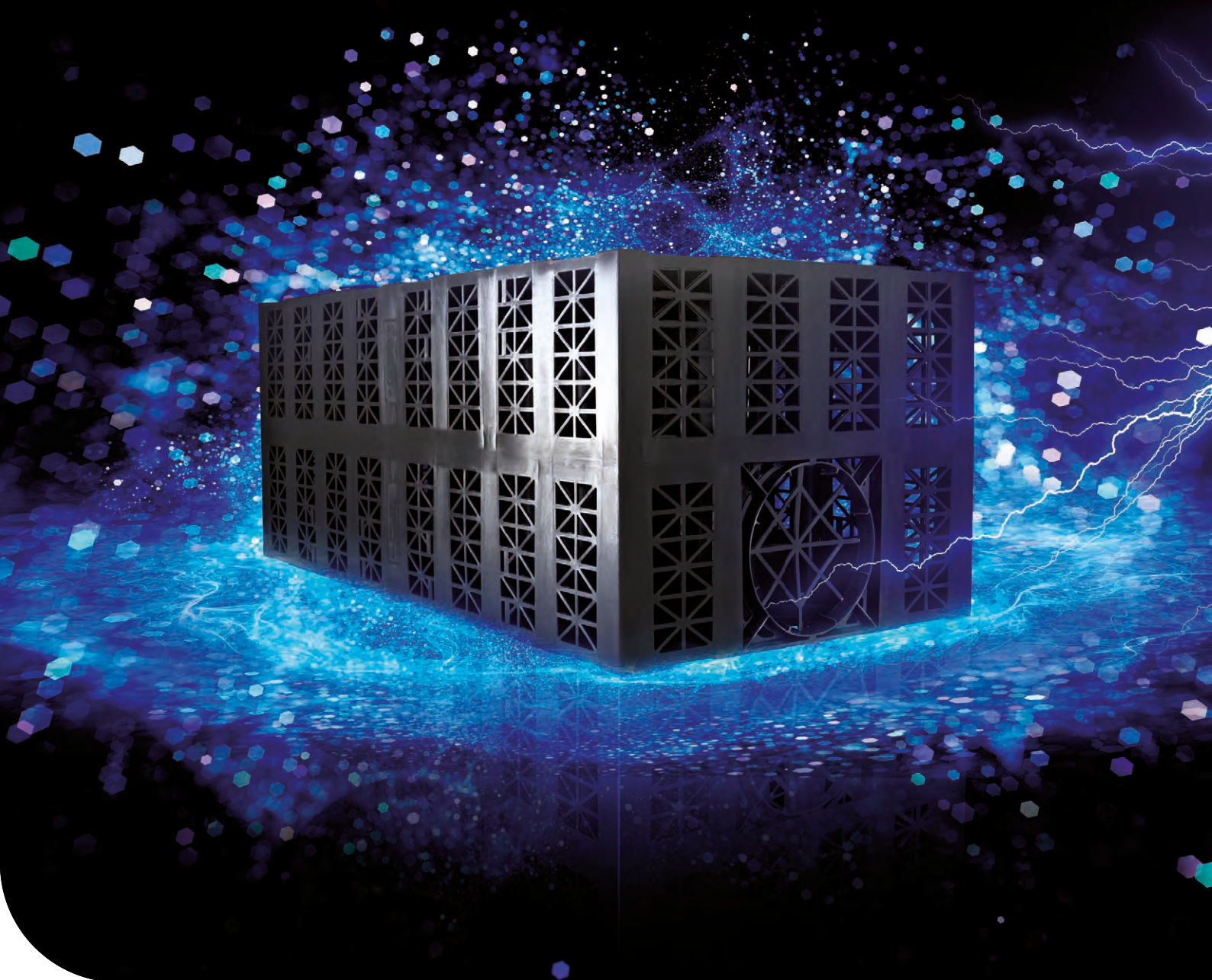


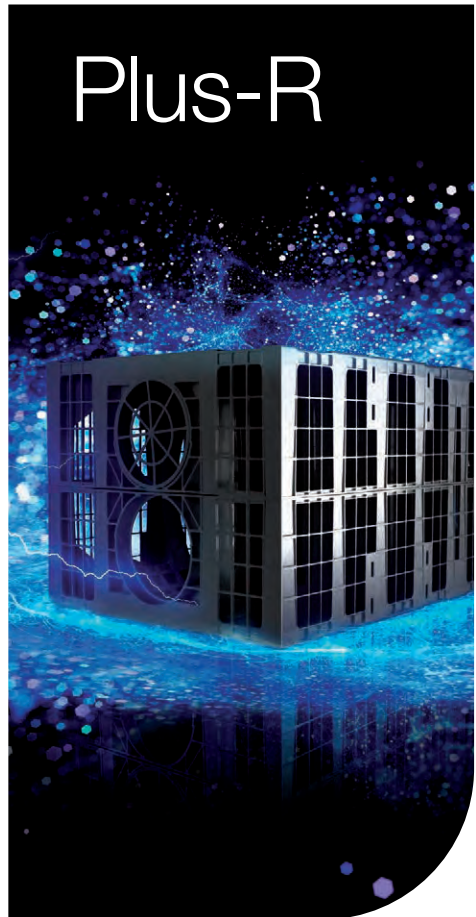
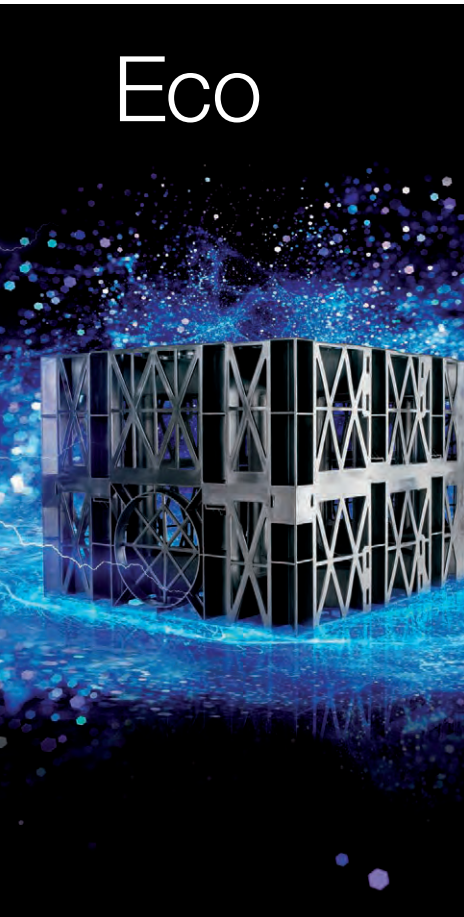
WATER MANAGEMENT

AquaCell systems

Product and installation manual



Contents



Introduction to SuDS	3	Installation	17	Wavin stormwater management .	32
Keeping you on top of legislation . .	4	Typical soakaway installation	17	Supplementary items	33
Overview	5	Typical storage tank installation	18	Silt Traps	33
Product range summary	6	Silt Trap and Air Vent termination	19	Ancillaries	34-35
Product details	7	Connections	20	Spares	36
AquaCell Eco	7	Top connection for Air Vent	20	Your notes	37
AquaCell Core-R	8	Side connection for Air Vent	20		
AquaCell Plus-R	9-10	Connections to AquaCell units	21		
Design guidance	11-15	Connection configurations	22		
Installation guidance	16	Soakaway – non-traffic loading	23		
AquaCell Core-R and Plus-R:		Soakaway – traffic loading	24		
Construction loads	16	On-line storage – box feed	25		
AquaCell Eco: Construction loads . . .	16	On-line storage – manifold feed	26		
		On-line storage – central pipe feed	27		
		Off-line storage – box feed	28		
		Off-line storage – manifold feed	29		
		Off-line storage – central pipe feed	30		
		Soakaway or storage tank –			
		with Silt Trap	31		

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 a 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.

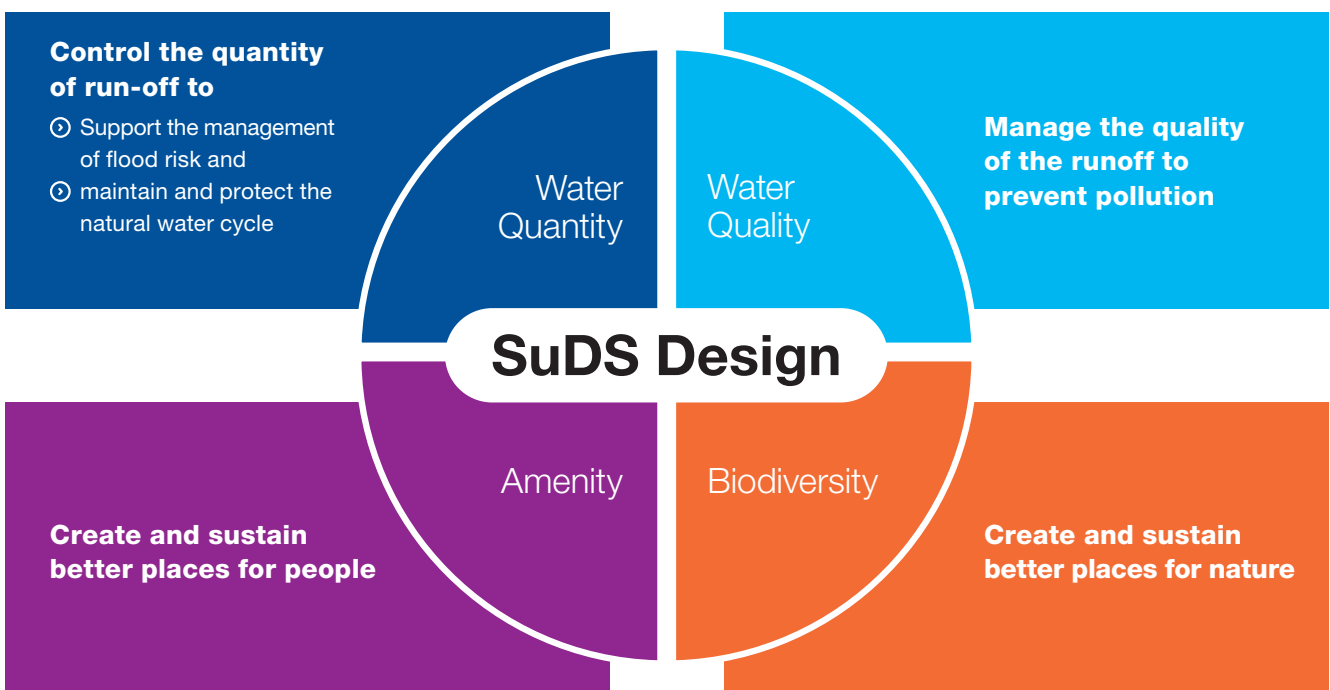
How can Wavin help with SuDS projects?

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 or political 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.



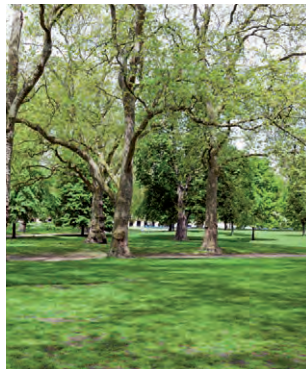
Overview

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

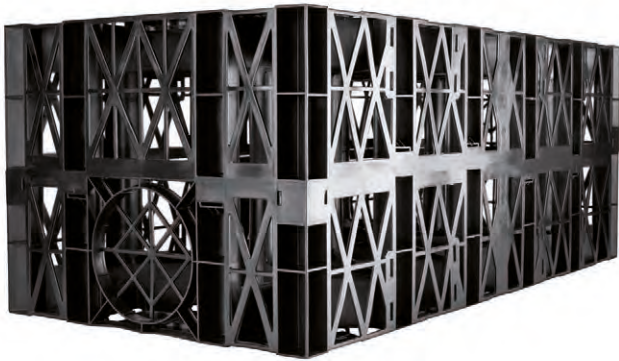
Environmental benefits

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

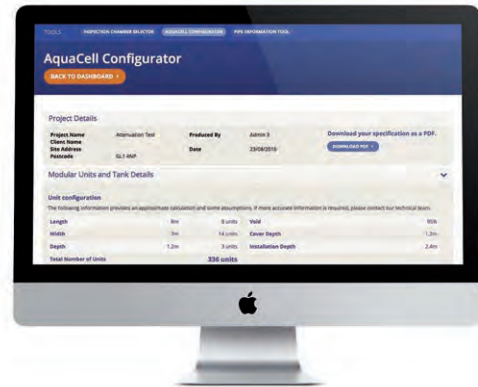


Eco



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

AquaCell Configurator Tool

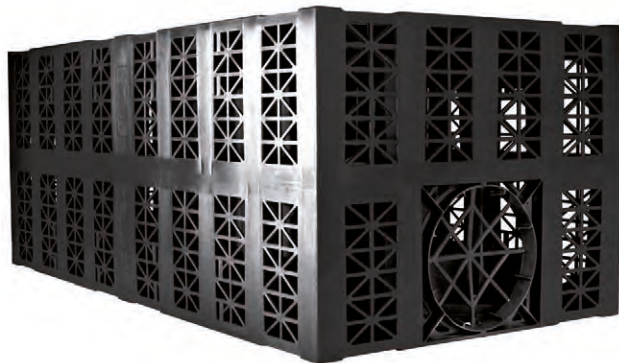


Optimise tank and soakaway designs with the AquaCell Configurator Tool

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

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 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).

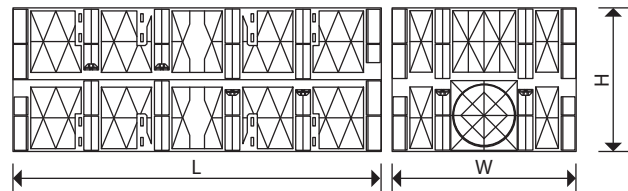
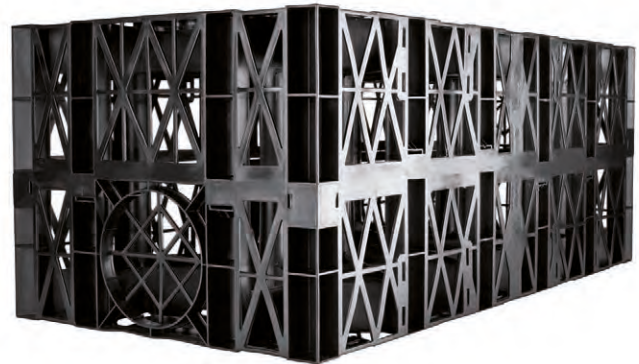
Any installation using AquaCell Eco must **NOT** be subjected to additional loading at any time. Trafficking by construction plant on site, including mechanical equipment, must be avoided.

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.

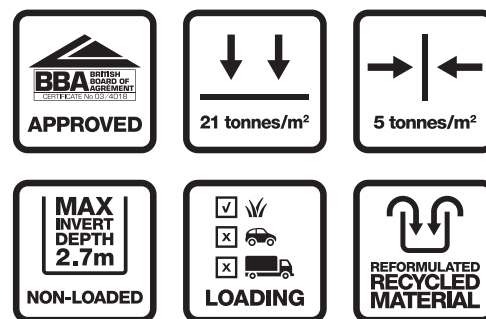
Features and benefits

- ⦿ 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



Material: Reformulated polypropylene

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



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

Typical soil type	Soil weight kN/m ³	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

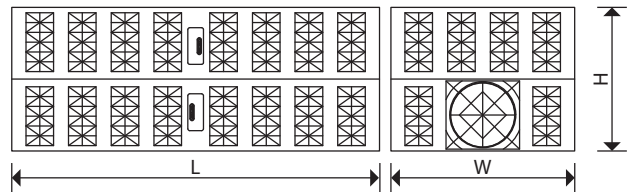
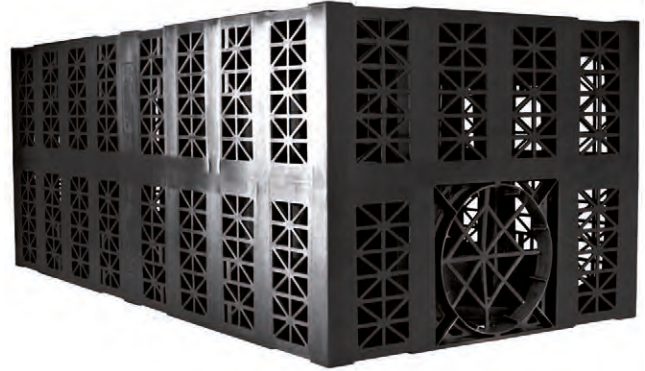
AquaCell Core-R has been designed for use in deep applications, subject to regular and heavy traffic loadings, e.g. cars and HGV's. AquaCell Core-R can also be used for deep soakaways and landscaped applications.

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.

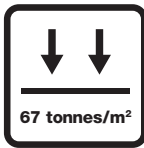
Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 1.11 metres is in place.

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

- (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.

Features and benefits

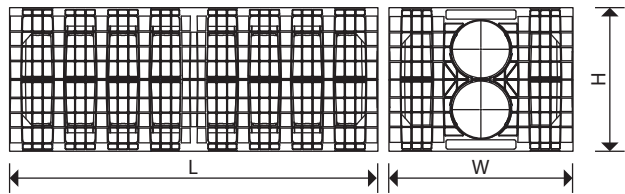
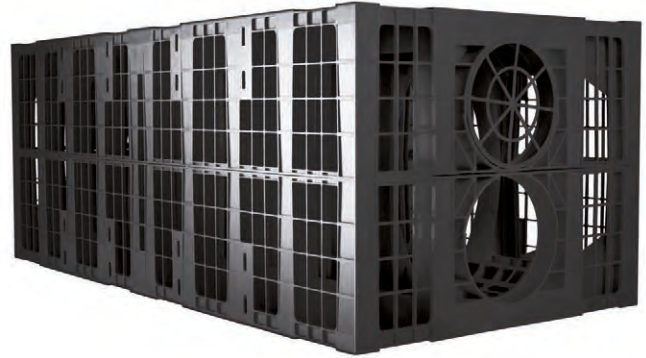
- ⦿ Suitable for extra deep installations
- ⦿ Inspectable (supplied with end cap for use when an inspection channel is not required)
- ⦿ Proven vertical loading capacity of: 70.2 tonnes/m² (702 kN/m²)
- ⦿ Proven lateral loading capacity of: 15.1 tonnes/m² (151 kN/m²)

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

Typical soil type	Soil weight kN/m ³	Angle of internal friction ϕ (degrees) ^{2,3}	Landscaped areas	Vehicle mass <9 tonnes ^{4,5}	Vehicle mass <44 tonnes
Over-consolidated stiff clay	20	24	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.



Material: Polypropylene

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

