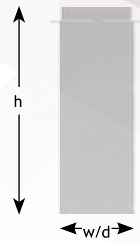
# Slotdrain product selector - Boxes

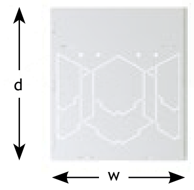
## Silt Box C/W Galvanised Recessed Cover (PaveSlot)

| Code | Description | To Suit Channels | Load Rating | Surface Finish | Height (h) (mm) | Width (w) (mm) | Depth (d) (mm) | Intake Area (mm²) | Pipe Outlet Sizes (mm) | Box Weight (kg) | Cover/Grate Weight (kg) | Total Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFC00125 | Silt Box c/w Galvanised Recessed Cover | Up to 225 | Up to C250 | Paving | 930 | 308 | 308 | 2710 | 115/ 165/ 205/ 255 | 14.1 | 28.7 | 45.4 |
| SFC00127 | Silt Box c/w Galvanised Recessed Cover | From 225 To 400 | Up to C250 | Paving | 1415 | 485 | 485 | 4460 | 205/ 255/ 320/ 360/ 440 | 57.1 | 50.5 | 119.4 |
| SFC00129 | Silt Box c/w Galvanised Recessed Cover | From 400 To 600 | Up to C250 | Paving | 1935 | 686 | 686 | 6460 | 320/ 360/ 440 | 133.8 | 78 | 242.8 |



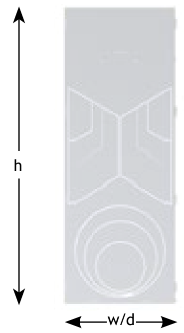

## Facade Access Box C/W Galvanised Recessed Covers (FacadeSlot)

| Code | Description | To Suit Channels | Load Rating | Surface Finish | Height (h) (mm) | Width (w) (mm) | Depth (d) (mm) | Intake Area (mm²) | Pipe Outlet Sizes (mm) | Box Weight (kg) | Cover/Grate Weight (kg) | Total Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FBA00140 | Façade Access Box c/w Galvanised Recessed Cover | 115 | A15 | Paving | 475 | 253 | 253 | N/A | N/A | 7.1 | 2.5 | 9.8 |



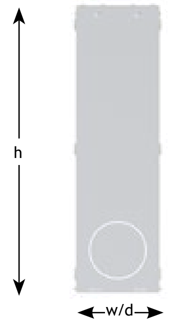

## Facade Outlet Box C/W Galvanised Recessed Covers (FacadeSlot)

| Code | Description | To Suit Channels | Load Rating | Surface Finish | Height (h) (mm) | Width (w) (mm) | Depth (d) (mm) | Intake Area (mm²) | Pipe Outlet Sizes (mm) | Box Weight (kg) | Cover/Grate Weight (kg) | Total Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FBA00144 | Façade Outlet Box c/w Galvanised Recessed Cover | 115 | A15 | Paving | 675 | 253 | 253 | N/A | 115, 165, 205 | 9.5 | 2.5 | 12.2 |




## Facade Combined Access/Outlet VBox (FacadeSlot)

| Code | Description | To Suit Channels | Load Rating | Surface Finish | Height (h) (mm) | Width (w) (mm) | Depth (d) (mm) | Intake Area (mm²) | Pipe Outlet Sizes (mm) | Box Weight (kg) | Cover/Grate Weight (kg) | Total Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FBA00146 | Façade Combined Access / Outlet Box | 115 | A15 | Paving | 575 | 168 | 333 | 7511 | 115, 165, 250 | N/A | N/A | 9.9 |

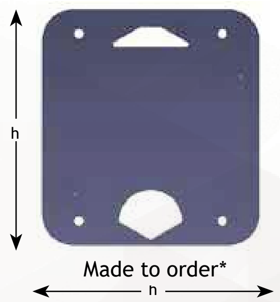



# Flow Regulators

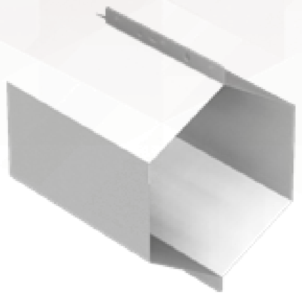
## Available for all Slotdrain
(for use with Gatic Access / Outlet / Silt Boxes)

| Code | Description | To suit Channel | Height (h) | Width (w) | Weight (kg) |
|---|---|---|---|---|---|
| 00217 | 225mm Flow Regulator | 225 | 295 | 275 | 1.9 |
| 00218 | 300mm Flow Regulator | 300 | 380 | 350 | 3.1 |
| 00219 | 350mm Flow Regulator | 350 | 440 | 400 | 4.1 |
| 00220 | 400mm Flow Regulator | 400 | 495 | 450 | 5.4 |
| 00221 | 500mm Flow Regulator | 500 | 610 | 550 | 8.1 |
| 00222 | 600mm Flow Regulator | 600 | 875 | 650 | 13.7 |

*Made to order outlet size on all regulators

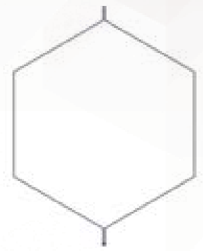


## CastSlot / CastSlot Treadsafe / UltraSlot / UltraSlot Treadsafe / PaveSlot Catchpit Connector

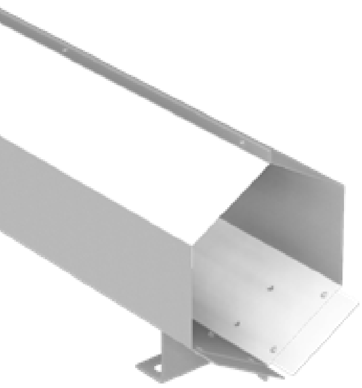


| Code | Description |
|---|---|
| CCA00173 | 100mm Catchpit Connector |
| CCA00174 | 150mm Catchpit Connector |
| CCA00175 | 225mm Catchpit Connector |
| CCA00176 | 300mm Catchpit Connector |
| CCA00177 | 350mm Catchpit Connector |
| CCA00178 | 400mm Catchpit Connector |
| CCA00179 | 500mm Catchpit Connector |
| CCA00180 | 600mm Catchpit Connector |

| To Suit Channel | Length (mm) | Effective Length (mm) | Weight (kg) |
|---|---|---|---|
| 100 | 375 | 300 | 1.9 |
| 150 | 375 | 300 | 2.6 |
| 225 | 375 | 300 | 3.9 |
| 300 | 375 | 300 | 5 |
| 350 | 375 | 300 | 5.8 |
| 400 | 375 | 300 | 10.9 |
| 500 | 375 | 300 | 13.5 |
| 600 | 375 | 300 | 21.9 |

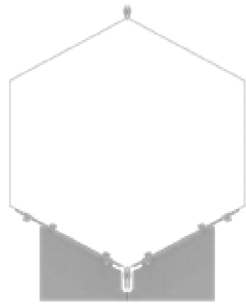


## CastSlot / CastSlot Treadsafe / UltraSlot / UltraSlot Treadsafe / PaveSlot Channel Pipes

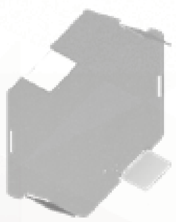


| Code | Description |
|---|---|
| SPA00181 | 100mm Channel Pipe - 3m |
| SPA00182 | 150mm Channel Pipe - 3m |
| SPA00183 | 225mm Channel Pipe - 3m |
| SPA00184 | 300mm Channel Pipe - 3m |
| SPA00185 | 350mm Channel Pipe - 3m |
| SPA00186 | 400mm Channel Pipe - 3m |
| SPA00187 | 500mm Channel Pipe - 3m |
| SPA00188 | 600mm Channel Pipe - 3m |

| To Suit Channel | Length (mm) | Weight (kg) |
|---|---|---|
| 100 | 3000 | 17.1 |
| 150 | 3000 | 23.3 |
| 225 | 3000 | 33.5 |
| 300 | 3000 | 42.7 |
| 350 | 3000 | 49 |
| 400 | 3000 | 91.4 |
| 500 | 3000 | 112 |
| 600 | 3000 | 178.6 |



## CastSlot / CastSlot Treadsafe / UltraSlot / UltraSlot Treadsafe / PaveSlot / FacadeSlot End Caps / End Cap Outlets



| Code | Description |
|---|---|
| 00162 | 100mm End Cap / Outlet |
| 00163 | 150mm End Cap / Outlet |
| 00164 | 225mm End Cap / Outlet |
| 00165 | 300mm End Cap / Outlet |
| 00166 | 350mm End Cap / Outlet |
| 00167 | 400mm End Cap / Outlet |
| 00168 | 500mm End Cap |
| 00169 | 600mm End Cap |
| 00170 | FacadeSlot End Cap 50mm |
| 00171 | FacadeSlot End Cap 75mm |
| 00172 | FacadeSlot End Cap 115mm |

## CastSlot / CastSlot Treadsafe / UltraSlot / UltraSlot Treadsafe / PaveSlot / FacadeSlot End Caps / End Cap Outlets

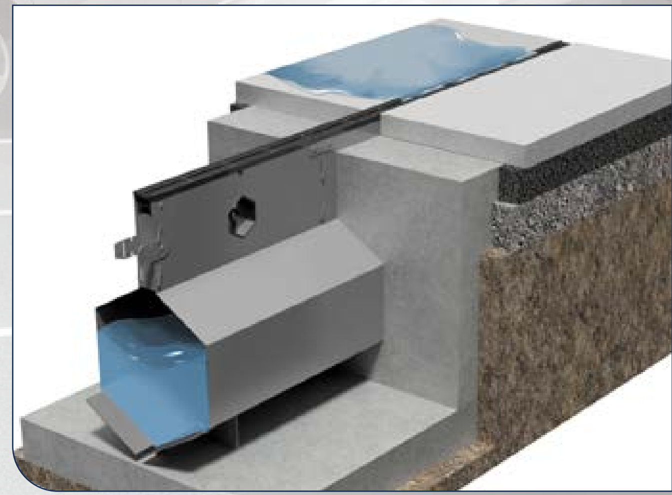
| To Suit Channel | Pipe Outlet Sizes (mm) | Weight (kg) |
|---|---|---|
| 100 | 92 | 0.2 |
| 150 | 115 | 0.4 |
| 225 | 115/165/205 | 0.7 |
| 300 | 115/165/205/255 | 1.2 |
| 350 | 115/165/205/255/320 | 1.6 |
| 400 | 115/165/205/255/320/360 | 3.3 |
| 500 | N/A | 4.9 |
| 600 | N/A | 10.6 |
| 50 | N/A | 0.1 |
| 75 | N/A | 0.2 |
| 115 | N/A | 0.4 |

# GATIC® Slotdrain

Waitrose



Tests undertaken by an independent hydraulics consultant indicated that the intake capacity of slot channel systems compares favourably with that of surface channel systems with conventional slotted gratings. Test results are available on request.



## Rainfall Intensity

When designing a drainage scheme, professional engineers will most often choose a worst case rainfall intensity rate experienced over a period of 10 years or longer. This ensures that the system can accommodate the most severe storm event.

## Slotdrain Intake Capacity

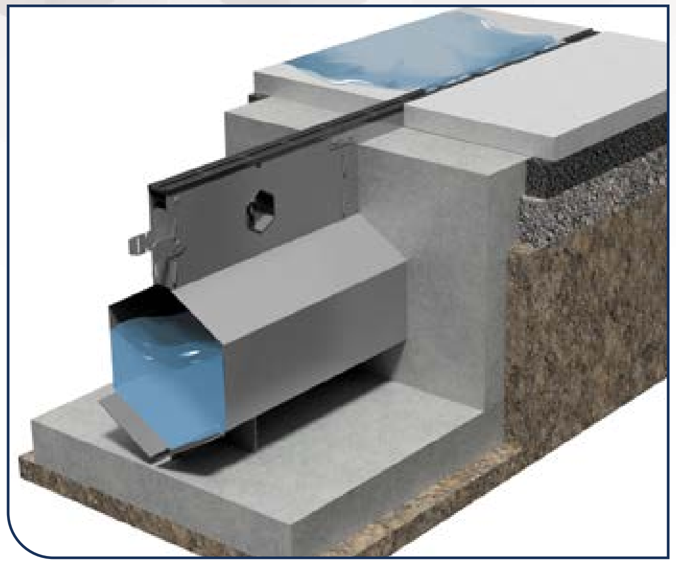
The intake capacity of each type of Gatic Slotdrain system is much greater than would be required in almost all realistic situations, despite the fact it only appears as a very neat 10 or 30mm wide slot in the pavement. The table right shows intake capacities for Gatic Slotdrain with surface water flowing to both sides, or from one side only (flow interception on a slope).

| Intake capacity (l/s per linear metre)* | | | | |
|---|---|---|---|---|
| Width of Slot | Feed Both Sides | Feed one side only at cross slope | | |
| | | 1:40 | 1:80 | 1:200 |
| 10mm | 8.5 | 2.6 | 3.5 | 3.2 |
| 30mm Treadsafe | 14 | 3.5 | 4.1 | 4.2 |
| 30mm Standard | 14 | 5.0 | 5.5 | 5.5 |

## Introduction

The design and requirements of a surface drainage system will vary according to geographic location. Some regions may experience very low levels of rainfall throughout the year, so drainage systems can be designed to capture and conserve water, which may be viewed as a valuable commodity.
Other regions may experience long periods of adverse weather conditions, with high and prolonged rainfall rates. In these areas, drainage systems can be designed to quickly and efficiently dispose of surface water. However, the flow of water away from the channel system or site may have to be regulated in order to reduce the flood risk of rivers downstream of the site.

Gatic Slotdrain can be incorporated within the drainage scheme of urban projects to assist with the efficient collection and re-use of water. This provides construction industry professionals with a simple and effective method of water storage and flow regulation.



## Water Storage

Gatic Slotdrain channels are available up to 600mm wide, the largest unit having a water storage capacity of 405 l/m. By including larger Slotdrain channels in a surface drainage design, individual channel runs can be used to store higher volumes of water immediately after rainfall occurs. Stormwater may then be diverted to a larger water storage facility on site to conserve water. The flow of water away from the channel may be controlled to meet regulations regarding stormwater discharge from sites. Gatic Slotdrain provides the greatest advantage when ‘close to source’ water storage is required.

| Gatic Slotdrain Channel | Capacity |
|---|---|
| 100mm | 9 l/m |
| 150mm | 20 l/m |
| 225mm | 45 l/m |
| 300mm | 78 l/m |
| 350mm | 108 l/m |
| 400mm | 140 l/m |
| 500mm | 218 l/m |
| 600mm | 400 l/m |

## Examples are:

A. Depth restrictions on site for pipe inverts, or no space to install a deep water attenuation tank.
B. Water storage required at a shallow invert.
C. Rocky ground so deep excavation is restricted.
D. High water-table.
E. Areas of site infill.

## Flow Regulation

The easiest and most cost effective way to control water flow away from a slot drain channel system is through the use of an orifice plate, fitted to the catch pit of the channel system or to access units along the channel run. The methodology and hydraulic performance of the orifice plate is well proven and well understood. By designing the size of the orifice within a blanking end plate, maximum flow levels can be established and controlled.

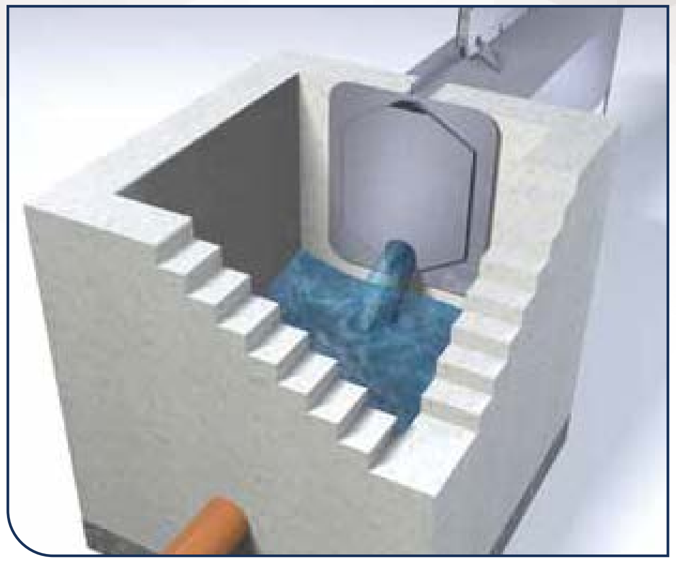
If you are considering using Gatic Slotdrain for water storage, or if you wish to design a slot drain system where the flow will be regulated, please use the AWMS Hydraulic Design Software, or contact our technical department who can provide details of the size of orifice required to achieve the flow rates requested.

**Flow Regulator:**
In order to control the flow of water away from the Gatic Slotdrain channel, a Flow Regulator accessory must be used.

Flow Regulators are supplied by Gatic in Grade 304 stainless steel, and are available in a variety of sizes to fit specific channel widths.

## Flow Regulator Performance & Maintenance

The Flow Regulator accessory supplied by Gatic incorporates a semi-circular sharp edged orifice, which is located at the invert level of the nearest slot drain channel, to ensure that there are no restrictions to flow in normal operational conditions.
If the orifice becomes blocked with debris, the Flow Regulator also incorporates an overflow weir at the top of the unit. This ensures that the channel system will not become totally blocked, which could cause surface flooding.



**A Flow Regulator can be installed at any point along the channel run where there is an access unit or catch pit, thus water flow can be regulated at any point along the channel run. This is particularly useful on sloping sites, where water can be retained at all levels of the site, rather than just at the bottom of the channel run.**
**The Flow Regulator is in all cases bolted neatly onto the inside wall of the catch pit or concrete chamber. This allows easy inspection and removal, for cleaning and maintenance purposes.**

## Design Formulae

The common equation used by professional engineers for the design of surface channel drainage is Manning's formula for flow calculation. This relates to the steady, uniform flow found in open channels such as culverts or irrigation trenches. This formula does not allow for the effects of lateral intake of water along the full length of a grated trench drain or slot drain system.

## HR Wallingford

The established and universally accepted methodology for calculating the hydraulic performance of linear drainage systems is the formula derived from the research carried out by HR Wallingford in the Report SR581 "Hydraulic Capacity of Drainage Channels With Lateral Inflows'.

As the name suggests, the formula derived from this research takes into account the flow of liquid carried through the slot channel, as well as the lateral intake of liquid through the slot along the full length of the channel. The liquid entering the slot along the length of the channel will have a disrupting effect on the flow of water through the channel, which leads to nonuniform flow within the channel.

Gatic Slotdrain 'Hydraulic Design Software' successfully incorporates the formula determined by HR Wallingford, so achieves very accurate results regarding the sizing of slot drain channels. These have been confirmed by manual calculations undertaken by professional engineers on many projects where Gatic Slotdrain has been installed. For further information regarding the formulae used in the design software, please refer to the 'Help' section within the software.

## Alternative Formulae

There are other formulae that have been used by some surface drainage manufacturers to size and design channel schemes. One such is the Gradually Varied Flow methodology and equation. When required, our technical department can provide an alternative design using this methodology, in order to provide a comparison with competing systems where their design has been based on this formula.

The Hydraulic Design Software provided by Gatic also has the option to calculate channel sizes using this methodology at the press of a button in order to avoid the necessity of manual calculations.

## Gatic Slotdrain Channel Sizing - Manual Procedure

Gatic Slotdrain is proven over hundreds of projects in the UK and overseas, however some professional engineers may wish to understand the formulae used within the software and calculate the channel hydraulics manually. Below are the manual procedures for sizing Gatic Slotdrain channels for a given project. Procedure for the design of Gatic Slotdrain

1. Calculate the total area of the catchment drainage area for a specific channel; in square metres.
2. Apply a permeability factor to that area to achieve an impermeable area (Ap) in square metres. Suitable figures for area multipliers are shown in the table below:

| Material | Run-off coefficient |
|---|---|
| Concrete | 1.0 |
| Roofing Materials | 0.95 |
| Tarmac | 0.90 |
| Asphalt | 0.85 |
| Block / Stone paving - Cement joints | 0.80 |
| Block / Stone paving - Open joints | 0.60 |
| High permeability materials (Gravel etc) | <0.60 |

3. Decide upon a design rainfall rate (r) in l/s/m$^2$.
4. Calculate required flow from the impermeable area x rainfall rate (Ap.r) in l\s.
5. If the slotdrain is to be used for conveyance of flow from other sources, such as roof drainage downpipes, then add the sum of the point inflows to the required flow.
6. Determine the required length of channel (L) in m.
7. Determine the ground slope along the length of the channel (S) as a %. The maximum value for S should not exceed 3.3% and S should not be adverse to the direction of flow along the channel.
8. Decide upon the design loading for the channel. If F900 loading is used, decide upon the slot type (Standard or Treadsafe). Select a channel range that is to be used for the design.
9. Decide if a stepped channel design can be incorporated; if so, proceed to Step 16 in the list.

## Single Size Channel

10. Calculate the slope factor b using the following rules:

**for S _< 0.5% b = 0.132S - 0.00022**
**for 0.5% < S _< 3.33% b = 0.00044**

11. Select a suitable channel from the range. When full, the water in the channel will be just below the section. Determine the maximum depth (h) in m, and the channel cross sectional area (A) in m for the chosen channel.

12. If L/h exceeds 1000 then select a larger channel and repeat from Step 11, or reduce the channel length and repeat from Step 6.

13. Calculate the channel capacity from:

$$Q = 2.66\,A^{1.25}\left(6.74\,S^{0.7} + 0.4 + \frac{L}{h}\,b\right)$$

14. If the required flow; calculated at step 5, is larger than the channel capacity calculated at Step 13, then select a larger channel and repeat from Step 11.

15. If the required flow; calculated at Step 5, is smaller than 40% of the channel capacity calculated at Step 13, it may be possible to use a smaller channel. To check this, select a smaller channel size and repeat from Step 11.

## Stepped Fall Channel Design

16. First time through, use the smallest channel in the range and perform the calculations as the previous Steps 10-13.

17. If the required flow; calculated at Step 5, is less than the channel capacity calculated at Step 16, then proceed to Step 20, otherwise select the next size of channel in the range.

18. Calculate the imposed slope given by the sum of the drops (steps) in the invert, divided by the channel length (Σstep * 100 /L) as a %.

19. Add the channel slope calculated at Step 7 to the imposed slope calculated at Step 18, to give S, and repeat the calculations from Step 16.

20. Calculate the required flow from the impermeable area x rainfall rate:

21. First time through, use a 3m length of channel (Lx = 3m) or any other length that the designer considers may be close to the finished design length.

22. Calculate the flow in the channel, from Lx times the flow per unit length, calculated at Step 20. Add any point inflows that occur in channel length Lx from the upstream end, to achieve the design flow.

23. Using the slope calculated at Step 19; and hence the last calculated value of b, and the values of A and h for the size of channel being considered, calculate the flow in the channel using:

$$Q = 2.66\,A^{1.25}\left(6.74\,S^{0.7} + 0.4 + \frac{L}{h}\,b\right)$$

24. If the required flow, calculated at Step 22, is less than the channel capacity, calculated at Step 23, then increase Lx by 3m (or any other length that the designer considers may be close to the finished design length) and repeat from Step 22.

25. Determine the length of channel at the current size, by subtracting the previous length of channel from Lx.

26. Use the next size unit in the design until all sizes set at step 17 have been allocated. Increase Lx by 3m (or any other length that the designer considers may be close to the finished design length) and repeat from Step 22.

## Key:

**Ap impermeable area (m$^2$).**
**r rainfall rate {l/s/m$^2$}.**
**L length of channel run (m).**
**S ground slope along length of channel**
**b coefficient.**
**h depth from invert to bottom of slotdrain throat (channel body) (m).**
**A cross-sectional area of channel body (excluding throat) (m$^2$).**
**Q flow capacity of channel (m$^3$/s.**
**Lx part length**

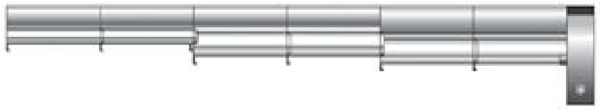
**Slotdrain Design Software:** We produce software that allows you to design your own Slotdrain system using the same programme as our in-house design engineers. To be sent a USB or digital download containing this free software, simply register your details with us.

**Available to download from:**

**www.alumascwms.co.uk**

## Stepped Fall Channel Layout

Gatic Slotdrain channels are available in various sizes ranging from a small and compact 100mm wide channel through to an extremely high capacity 600mm wide channel. Whilst single size channel runs may at times prove to be more suitable, there are significant improvements in hydraulic performance, invert depths and total installed cost where Slotdrain designs incorporate stepped falls.



## Benefits

• Creates an installed gradient within the channel, achieving a positive flow towards the outlet even if there is a 0% longitudinal ground slope along which the channel is laid. Often the installed gradient is greater than 0.6%.

• Large surface areas can be drained with a single Slotdrain run, which reduces the number of Slotdrain runs required in a given area.

• Longer runs can be formed by interconnecting channel sizes, greatly reducing the requirement for underground pipe-work, manhole chambers and outlets and significantly reducing installation time and costs.

• Achieves higher water flow velocity within the channel to improve the self-cleansing capabilities of the system.

• Increased flow velocity reduces the channel sizes required in the channel run.

• Optimises the use of smaller channel units at the head of the channel, therefore reducing installation costs.

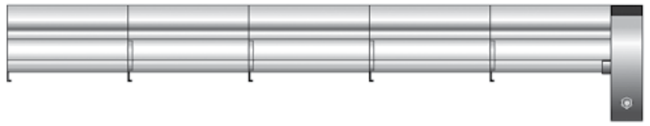
• Minimises invert depths at the outlet end.

• Reduces the amount of excavation, by using the smallest channels available.

## Same Depth Channel Layout

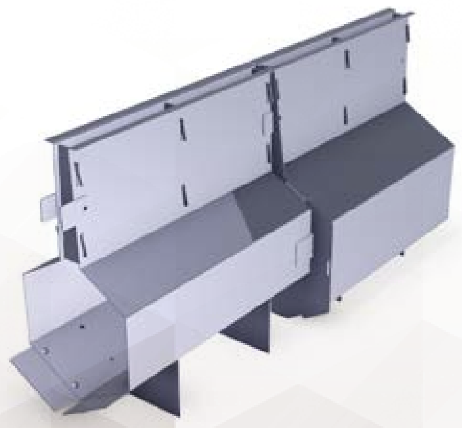
Channel runs formed from same depth channel units may prove more practical and easier to install in some projects. These are generally used when the channel is laid along a positive gradient. Same depth channel layouts can also be used when there is no ground slope, usually if the channel run is short. In such instances, water will find its way to the outlet point, due to the effect of gravity on the body of water, which achieves a natural installed gradient regarding the water line within the channel.

**When using Slotdrain as a storage medium, a same depth channel layout also provides storage volume for surface water.**



## Drop Connectors

**These system components provide a smooth transition between different sizes of channel, whilst the surface detail of the channel run remains the same.**



## Gatic Slotdrain modular drainage system as manufactured by Gatic

## www.alumascwms.co.uk

The channel system should have a continuous, single, horizontal slot design to ensure maximum intake and to resist 'wash-over' of surface liquids. Channels to be a single unit design, with no removable parts. Units should have a hexagonal profile with v-shaped channel base for improved self-cleansing and optimum flow. Channels to have a *10mm/ 30mm (*insert appropriate dimension - 10mm/30mm) wide intake slot and a tapered throat. Throat walls can be designed to incorporate weep holes to allow for drainage of subsurface water if this is required.

Channels should be impact-resistant and manufactured from galvanised sheet steel to BS EN 10346: DX51D+Z275-NA-C. Channel material should have 0% water absorption. All materials used in manufacture of channel units should be heatresistant and recyclable. The manufacturer should ideally operate in accordance with the European Environmental Standard BS EN ISO 14001.
Channel units should be level invert and supplied in 3.0m, 1.0m or 0.5m lengths.

A stepped fall channel configuration can be achieved if required by using varying depths of Gatic Slotdrain channel in combination, towards the outlet.
Channels should be fitted with socket and spigot joints, support feet and concrete anchors that are integral within the design of each unit. Anti-lift channel stabilisers will be fitted to Gatic Slotdrain channels that are 300mm, 350mm, 400mm, 500mm and 600mm wide.

Channels are to be fitted with a removable plastic throat protection strip or tape to prevent debris from entering the slot and throat area during installation. The system shall be supplied with appropriate 'End Caps' and 'Drop Connectors' relevant to the channels specified. Please refer to the manufacturer's product literature for reference numbers of relevant End Caps/ Drop Connectors to be specified and installed. All components within the scope of this system shall be obtained from the manufacturer.

The system shall be installed in accordance with the manufacturer's guidelines and the work carried out as specified by the structural/mechanical engineer and in accordance with recognised good practice. Standards of workmanship should generally be as specified in BS EN 752 and BS 8000 - 0.

## Outlets - D400 Channel

The system is to be supplied with a range of Access, Silt and Outlet Boxes designed to withstand a load of D400, complete with recessed covers or gratings as supplied by Gatic.

## Outlets - F900 Channel

Ultra Heavy Duty Outlet Boxes will be used to terminate all Gatic UltraSlot runs. Alternatively, purpose made 'Catch Pit Connectors' are available from Gatic to provide simple connection of channel units to Catch Pits/Manhole Chambers. Gatic also provides a range of Ultra Heavy Duty (F900) grated or solid covers for Catch Pits/Manhole Chambers.

The system shall be supplied with in line Access Units where required. These should be fitted with solid or grated covers up to F900 loading, as available from Gatic.

## Specific Channel Types

The channel type(s) should be the following: List product reference and characteristics for each channel type to be specified - please refer to product catalogue for relevant details.

## Gatic Slotdrain Ref:
## (*Insert Channel Reference)

Where Gatic UltraSlot is specified, if the 'Treadsafe' option is required, the relevant product reference number should be selected.

**Channel Width: mm**
**Channel Invert Depth: mm**
**Channel Overall Depth: mm**
**Throat Depth: mm**

NB: Where possible, please attach data sheets from the Slotdrain software programme for each channel run.

These contain all of the specific information referred to above

# Structural Design

Drawings are available in both ‘AutoCAD’ or ‘pdf’ formats. Drawings are included in the Hydraulic Design Software package, can be downloaded from the website (www.gatic.com), or can be supplied on a USB Stick. Please contact Gatic or complete an enquiry form on the website.

Manufactured from high quality galvanised sheet steel, and with an innovative design incorporating special features to enhance the structural integrity of the installation, the Gatic Slotdrain system is strong and durable. When specified and installed according to manufacturers’ recommendations, the system is fit for purpose and will meet the performance requirements of the client and specifying engineer.

## Load Testing

Gatic Slotdrain channels comply with BS EN 1433, Load classes A15 to F900.

## Installation Details

A comprehensive set of standard construction installation details are available for each channel type and size, relating to a variety of surface materials (flexible asphalt, paving units, concrete pavement). Installation details and product drawings are also available for the system accessories (modular boxes, drop connector, end caps, flow regulators, etc) supplied with Gatic Slotdrain.

# Durability

## Impact Resistant

Gatic Slotdrain is manufactured from pre-galvanised sheet steel. Channel units are impact resistant, and will not break during transport, site storage, installation and when the facility is in operation. This reduces replacement costs for the contractor, and lowers long term maintenance costs for the client.

## Extreme Temperatures

The system can be used in regions where temperatures may fall well below freezing point. Gatic can supply a much deeper modular outlet to special order (for D400 and F900 load applications), for regions subject to perma-frost, to ensure that underground pipes running from these boxes are located beneath the perma-frost layer.

## Longevity

Specified and installed in accordance with manufacturers’ recommendations, Gatic Slotdrain should perform and be ‘fit for purpose’ for the lifetime of an appropriate site.

Gatic Slotdrain can be considered as a concrete trench drainage system, with a durable steel lining along the inner wall of the channel. The system is therefore likely to be more durable compared with a ‘cast in place’ trench drainage system formed from concrete on site. For performance information regarding more extreme environmental conditions and/or resistance to specific chemicals, please refer to Gatic.

*Gatic Slotdrain can also be supplied in stainless steel.*

# Steel Reinforcing

To meet the strength requirements of BS EN 1433, the following has been concluded:
**A15 - C250** Loading:

All channel sizes – Steel reinforcing is not required within the channel concrete encasement/surround.

**D400 - 600mm** Requires reinforcement.
**E600** Loading:
*UltraSlot channel sizes 150-350mm wide – Steel reinforcing is not required within the channel concrete encasement/surround.
**F900** - Loading
UltraSlot & CastSlot channel sizes 100 - 600mm wide – Steel reinforcing is required within the channel concreteencasement/surround.

The project engineer may decide to install steel reinforcing around all sizes of Gatic Slotdrain where the traffic is heavy and constant, or where ground conditions dictate.

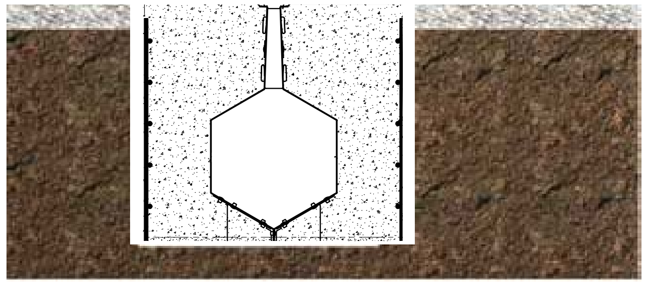
## Installing Steel Reinforcing

Steel reinforcement installation details are available from Gatic on request for all UltraSlot channels and for chambers formed from concrete on site. These drawings can be supplied to provide an indication of the steel reinforcing for an F900 loading application. Each project has a unique and diverse combination of ground conditions and traffic movements that are beyond the control of Gatic.

As such the Slotdrain product may be required to withstand vertical and horizontal loads outside the scope of the load class and testing criteria specified within BS EN 1433.

We therefore advise that the specifying engineer departs from our standard installation details and adds reinforcement or other applicable construction details where necessary.

Fitting of the steel reinforcement cage can be carried out away from the trench, making the task easier for the contractor. The completed unit can then be lifted into the trench.



# Forming a Radius

In some projects there may be a requirement to install the slot drain system to follow a given radius, for example around the perimeter of a taxi-way on an airport project, or following the curve of a landscape feature.

Gatic Slotdrain channel units are available in straight lengths of 500mm, 1m or 3m.

## Gradual Radius

These can be formed using standard units, with each consecutive channel unit positioned at a slight angle in relation to the previous channel. Please refer to the table below for the achievable radius for standard channels in the range.
When positioning channel units, the gap formed between channels on the outside edge of the radius should not exceed 5mm.

All gaps between the channel joints, on both sides of the channel, should be sealed with a strong construction tape prior to concreting.

| | Channel Width (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Slotdrain Type and Length | 50 | 75 | 100 | 115 | 150 | 225 | 300 | 400 | 500 | 600 |
| FacadeSlot System 3m Channels | 32m | 48m | | 70m | | | | | | |
| FacadeSlot System 1m Channels | 13m | 17m | | 25m | | | | | | |
| FacadeSlot System 500mm Channels | 6m | 8m | | 12m | | | | | | |

| | Channel Width (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Slotdrain Type and Length | 50 | 75 | 100 | 115 | 150 | 225 | 300 | 400 | 500 | 600 |
| Other Slotdrain Systems 3m Channels | | | 64m | | 94m | 139m | 183m | 244m | 304m | 363m |
| Other Slotdrain Systems 1m Channels | | | 23m | | 32m | 46m | 62m | 82m | 103m | 123m |
| Other Slotdrain Systems 500mm Channels | | | 11m | | 16m | 23m | 31m | 41m | 51m | 61m |



# Positioning Access Units

A slot drain channel system will require access units to be placed in strategic locations along the channel run, to provide access into the system for cleaning and maintenance.

The position of access units should be determined by the client and project engineer, taking into account the maintenance equipment that will be used. Specifiers may consider the following:

• Access units should be placed at the start of every channel run.

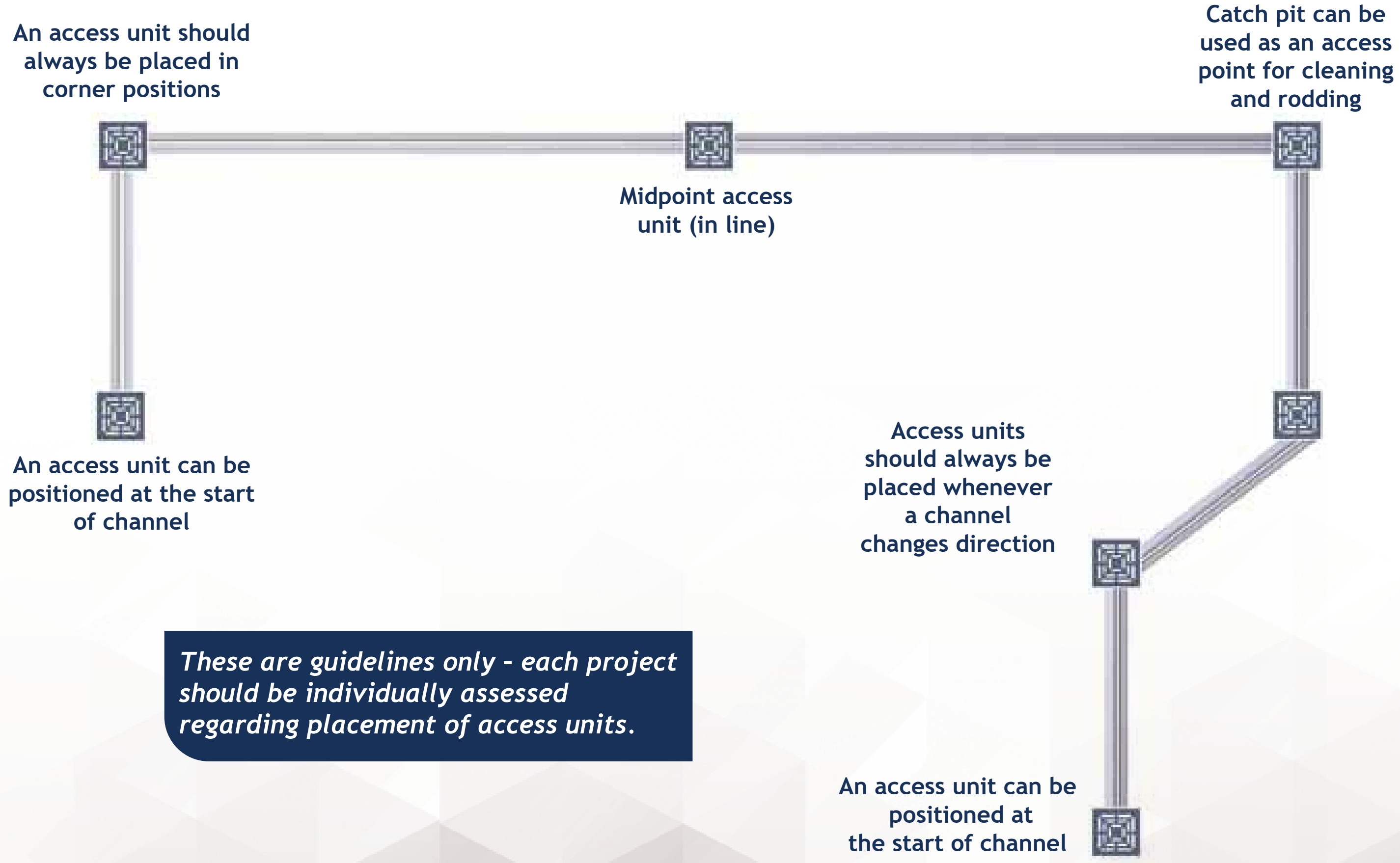
• Access units should be placed at every corner, or at the point where the channel changes direction.

• 100-350mm Wide Channels: Mid-run access units should be placed every 30-50m.

• 400-600mm Wide Channels: Mid-run access units should be placed every 75-100m.

• For short channel runs of 15m long or less, then channel end-caps may be sufficient at the start of the channel run, as cleaning can be carried out from the catch pit end.

Further advice and information is available from Gatic regarding the positioning of access units.




*These are guidelines only - each project should be individually assessed regarding placement of access units.*

# Gatic Projects From around the world

# Notes

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ALUMASC

WATER MANAGEMENT SOLUTIONS

## Appendix B – SPEL Puraceptor Full Retention Separator

**SPEL Products data manual**

# Section 8
# SPEL Puraceptor® class 1 full retention separators


SPEL Puraceptor class 1 separators are full retention single or two chamber units incorporating an automatic closure device and a coalescer unit.

Compliant to the European Standard BS EN 858-1, the Environment Agency's Pollution Prevention Guidelines PPG3 and the Construction Products Regulations.

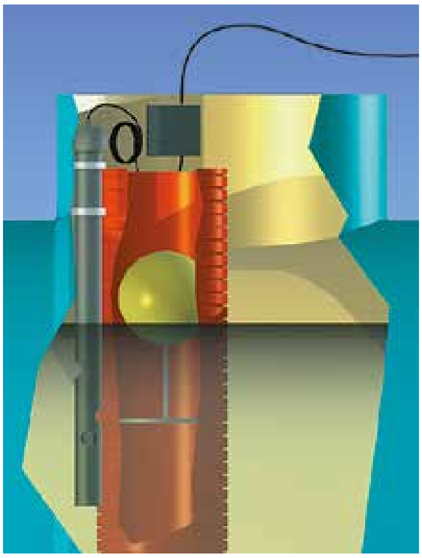
## Introduction and operation

**The 'heart' of the SPEL Puraceptor is the unique long life, low maintenance coalescer unit which 'polishes' the final effluent AFTER 90% hydrocarbons of silt have been separated out.**

The SPEL Puraceptor models are designed for high performance and long service life between maintenance periods. SPEL Puraceptors have been tested in accordance with the European Standard BS EN 858-1 and the results were substantially within the maximum hydrocarbon concentration in the outlet of 5mg/litre. The average for all units tested was 1.22mg/litre.

The Puraceptor is available in two versions, single or two chamber, dependent upon the site application and requirements.

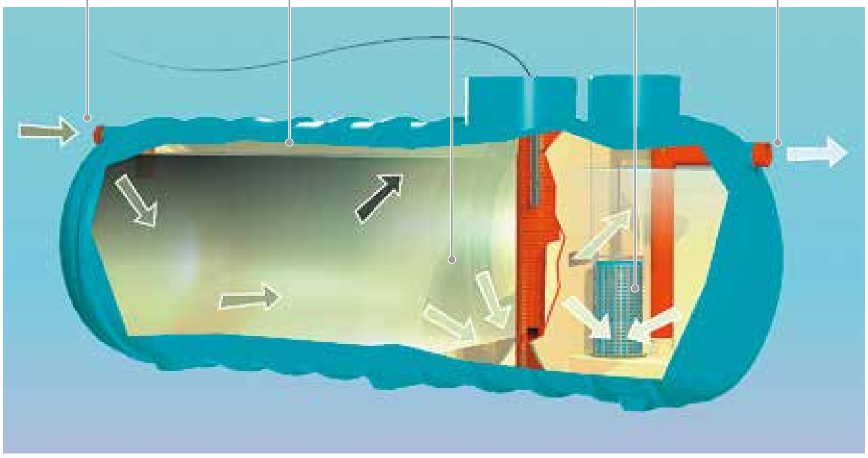
The 'heart' of the separation process is the robust and highly efficient coalescer unit or units. These strong stainless steel units incorporate robust high volume reticulated foam inserts. The inserts efficiently coalesce the finer globules of hydrocarbons for gravity separation and due to their large volume, last for long periods before requiring cleaning. Cleaning is then a simple operation using normal pressure water. The inserts can be reused again and again, rarely requiring replacement.



The automatic closure device automatically closes the outlet point, thus preventing pollutants passing to the drain when there is a heavy spillage.

Compliant to the European Standard BS EN 858-1, the Environment Agency's Pollution Prevention Guidelines PPG3 and the Construction Products Regulations

Oily water in
Oil to top
Cleaner water to second chamber
To coalescer
Clean water out



**SPEL Puraceptor class 1 – single chamber units are suitable for:**

- Medium to high risk oil/fuel storage and handling areas.
- Filling stations, (SPEL Puraceptor forecourt separator FP1CSC).
- Commercial vehicle/plant maintenance yards and heavily contaminated industrial areas.

**SPEL Puraceptor class 1 – two chamber units**

The coalescer unit is mounted in the second chamber, providing a coalescence process for the separation of smaller globules of light liquid pollutants before final discharge to the surface water drain.

Being incorporated in the second chamber prevents contamination or blockage of the coalescer insert in the event of heavy spillages, large amounts of accumulated hydrocarbon or heavy silt content in surface water. It can be simply lifted out for cleaning during routine maintenance.

Typical applications are:

- High risk oil/fuel storage and handling areas
- Filling stations, (SPEL Puraceptor forecourt separator FP2C).
- Heavily contaminated industrial areas, commercial vehicle/plant maintenance yards, power/sub stations, fire training grounds and railway light maintenance and fuelling depots.

## Projects of interest


SPEL Puraceptor Class 1 full retention single chamber separator NS942 with 'automatic' Econoskim System serving a large catchment area (5.0 hectares) at Bristol International Airport.


SPEL Puraceptor class 1 forecourt separator 300 series FP2C (two chamber) for garage forecourts, LFCDA approved. Under test the average hydrocarbon content measured at the outlet was 1.86mg/l.


SPEL Puraceptor class 1 separators (two chamber) are frequently specified for transformer stations, rail maintenance depots etc. Both single and two chamber models are available dependant upon category of site.

## Features, specifications and models available

**SPEL Puraceptor class 1 single and two chamber separators are compliant to the Environment Agency's Pollution Prevention Guidelines PPG3, the European Standard BS EN 858-1 and the Construction Products Regulations.**

Design and manufacture with reference to BS 4994/BS EN 976 and BS 8301. SPEL Puraceptor separators are filament wound in glass reinforced polyester and have a life expectancy in excess of fifty years.

SPEL Puraceptor separators have been designed and tested to meet the stringent European Standard BS EN 858-1 for installations for separators of light liquids where the maximum hydrocarbon concentration in the outlet does not exceed 5mg/l, suitable for discharging into a surface water drain.

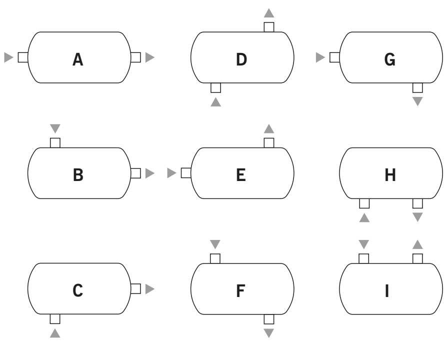
One important feature of SPEL class 1 separators is the design and construction of the coalescer units. These strong stainless steel units incorporate robust high volume reticulated foam inserts. The inserts efficiently coalesce the finer globules of hydrocarbons for gravity separation and due to their large volume, last for long periods before requiring cleaning. Cleaning is then a simple operation using normal pressure water. The inserts can be reused again and again, rarely requiring replacement.

### Features

- Tank shell designed in accordance with BS4994/BS EN 976.
- Filament wound shell – the embodiment of strength and durability – yet lightweight.
- Life expectancy in excess of 50 years.
- Smooth, high gloss internal corrosion resistant surface.
- External 'flow coat' water penetration barrier.

**Choice of pipe connections**

Orientation of inlet/outlet pipe connections.




- Good access to all parts for desludging.
- Coalescer unit/s incorporated into second chamber.
- Coalescer unit/s provided with lifting handle.
- Access shafts for generous access for desludging tank and servicing of ACD and coalescer units.
- Sampling point incorporated into outlet
- Robust stainless steel coalescer unit with long life foam insertion and lifting handle.
- Sized for working capacity PLUS fuel/oil and sludge containment ensuring optimum performance between maintenance periods.
- Generous sizing extends maintenance free periods and reduces desludging costs.
- Stainless steel/plastic or copper ball automatic closure device (ACD).
- Designed for high performance and low maintenance over a long life span.
- Dip pipe inlet for minimum turbulence and to prevent inflammable vapours passing upstream in drainage system.

### Optional extras

- Chemical resistant inner lining for aviation fuels, toluene etc. (CR and HCR specification available – see 1.2 – 1.4).
- Extension shafts available ex. stock in standard lengths of 0.5, 1.0, 1.5 and 2.0m.
- Extension/access shafts for man access – 750 or 900 diameter available to order.
- Extension/access shafts with GRP ladder and stainless steel fixings available to order.
- Coalescer unit guide rail and lifting/locating/ locking systems available for easy removal and re-insertion of coalescer units during maintenance – see 9.7.
- SPEL tripod and hoist for raising and lowering coalescer units during maintenance – see 9.8/9.9.
- SPEL Econoskim® light liquid/oil skimming and separate containment system for 400, 500 & 600 series separators – see section 11.
- Flex-Seal/Band-Seal or similar flexible couplings are available for connecting to site pipe work if required.
- Access shaft safety grating can be incorporated under the manhole cover for additional safety when carrying out an inspection.

### Inlet/outlet connections

- 160/225/300mm diameter PVCU socket/spigot.
- 400/450mm diameter GRP spigot only.

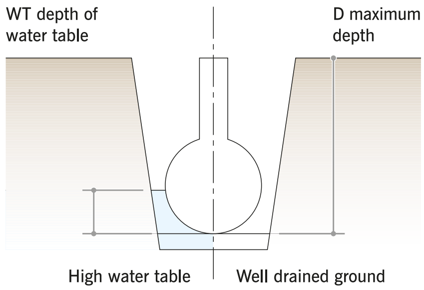
For connecting to site pipework Flex-Seal/Band-Seal or similar flexible couplings can be used.

### Specification

Standard, heavy, extra heavy or special specification available dependent upon tank burial depth and water table level in winter. The tables below refer to tanks with a concrete surround. For extra heavy and special specification range and pea gravel surround refer to section 4 or contact technical sales.

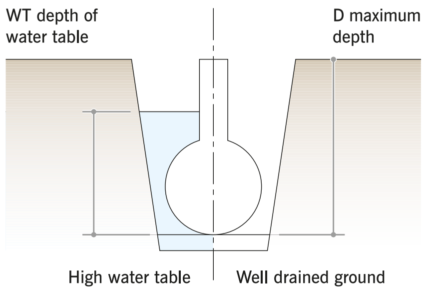
### Standard tanks

| Series | WT(m) | D(m) |
|---|---|---|
| 100/200 | 1.0 | 4.0 |
| 300 | 0.9 | 4.0 |
| 400 | 1.3 | 5.0 |
| 500 | 1.9 | 5.7 |
| 600 | 2.4 | 6.2 |




### Heavy tanks

| Series | WT(m) | D(m) |
|---|---|---|
| 100/200 | 2.0 | 6.0 |
| 300 | 2.8 | 5.6 |
| 400 | 3.5 | 6.0 |
| 500 | 4.5 | 7.25 |
| 600 | 4.7 | 7.3 |



## Full retention

### Handling

Tanks should be lifted using slings not chains or wire ropes. DO NOT drag tanks along the ground for any distance and avoid jarring or bumps. DO NOT lift with water in the tank. See 4.2.

### Installation guidance notes

Installation should be carried out by a competent contractor in accordance with the following procedures, Health & Safety at Work legislation and good building practice.

For detailed instructions see section 4 or installation instructions supplied with every tank.

1. Determine the size of the excavation allowing for the drain invert depth and a concrete surround. Allowance should be made for consolidating concrete under the unit when backfilling.
2. Pour concrete base to correct depth and level off.
3. When the concrete has set sufficiently, place the tank in position, check for levels (including inlet/outlet inverts) and fill with water to a maximum depth of: 200 series – 200mm, 300 series – 300mm, 400 series – 400mm. Ensure concrete slab is clean ready for placing concrete surround. Surround should preferably be placed within 48 hours of casting the base slab.
4. Place backfill concrete (ST4 mix) up to the depth of the water in the tank ensuring the concrete is properly consolidated under the tank to prevent voids. Consolidate by hand – do not use vibrating pokers. Connect up pipework.
5. Continue backfilling with concrete and at the same time filling the tank with water to equalise pressure and resist floatation. Where the tank is divided into chambers ensure all chambers are filled equally.
6. Top up the tank with water to inlet/outlet invert level and place remainder of concrete to a depth of approximately 200-250mm above the top of the tank. Where extension access shaft is fitted, this can be surrounded in concrete once the main tank concrete surround has set. (See Extension access shafts).
7. Where the concrete slab over the tank is to take vehicle loading it should be reinforced in accordance with good practice to take the maximum load and should be extended onto unexcavated ground. It is important that vehicle loading is not transferred to the tank shell or its concrete surround.
8. Incorporate inspection cover and frame.

### Venting

SPEL Separators are governed by the requirements of petroleum regulations: Petrol filling stations: Construction and Operation HS(G)41, ISBN 0-11885449-6. These state in paragraph 45, that each chamber of a petrol interceptor should be vented and vent pipes should extend to not less than 2.4m above ground level, should not be less than 75mm diameter and of a robust construction, and should be manifolded above ground.

### Extension access shafts

SPEL extension shafts should be surrounded with concrete. Pour in lifts of approximately 500mm, allowing the concrete to set between each lift.

### SPEL automatic alarm/monitoring system

Requirement of the Environment Agency's Pollution Prevention Guidelines PPG3

The SPEL automatic alarm/monitoring system shall be fitted for continuous monitoring of the separator contents by sensing when the light liquid within the separator has filled to a predetermined level (with design safety margins), and provides a simple audio-visual warning to alert the operator that the separator needs to be emptied.

The system is very easy to install and comprises two parts: a compact control unit and a probe unit. It is self-contained and requires only a normal 240v AC electrical supply. The control incorporates a ATEX approved intrinsically safe circuit, which enables the probe unit to be used in Zone Zero Environments. See section 10.

### Maintenance

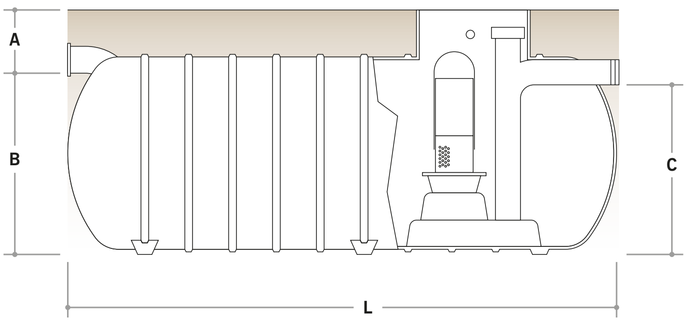
The SPEL Separators have good access for periodic emptying of retained light liquids and sludge which is essential to maintain the units optimum performance.

Periods between emptying will have to be determined depending on site conditions but normally at least twice a year. For further details see Section 9.

| Model | Series | Nominal size (NS) | Catchment area (m²) | Oil storage (litres) | Silt capacity (litres) | Overall length* (mm) L | Overall diameter (mm) | Inlet Invert (mm) A | Base to Inlet (mm) B | Base to outlet (mm) C | Max in/out pipe diameter (mm) | Number of access shafts (dia. mm) 600 | 750 | 900 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P004/1CSC | 200 | 4 | 222 | 40 | 400 | 1,720 | 1225 | 540 | 1,200 | 1,140 | 160 | – | 1 | – | – |
| P006/1CSC | 200 | 6 | 333 | 60 | 600 | 2,270 | 1225 | 540 | 1,200 | 1,140 | 160 | – | 1 | – | – |
| P010/1CSC | 200 | 10 | 556 | 100 | 1,000 | 3,410 | 1225 | 540 | 1,200 | 1,140 | 160 | – | 1 | – | – |
| P015/1CSC | 300 | 15 | 833 | 150 | 1,500 | 3,200 | 1875 | 350 | 1,800 | 1,740 | 225 | – | 1 | – | – |
| P020/1CSC | 300 | 20 | 1111 | 200 | 2,000 | 3,540 | 1875 | 350 | 1,800 | 1,740 | 225 | 1 | 1 | – | – |
| FP1CSC | 300 | 20 | 1111 | 200 | 2,000 | 4,290 | 1875 | 350 | 1,800 | 1,740 | 225 | | 1 | – | – |
| P030/1CSC | 300 | 30 | 1667 | 300 | 3,000 | 4,420 | 1875 | 390 | 1,760 | 1,700 | 300 | 1 | – | 1 | – |
| P040/1C | 300 | 40 | 2222 | 400 | – | 4,020 | 1875 | 390 | 1,760 | 1,700 | 300 | | – | 1 | – |
| P040/1CSC | 300 | 40 | 2222 | 400 | 4,000 | 5,760 | 1875 | 390 | 1,760 | 1,700 | 300 | 1 | – | 1 | – |
| P050/1C | 300 | 50 | 2778 | 500 | – | 5,070 | 1875 | 390 | 1,760 | 1,700 | 300 | – | – | 1 | – |
| P050/1CSC | 300 | 50 | 2778 | 500 | 5,000 | 7,060 | 1875 | 390 | 1,760 | 1,700 | 300 | 1 | – | 1 | – |
| P065/1C | 400 | 65 | 3611 | 650 | – | 3,710 | 2700 | 425 | 2,625 | 2,525 | 300 | | – | 2 | – |
| P065/1CSC | 400 | 65 | 3611 | 650 | 6,500 | 4,810 | 2700 | 425 | 2,625 | 2,525 | 300 | 1 | – | 2 | – |
| P080/1C | 400 | 80 | 4444 | 800 | – | 4,400 | 2700 | 425 | 2,625 | 2,525 | 300 | – | – | 2 | – |
| P080/1CSC | 400 | 80 | 4444 | 800 | 8,000 | 5,700 | 2700 | 425 | 2,625 | 2,525 | 300 | 1 | – | 2 | – |
| P100/1C | 400 | 100 | 5555 | 1000 | – | 5,250 | 2700 | 475 | 2,575 | 2,475 | 400 | | – | 2 | – |
| P100/1CSC | 400 | 100 | 5555 | 1000 | 10,000 | 7,400 | 2700 | 475 | 2,575 | 2,475 | 400 | 1 | – | 2 | – |
| P125/1C | 400 | 125 | 6944 | 1250 | – | 6,090 | 2700 | 475 | 2,575 | 2,475 | 400 | – | – | 2 | – |
| P125/1CSC | 400 | 125 | 6944 | 1250 | 12,500 | 8,580 | 2700 | 475 | 2,575 | 2,475 | 400 | – | 1 | 2 | – |
| P150/1C | 400 | 150 | 8333 | 1500 | – | 7,400 | 2700 | 475 | 2,575 | 2,475 | 400 | – | | 2 | – |
| P150/1CSC | 400 | 150 | 8333 | 1500 | 15,000 | 10,180 | 2700 | 475 | 2,575 | 2,475 | 400 | – | 1 | 2 | – |
| P165/1C | 400 | 165 | 9166 | 1650 | – | 7,960 | 2700 | 500 | 2,550 | 2,450 | 450 | 2 | | 1 | – |
| P165/1CSC | 400 | 165 | 9166 | 1650 | 16,500 | 11,200 | 2700 | 500 | 2,550 | 2,450 | 450 | 2 | 1 | 1 | – |
| P200/1C | 400 | 200 | 11110 | 2000 | – | 9,600 | 2700 | 660 | 2,390 | 2,290 | 600 | 2 | 1 | 1 | – |
| P200/1CSC | 400 | 200 | 11110 | 2000 | 20,000 | 13,710 | 2700 | 660 | 2,390 | 2,290 | 600 | 2 | 1 | 1 | – |
| P250/1C | 400 | 250 | 13888 | 2500 | – | 11,830 | 2700 | 660 | 2,390 | 2,290 | 600 | 2 | | 2 | – |
| P250/1CSC | 400 | 250 | 13888 | 2500 | 25,000 | 16,750 | 2700 | 660 | 2,390 | 2,290 | 600 | 2 | 1 | 2 | – |
| P300/1C | 400 | 300 | 16665 | 3000 | – | 14,120 | 2700 | 660 | 2,390 | 2,290 | 600 | 2 | | 2 | – |
| P300/1CSC | 500 | 300 | 16665 | 3000 | 30,000 | 12,410 | 3650 | To suit site drainage requirements | | | | 1 | 2 | 2 | – |
| P400/1C | 500 | 400 | 22220 | 4000 | – | 11,180 | 3650 | | | | | 2 | 1 | 2 | – |
| P400/1CSC | 500 | 400 | 22220 | 4000 | 40,000 | 15,760 | 3650 | | | | | 2 | 2 | 2 | – |
| P500/1C | 500 | 500 | 27775 | 5000 | – | 14,340 | 3650 | | | | | 2 | 2 | 1 | 1 |
| P500/1CSC | 500 | 500 | 27775 | 5000 | 50,000 | 20,530 | 3650 | | | | | 2 | 2 | 1 | 1 |
| P500/1C | 600 | 500 | 27775 | 5000 | – | 11,470 | 4150 | | | | | 2 | 2 | 1 | 1 |
| P500/1CSC | 600 | 500 | 27775 | 5000 | 50,000 | 16,040 | 4150 | | | | | 2 | 2 | 1 | 1 |
| P550/1C | 600 | 550 | 30553 | 5500 | – | 12,690 | 4150 | | | | | 2 | 2 | 1 | 1 |
| P550/1CSC | 600 | 550 | 30553 | 5500 | 55,000 | 17,450 | 4150 | | | | | 2 | 2 | 1 | 1 |
| P600/1C | 600 | 600 | 33330 | 6000 | – | 13,510 | 4150 | | | | | 2 | 2 | – | 2 |
| P600/1CSC | 600 | 600 | 33330 | 6000 | 60,000 | 19,080 | 4150 | | | | | 2 | 2 | – | 2 |
| P800/1CSC | 600 | 800 | 44440 | 8000 | 80,000 | 24,660 | 4150 | | | | | 3 | 2 | 2 | 1 |
| P1000/1C | 600 | 1000 | 55550 | 10000 | – | 22,270 | 4150 | | | | | 3 | 2 | 1 | 3 |

Note: Model **FP1C** is a special forecourt unit with 7600 litre spillage holding capacity.

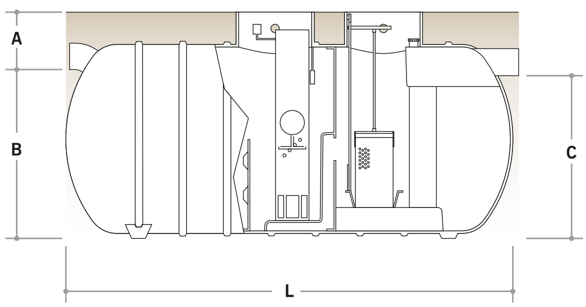
*Overall length subject to inlet/outlet size and orientation.

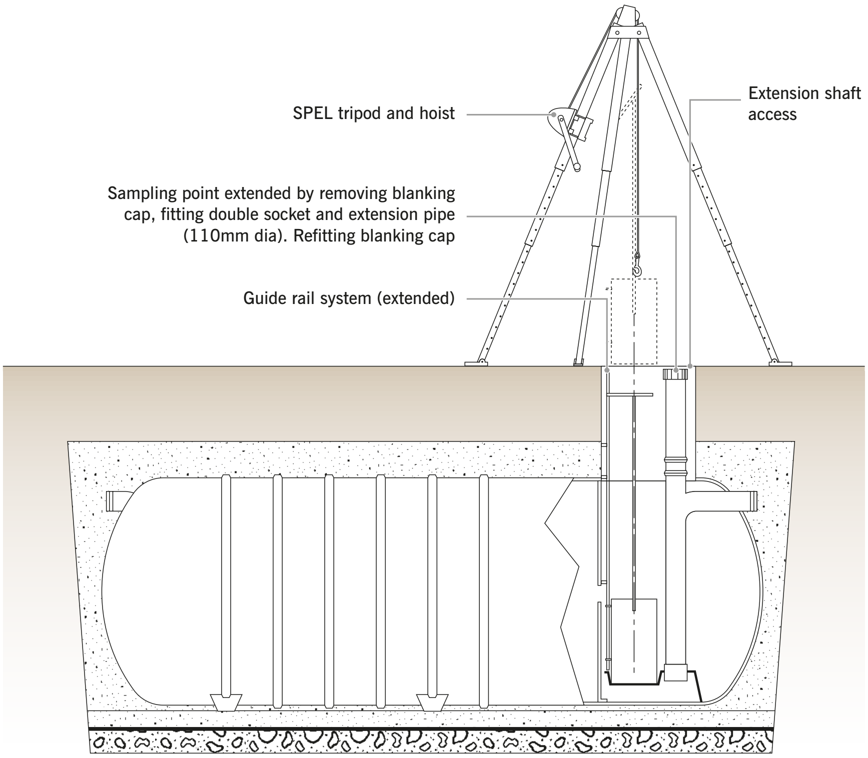


# SPEL Puraceptor® class 1 two chamber separators – full retention

| Model | Series | Nominal size (NS) | Catchment area (m²) | Oil storage (litres) | Silt capacity (litres) | Overall length** (mm) L | Overall diameter (mm) | Inlet Invert (mm) A | Base to Inlet (mm) B | Base to outlet (mm) C | Max in/out pipe diameter (mm) | Number of access shafts (dia. mm) 450 | 600 | 750 | 900 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P006/2CSC | 200 | 6 | 333 | 60 | 600 | 3,050 | 1225 | 340 | 1,200 | 1,140 | 160 | – | – | 2 | – | – |
| P010/2CSC | 200 | 10 | 556 | 100 | 1,000 | 3,820 | 1225 | 340 | 1,200 | 1,140 | 160 | – | – | 2 | – | – |
| P015/2CSC | 300 | 15 | 833 | 150 | 1,500 | 4,020 | 1875 | 350 | 1,800 | 1,740 | 225 | – | – | 2 | – | – |
| P020/2CSC | 300 | 20 | 1111 | 200 | 2,000 | 4,020 | 1875 | 350 | 1,800 | 1,740 | 225 | – | – | 2 | – | – |
| P025/2CSC | 300 | 25 | 1389 | 250 | 2,500 | 4,290 | 1875 | 350 | 1,800 | 1,740 | 225 | – | – | 2 | – | – |
| P030/2CSC | 300 | 30 | 1667 | 300 | 3,000 | 4,420 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 1* | 2 | – | – |
| FP2CSC | 300 | 20 | 1111 | 200 | 2,000 | 5,500 | 1875 | 350 | 1,800 | 1,740 | 225 | – | – | 2 | – | – |
| P035/2CSC | 300 | 35 | 1944 | 350 | 3,500 | 5,070 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 1* | 2 | – | – |
| P040/2CSC | 300 | 40 | 2222 | 400 | 4,000 | 5,760 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 1* | 2 | – | – |
| P050/2CSC | 300 | 50 | 2778 | 500 | 5,000 | 7,060 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 1* | 2 | – | – |
| P065/2CSC | 300 | 65 | 3611 | 650 | 6,500 | 9,180 | 1875 | 390 | 1,760 | 1,700 | 300 | 1 | – | 2 | – | – |
| P065/2CSC | 400 | 65 | 3611 | 650 | 6,500 | 5,470 | 2700 | 425 | 2,625 | 2,525 | 300 | 1 | – | 1 | 1 | – |
| FP15/2CSC | 400 | 15 | 833 | 150 | 1,500 | 7,400 | 2700 | 425 | 2,625 | 2,525 | 300 | – | 1 | 2 | – | – |
| P080/2CSC | 400 | 80 | 4444 | 800 | 8,000 | 5,700 | 2700 | 425 | 2,625 | 2,525 | 300 | – | – | 1 | 1 | – |
| P100/2CSC | 400 | 100 | 5555 | 1000 | 10,000 | 7,400 | 2700 | 475 | 2,575 | 2,475 | 400 | – | – | 1 | 1 | – |
| P125/2CSC | 400 | 125 | 6944 | 1250 | 12,500 | 8,580 | 2700 | 475 | 2,575 | 2,475 | 400 | – | – | 2 | 1 | – |
| P150/2CSC | 400 | 150 | 8333 | 1500 | 15,000 | 10,180 | 2700 | 500 | 2,550 | 2,450 | 450 | – | – | 2 | 1 | – |
| P200/2CSC | 400 | 200 | 11110 | 2000 | 20,000 | 13,710 | 2700 | 660 | 2,390 | 2,290 | 600 | – | 1 | 2 | 1 | – |
| ***P300/2CSC | 500 | 300 | 16665 | 3000 | 30,000 | 12,530 | 3650 | 675 | 3,200 | 3,100 | 600 | – | 1 | 2 | – | 1 |
| P350/2CSC | 500 | 350 | 19443 | 3500 | 35,000 | 13,950 | 3650 | 675 | 3,200 | 3,100 | 600 | – | 2 | 2 | 2 | – |
| ***P400/2CSC | 500 | 400 | 22220 | 4000 | 40,000 | 15,980 | 3650 | 675 | 3,200 | 3,100 | 600 | – | 2 | 2 | 2 | – |

Note: Model FP2C is a special forecourt unit with 7600 litre spillage holding capacity.
*Optional for ease of silt removal. **Overall length subject to inlet/outlet and orientation. ***500 or 600 series available – designed to suit specific requirements.






## SPEL tripod and hoist

Where surface water run-off has a high silt content the coalescer units can become filled, making them heavy to lift out. In order to facilitate easy withdrawal of coalescer units the SPEL tripod & hoist is recommended.

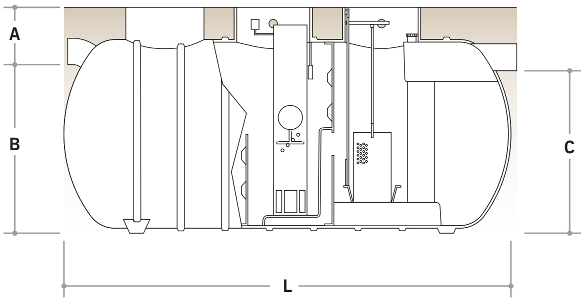
A stainless steel lifting hook is included for automatically engaging the coalescer unit,

even under water. This enables coalescer units to be lifted out safely from ground level.

**Note: The SPEL tripod and hoist can be used for servicing pumps in SPEL package pumping stations. For further details see SPEL Data Manual section 9.**

| Model | Series | Nominal size (NS) | Catchment area (m²) | Oil storage* (litres) | Silt capacity (litres) | Overall length (mm) L | Overall diameter (mm) | Inlet Invert (mm) A | Base to Inlet (mm) B | Base to outlet (mm) C | Max in/ out pipe diameter (mm) | Number of access shafts (dia. mm) 450 | 750 | 900 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P006/2CSC/NG | 200 | 6 | 333 | 60 | 600 | 3,050 | 1225 | 340 | 1,200 | 1,140 | 160 | – | 2 | – |
| P010/2CSC/NG | 200 | 10 | 556 | 100 | 1,000 | 3,820 | 1225 | 340 | 1,200 | 1,140 | 160 | – | 3 | – |
| P015/2CSC/NG | 300 | 15 | 833 | 150 | 1,500 | 4,020 | 1875 | 350 | 1,800 | 1,740 | 225 | – | 3 | – |
| P020/2CSC/NG | 300 | 20 | 1111 | 200 | 2,000 | 4,020 | 1875 | 350 | 1,800 | 1,740 | 225 | – | 3 | – |
| P025/2CSC/NG | 300 | 25 | 1389 | 250 | 2,500 | 4,290 | 1875 | 350 | 1,800 | 1,740 | 225 | – | 3 | – |
| P030/2CSC/NG | 300 | 30 | 1667 | 300 | 3,000 | 4,420 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 3 | – |
| P035/2CSC/NG | 300 | 35 | 1944 | 350 | 3,500 | 5,070 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 3 | – |
| P040/2CSC/NG | 300 | 40 | 2222 | 400 | 4,000 | 5,760 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 3 | – |
| P050/2CSC/NG | 300 | 50 | 2778 | 500 | 5,000 | 7,060 | 1875 | 390 | 1,760 | 1,700 | 300 | – | 3 | – |
| P065/2CSC/NG | 300 | 65 | 3611 | 650 | 6,500 | 9,180 | 1875 | 390 | 1,760 | 1,700 | 300 | 1 | 3 | – |
| P065/2CSC/NG | 400 | 65 | 3611 | 650 | 6,500 | 5,470 | 2700 | 425 | 2,625 | 2,525 | 300 | 1 | 1 | 1 |
| P080/2CSC/NG | 400 | 80 | 4444 | 800 | 8,000 | 5,700 | 2700 | 425 | 2,625 | 2,525 | 300 | – | 1 | 1 |
| P100/2CSC/NG | 400 | 100 | 5555 | 1000 | 10,000 | 7,400 | 2700 | 475 | 2,575 | 2,475 | 400 | – | 1 | 1 |
| P125/2CSC/NG | 400 | 125 | 6944 | 1250 | 12,500 | 8,580 | 2700 | 475 | 2,575 | 2,475 | 400 | – | 2 | 1 |
| P150/2CSC/NG | 400 | 150 | 8333 | 1500 | 15,000 | 10,180 | 2700 | 500 | 2,550 | 2,450 | 450 | – | 2 | 1 |

*A minimum oil storage volume of 4000 litres is provided for in all models except P006 and P010 which have 60 and 100 litres of oil capacity respectively.

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## Maintenance

### SPEL Puraceptor® class 1 separators

The SPEL Puraceptor® class 1 separator is available in single chamber or two chamber models.

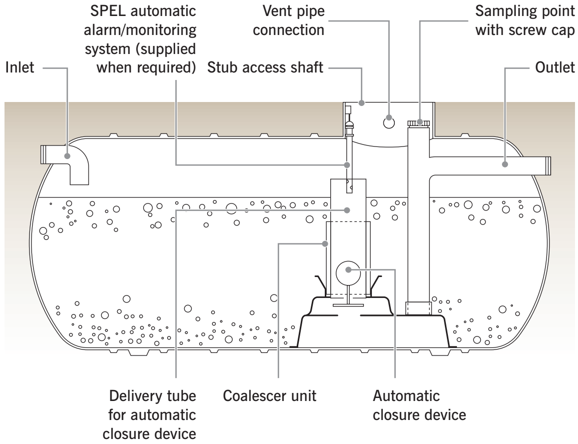
### Single chamber models (Figure 1)

These incorporate a coalescer unit and an automatic closure device type 'R'. For maintenance see 3.20.

### Two chamber models (Figure 2)

The maintenance procedure for the SPEL Puraceptor® class 1 two chamber models is detailed on sheet 3.20.

**Figure 1**



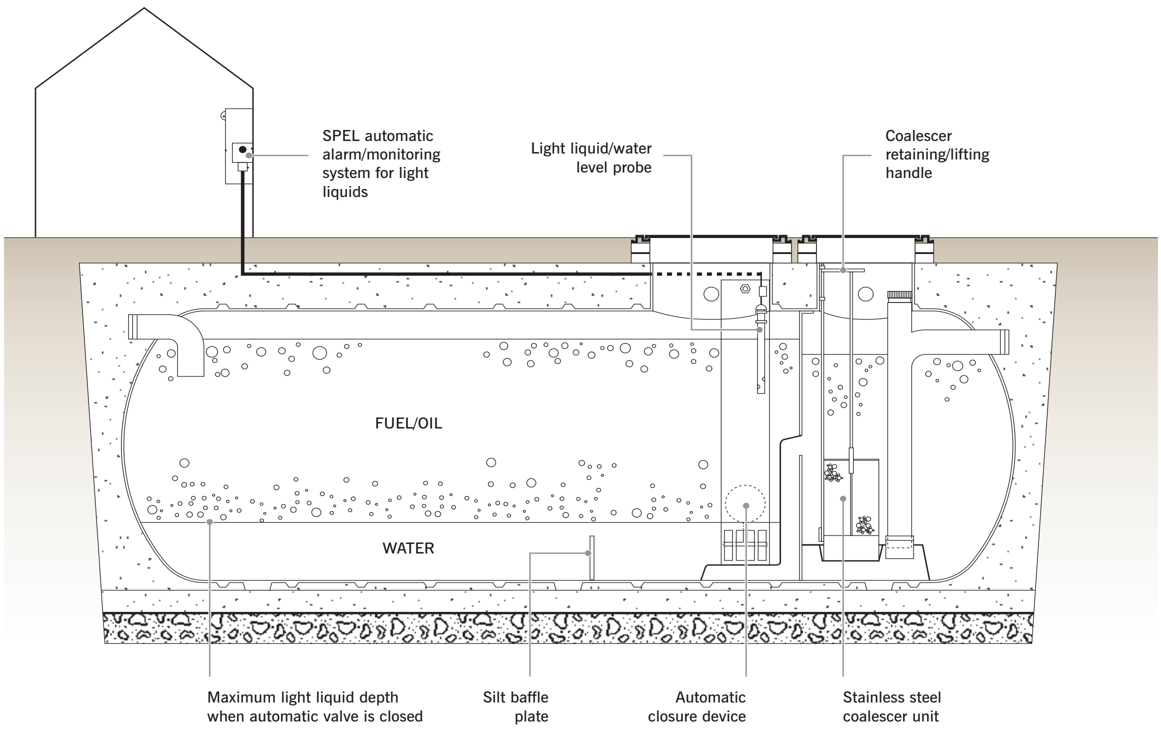

### Maintenance requirements

The SPEL automatic alarm/monitoring system will automatically warn you when the SPEL Separator requires emptying of light liquids. See ref. 3.10 – 3.19. However, silt will accumulate and require removing at intervals depending on the site conditions.

We recommend the SPEL Separator is checked at 3, 6 or 12 monthly intervals to determine the depth of silt in the primary chamber.

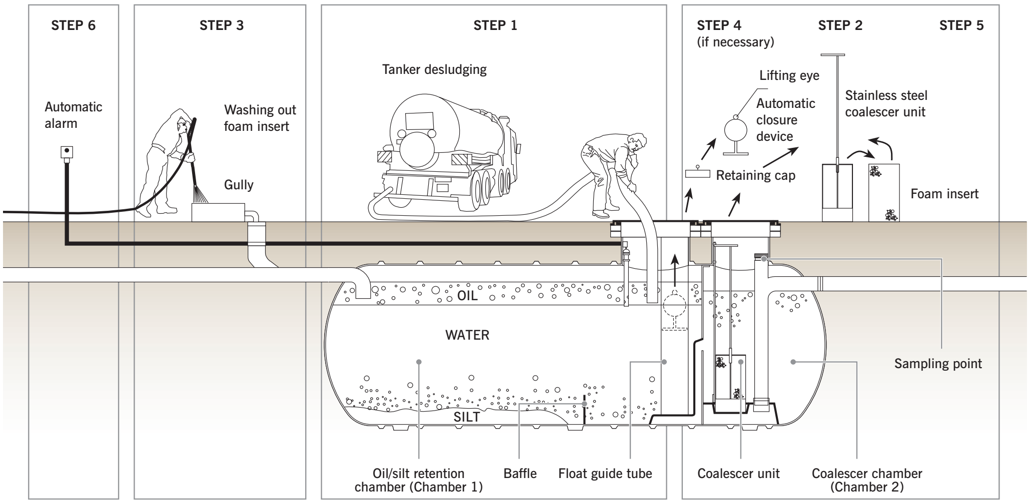
Separators must be provided with a remote device to provide visual and audible warning when the level of oil reaches 90 per cent of the oil storage volume (V) under static liquid level conditions. This automatic warning device indicates that the separator is in need of immediate emptying for it to continue to work effectively.

**Figure 2**



## Maintenance

SPEL Puraceptor® separator - two chamber model




### Step 1: Coalescer unit

Use the lifting handle or unclip the retaining clip for the wire rope and lift the coalescer unit out of the tank and place ahead of the Puraceptor®.

### Step 2: Cleaning foam insert

Remove foam insert and wash with normal water pressure ensuring the dirty water runs into the Puraceptor®.

### Step 3: Sucking out oil/fuel and silt

Suck off the retained oil from both chambers of the Puraceptor® and then the silt deposited on the bottom, leaving sufficient water to ensure the ACD remains floating.

### Step 4: Sucking out complete contents (if necessary)

If the quantity of pollutants exceeds recommended levels, the complete contents of the Puraceptor® may need to be removed.

After sucking out completely, remove the ACD in the ACD retaining tube by first removing the retaining cap (this is to safeguard against the removal of the float by unauthorised persons).

Then, by means of a pole with a hook, lift out the ACD using the lifting eye on the float. Check the seating at the base of the retaining tube is free of debris/silt that could prevent the ACD closing off in an emergency.

### Step 5: Re-insert coalescer unit and ACD

Re-insert the foam insert into the stainless steel coalescer unit and re-insert the coalescer unit into the Puraceptor®. Re-clip the wire rope or location pin as provided with the SPEL lifting/locating/locking system (see 3.7).

Partially fill the Puraceptor® with clean water to ensure the ACD when re-inserted remains floating. Check the ACD is not damaged and the closure plate is clean. Re-insert the ACD.

Finally check the ACD is floating and the retaining cap has been replaced to safeguard against its removal by unauthorised persons, unless depth of tank precludes doing so from ground level.

### ACD closes off in emergency due to oil spill

If the ACD closes off, the oil/fuel spill needs to be removed by a suction tanker. With a single chamber model, the complete contents will need to be removed in order to release the ACD. With the two chamber models, insert the suction hose into the first chamber (oil/silt retention chamber) and then the head in the second chamber will normally provide a back pressure and automatically release the ACD.

**Precaution:** never try to pull the ACD off its seating by force.

### Step 6: SPEL automatic alarm /monitoring system

The SPEL automatic alarm/monitoring system probe should be lifted out of the probe protection tube, wiped clean and re-inserted. The system should now be reset according to instructions. See 3.10 – 3.19.

### Maintenance procedure

The SPEL automatic alarm/monitoring system will automatically warn you when the Puraceptor® requires emptying. See 3.10 – 3.19. Where a SPEL automatic alarm/monitoring system is not fitted, SPEL Puraceptors® should be checked at three, six or twelve-monthly intervals depending on site conditions, to determine the depth of retained pollutants and silt in both chambers and the correct operating of the ACD (automatic closure device). When the depth of the oil/fuel retained has reached the predetermined design level, in accordance with BS EN 858-1, it should be emptied.

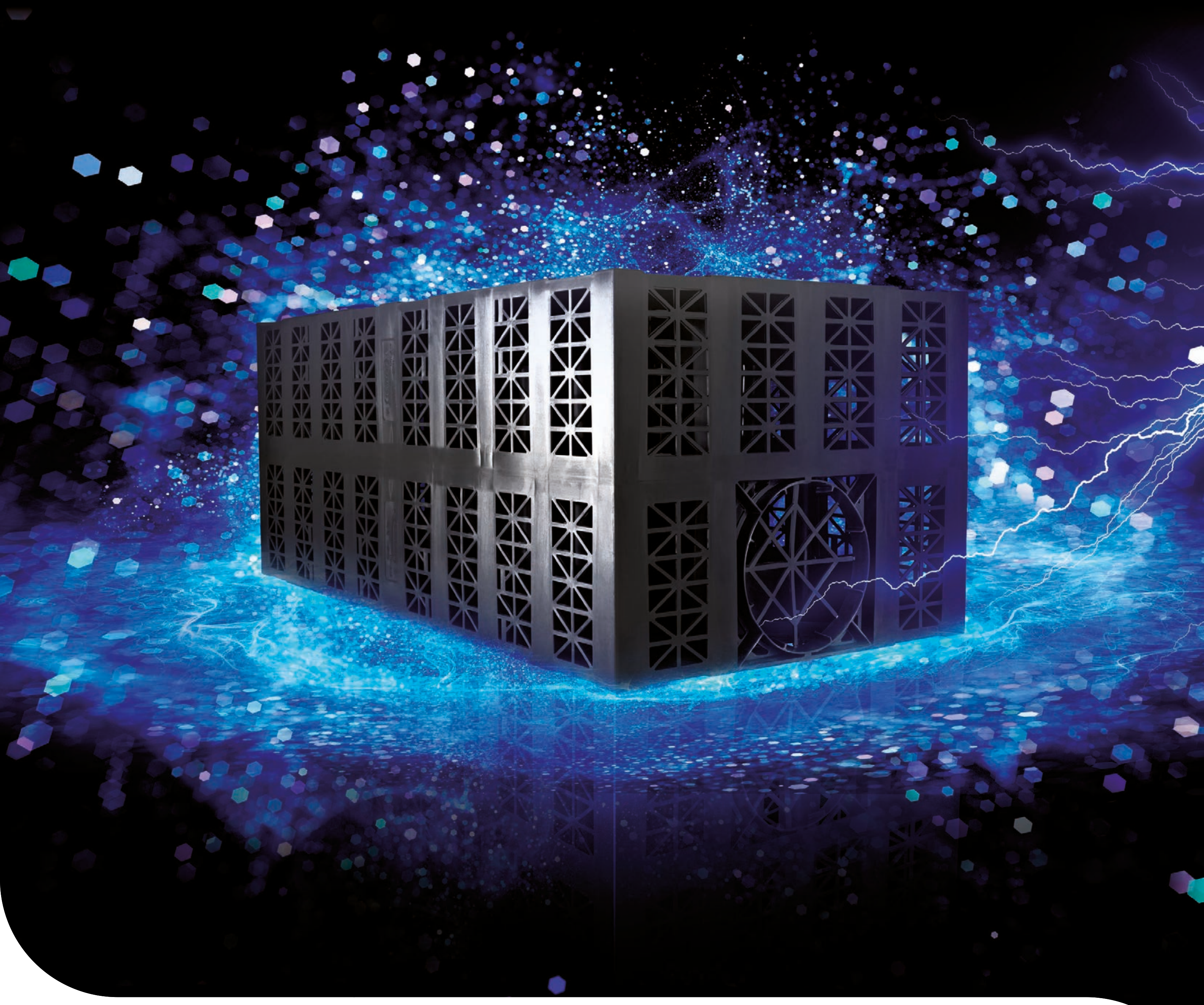
Important Note: When emptying, ensure both chambers are emptied equally starting with the oil retention chamber and then the coalescer chamber and back again until empty.

Appendix C – Wavin Aquacell Geocellular Storage

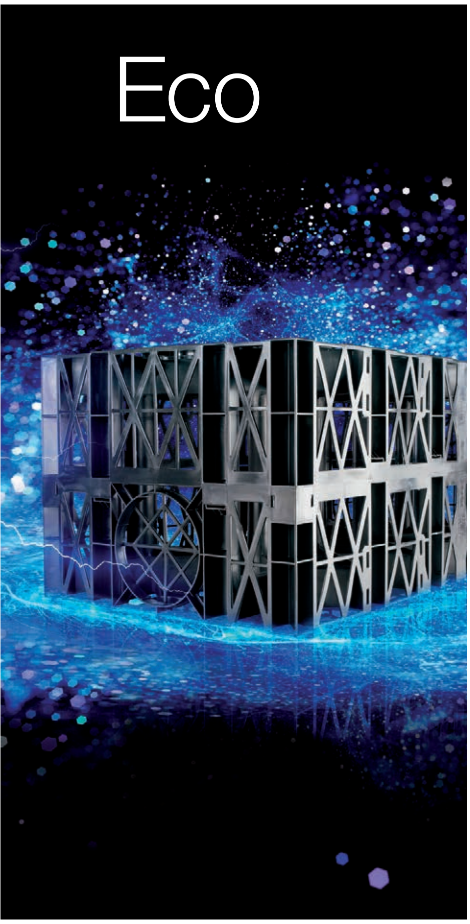
WATER MANAGEMENT

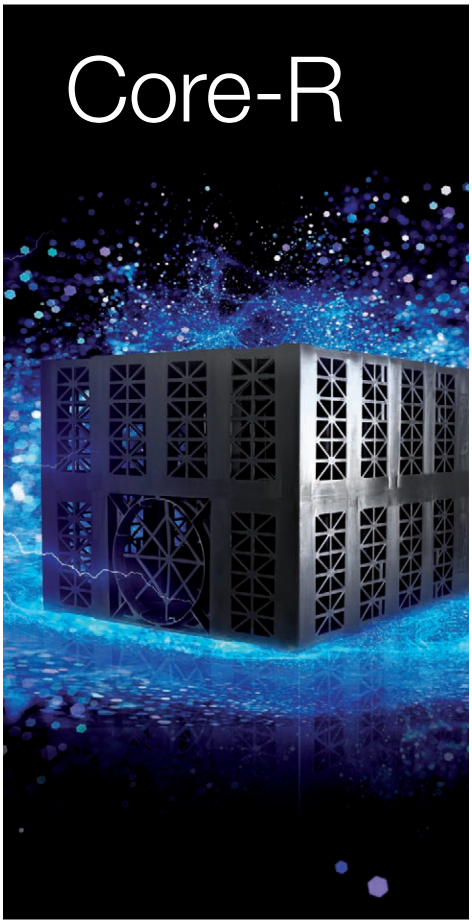
# AquaCell systems

## Product and installation manual



# Contents




# 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.

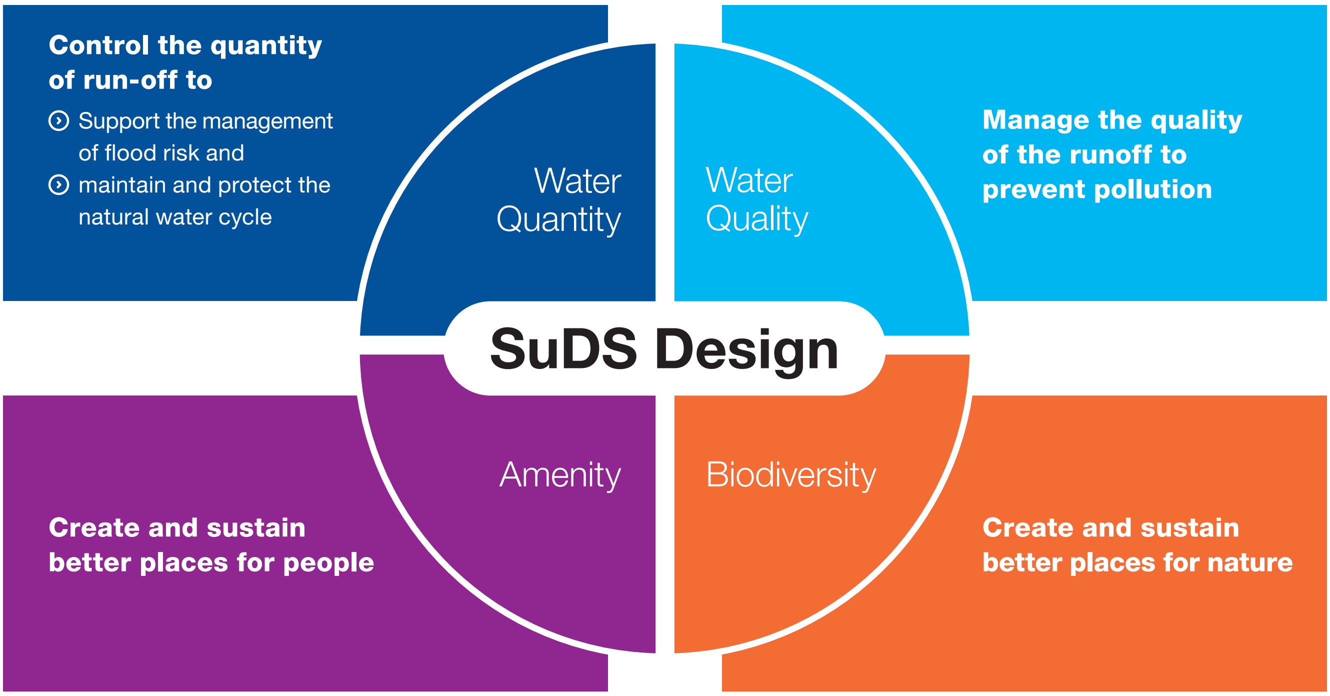
### Which SuDS components are best?

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

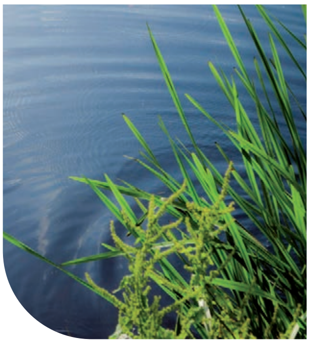
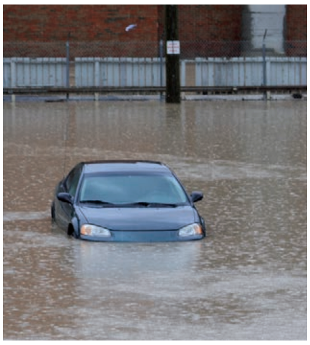
Nearly half the EU population lives in 'water-stressed' countries, caused by high extraction from freshwater sources, and demand is growing all the time. The EU Water Framework Directive introduces a new legislative approach designed to better manage and protect water resources, based not on national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

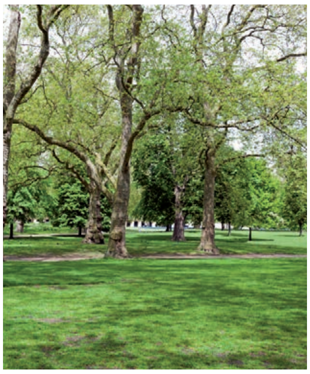
# Overview

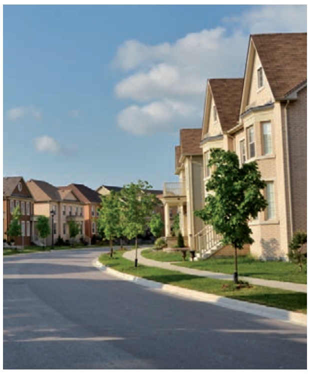
The AquaCell range of geocellular systems are a fully tried and tested, BBA approved, modular technique for managing excessive rainfall.

### 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:

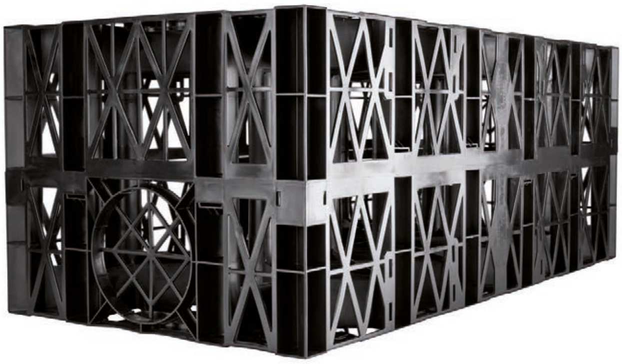
- BBA Approved – certificate No. 03/4018
- Modular, lightweight and versatile
- Easy to handle and quick to install
- Proven clip and peg connection system
- 95% void (each unit holds 190 litres of water)
- Can be brick-bonded for extra stability
- Units can be mixed and matched together for optimum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

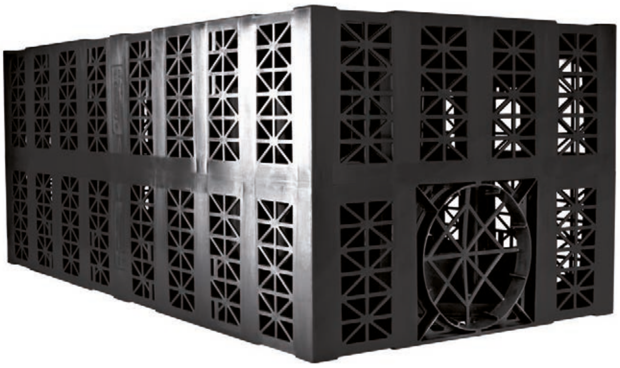
- Reduced flooding risk
- Controlled release of stormwater into watercourses or, where permitted, existing sewer systems
- Recharging of local groundwater (if infiltration/soakaway application)
- Aerobic purification to improve water run-off quality
- Sustainable, cost effective management of the water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

# Eco



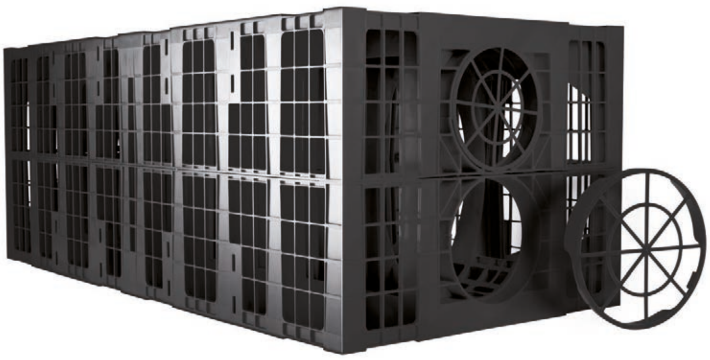
Eco is manufactured from specially reformulated, recycled material and has been designed for shallow, non-trafficked, landscape applications.

# Core-R



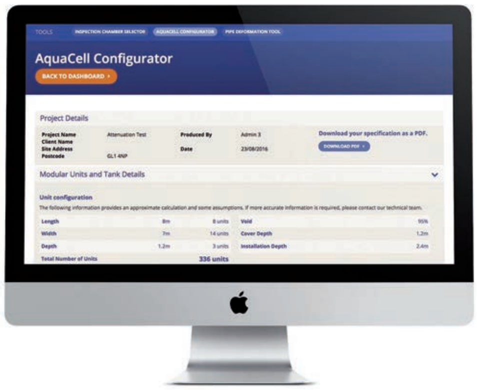
Core-R has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's.

# 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

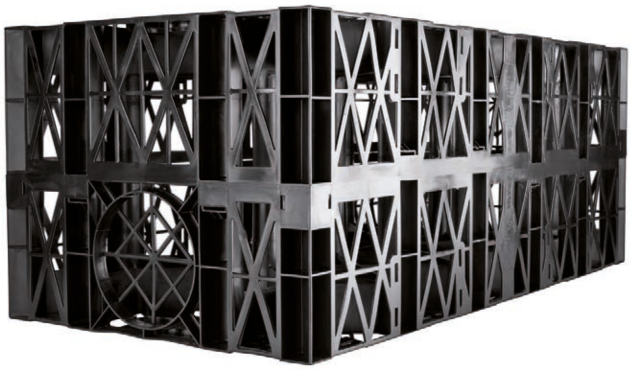
AquaCell Eco is manufactured from specially reformulated, recycled material and has been specifically designed for shallow, non-trafficked, landscaped applications. AquaCell Eco is **NOT** suitable for locations subject to high water tables.

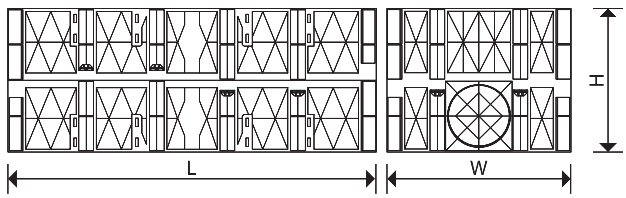
AquaCell Eco is typically suitable for installations to a maximum depth of 2.68 metres, to the base of the units from ground level, with a minimum cover depth of 0.3 metres, (CIRIA's recommendation, is to allow a cover depth of 0.5 metres in applications where a ride on mower may be used).

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.



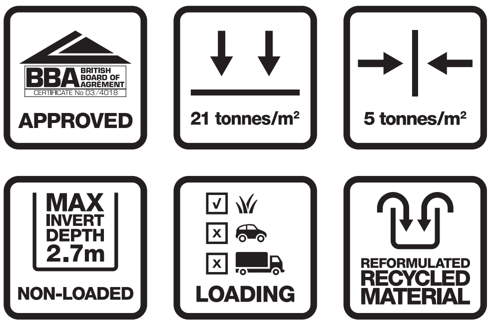



Material: Reformulated polypropylene

| 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

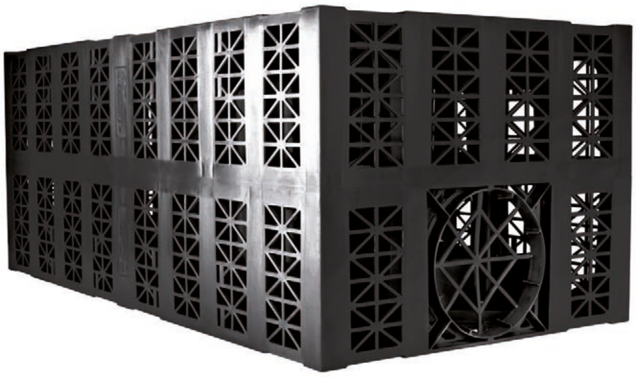
AquaCell Core-R has been designed for use in deep applications, subject to regular and heavy traffic loadings, e.g. cars and HGV's. AquaCell Core-R can also be used for deep soakaways and landscaped applications.

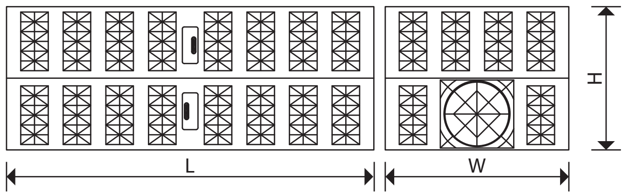
Typically for use down to depths of 6.68m in landscaped areas (6.43m trafficked by cars) to the base of the units from ground level, in best soil conditions.

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.

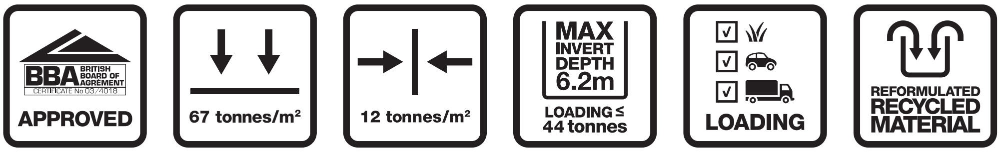
### Features and benefits

- 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]

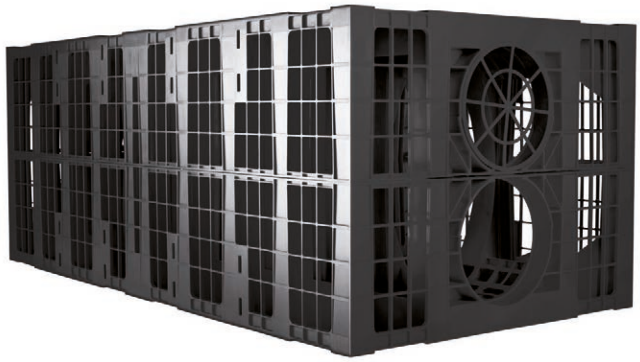
| Typical soil type | Soil weight kN/m³ | Angle of internal friction φ (degrees)[2, 3] | Landscaped areas | Vehicle mass <9 tonnes[4, 5] | Vehicle mass <44 tonnes |
|---|---|---|---|---|---|
| Over-consolidated stiff clay | 20 | 24 | 3.85 | 3.61 | 3.36 |
| Silty sandy clay | 19 | 26 | 4.35 | 4.09 | 3.83 |
| 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 |

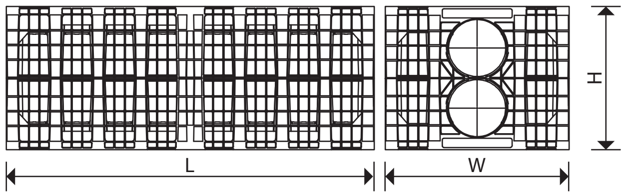
(1) Without groundwater present below base of units – AquaCell Core-R may be used where groundwater is present, contact Wavin for technical advice.
(2) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing 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.

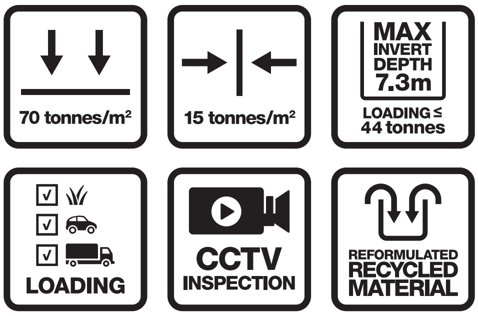
Typically for use down to depths of 7.82m in landscaped areas (7.57m trafficked by cars and 7.3m trafficked by HGV's) to the base of the units from ground level, in best soil conditions. Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum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

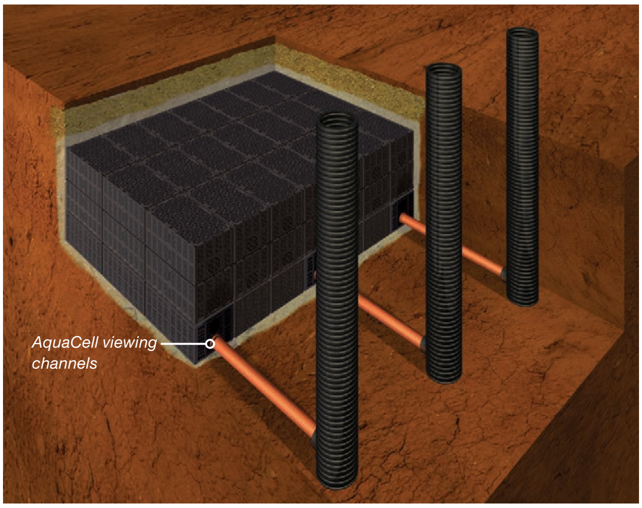
CCTV inspection at every inspection point is recommended:
— after every major storm
— at regular intervals according to the specific maintenance plan for the site

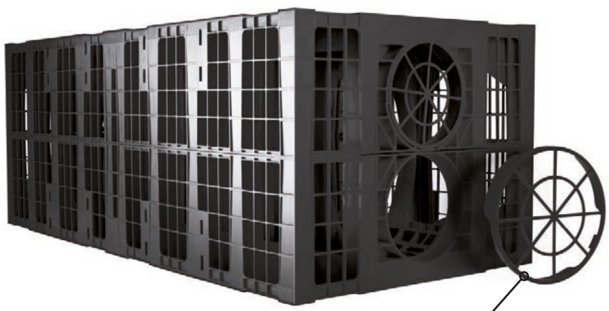
Silt traps prior to inlet pipework should be routinely inspected and cleaned out to minimise debris reaching the tank.
It is important to prevent construction silt from entering the AquaCell structure.

### Inspectability scenarios

AquaCell Plus-R viewing channel

Trafficked tank installation with inspection chambers



*End cap for when an inspection channel is not required*

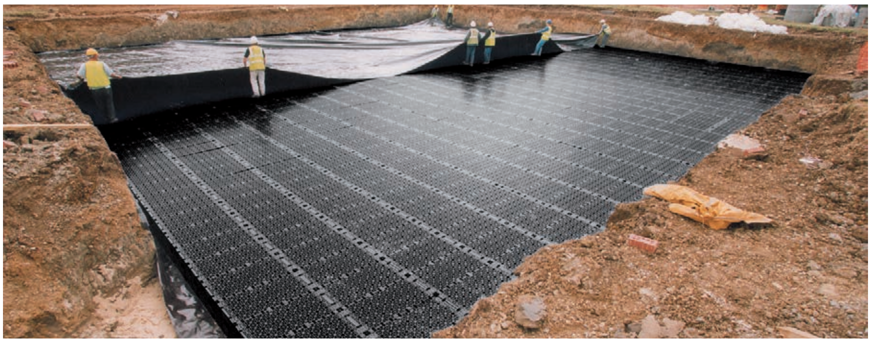
# Design guidance

## 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.

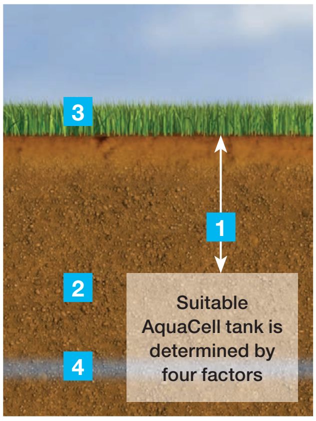
To guarantee the structural integrity of an engineered drainage system, any underground structure must be strong enough to support the loads to which it will be subjected without any unacceptable deflection.

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.

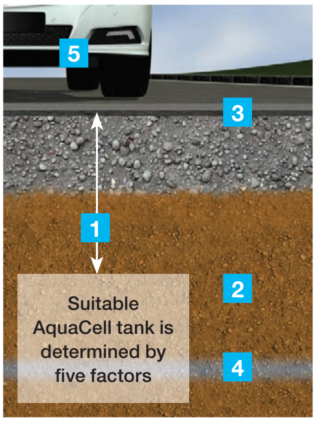
The five key site considerations to be noted when designing a geocellular structure are:

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.

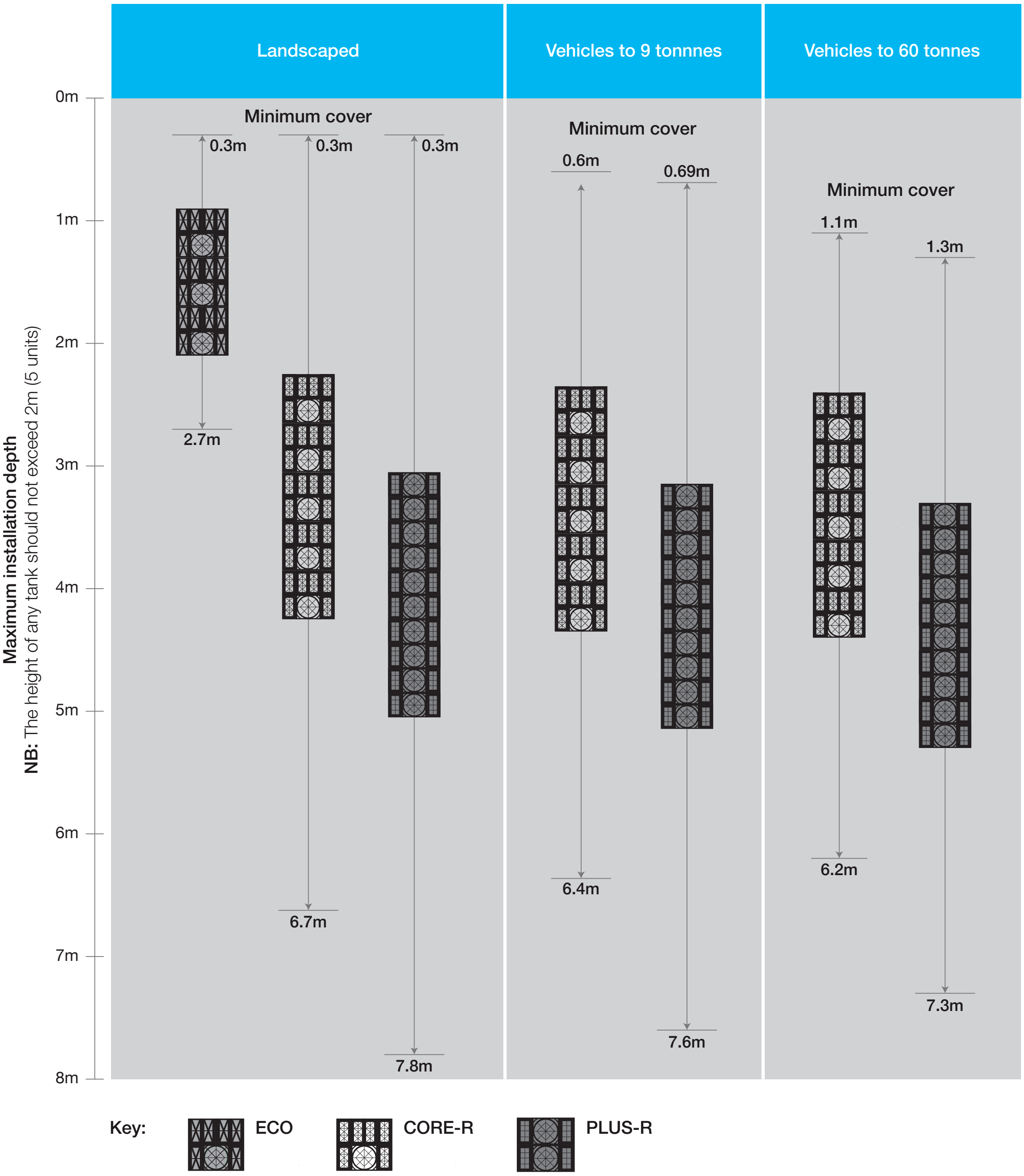
(3) Allowable maximum depth to base of bottom layer of units is dependent on soil type, angle of shearing resistance, loadings, and groundwater level. The above depths are based on 38° angle of shearing resistance and no groundwater.

**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.

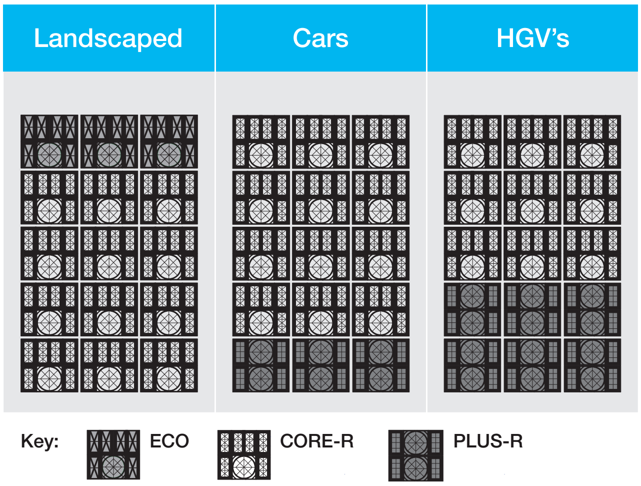
# Design guidance

### 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.

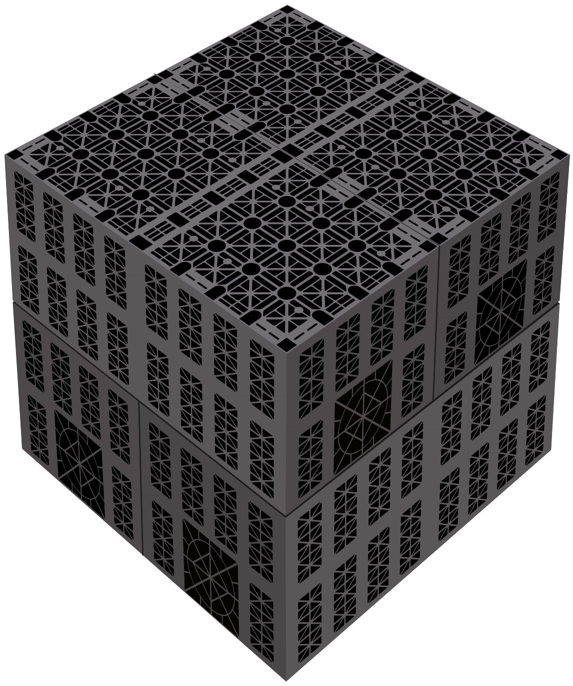
This helps minimise continuous vertical joints in the assembly, and gives the structure extra stability.

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.

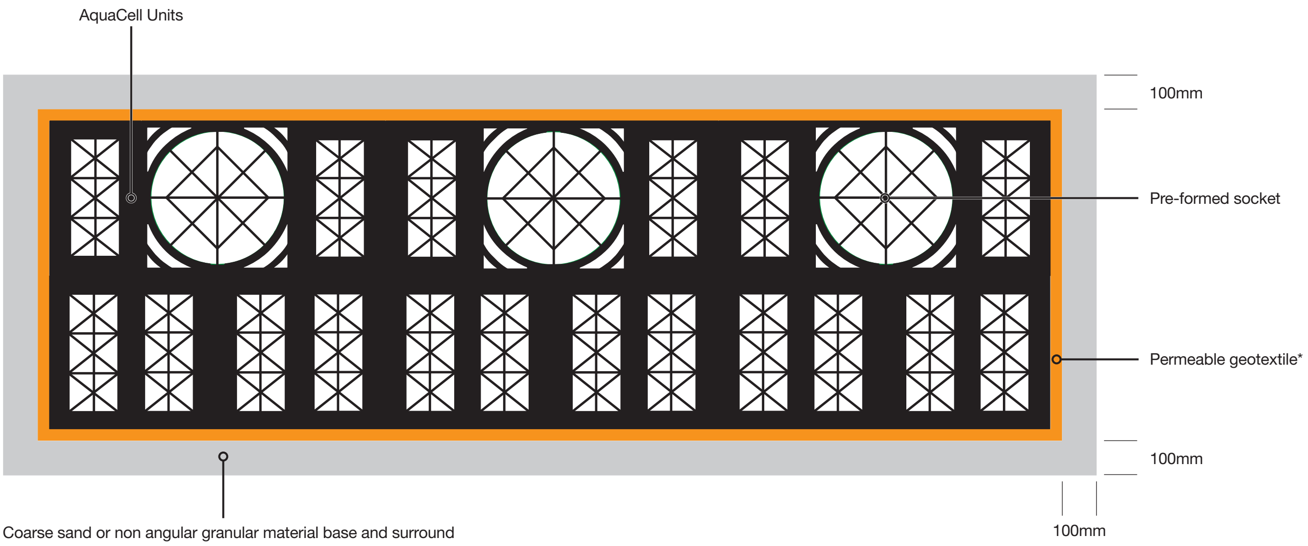
The 150mm Flange Adaptor (6LB104) should only be used when constructing an air vent on the top surface of an AquaCell Eco unit. The adaptor should not be used to connect inlet pipes to the side of an Eco unit.

# 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.

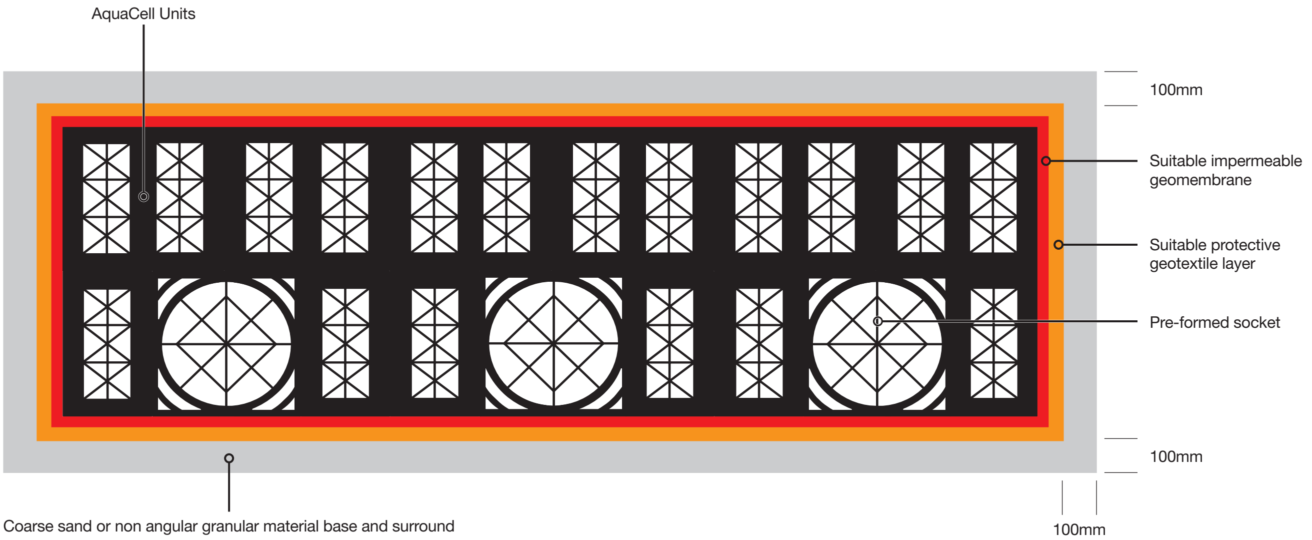
**The geotextile should be selected according to specific site conditions. Specialist advice should be sought if surrounding soil characteristics exhibit a high degree of fines/low infiltration capacity and/or there is a high risk of damage from ground contaminants.*

# 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.

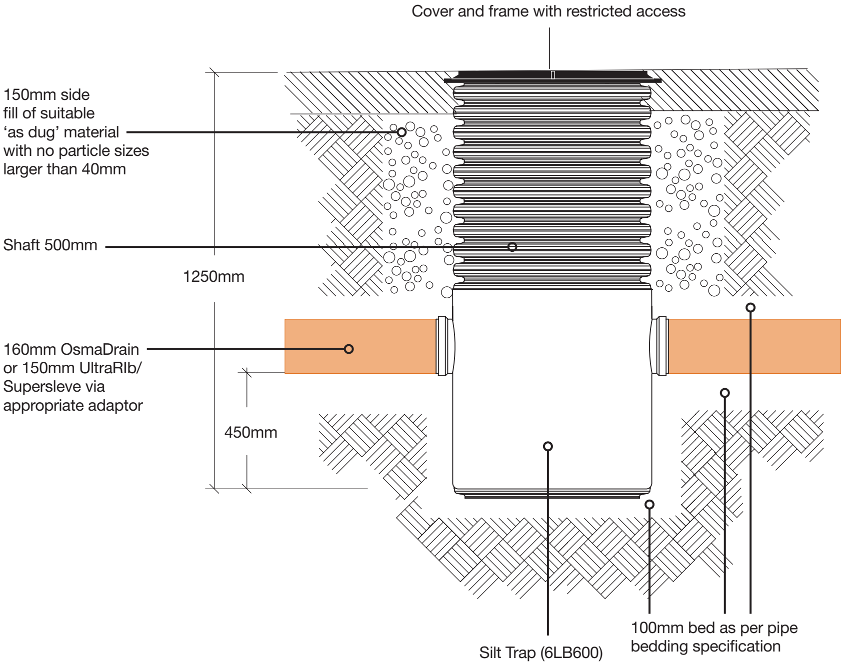
*1. For protective geotextiles CIRIA C753 – The SuDS Manual recommends a geotextile of at least 2mm thick and 300gsm.*

*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

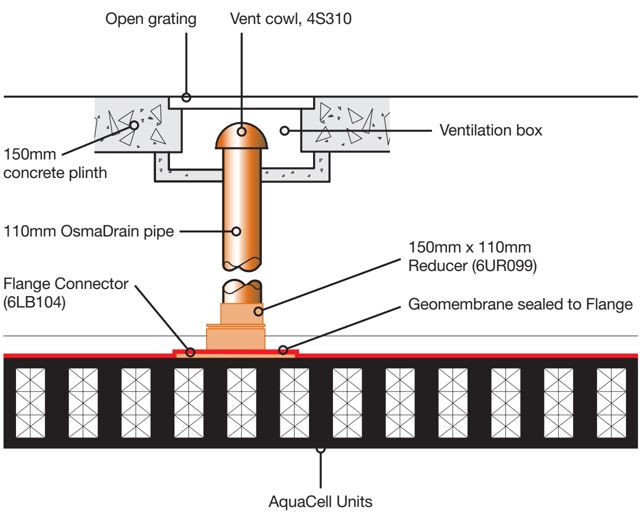



### Typical installation procedure

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).

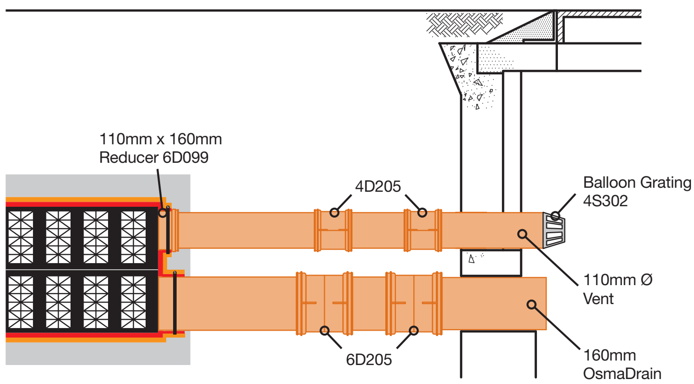
### Typical Air Vent design




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.

### Typical Air Vent through manhole

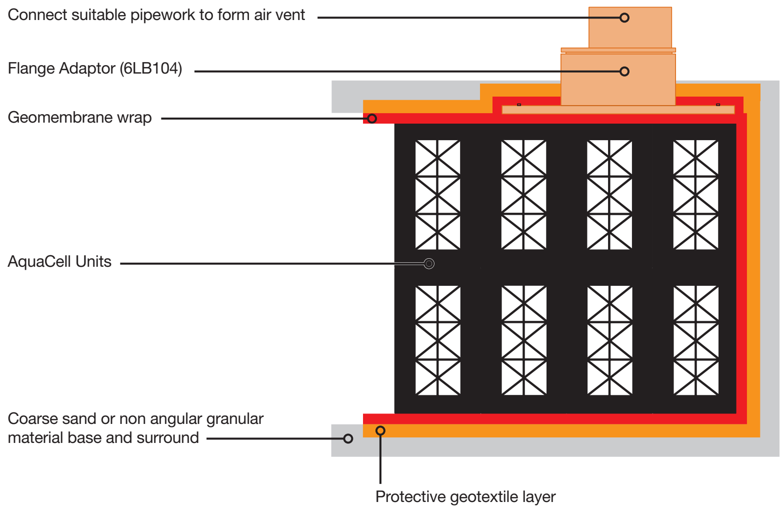



NOTE: It is recommended that one vent pipe, 110mm in diameter, is provided per 7,500 square meters of impermeable catchment area on a site. Please contact Wavin Technical Design for further details.

# Connections

## Top connection for Air Vent

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

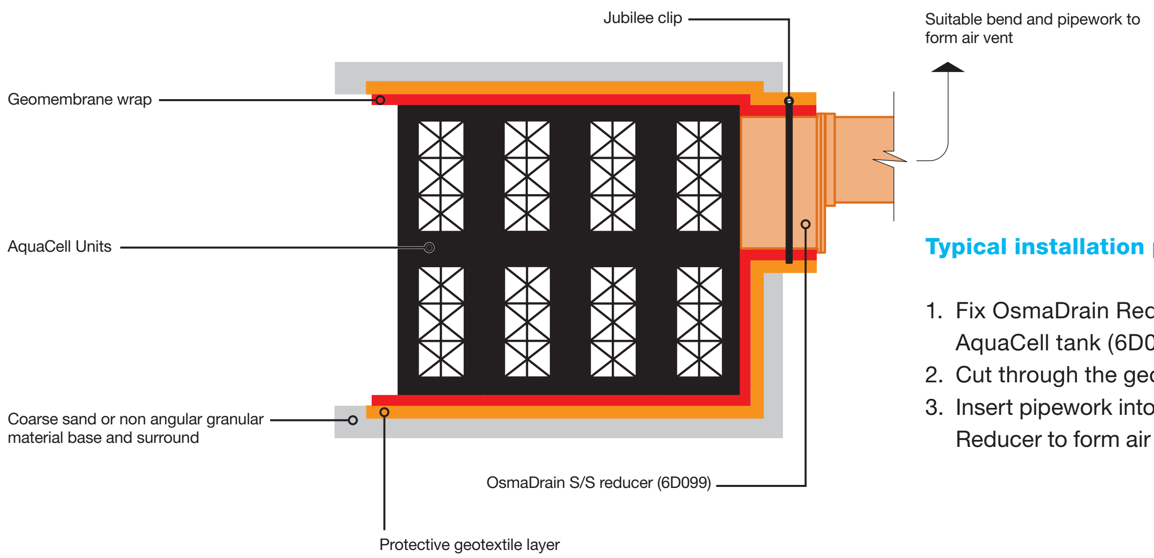



### Typical installation procedure

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

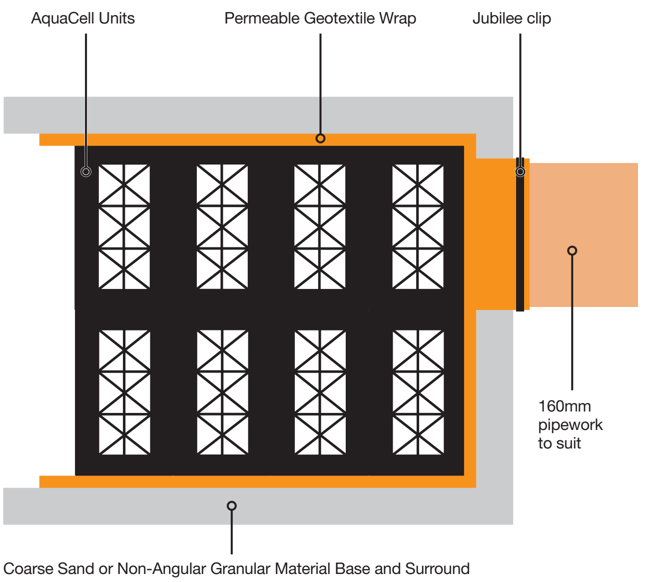
Connect into the side of the AquaCell tank unit using standard Reducer.




### 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

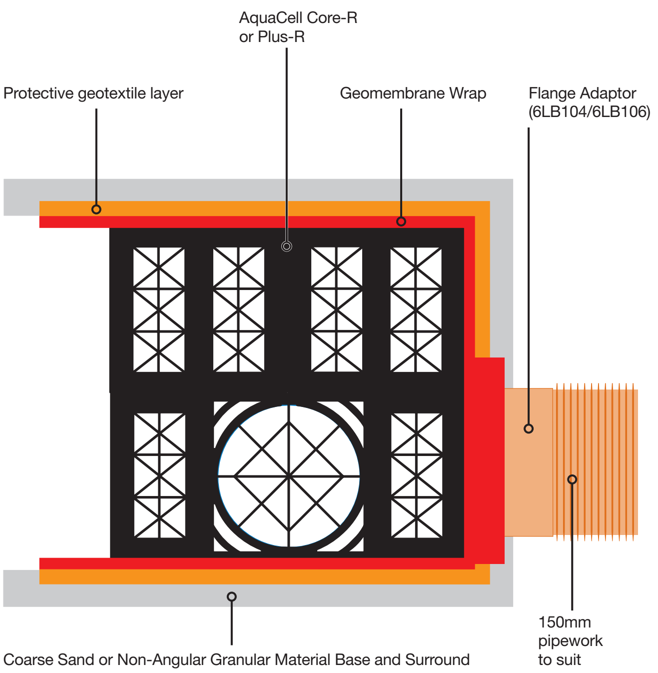



## Connections to AquaCell units

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:

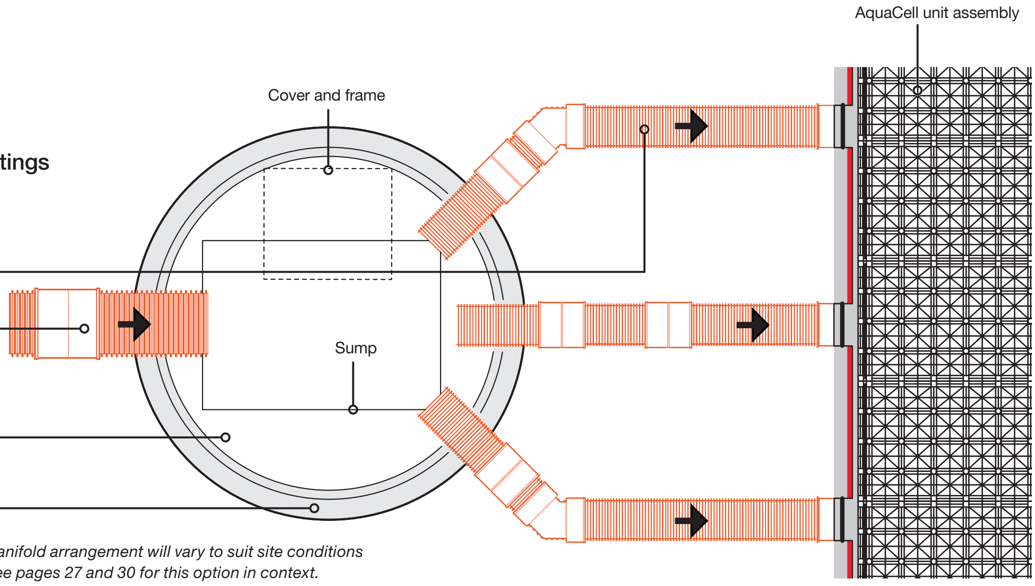
- 9TW145: UltraRib 225mm Spigot Adaptor connects to 225mm Twinwall
- TA/4: UltraRib 225mm Spigot Adaptor connects to 225mm Supersleve Clay

# 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

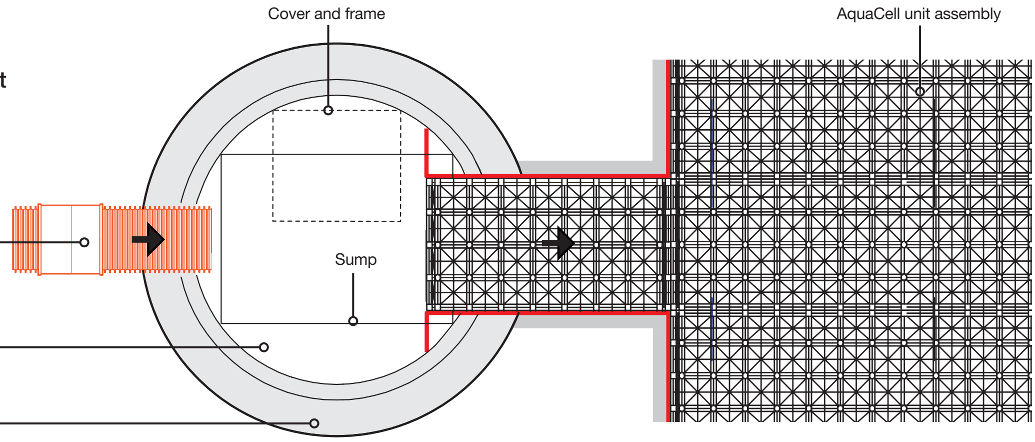
### Using standard pipes and fittings




*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

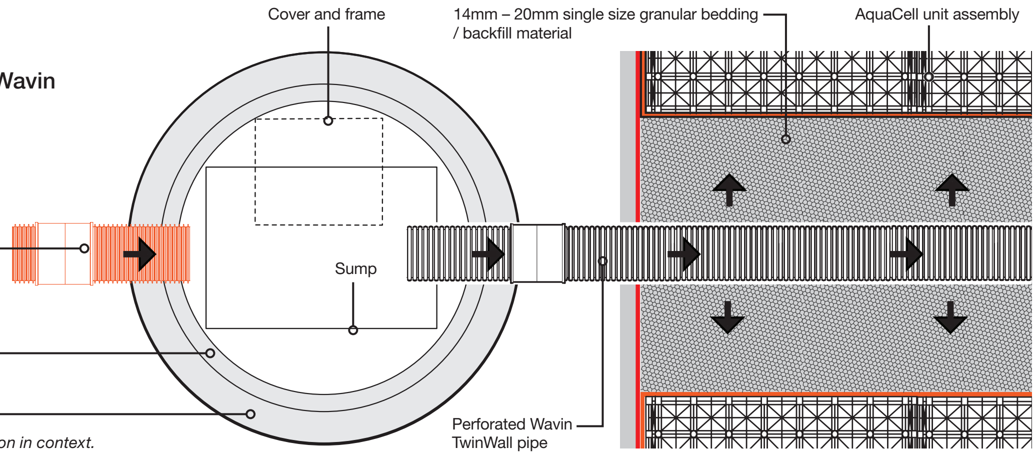
### Using AquaCell units for fast water transfer




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

## Central pipe connection

### Using standard perforated Wavin TwinWall pipe and fittings

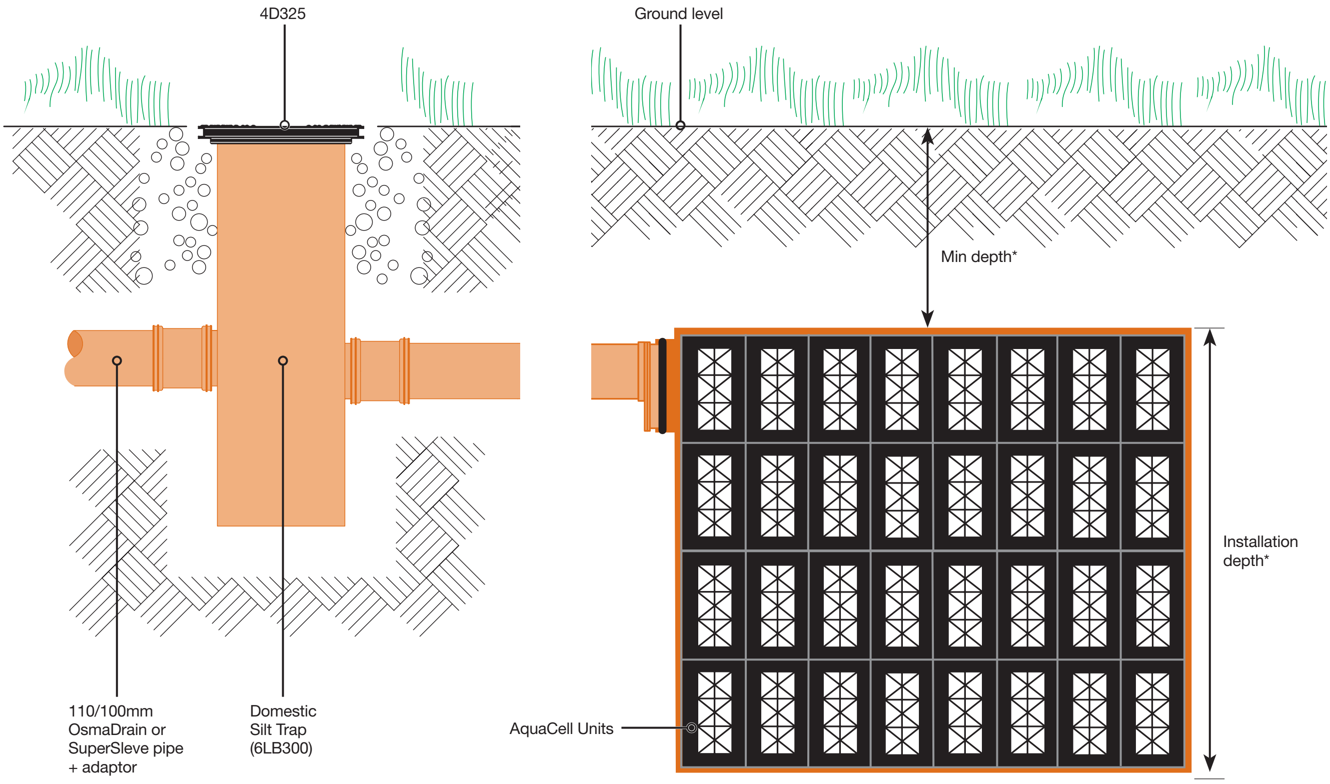



*NOTE: See pages 28 and 31 for this option in context.*

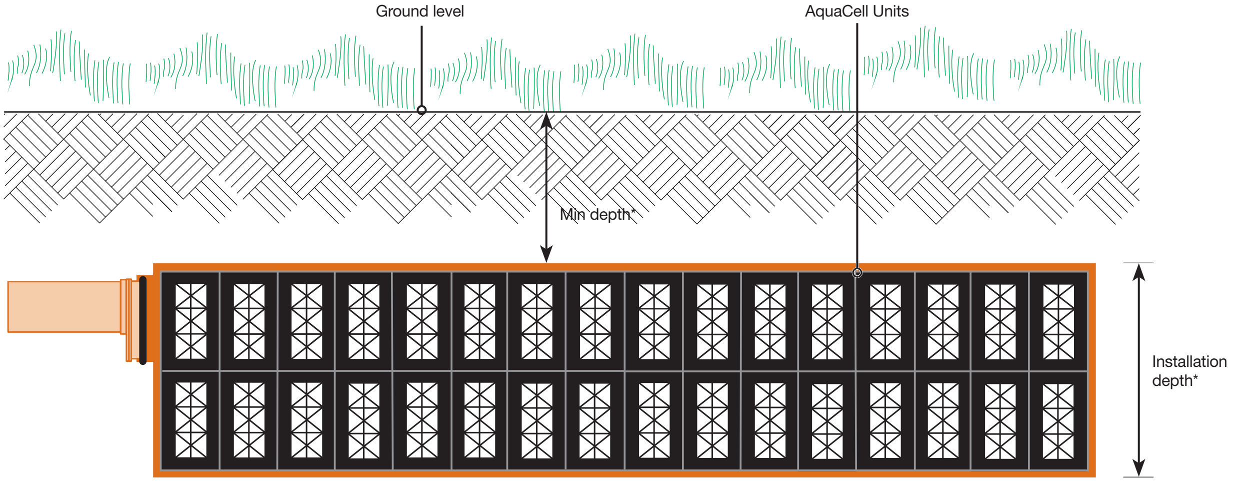
# Soakaways

## Soakaway – non-traffic loading

### Soakaway



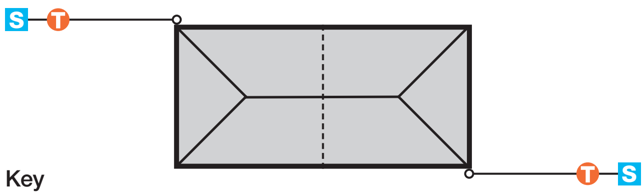

### Trench soakaway




**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.



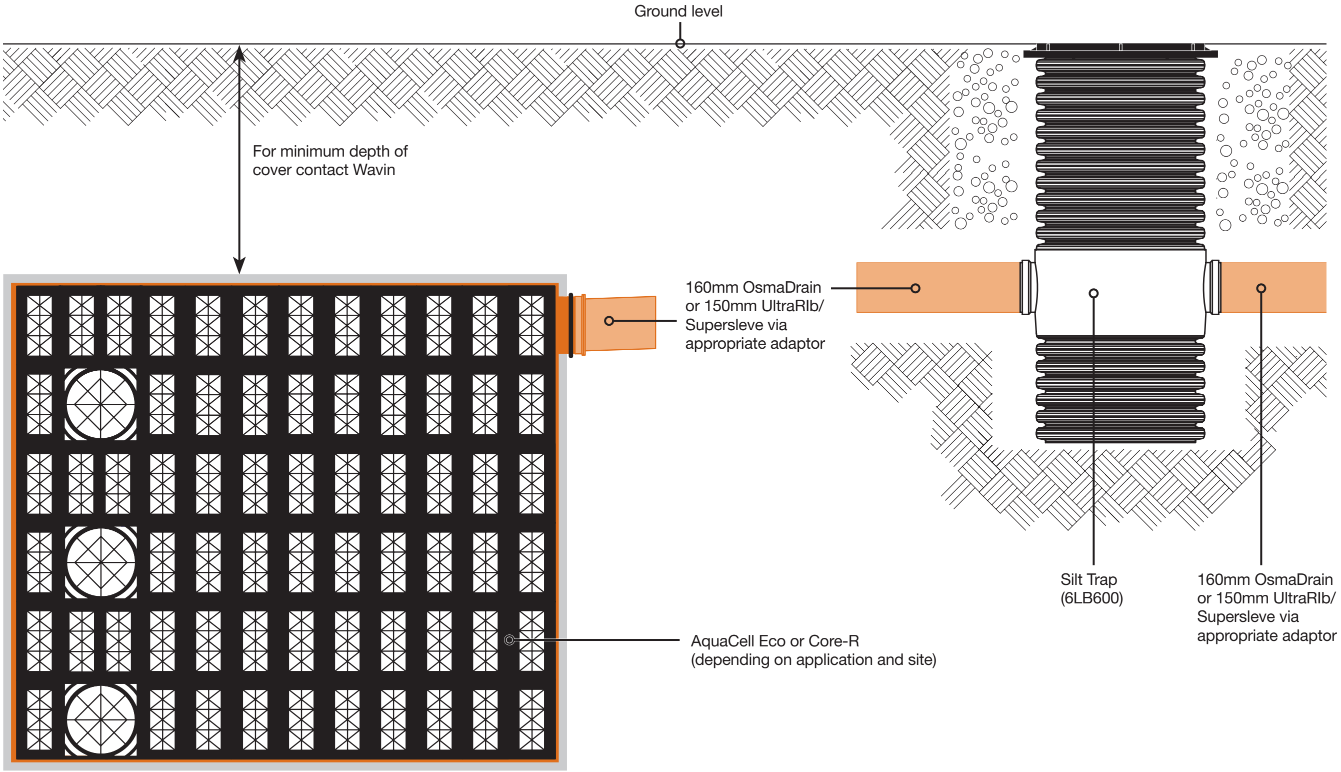

**Key**

S = AquaCell units soakaway (See note 2)

T = 250mm Dia Silt Trap

# Soakaway – traffic loading

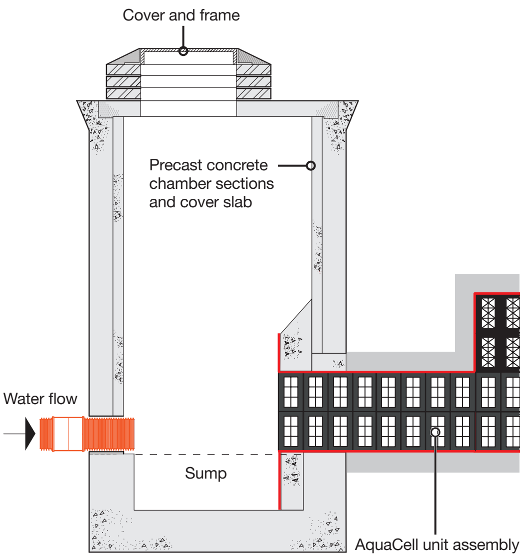
## Soakaway



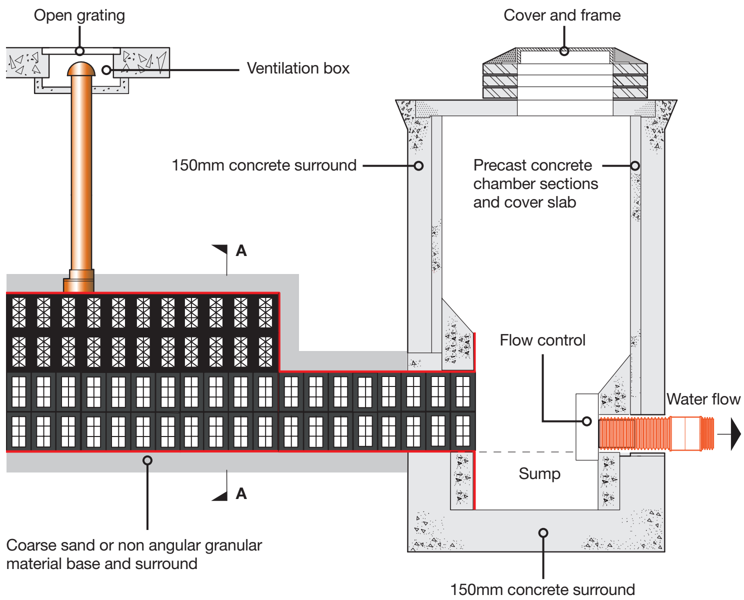
# On-line storage

## On-line storage – box feed

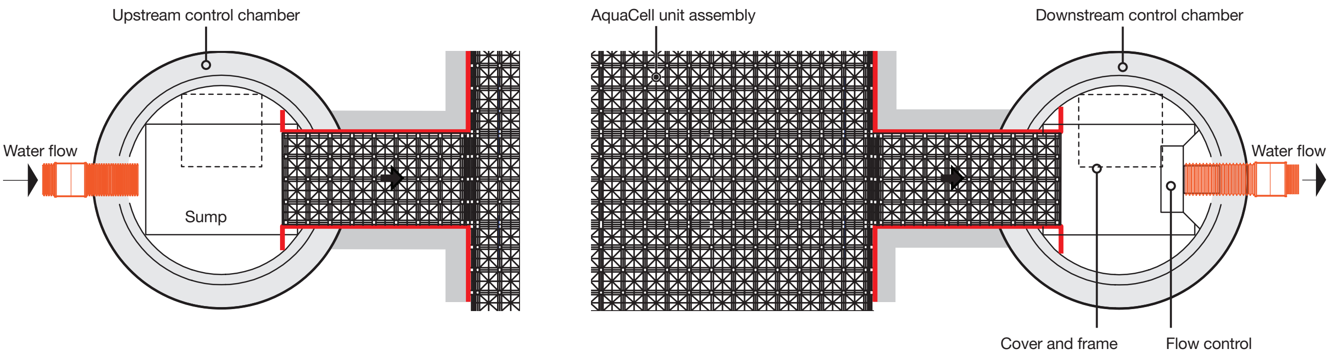
### Long section



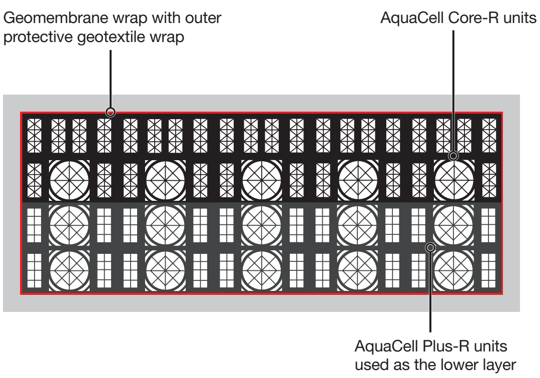

### Typical vent detail




### Plan




### Cross section A-A

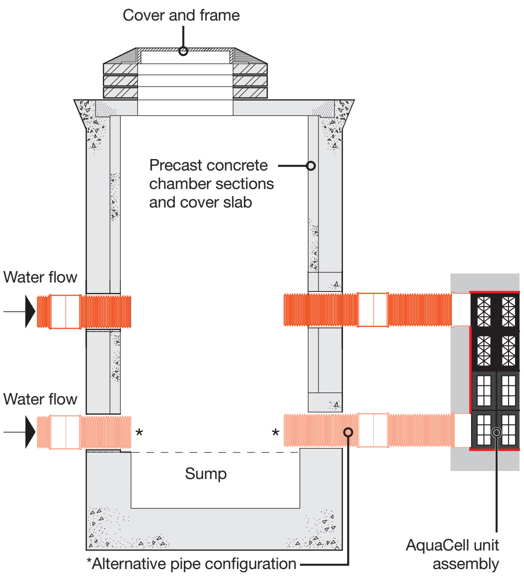



### What happens to the water?

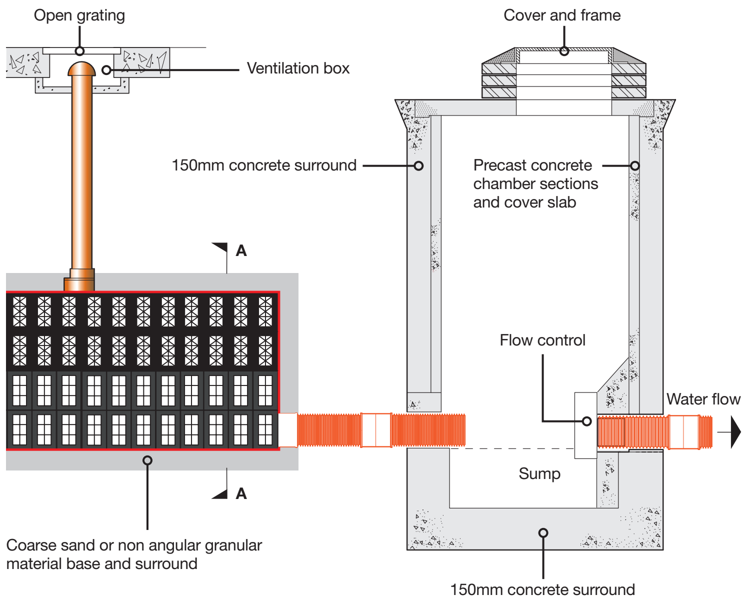
1. The water level in the upstream control chamber rises.
2. Then, during a storm event, the AquaCell storage assembly quickly fills with water via the AquaCell feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream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

# On-line storage – manifold feed

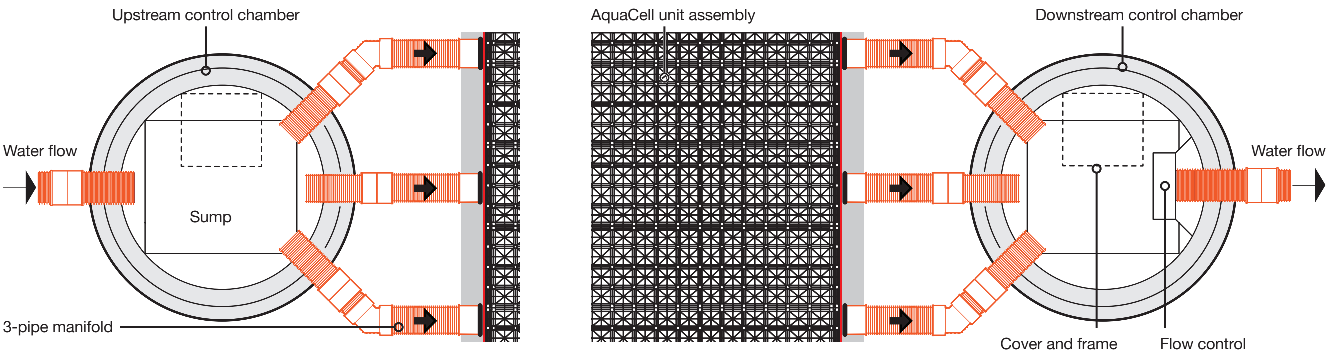
## Long section



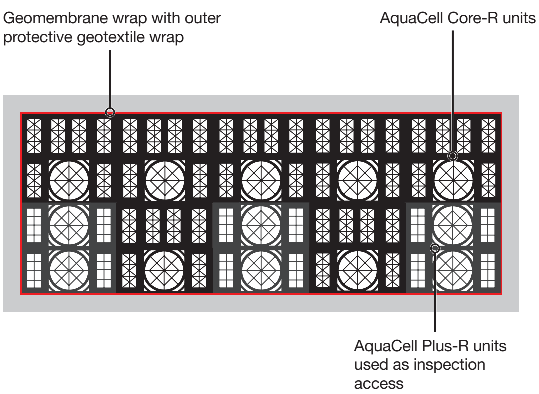

## Typical vent detail




## 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.