

Stormwater Management

Keyline offers Stormwater Management Systems which provide versatile and cost effective methods of controlling rainwater run-off from impermeable areas.

AquaCell systems are designed to offer an integrated surface and stormwater run-off management system. AquaCell can be used for soakaway and storage applications in areas remote from public sewer or water course, and within urban, fully sewered areas to limit the impact of development run-off. This is particularly beneficial in areas liable to flooding.

The Garastor stormwater attenuation system uses a polypropylene control chamber connected to a water storage reservoir either located in a void beneath the garage of individual houses or made up of AquaCell units.



AquaCell Systems: how they work

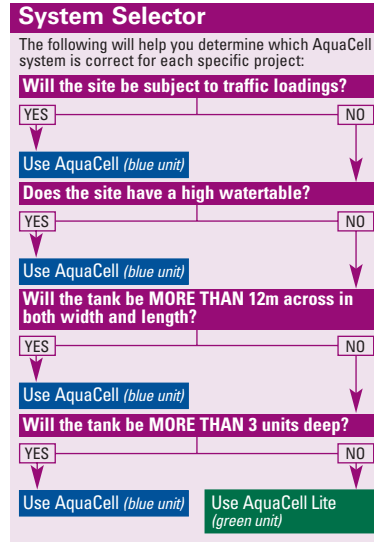
Stormwater exceeding the capacity of the conventional drainage system is attenuated by the control manhole and channelled into the AquaCell unit assembly. The internal structure of each unit is designed to bring surging water under control and hold it in temporary storage. If the wrap that envelops the unit assembly is impermeable the water will remain in the unit assembly until such a time as it can flow back into the control chamber and discharge through the outflow control.

However if the wrap is permeable, the temporarily stored water may be released into the surrounding ground, soil conditions permitting. By controlling the stormwater at source and recharging the local groundwater it not only eases the pressure on conventional drainage systems but benefits the local environment as well.



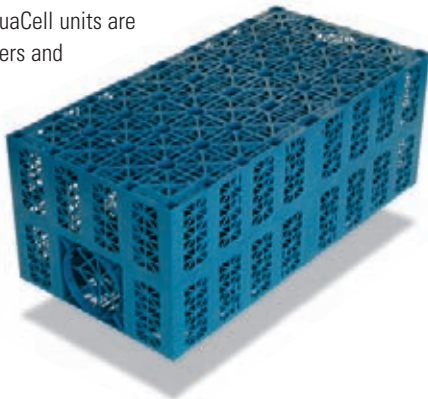
Key Benefits

- Significantly reduced risk of flooding and its consequences
- Controlled and reduced volume discharge into existing main sewer systems and water courses
- Aerobic purification stimulated within the system improves water quality
- Sustainable, cost effective management of the water environment
- Recharging the local ground water
- BBA approved
- Meets the technical requirements of the NHBC



AquaCell Stormwater Attenuation and Infiltration

The OSMA AquaCell unit is modular (1.0m x 0.5m x 0.4m), has a capacity of 190 litres and weighs 9kg. It is 95% void and has a surface area that is 43% perforated. Conical columns within the unit ensure high strength and rigidity. AquaCell units are clipped together in single layers and pegged together in multiple layers. Conventional pipework is connected to the units by means of a number of adaptors.



AquaCell Stormwater

Supplier Code	Description	Keyline Code
6LB100	AquaCell Unit	992674
6LB050	AquaCell Lite Infiltration Unit	222571
Ancillary Items		
6UR141	S/S Adaptor - 6UR Socket x 160mm BS EN 1401 Spigot for connection to Osma UltraRib in Infiltration Unit	800828
6UR099	S/S Level Invert Reducer - to 110mm OsmaDrain Pipe	800831
6TW141	S/S Adaptor - 6TW Socket x 160mm BS EN 1401 Spigot	924181
6D099	S/S Level Invert Reducer - to 110mm OsmaDrain	711893
4D916	PE Adaptor - 160mm Spigot Connection to OsmaDrain	-
6LB104	Flange Adaptor - 6UR Socket for Connection of Osma UltraRib to Infiltration Unit Positions other than Preformed Opening	514347
6LB105	AquaCell Clip (spare) - for Joining Infiltration Units	992675
6LB102	AquaCell Shear Connector (spare) - for Joining Infiltration Units in Multi Layer Installations	514350
6LB600	500mm Silt Trap - 1.25m depth	536805
6LB106	225mm Flange Adaptor	-

AquaCell Lite

OSMA AquaCell Lite has been designed and developed for landscaped and other **traffic-free areas** where heavy loading capability is not required.

This now enables specifiers, developers and contractors to choose the right product to suit each situation.

The new AquaCell Lite (green unit) offers all the proven installation versatility and functional performance advantages of the original AquaCell blue unit, but it has been specifically engineered to provide a cost-effective option for low-loaded locations.

In addition to features and benefits applicable to BOTH systems those specifically applicable to AquaCell Lite (green unit) include:

- Proven vertical loading capacity: 17.5T/m²
- Proven lateral loading capacity: 4T/m²
- For installation depth (to base of units) of up to 1.5m maximum

- Built in 'hand holes' for easy carrying/handling
- Distinctive GREEN colour – easy to identify
- Specifically designed for restricted depth, low loaded, landscaped sites: – ideal for smaller projects.

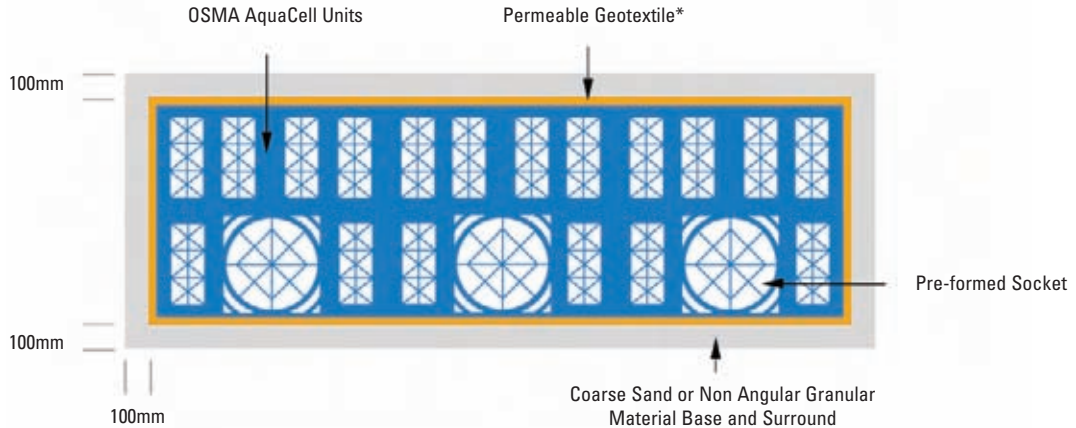
Note: NOT suitable for locations subject to a high water table.

Typical applications: Domestic gardens,
grassed and leisure
areas, roundabouts.

See previous page for AquaCell technical information.



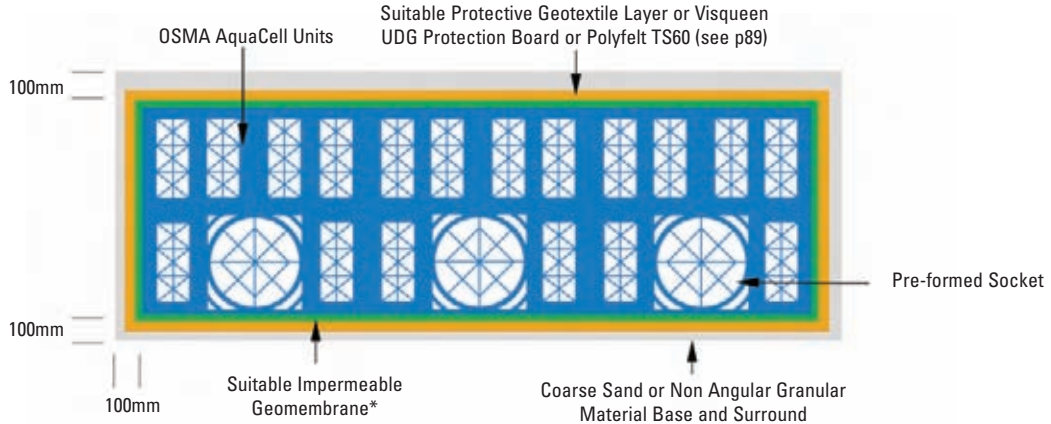
Typical Soakaway Installation



Important

*If the AquaCell unit is used as a soakaway, wrapping the structure in a geotextile Lotrak 2300 should suffice.
AquaCell - very robust modular units for trafficked installations.

Typical Storage Tank Installation/Attenuation Tank Installation

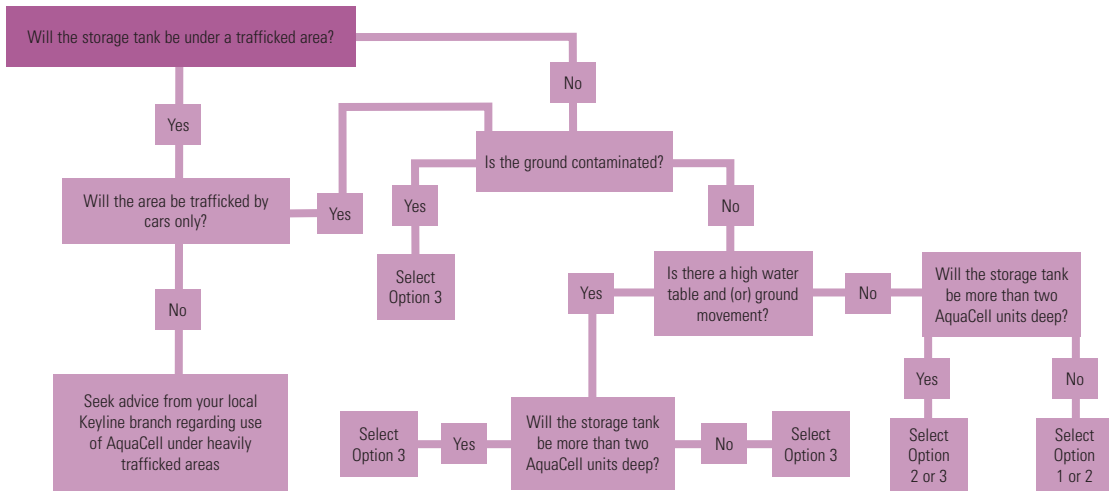


Important

*Please refer to the Visqueen Geomembrane Section flow chart on the page below.

AquaCell - very robust modular units for trafficked installations. AquaCell Lite – Lighter version designed for non-trafficked installations.

Visqueen Geomembrane Selection Flowchart



Options from Visqueen

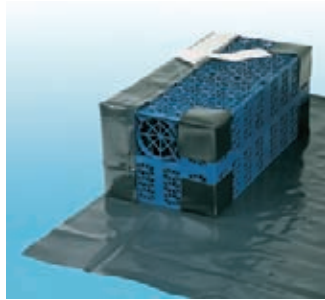
- 1 = Visqueen Urban Drainage Geomembrane Taping System
- 2 = Visqueen Urban Drainage Factory-welded Geomembrane panels (finished on site with tape)
- 3 = Visqueen GX Geomembrane (fully welded on site)

Notes:

- 1) For options 1 & 2, Visqueen UDG taping joint, corner protection units & protection board (or protective geotextile fleece) will be required.
- 2) In all situations Option 3 would be suitable, especially if it is preferable to have no taped joints on site.
- 3) All geomembranes must be installed in accordance with the Visqueen Building Products Instructions.

Visqueen Urban Drainage Geomembrane

- A comprehensive system for use with Stormwater Management Attenuation systems
- Visqueen Urban Drainage Geomembrane is available in factory-welded panels to allow for faster installation times
- Visqueen UDG Taping System allows for flexibility of on-site fabrication for small domestic applications
- Meets the requirements of Wavin Plastics Ltd when installed in accordance with Visqueen Building Products instructions



Description

The Visqueen Urban Drainage Geomembrane System has been specially designed and tested for use with underground stormwater storage systems. Wavin has accepted it for use with their AquaCell Stormwater Management System when installed in accordance with Visqueen Building Products instructions.

Impermeable geomembranes used in stormwater storage systems are subjected to very high hydrostatic pressures during the lifetime of the system. To avoid geomembrane failure in these demanding applications Visqueen Building Products has designed a high performance geomembrane system.

The Visqueen Urban Drainage Geomembrane System has been comprehensively tested to ensure that it is capable of withstanding the hydrostatic pressures anticipated with underground stormwater storage facilities thereby providing an effective impermeable barrier for most stormwater management applications (when installed in accordance with Visqueen Building Products instructions).

Garastor: stormwater attenuation

The Garastor unit is a polypropylene chamber that connects to a water storage reservoir. There are two versions of the Garastor available both of which are 500mm in diameter, the 6SC500 version is 1m deep for garage installations (with a 300mm storage depth capacity) and the 6SC501 is 1.25m deep for use with AquaCell (with a 400mm storage depth capacity). When Garastor is used in conjunction with an AquaCell tank the configuration of units must be no deeper than 1 AquaCell unit. If site conditions are such that a deeper Garastor unit is required, then the 500mm Extension Kit (6SC205 – consisting of a coupler and two ring seals) can be used in conjunction with a shaft of 500mm TwinWall cut to suit, to extend the Garastor unit.

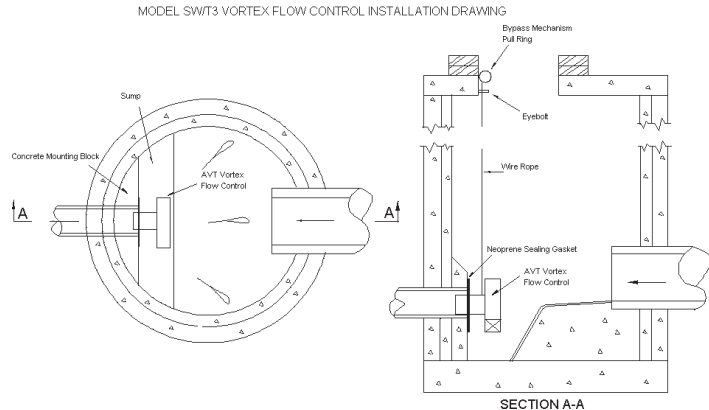
Garastor

	Supplier Code	Description	Keyline Code
	6SC500	1m Deep Unit (for use with garage undercroft)	523522
	6SC501	1.25m Deep Unit (for use with AquaCell)	523523
	6SC205	500mm Extension Unit	861676
	6SC200	Garastor Connection Kit	-

Flow Control Units

The vortex flow control is a self-activating flow control device which induces a vortex motion in the flow to control the rate at which water is allowed to enter downstream drainage systems. The energy inherent in the water flow is harnessed to generate the vortex and hence has no need of external energy requirements. The flow control itself has no moving parts.

The VFC has a superior hydraulic performance when compared to conventional flow controls such as orifice plates, throttle pipes and penstocks. With outlet diameters up to 400% larger than conventional flow control devices, the risk of blockage is minimised. VFCs have a unique head/flow characteristic with a distinctive “S” shaped curve with high flush and kick-back flow points. This characteristic can reduce storage volume requirements thereby lowering project costs.



Applications

- Control of surface water run-off from
 - Housing
 - Industrial developments
 - Infrastructure developments
 - Land drainage
- As part of flood and pollution alleviation schemes within
 - Existing sewerage systems
 - River networks
- Flow balancing in new and existing sewerage systems
 - Sewage treatment works
 - Potable water treatment plants
- Control of pass-on flows from
 - Combined sewer overflows
 - Storage tanks
 - Reservoirs
 - Swales

Advantages

- Less prone to blockage due to outlet cross-sectional areas of up to 4 times larger than
 - Orifice plates
 - Penstocks
 - Throttle pipes
- Unique blockage release mechanism which also allows
 - Downstream access for maintenance
 - Drain down
 - Easy operation from ground level
- Other features
 - No moving parts
 - Self-activating
 - No external energy requirements
 - Resistant to abrasion and corrosion
 - Individually designed
 - Savings in time and labour due to flexible installation methods
 - Unique head/flow relationship can produce savings in storage volumes

Charcon Permavoid™

With any SUDS system, the key element is the provision of water storage prior to controlled run-off. Charcon SUDS range offers a choice of storage options with benefits relevant to specific ground and site conditions. Technical advice is available on the optimum choice for a particular scheme.

SUDS Option 1 – Sub-base Replacement System

Charcon Permavoid™ is a unique high strength sub-base replacement system incorporating ties to create a structural raft. This highly-voided structure (92 per cent) ensures maximum water storage in a small area. Manufactured from recycled plastics, each unit weighs less than 3kg and is therefore easily handled on site. Charcon Permavoid™ has been independently validated through exhaustive laboratory investigations, field trials and computer modelling to evaluate hydraulic flow, structural integrity and water quality performance.

Charcon Permavoid™ is suitable for all applications where a traditional aggregate sub-base can be used. With specialist Geomembranes and Geotextiles provided from the Charcon range the system will provide either an attenuation or infiltration drainage solution. The system has the following benefits:

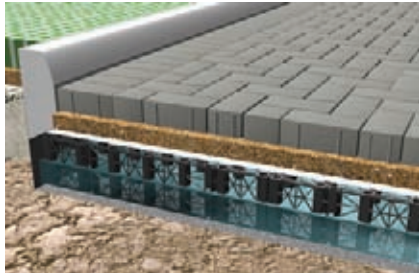
The high void capacity of Charcon Permavoid™ (92 per cent), typically a 4:1 ratio when compared with alternative granular systems, results in a reduced area of system thickness and usually allows for water storage to be confined within the sub-base layer. This approach often results in a lower overall cost.

Each Charcon Permavoid™ unit is only 150mm deep – at least one-third the depth of competing granular storage systems. This means a shallower construction minimising excavation and waste, particularly important on brownfield sites with contaminated ground and in view of the escalating costs of waste disposal.

Complementary products

Charcon offer the following complementary and unique products in addition to the Charcon Permavoid™ system, with the option of retro-fit for existing non-SUDS schemes.

- Charcon Permakerb™ and Charcon Permachannel™ convey rainwater into the Charcon Permavoid™ system through surface drainage systems, which integrate with conventional hard surfaces
- Charcon Permaceptor™ is an integral petrol/oil interception facility which eliminates the need for separate expensive conventional interceptor systems



SUDS Option 2 – Granular System

Incorporation of an open granular sub-base is the traditional method used as a water storage solution and can be adopted for both attenuation and infiltration systems.

The attenuation system pioneered by Formpave in conjunction with Coventry University, is offered by Charcon under licence from Formpave when used in conjunction with concrete block paving surfaces. The experience gained through many years of use of this system provides a strong proof of performance for clients opting to use this method.

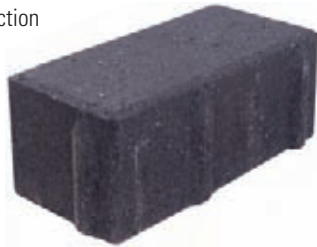


Charcon Infilta

Charcon Infilta is a rectangular block paving system incorporating a 5mm spacer design. Each interlocking unit with its specially designed structure, provides a 5mm void, allowing ingress of surface water through to the storage system below.

Available in a range of colours, Charcon's Infilta block paving offers all the strength and performance properties of Charcon's established range, with the added environmental benefit of sustainable drainage.

Infilta block paving can be used in conjunction with Charcon Permavoid or specified granular sub-base.



Features & Benefits

- Permeable surfacing
- Colour mix options to achieve subtle shade differences between adjacent blocks
- Can be easily lifted for access to services and reinstated without leaving the usual repair scars
- Offers good grip and high levels of durability

Standards

Infilta products comply with the performance levels in European standard BS EN 1338.

Marshalls Piora Block Paving

The occurrence of major flooding is becoming more common and has sent sustainable urban drainage systems (SUDS) to the top of the agenda for new developments. Marshalls Piora is an innovative block paving system, coupled to a specific design methodology and sub-base specification. Together, these contribute to a SUDS solution, which allows surface water to be controlled at source, draining directly into the sub-base. This reduces the requirement for additional drainage systems whilst at the same time recharging the natural groundwater, creating a cost-effective and environmentally friendly solution to the management of surface water run-off.

The Piora range is now extended to include Tegula, Mistral and the Rustic Olde options, combining the proven engineering benefits of the Piora Interblock system with the aesthetics of those popular products.



ACO GroundGuard

The award-winning lightweight ground reinforcement system. Ideal for stabilising grass or gravel, it helps eliminate the risks of pot holes, rutting or grass damage. The system is suitable for a wide variety of applications including paths, drives, parking areas and emergency access routes.

Key Benefits

Ideal for a wide variety of applications – vehicle and pedestrian traffic, fire access lanes and parking areas.

- Lightweight – just 1kg per piece
- Easy to handle and install – simple clip-together fixings
- Easily cut to shape for irregular edging
- Cost effective solution – competitive with asphalt or block paving
- Suitable for gradients up to 5% or steeper when pegged
- Eliminates gravel migration and raking



Wavin AquaGrid

AquaGrid is a high performance plastic pervious paving system for use in all types of Sustainable Drainage Systems (SUDS).

Key Benefits

The AquaGrid system provides benefits over traditional forms of grass protection and gravel retention systems such as:

- Interlocking and pinning arrangement
- Inter-connecting modular units
- Lateral flow capability
- 90% surface area available for infill
- Demarcation Blocks available for identification of car park areas

