m Wavin Non-Entry Inspection Chambers
- Down to 5m Wavin Range 600 Inspection Chambers, or a traditional manhole*

**where inlet pipework is replaced by AquaCell units acting as flow conduit.*

For off-line installations:
- Manhole with in-built flow control

Recommendation: If installing any Wavin Non-Entry Inspection Chamber, deeper than 1.2 metres, ensure that the cover and frame includes a 350mm restrictor to prevent man entry.

Inspection and maintenance

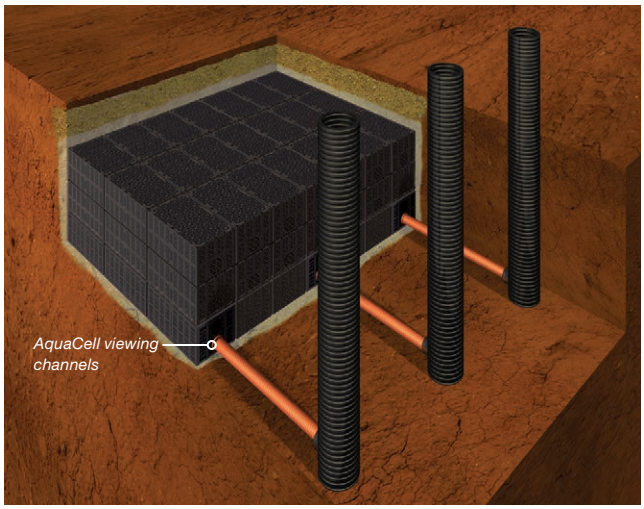
CCTV inspection at every inspection point is recommended:
- after every major storm
- at regular intervals according to the specific maintenance plan for the site

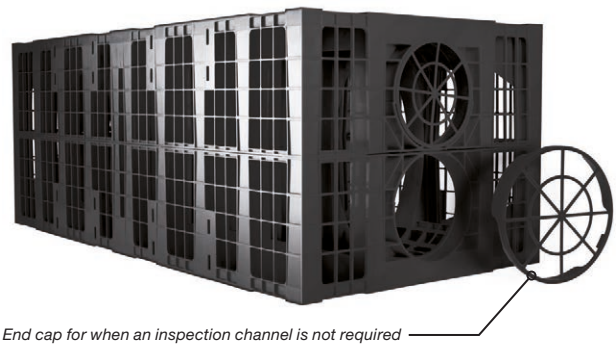
Silt traps prior to inlet pipework should be routinely inspected and cleaned out to minimise debris reaching the tank.
It is important to prevent construction silt from entering the AquaCell structure.

Inspectability scenarios

AquaCell Plus-R viewing channel

Trafficked tank installation with inspection chambers





End cap for when an inspection channel is not required

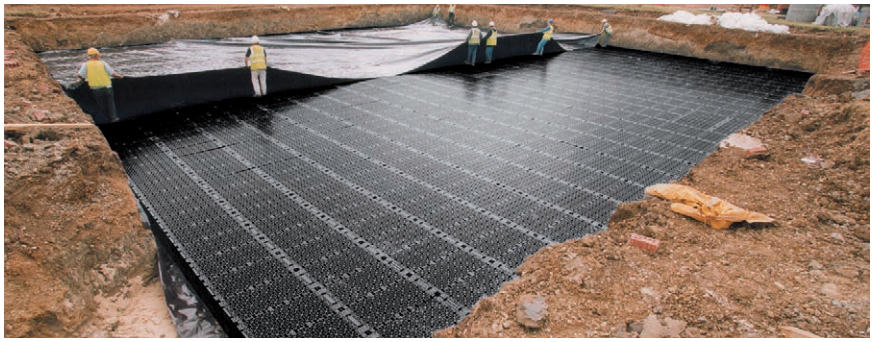
Design guidance

Infiltration or attenuation?

The AquaCell range can be used either as:

- A soakaway whereby the units will be installed in suitable pervious soils so the units can be wrapped in a geotextile to allow infiltration of the stormwater into the surrounding ground, or
- As an attenuation tank in impervious ground (e.g. clay) where infiltration is not possible, here the units are encapsulated in a geomembrane (which is in turn wrapped in a protective geotextile layer) so that the structure can hold the stormwater temporarily until local drainage flows can accept it for normal disposal at a permissible outflow rate.

Large scale AquaCell Core-R storage tank



Domestic AquaCell Core-R soakaway

Site assessment

Ground conditions may be established as part of a geotechnical assessment. This may include tests for infiltration and ground water level.

If there is no confirmation that such assessments have been conducted, or resulting conclusions are unavailable, a trial pit will be required in accordance with BRE 365.

For further information and guidance, please contact the Wavin Technical Design Team.

Infiltration (soakaways)

According to the principals of SuDS, wherever possible stormwater should be drained back into the ground via a soakaway as the first priority. A site must meet BOTH of the following criteria for infiltration to be possible:

- The underlying soil surrounding the proposed installation is sufficiently permeable
- The seasonally high water table is a minimum of 1 metre below the base of the proposed installation

If either of these criteria is not met, or cannot be confirmed for any reason, a soakaway system may not be suitable for the application, in which case a storage tank must be used.

Attenuation (storage tanks)

A storage tank may be designed to be online or offline (see pages 26-31 for typical details). However, if the site is subject to groundwater or a high water table, it is important to ensure that the tank is not vulnerable to flotation. Sufficient weight from soil, or other covering placed over the AquaCell units, must be sufficient to counter any buoyancy uplift force from the rising groundwater level.

Important design considerations for geocellular structures

Rising rainfall levels and increased focus on SuDS compliance, have led to an increase in the use of modular units to create underground structures for infiltration or the temporary storage of stormwater.

However, not all currently available systems have the proven performance characteristics necessary to meet the wide range of complex underground geocellular applications.

The Wavin range of AquaCell units provide assured performance, since all strength and hydraulic capabilities have been verified by independent testing and all units are fully BBA approved.

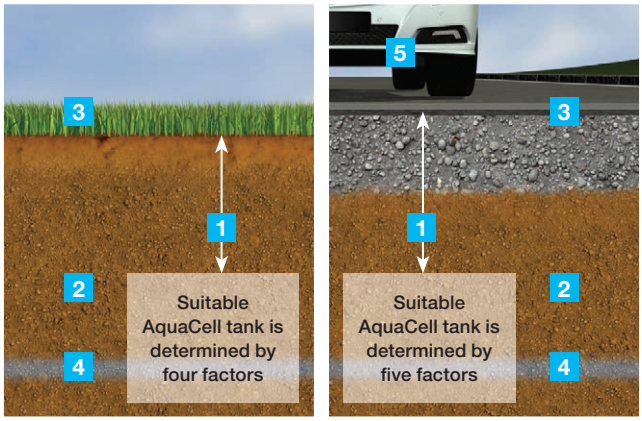
To guarantee the structural integrity of an engineered drainage system, any underground structure must be strong enough to support the loads to which it will be subjected without any unacceptable deflection.

The correct choice of geocellular unit must have appropriate proven top (vertical) and side (lateral) load bearing capacity and deflection characteristics to suit site conditions.

The five key site considerations to be noted when designing a geocellular structure are:

1. Depth of cover (See page 14)
2. Soil type
3. Surface finishing
4. Presence of groundwater
5. Type of traffic/loading

A: Non-trafficked **B: Trafficked**



The combination of these 5 factors effectively means that the required characteristics of a geocellular structure to be installed under a trafficked location (for example) will be very different from that under a landscaped/low-loaded location.

Two typical examples are given below.

Example A: Landscaped/non-trafficked location and 0.3m cover depth. Typically requires minimum vertical strength of 17.5 tonnes/m²

Example B: Car park with occasional light delivery traffic and between 0.5 – 0.7m cover depth. Typically requires minimum vertical strength of 40 tonnes/m²

Design guidance

Hydraulic design

All AquaCell units have identical dimensions: 1m x 0.4m x 0.5m, have a nominal void ratio of 95% and each holds 190 litres of water. Hydraulic calculations are accordingly the same for AquaCell Eco, Core-R and Plus-R.

Structural design however, requires careful consideration of loading factors specific to each location – see CIRIA C680 or CIRIA C737 for further guidance (we recommend using the BPF Guide Designing Geocellular Drainage Systems to CIRIA Report C737 alongside.)

Structural design – installation and cover depths

Each AquaCell unit has been designed to have specific loading capacities (see pages 8-10) that define the maximum depth parameters for which they are suitable.

Minimum depth of cover varies according to whether or not the installation will be subject to trafficking by cars/HGVs.

However, in some situations, installations may have to be located with greater cover depths. Reasons may include:

- Deep-running drainage network
- Other buried services running above tank location
- Installation into banked/ sloping ground
- Upper layer of clay preventing infiltration

The table shows a summary of typical cover depths and installation depths as a guide.

Typical minimum cover depths and maximum installation depths

Location type	Minimum cover depths (m)		
	AquaCell Eco	AquaCell Core-R	AquaCell Plus-R
Landscaped/non-trafficked areas[2]	0.30	0.30	0.30
Car parks, vehicle mass up to 9 tonnes[1]	n/a	0.60	0.69
HA/HGV loading up to 60 tonnes	n/a	1.11	1.30
	Maximum installation depths (m)[3]		
Maximum depth to base of unit (Landscaped)	2.68	6.68	7.82
Maximum depth to base of unit – vehicle mass up to 9 tonnes	n/a	6.43	7.57
Maximum depth to base of unit – vehicle mass up to 44 tonnes	n/a	6.18	7.30

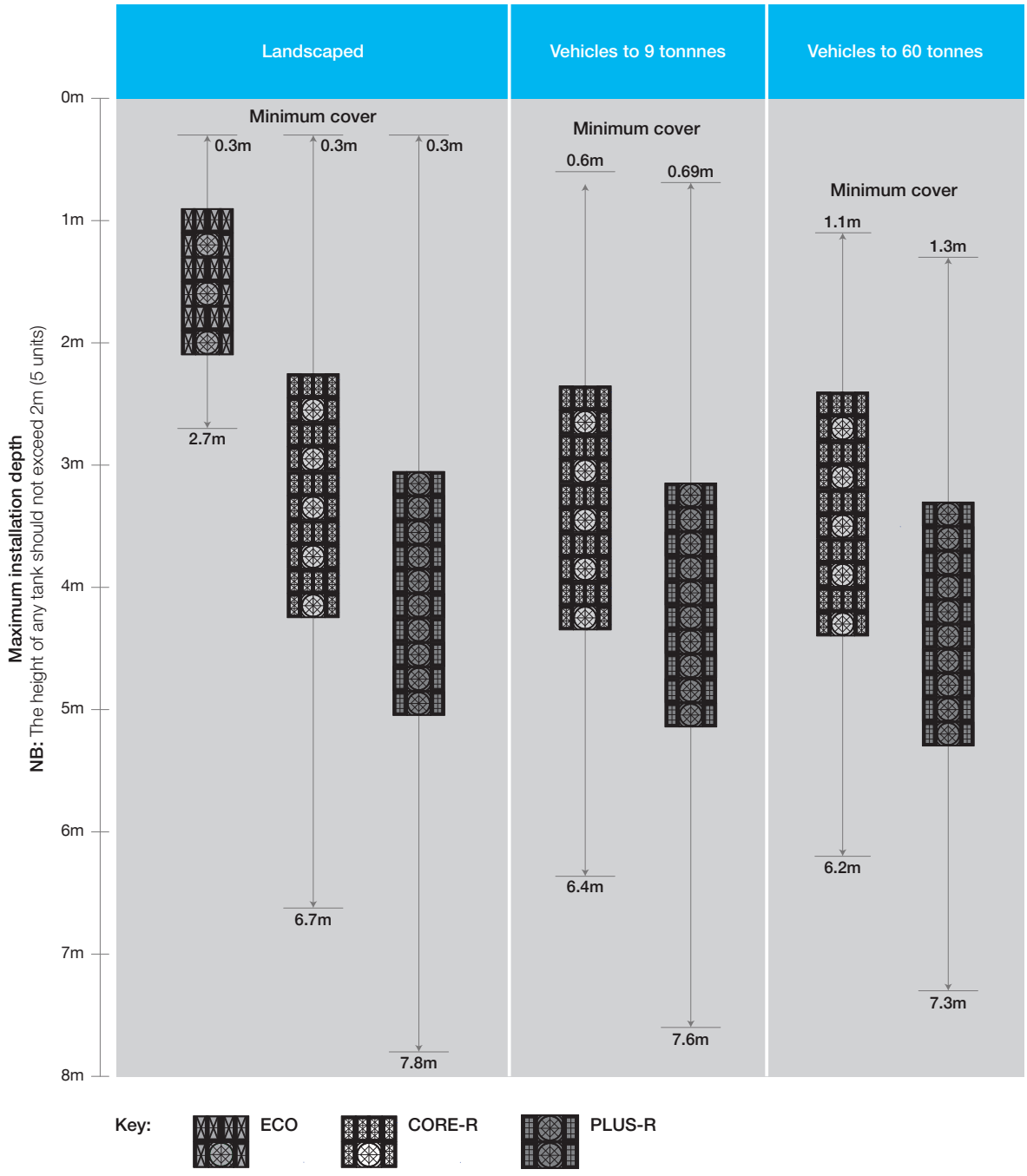
(1) For specific advice on cover depths for heavier loadings/HGV applications, contact Wavin Technical Design on 0844 856 5165.
(2) 0.30m is minimum depth for AquaCell in landscaped applications. 0.5m cover is recommended in applications where ride-on mowers may be used. If construction plant is to be used on site, extra protection may be needed.
(3) Allowable maximum depth to base of bottom layer of units is dependent on soil type, angle of shearing resistance, loadings, and groundwater level. The above depths are based on 38° angle of shearing resistance and no groundwater.

In trafficked applications it is recommended that the height of any tank should not exceed 2m (5 units). If you require a tank that exceeds this, please contact Wavin Technical Design for guidance:

T: 0844 856 5165 E: technical.design@wavin.co.uk

Minimum cover and maximum installation depths to base of units from ground level, in best soil conditions

This chart shows how deep each unit can be used for different applications in best soil conditions.



Note: The AquaCell units can also be used in combination with each other, see page 16 for details.

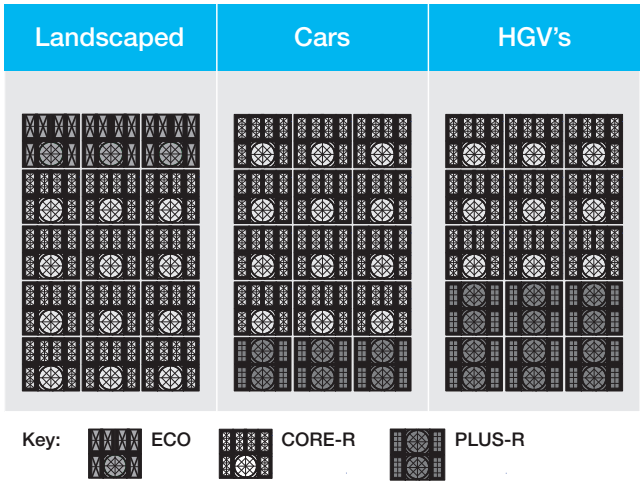
Design guidance

Mix and match

Although all AquaCell units have identical dimensions, and a high nominal void ratio of 95%, they are manufactured to perform at a range of depths, dependent on soil type, angle of shearing resistance, loading and ground water levels. For optimum performance the units can be mixed and matched (in layers) to value engineer the most effective design (in cost and performance terms) for each installation. For example, in a landscaped application if you needed to install a tank or soakaway that is deeper than 2.7m, you could install layers of AquaCell Core-R underneath the AquaCell Eco. See below illustrations showing examples of how the AquaCell units can be mix and matched together. For advice on how to optimise a tank or soakaway design using more than one type of AquaCell please contact Wavin Technical Design.

Note: AquaCell Eco cannot be used directly with AquaCell Plus-R therefore there must be a layer of AquaCell Core-R between them.

Typical examples of mix and match with AquaCell



Brick bonding – for extra stability

When assembling a geocellular structure that comprises two or more layers, it is recommended that AquaCell units are placed in a 'brick-bonded' configuration for extra stability.

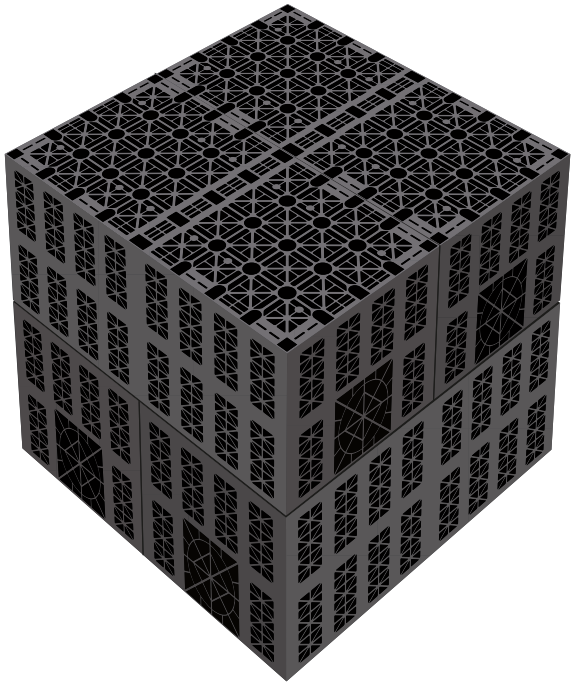
This helps minimise continuous vertical joints in the assembly, and gives the structure extra stability.

A significant advantage of AquaCell unit design is that brick bonding placement does not require extra connectors.

All three AquaCell units may be placed in this way, unless inspection channels and cleaning access are required using AquaCell Plus-R.

AquaCell Plus-R units incorporate integral inspection channels. These are designed for combined alignment to create viewing tunnels at the base of an assembled structure (see page 11).

Example of AquaCell being brick bonded



Installation guidance

AquaCell Core-R and Plus-R: Construction loads

Construction plant such as excavators can impose significant loads on any AquaCell unit. The following guidelines should be observed:

- Tracked excavators (not exceeding 21 tonnes weight) should be used to place fill over the AquaCell units when the geotextile or geomembrane wrapping has been completed
- At least 300mm of fill should be placed before the excavators or trucks delivering the backfill are allowed to traffic over the installed units
- Compaction plant used over the AquaCell units should not exceed 2300kg/metre width. This will allow the compaction of Type 1 sub-base in 150mm layers over the units in accordance with the Specification for Highways Works
- All other construction plant should be prevented from trafficking over the system once it is installed and surfacing completed, unless a site specific assessment demonstrates that it is acceptable
- In particular cranes should not be used over, or place their outriggers over the system

AquaCell Eco: Construction loads

As AquaCell Eco is designed for landscaped and non-loaded applications, certain precautions are recommended on site to prevent damage to the units through excess loading.

Manual assembly

Whilst assembling the tank, it may be necessary to walk on top of previously laid AquaCell units. Therefore care should be taken not to damage the edges of the units.

Backfilling

When backfilling AquaCell Eco installations:

- Machines placing the material must be located OFF the units
- Only light compaction should be applied to the material
- Backfill with suitable, stone-free, as-dug material
- First layer should be 300mm thick before using any compaction plant
- NO vibratory mechanism should be used for compacting this first layer
- Compaction plant must not exceed 2300kg per metre width

Construction traffic on site

Once backfilled, if construction plant (e.g. excavators or loaders) are likely to run over the installation, ensure that:

- MINIMUM protective cover should be 500mm well-compacted granular material
- Only tracked excavators can be used and MUST NOT weigh more than 14 tonnes.
- HGVs MUST NOT run over installed AquaCell Eco units

Manual assembly

All ancillaries and adaptors (see pages 34-37) can be used with either the AquaCell Eco, Core-R or Plus-R units, except the 225mm Flange Adaptor (6LB106) which must only be used with AquaCell Core-R or Plus-R.

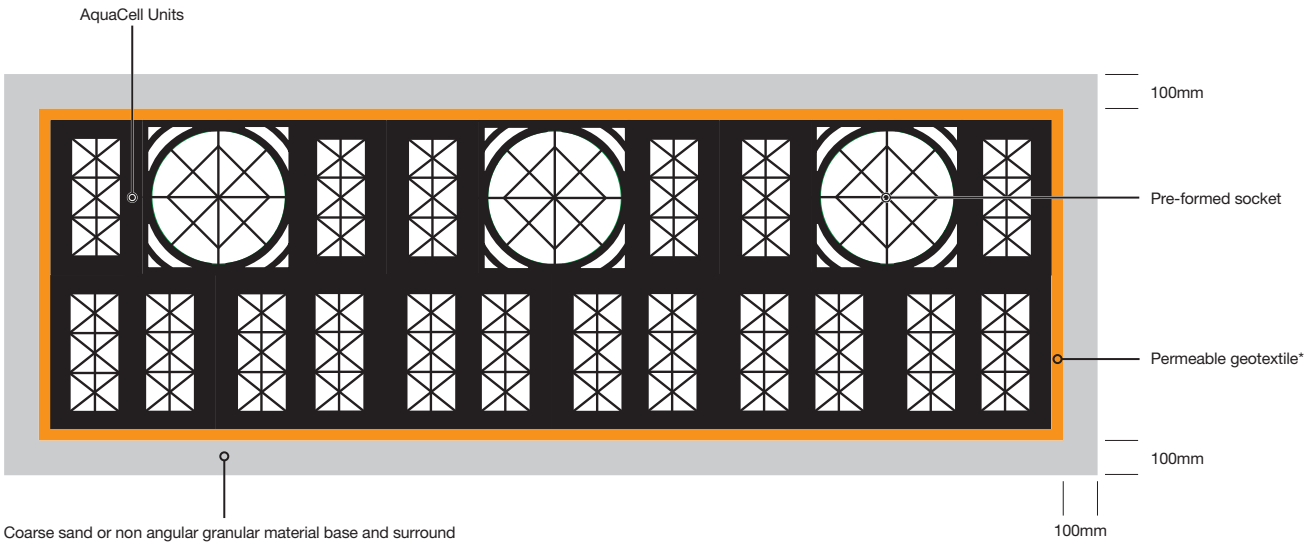
The 150mm Flange Adaptor (6LB104) should only be used when constructing an air vent on the top surface of an AquaCell Eco unit. The adaptor should not be used to connect inlet pipes to the side of an Eco unit.

Installation

Typical soakaway installation method

Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile* over the base and up the sides of the trench.
4. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 16. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
5. Fix the Adaptors to the AquaCell units as required and connect pipework.
6. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or one of the standard Silt Traps (6LB600, 6LB625, 6LB630) is installed prior to the inlet pipework – see page 24 for installation guidelines.
7. Wrap and overlap the geotextile covering the entire AquaCell structure.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
10. Backfill with suitable material.
11. Rainwater from roof areas may discharge directly into the soakaway but rainwater from carparks must discharge through a catchpit manhole and/or a petrol interceptor.



Example shows the use of AquaCell Eco. However, a soakaway can also be installed as shown using either of the other versions of AquaCell units (Core-R or Plus-R) as appropriate.

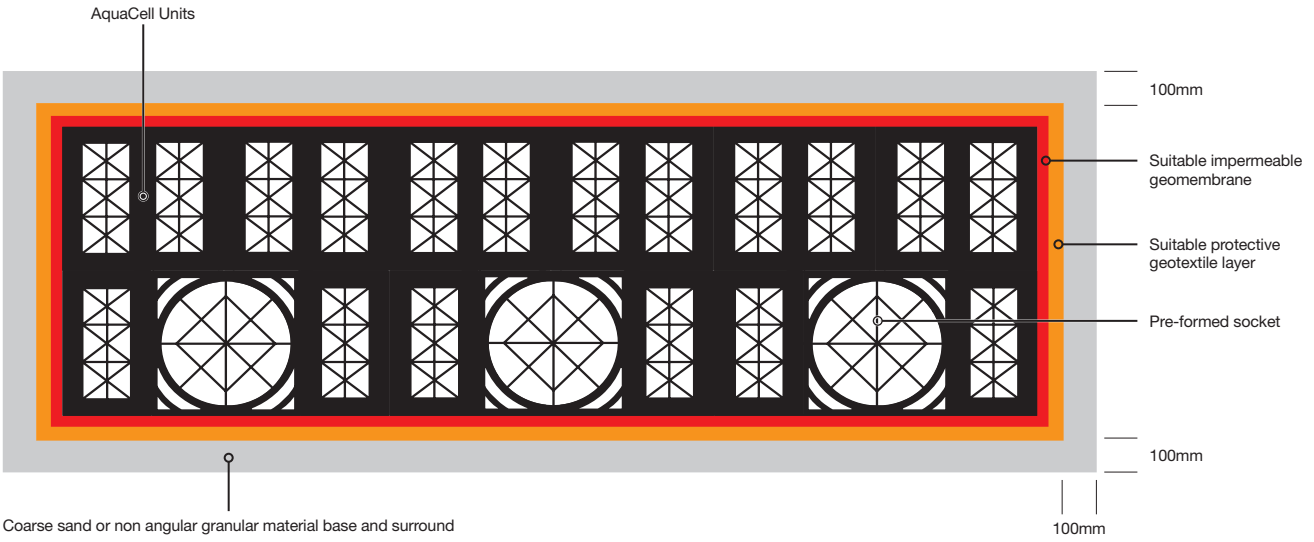
**The geotextile should be selected according to specific site conditions. Specialist advice should be sought if surrounding soil characteristics exhibit a high degree of fines/low infiltration capacity and/or there is a high risk of damage from ground contaminants.*

Typical storage tank installation method

Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non-angular granular material, level and compact.
3. Lay the geotextile[1] over the base and up the sides of the trench.
4. Lay the geomembrane[2] on top of the geotextile over the base and up the sides of the trench.
5. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 16. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
6. Wrap the geomembrane around the AquaCell structure and seal to manufacturers recommendations.*
7. If side connections into the AquaCell units is required, (other than the preformed socket), use the appropriate Flange Adaptor (6LB104 or 6LB106). Fix the flange adaptor to the unit using self-tapping screws. Drill a hole through the Flange Adaptor and connect the pipework. (6LB106 should not be used with AquaCell Eco).
8. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework – see page 20 for installation guidelines.
9. Wrap and overlap the geotextile covering the entire AquaCell structure, to protect the geomembrane.
10. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
11. Lay 100mm of coarse sand or non angular granular material over the geotextile/geomembrane and compact.
12. Backfill with suitable material.

NB: A storage tank must be vented, and it is recommended that one vent pipe, 110mm in diameter is provided per 7,500 square metres of impermeable catchment area on a site, see page 20 for design.



Example shows the use of AquaCell Core-R. However, a storage tank can also be installed as shown using any of the other versions of AquaCell units (Eco, Core-R or Plus-R) as appropriate.

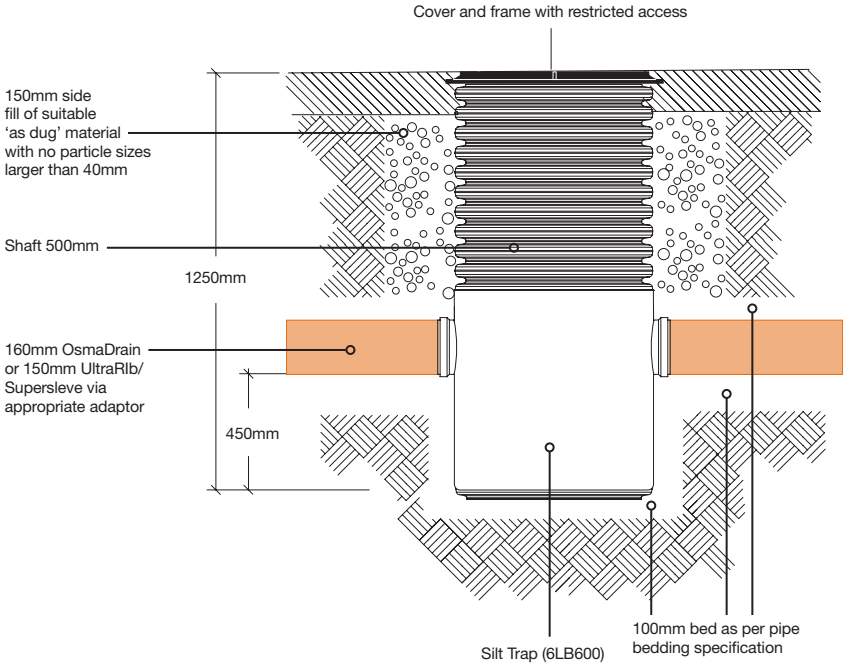
1. For protective geotextiles CIRIA C753 – The SuDS Manual recommends a geotextile of at least 2mm thick and 300gsm.

2. The geomembrane should be designed to survive the rigours of construction, this is typically at least 0.5mm thick. Joints should be sealed using proprietary welding techniques.

Installation

Silt Trap and Air Vent termination

Silt Trap

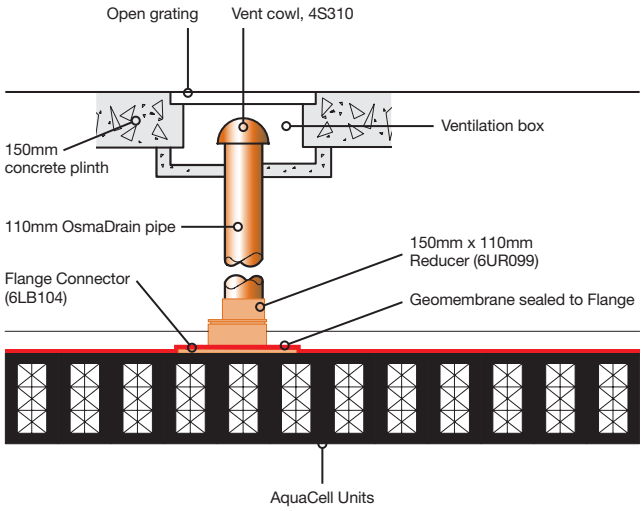


Typical installation procedure

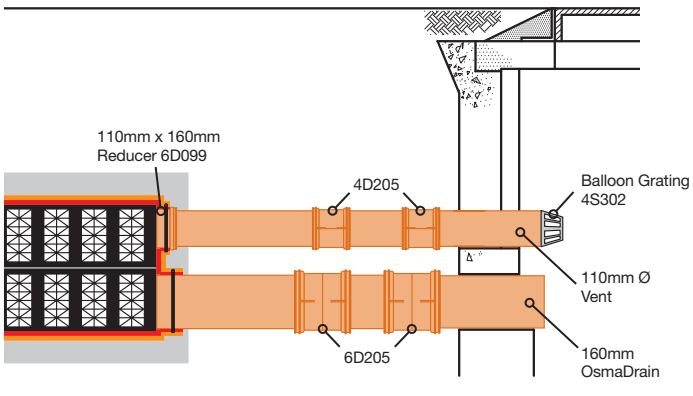
1. Place the Silt Trap (6LB600, 6LB625, 6LB630) on a minimum of 100mm bed as per pipe bedding specification. Ensure that the trap is as close to the AquaCell unit as possible and in a suitable position to allow pipework connection.
2. Connect the relevant pipework in accordance with standard pipe installation guidelines.
3. Surround the sides of the Silt Trap with 150mm of 'as dug' material, with no particle sizes larger than 40mm.
4. Fit relevant cover and frame.

NOTE: When surrounded by a concrete plinth (150mm x 150mm) the 4D920 Cover and Frame can be used in situations with a loading of up to 50kN (5 tonne).

Typical Air Vent design



Typical Air Vent through manhole



NOTE: It is recommended that all connections and air vent installations in storage applications (using geomembrane) are made using a Flange Adaptor.

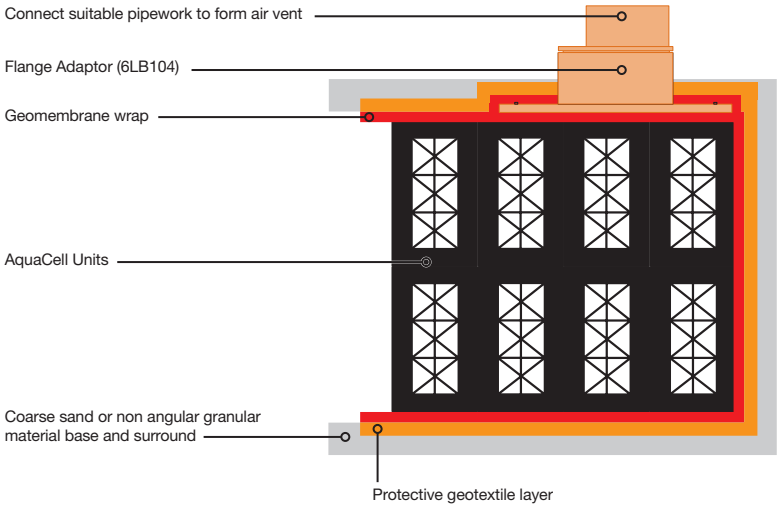
Adhesive or double sided tape should be used between the geomembrane and the flange plate to ensure a watertight seal.

NOTE: It is recommended that one vent pipe, 110mm in diameter, is provided per 7,500 square meters of impermeable catchment area on a site. Please contact Wavin Technical Design for further details.

Connections

Top connection for Air Vent

Connect into the top of the AquaCell unit, using Flange Adaptor.

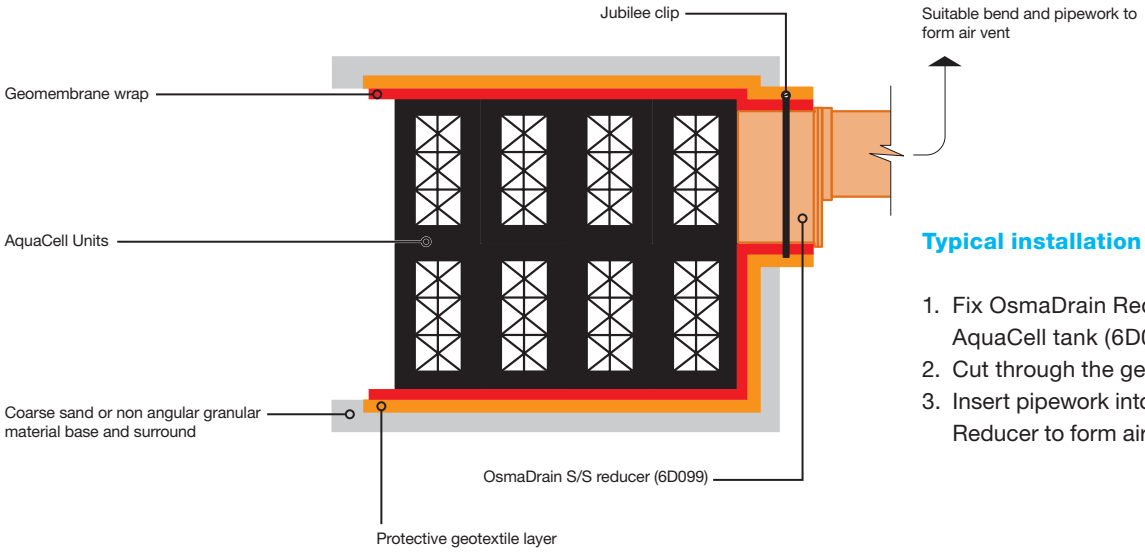


Typical installation procedure

1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor to form air vent.

Side connection for Air Vent

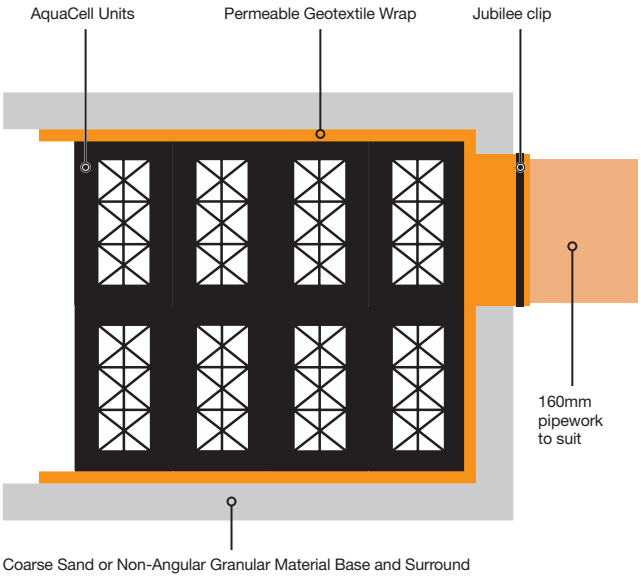
Connect into the side of the AquaCell tank unit using standard Reducer.



Typical installation procedure

1. Fix OsmaDrain Reducer to the AquaCell tank (6D099).
2. Cut through the geomembrane.
3. Insert pipework into OsmaDrain Reducer to form air vent.

Connections

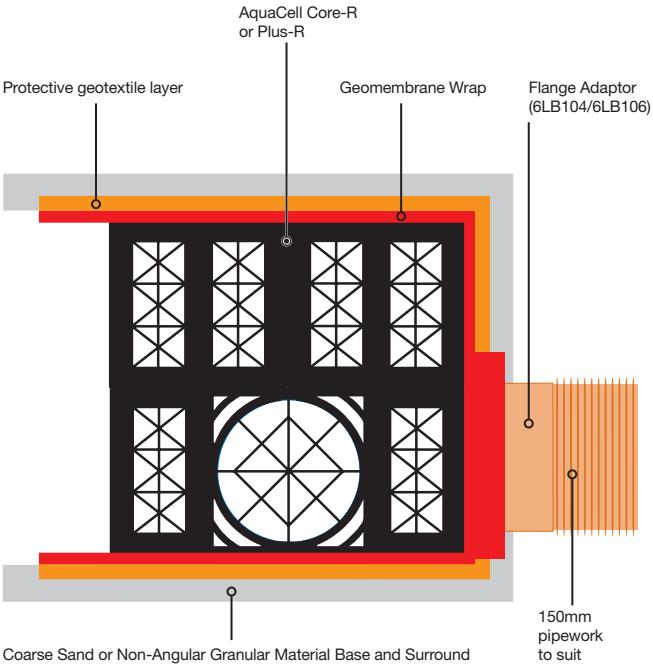


Connections to AquaCell units

Connection for soakaway application using either the pre-formed socket (as shown below) or standard adaptors into pre-formed socket*.

*NOTE: For pipework other than 160mm OsmaDrain, these adaptors can be used to connect to the following:

- 6TW141: TwinWall S/S Adaptor connects to 150mm TwinWall
- 6D099: OsmaDrain Adaptor connects to 110mm OsmaDrain
- 6UR141: UltraRib S/S Adaptor connects to 150mm UltraRib
- SA15/2: Double Spigot Adaptor connects 160mm OsmaDrain to 150mm Supersleve Clay



Connection for storage application using Flange Adaptor at points other than pre-formed socket, (for AquaCell Core-R or Plus-R).

Installation procedure

1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor.

*NOTE: When using the 6LB104: For pipework other than 150mm UltraRib these adaptors can be used to connect to the following:

- 6UR099: S/S Level Invert Reducer to 110mm OsmaDrain
- 6UR143: UltraRib 150mm Spigot Adaptor connects to 160mm OsmaDrain
- 6TW145: UltraRib 150mm Spigot Adaptor connects to 150mm Twinwall
- TA/2: UltraRib 150mm Spigot Adaptor connects to 150mm Supersleve Clay

When using the 6LB106: For pipework other than 225mm UltraRib these adaptors can be used to connect to the following:

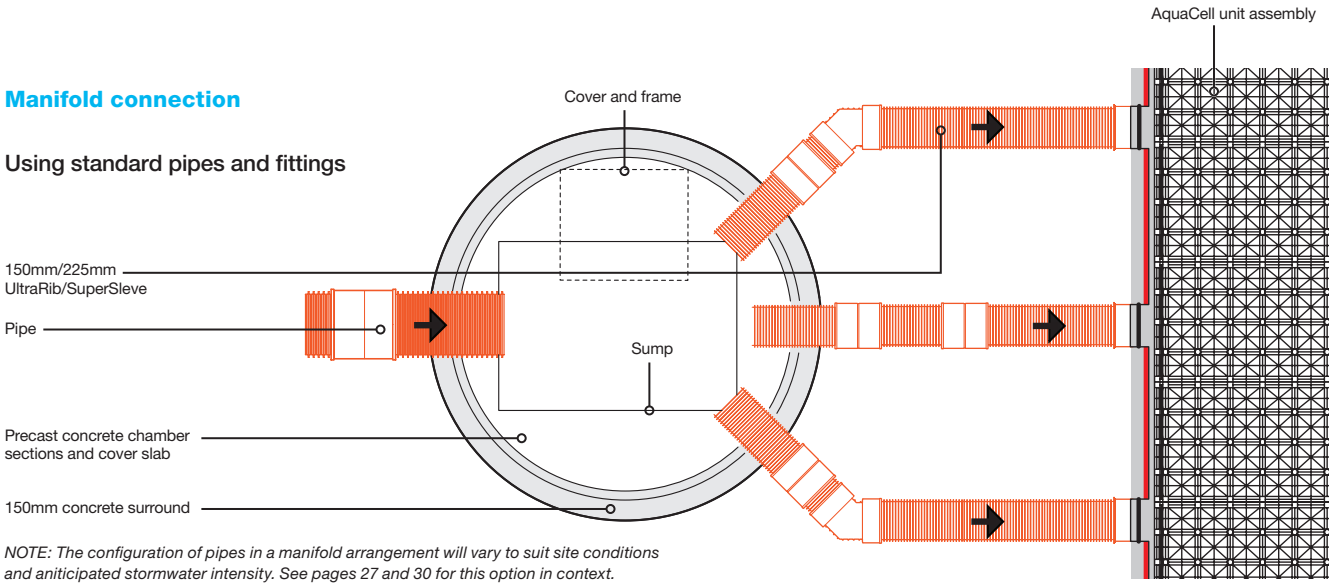
- 9TW145: UltraRib 225mm Spigot Adaptor connects to 225mm Twinwall
- TA/4: UltraRib 225mm Spigot Adaptor connects to 225mm Supersleve Clay

Connection configurations

The connections shown here in schematic form, are the typical options used to connect AquaCell units to control chambers. They provide a controlled feed into and out of the AquaCell units, and are used for either infiltration or attenuation schemes.

Manifold connection

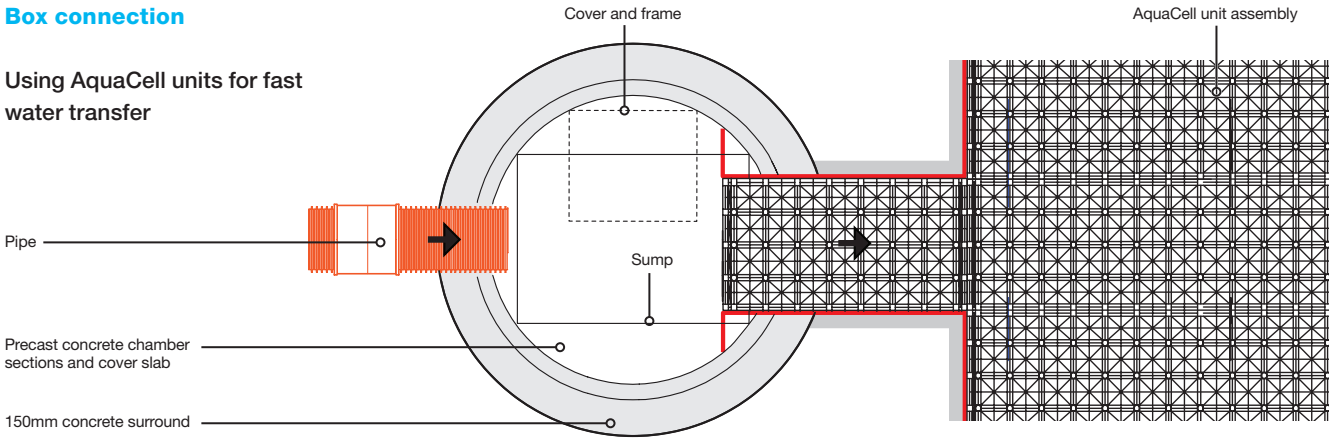
Using standard pipes and fittings



NOTE: The configuration of pipes in a manifold arrangement will vary to suit site conditions and aniticipated stormwater intensity. See pages 27 and 30 for this option in context.

Box connection

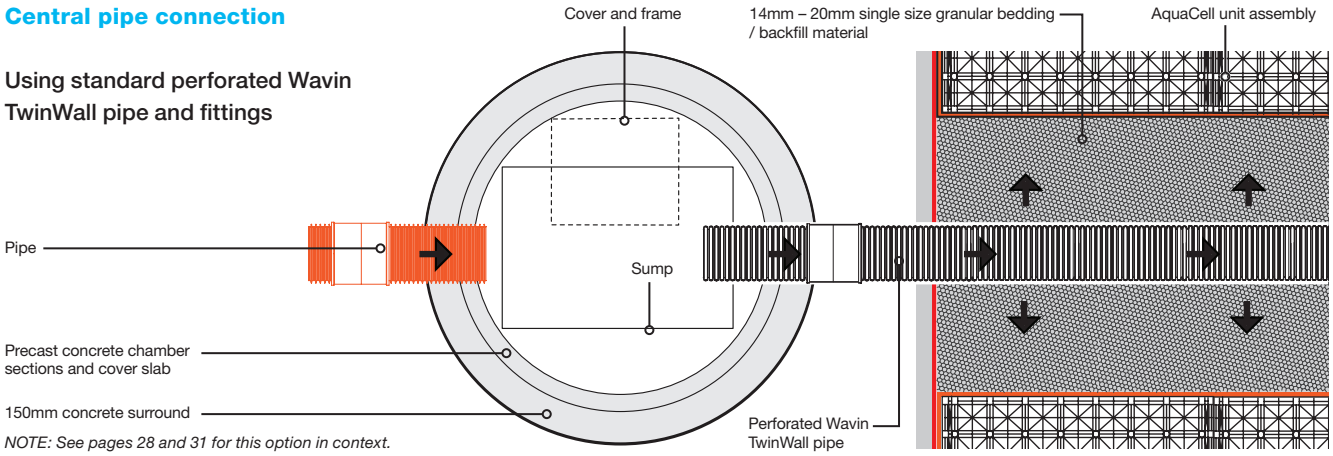
Using AquaCell units for fast water transfer



NOTE: See pages 26 and 29 for this option in context.

Central pipe connection

Using standard perforated Wavin TwinWall pipe and fittings

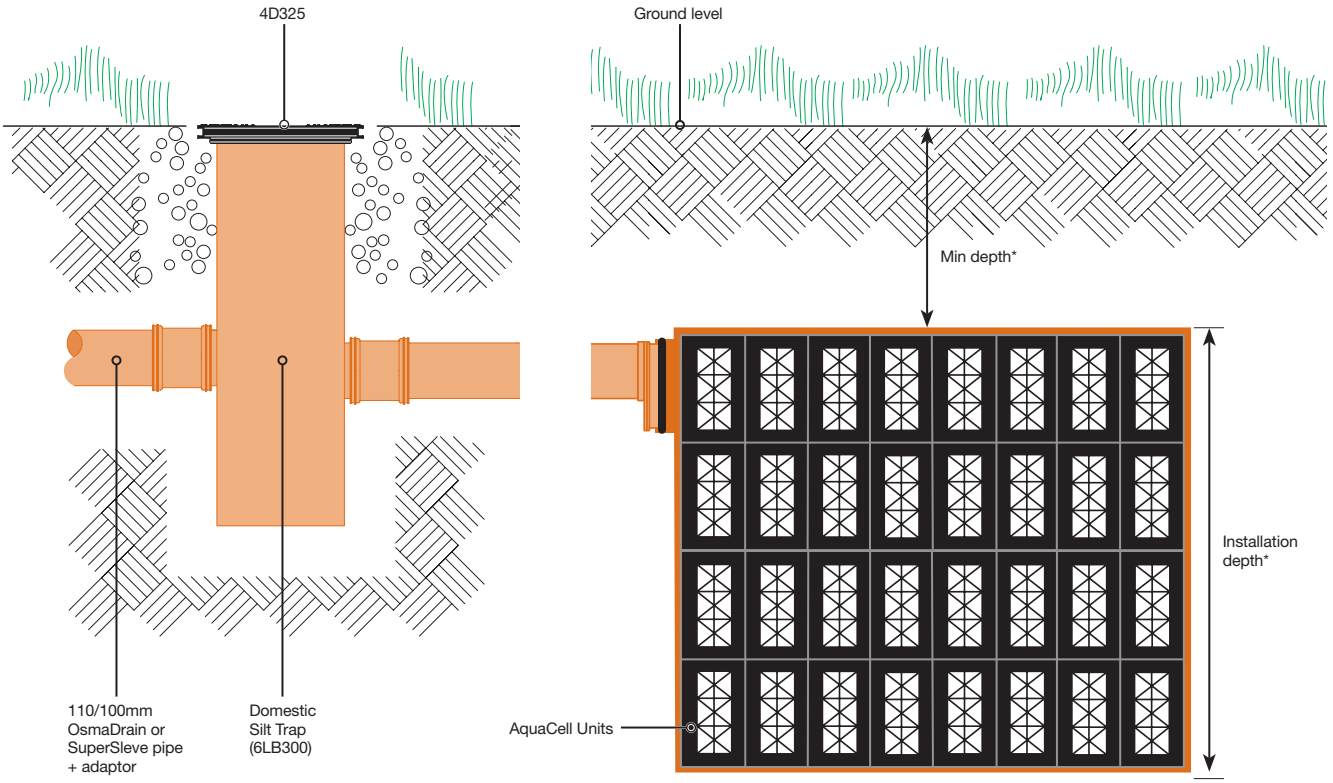


NOTE: See pages 28 and 31 for this option in context.

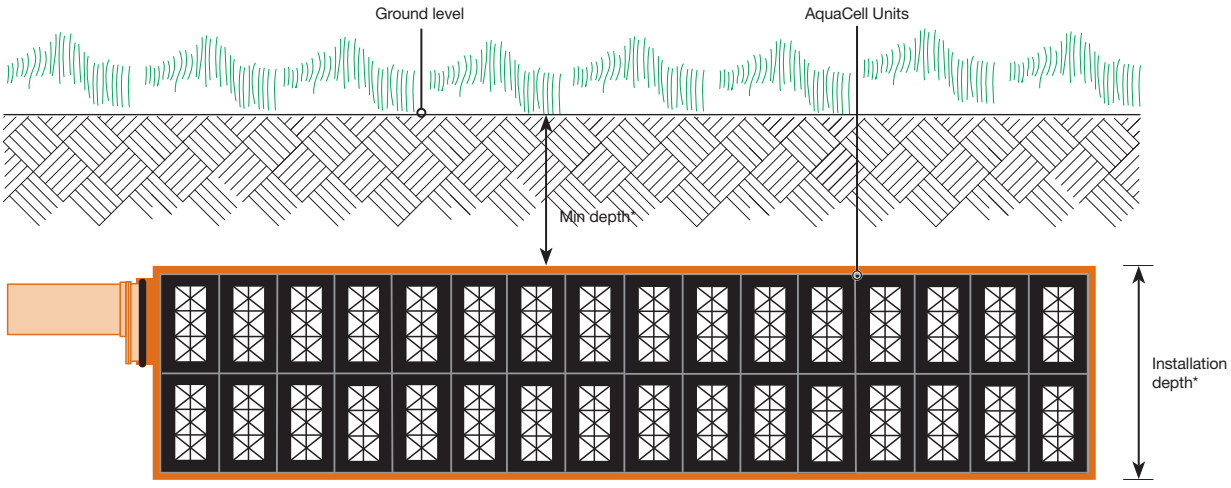
Soakaways

Soakaway – non-traffic loading

Soakaway

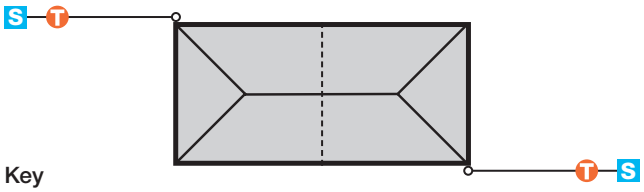


Trench soakaway



Notes

1. Soakaways should be sited at least 5m away from the building (Ref BS EN 752-4).
2. The exact size and shape of the soakaways are to be determined once all the necessary calculations have been produced.
   *For information regarding cover depths and installation depths, see page 15.

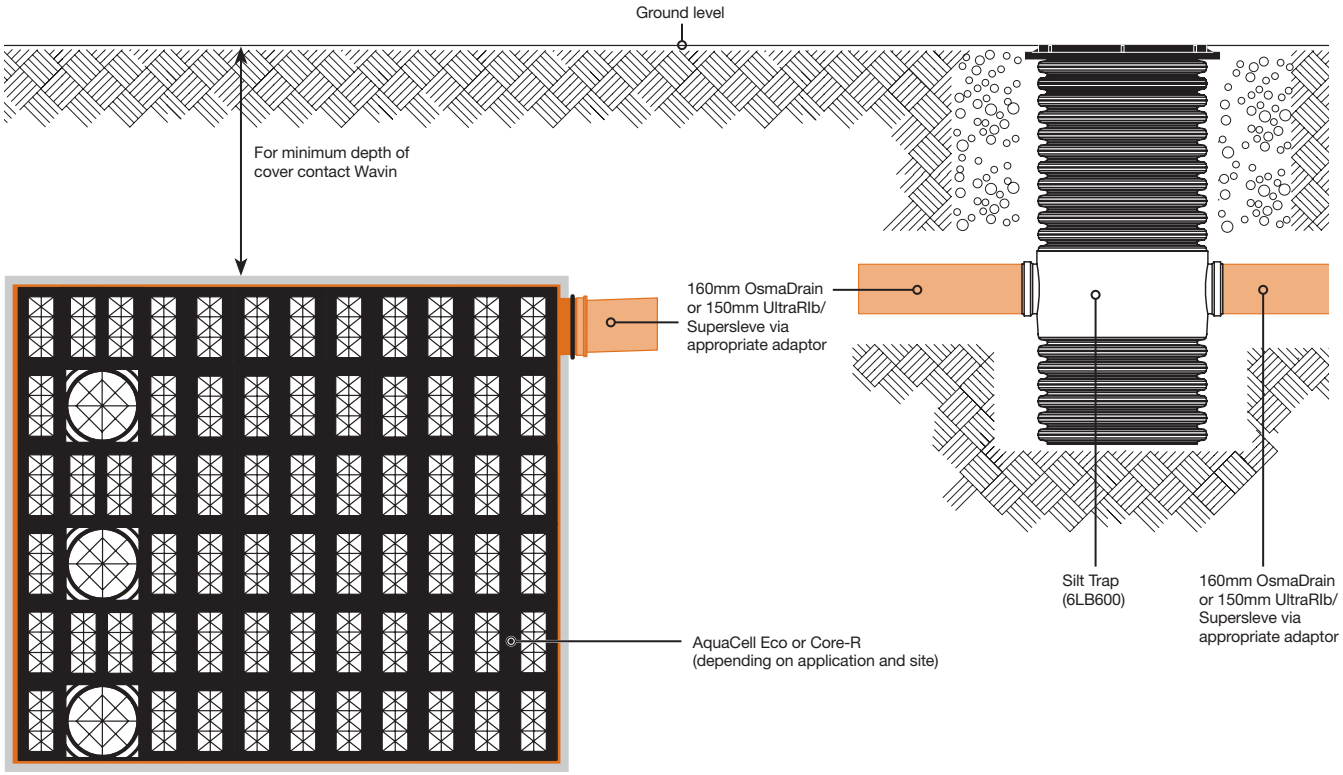


Key

S = AquaCell units soakaway (See note 2)
T = 250mm Dia Silt Trap

Soakaway – traffic loading

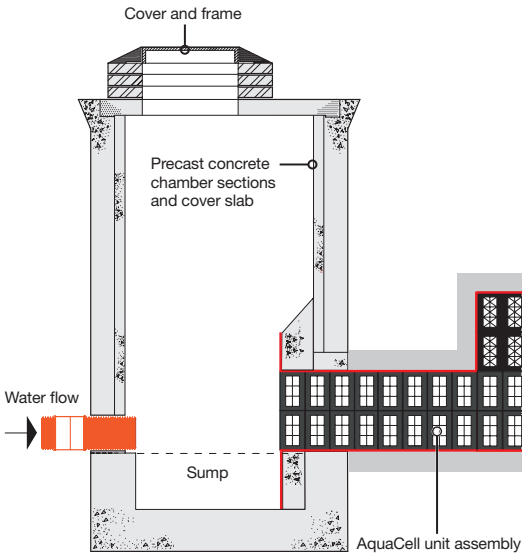
Soakaway



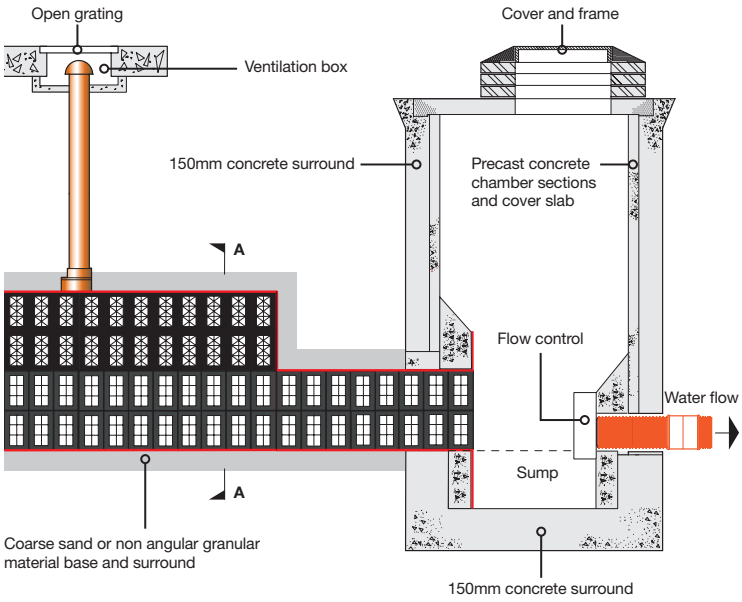
On-line storage

On-line storage – box feed

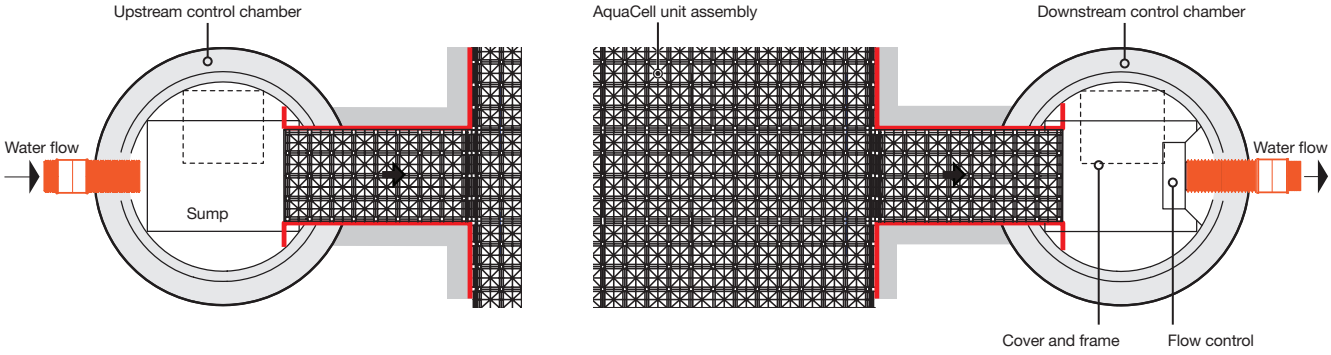
Long section



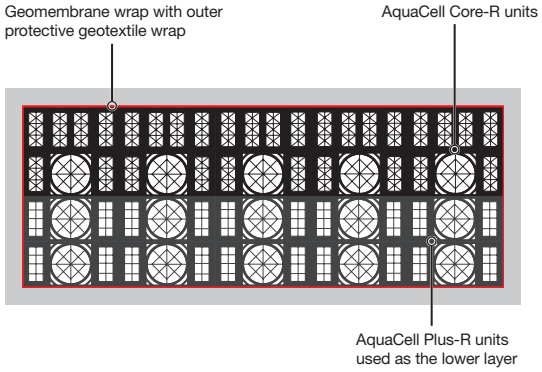
Typical vent detail



Plan



Cross section A-A

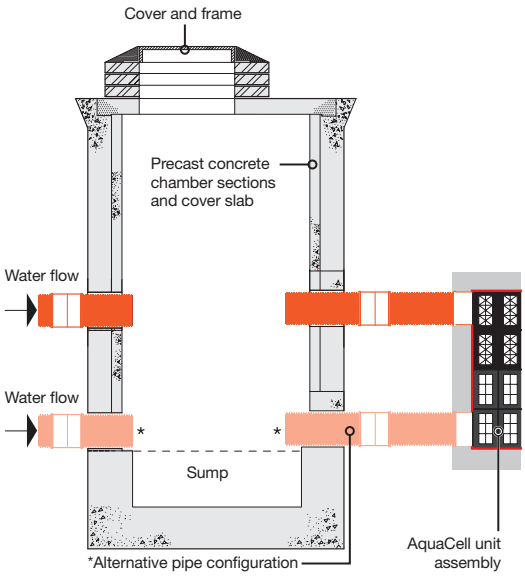


What happens to the water?

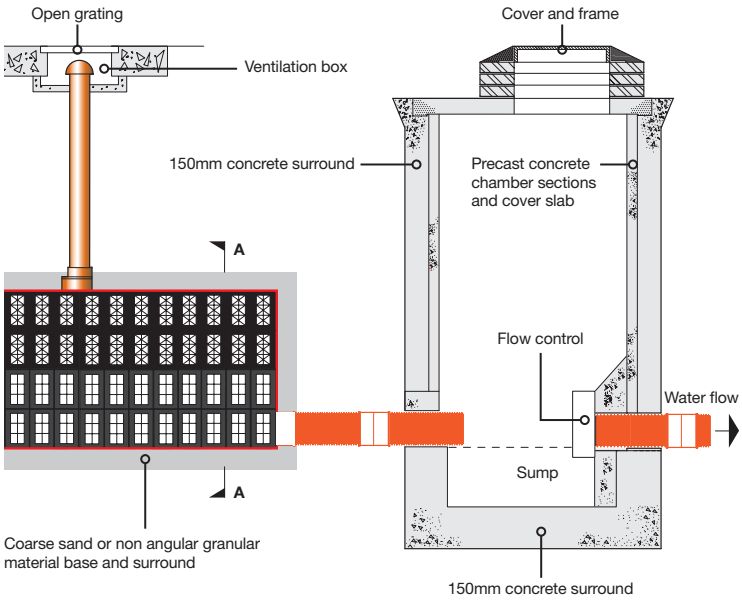
1. The water level in the upstream control chamber rises.
2. Then, during a storm event, the AquaCell storage assembly quickly fills with water via the AquaCell feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

On-line storage – manifold feed

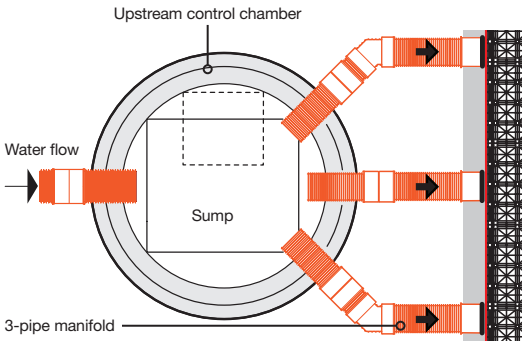
Long section

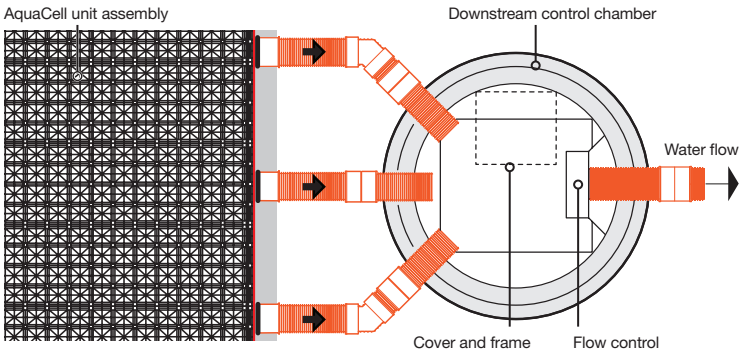


Typical vent detail

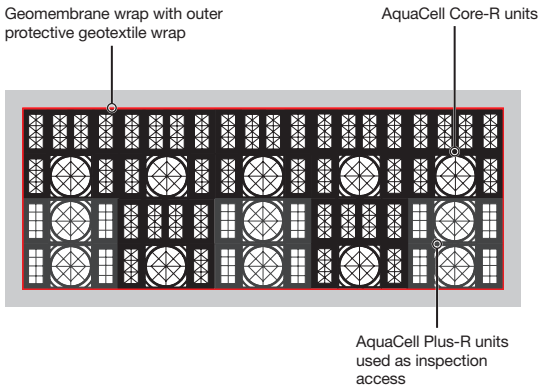


Plan





Cross section A-A



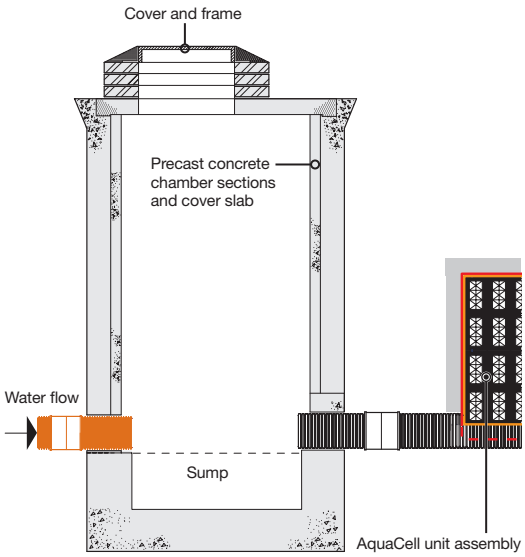
What happens to the water?

1. The water level in the upstream control chamber rises.
2. During a storm event, the AquaCell storage assembly fills with water via the manifold feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

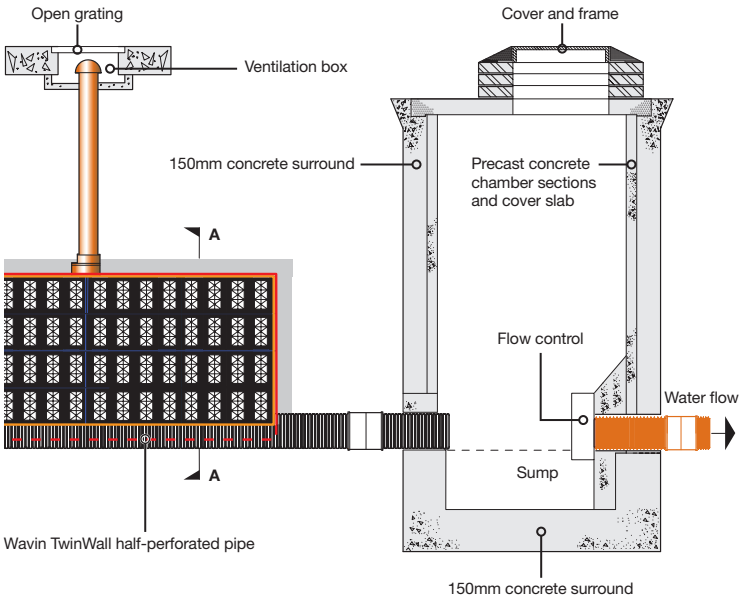
On-line storage

On-line storage – central pipe feed

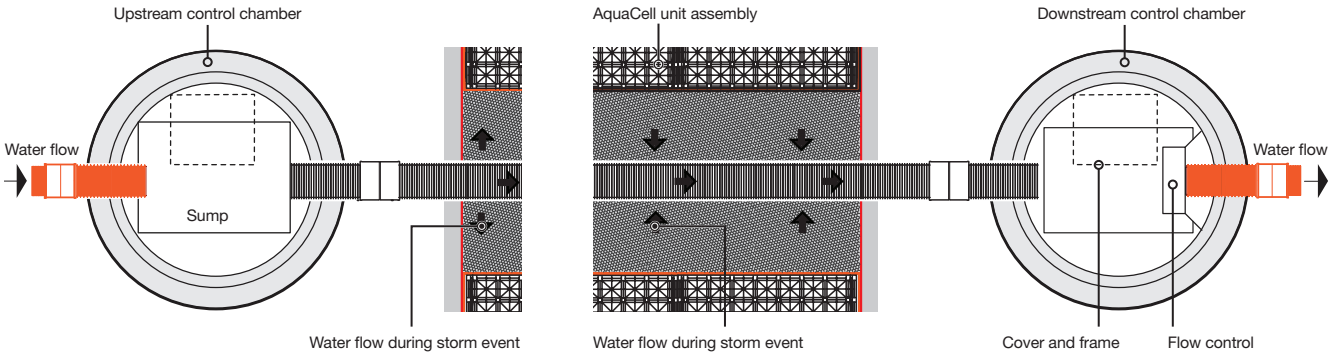
Long section



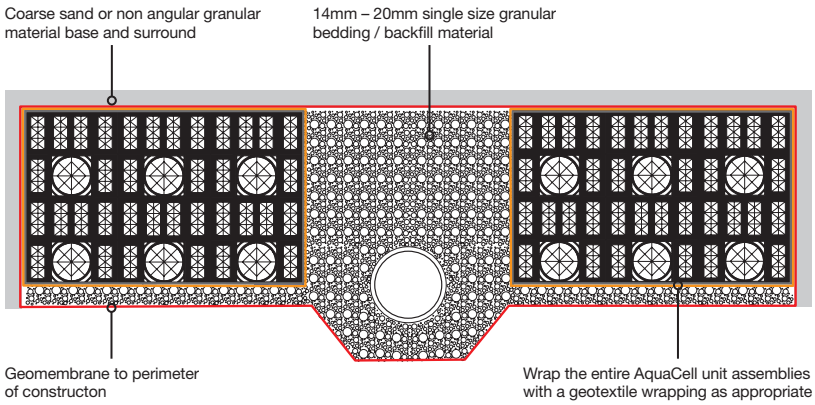
Typical vent detail



Plan



Cross section A-A



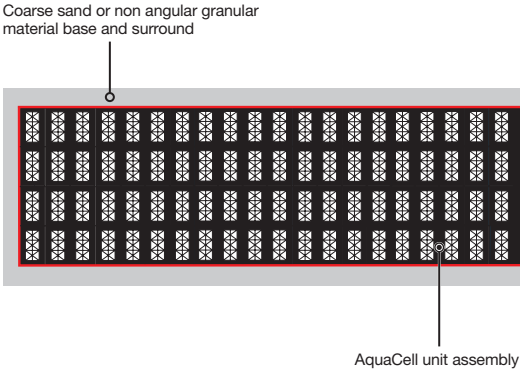
What happens to the water?

1. The water level in the upstream control chamber rises.
2. AquaCell storage assemblies fill with water via the central pipe connection and percolate's through the granular bedding material.
3. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

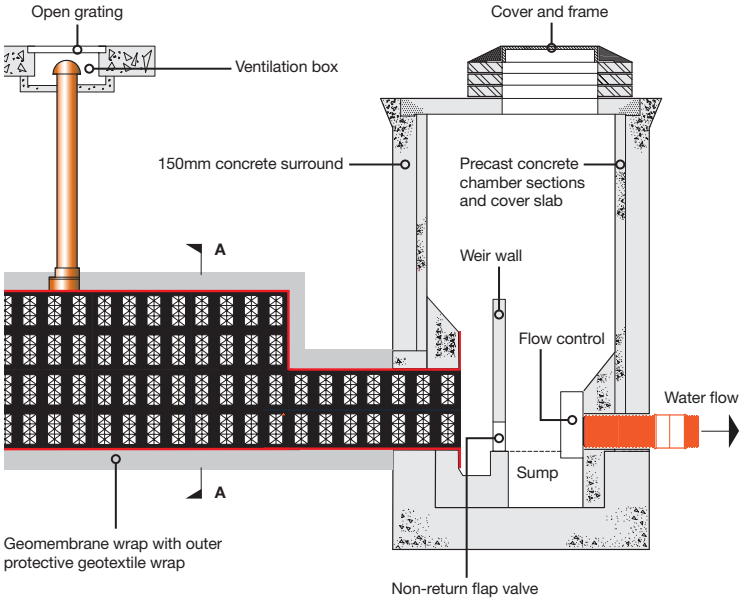
Off-line storage

Off-line storage – box feed

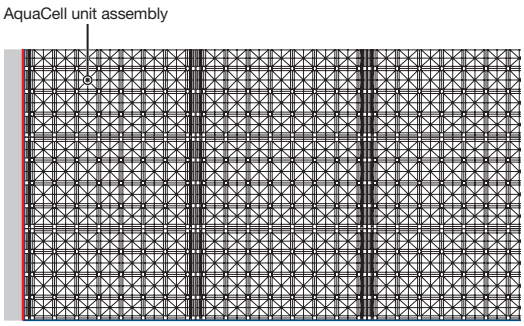
Long section

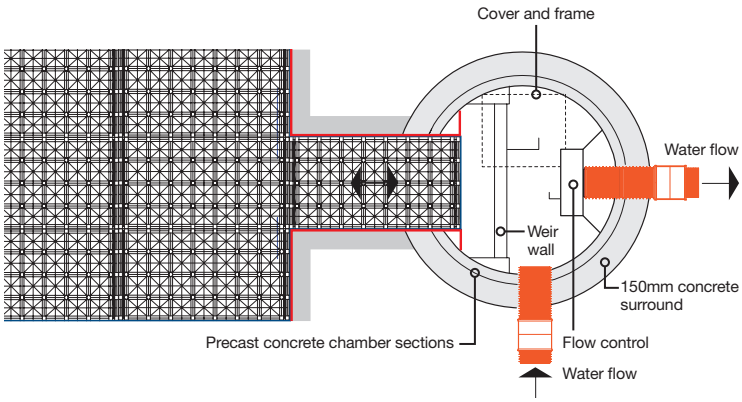


Typical vent detail

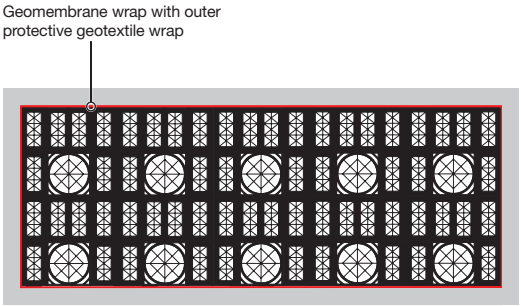


Plan





Cross section A-A



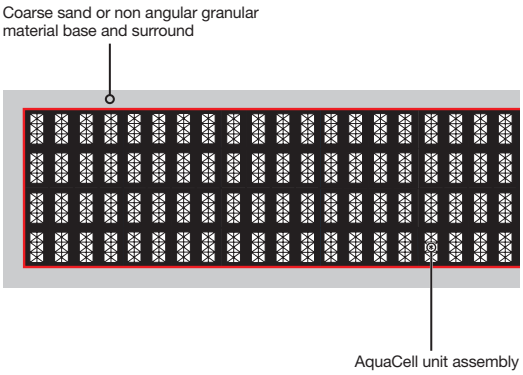
What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the AquaCell connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

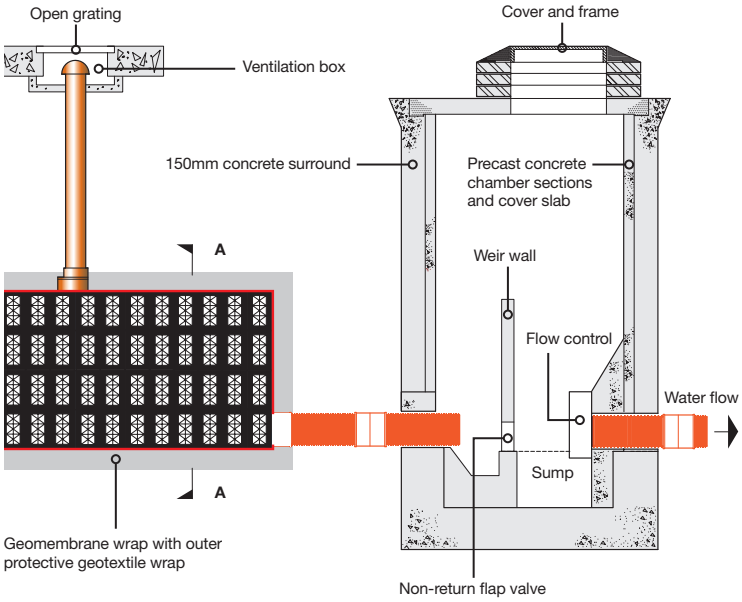
Off-line storage

Off-line storage – manifold feed

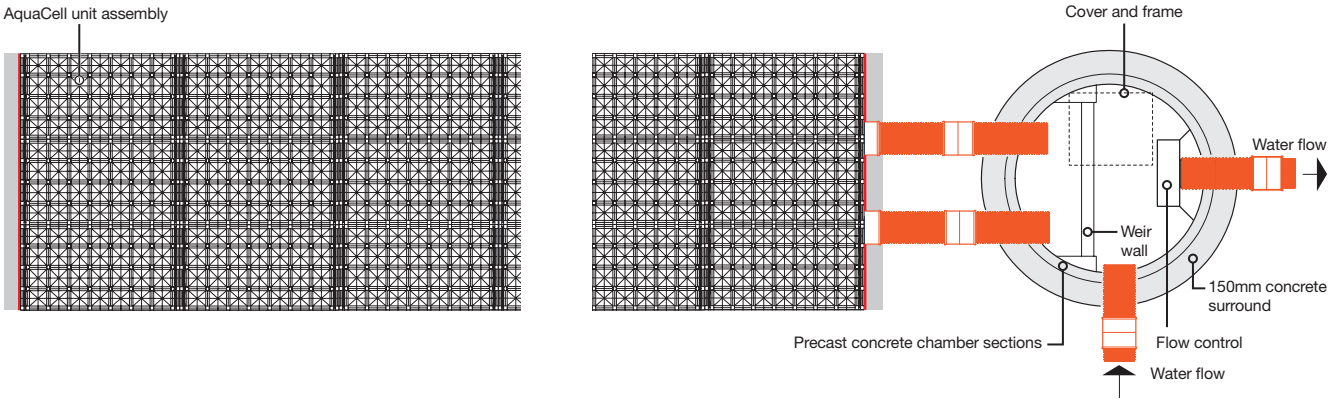
Long section



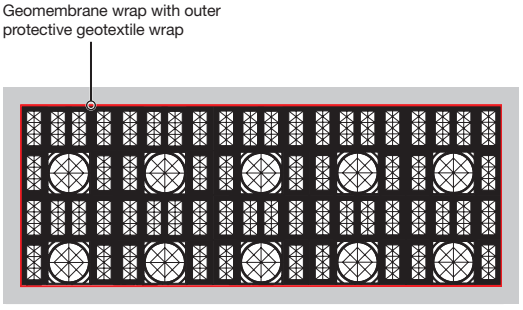
Typical vent detail



Plan



Cross section A-A

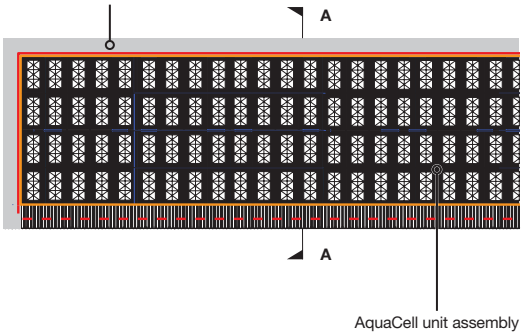


What happens to the water?

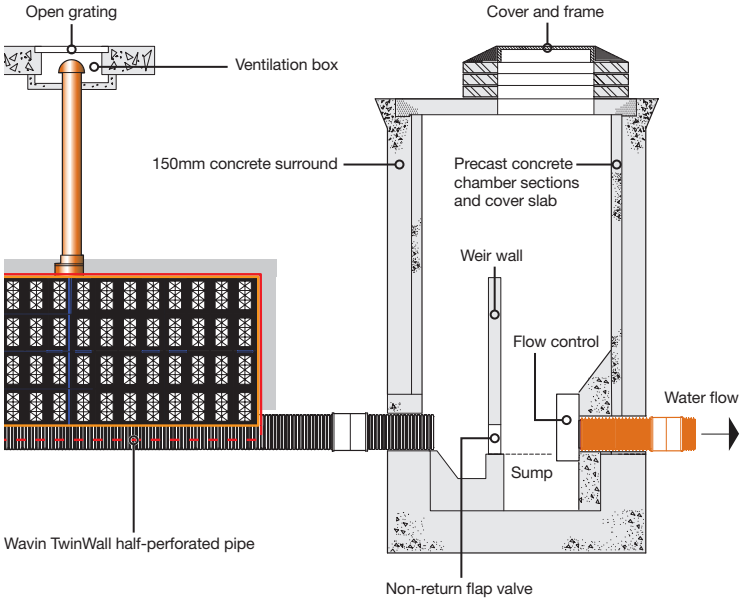
1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the manifold connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

Off-line storage – central pipe feed

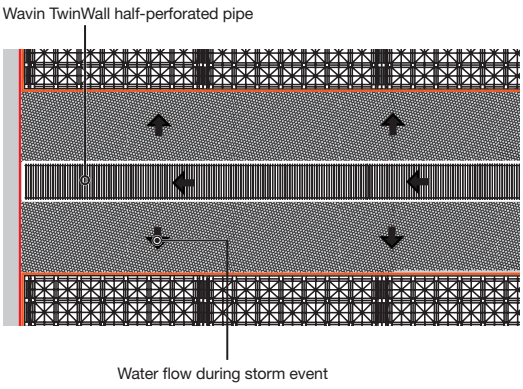
Long section

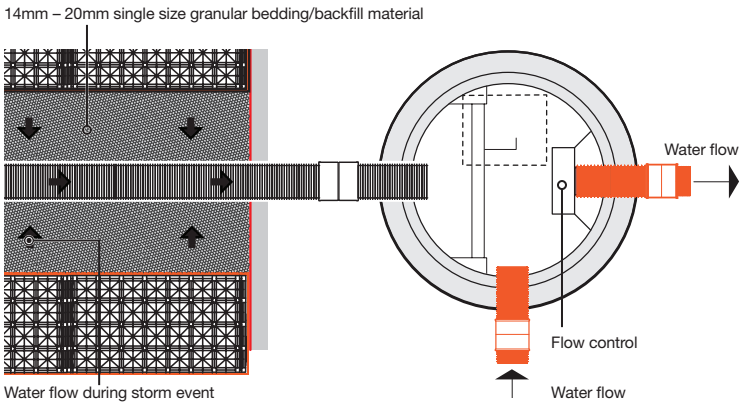


Typical vent detail

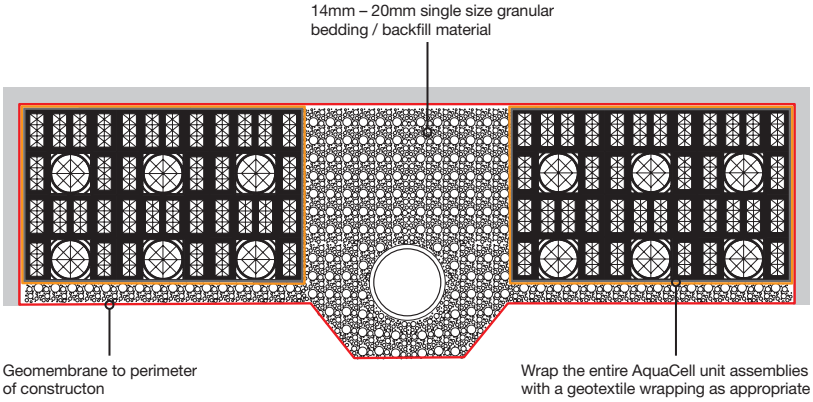


Plan





Cross section A-A

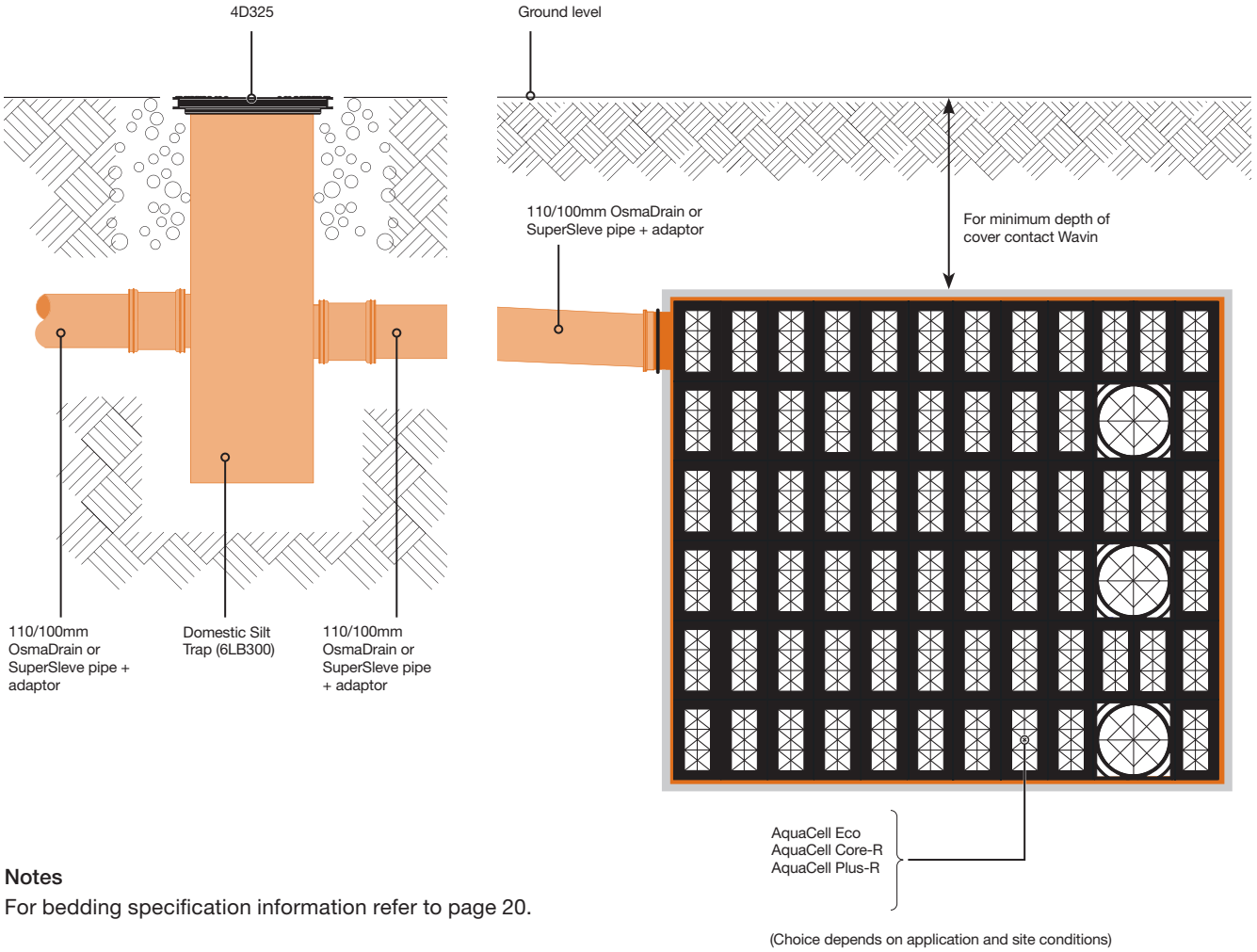


What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assemblies via the central pipe connection and percolate's through the granular bedding material.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve

Soakaway with Silt Trap

Soakaway or storage tank – with Silt Trap



Notes

For bedding specification information refer to page 20.

The silt trap can be used in conjunction with a soakaway (as shown) or a storage tank.

Wavin stormwater management

To achieve optimum stormwater management

The Wavin Stormwater Management System represents a combination of specialist expertise and technology from Wavin. This is specifically focused on achieving the optimum solution for each project requiring effective and sustainable management of stormwater.

Such a solution may be entirely based on a tailored combination of our engineered systems.

In other cases, Wavin Stormwater Systems can be integrated with 'soft' SuDS techniques, such as ponds and swales, to help achieve the optimal solution.

Other Wavin stormwater systems

Channel drainage

Environmentally-friendly polyester concrete systems to cover all EN 1433 load classes. With outstanding chemical resistance and low water absorption:

- Medium duty range for applications up to C250
- Heavy duty range for D400 / F900 application

Plastic pervious paving

High performance, plastic pervious paving system, for use in all types of Sustainable Drainage systems (SuDS).

- AquaGrid 50 – for use in landscape projects
- AquaGrid 75 – for use in car parking areas

Flow control valves

The Wavin+Mosbaek range of vortex flow control valves are manufactured from stainless steel and are custom-built to meet exact site requirements:

- Tornado, Hurricane and Typhoon stainless steel flow control valves with no moving parts of power needs

Q-Bic Plus

As part of an effective SuDS solution, no other attenuation tank ticks as many boxes as Q-Bic Plus.

Designed from the ground up to be compliant with Sewers for Adoption 8, it is easy to handle, fast and simple to install, and carries BBA approval. The high void design makes it the most accessible, inspectable and cleanable attenuation tank on the market, scoring with specifiers for its design flexibility whatever the soil type, available area or load.

Anti-flood valves

- Anti-Flood Valves that comply with EN 13546-1, and Part H1– Sections 2.8-2.12 of Building Regulations

Below ground water transportation

Wavin Stormwater installations can draw from an extensive choice of plastic and clay pipe systems, including:

- OsmaDrain solid wall PVC-U pipe system
- Structured wall plastic UltraRib and TwinWall pipe systems
- SuperSleve clay pipe systems

Other options include perforated pipe for land drainage: WavinCoil plastic and HepLine clay – and a full range of Wavin Non-Entry Inspection Chambers.

The Wavin stormwater service

Precision and performance

The Wavin Technical team are ready to contribute to any stormwater management project.

This may be at the very earliest stage – or when initial plans have already been developed. There are no pre-conditions with regards to you requesting Wavin to become involved.

We are ready to:

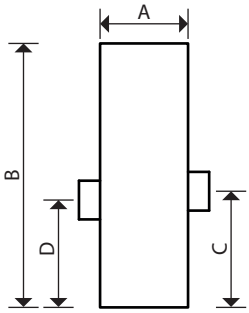
- Originate project design
- Comment on an existing design
- Help validate a specification – or, where we see an opportunity to do so, to suggest how it may be enhanced
- Check, clarify and confirm maximum cost-efficiency, performance capability and regulatory compliance

This involvement is a core part of the Wavin principle. It extends beyond the systems and components.

To discuss your stormwater management project, call 0844 856 5165 or email technical.design@wavin.co.uk.

Supplementary items

Silt Trap – domestic – for non loaded applications

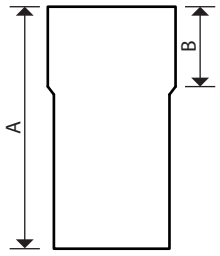


Domestic Silt Trap

- 250mm x 750mm depth
- With 110mm diameter inlet and outlet spigots
- For use with the 4D325 cover and frame

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C	D
–	6LB300	250	750	330	305

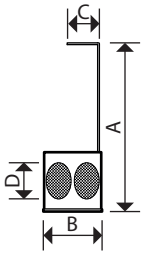


Extension Piece for 6LB300

- 250mm x 500mm depth (effective length = 335mm)

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B
–	6LB301	500	165



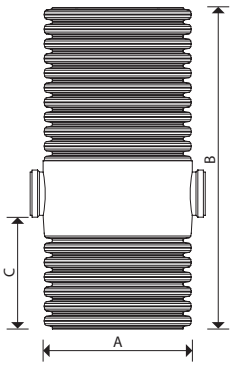
Silt Trap Bucket for 6LB300

- 200mm x 210mm depth

Material: PVC-U/Polypropylene

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C	D
–	6LB302	597	208	114	127.5

Silt Trap – trafficked



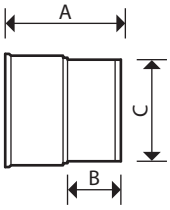
Silt Trap

- 500mm diameter x 1.25m depth

Material: Polypropylene

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
160mm	6LB600	500	1250	450
225mm	6LB625	500	1250	450
300mm	6LB630	500	1250	450

Ancillaries

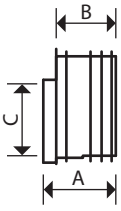


S/S Adaptor

- 6UR socket x 160mm BS EN 1401 spigot

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
150	6UR141	180	84	160

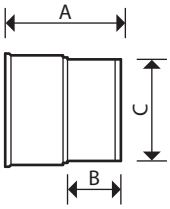


S/S Level Invert Reducer

- To 110mm OsmaDrain spigot

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
150 x 110	6UR099	115	95	111

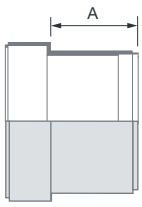


S/S Adaptor

- 6TW socket x 160mm BS EN 1401 spigot

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C
150	6TW141	180	84	160



Double Ended Spigot Adaptor

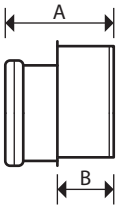
- For connecting SuperSleve pipes to OsmaDrain pipes

Material: Polyproylene

Nominal Size (mm)	Part Number	Dimensions (mm) A
100	SA15/1	65
150	SA15/2	80

Supplementary items

Ancillaries



S/S Level Invert Reducer

- To 110 OsmaDrain

Material: PVC-U

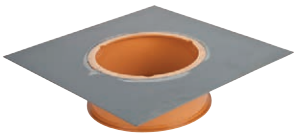
Nominal Size (mm)	Part Number	Dimensions (mm) A	B
160	6D099	127	70

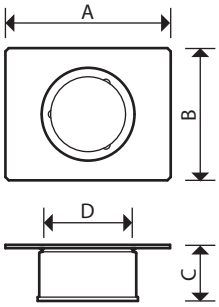
P/E Adaptor

- 160mm spigot connection

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A
160	4D916	325





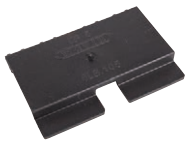
Flange Adaptor

- 6UR socket for connection of UltraRib to infiltration unit at positions other than preformed opening
- 9UR socket for connection of UltraRib to infiltration unit (can only be used with AquaCell Core-R and Plus-R)

Material: PVC-U

Nominal Size (mm)	Part Number	Dimensions (mm) A	B	C	D
150	6LB104	300	300	100	160.3
225	6LB106	500	400	120	226.5

Spares



AquaCell Clip

- For jointing all AquaCell units horizontally

Material: Polypropylene

Nominal Size (mm)	Part Number
–	6LB105

AquaCell Shear Connector

- For jointing all AquaCell units vertically

Material: Polypropylene

Nominal Size (mm)	Part Number
–	6LB102

AquaCell Plus End Cap

- For blocking off unused inlets/outlets

Material: Polypropylene

Nominal Size (mm)	Part Number
–	6LB202

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