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Agrément Certificate

03/4018

Product Sheet 7 Issue 1

WAVIN AQUACELL ATTENUATION AND INFILTRATION SYSTEMS

AQUACELL NG GEOCELLULAR UNIT

This Agrément Certificate Product Sheet⁽¹⁾ relates to Aquacell NG Geocellular Unit, comprising polypropylene geocellular boxes, for use as below ground water storage attenuation tanks or soakaways to manage stormwater run-off from impermeable surfaces.

(1) Hereinafter referred to as 'Certificate'.

The assessment includes

Product factors:

- compliance with Building Regulations
- compliance with additional regulatory or non-regulatory information where applicable
- evaluation against technical specifications
- assessment criteria and technical investigations
- uses and design considerations

Process factors:

- compliance with Scheme requirements
- installation, delivery, handling and storage
- production and quality controls
- maintenance and repair

Ongoing contractual Scheme elements†:

- regular assessment of production
- formal 3-yearly review



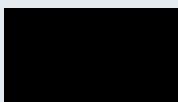
KEY FACTORS ASSESSED

- Section 1. Mechanical resistance and stability
- Section 2. Safety in case of fire
- Section 3. Hygiene, health and the environment
- Section 4. Safety and accessibility in use
- Section 5. Protection against noise
- Section 6. Energy economy and heat retention
- Section 7. Sustainable use of natural resources
- Section 8. Durability

The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of issue: 4 July 2023



Hardy Giesler
Chief Executive Officer

This BBA Agrément Certificate is issued under the BBA's Inspection Body accreditation to ISO/IEC 17020. Sections marked with † are not issued under accreditation.

The BBA is a UKAS accredited Inspection Body (No. 4345), Certification Body (No. 0113) and Testing Laboratory (No. 3537).

Readers MUST check that this is the latest issue of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

The Certificate should be read in full as it may be misleading to read clauses in isolation.

Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

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SUMMARY OF ASSESSMENT AND COMPLIANCE

This section provides a summary of the assessment conclusions; readers should refer to the later sections of this Certificate for information about the assessments carried out.

Compliance with Regulations

Having assessed the key factors, the opinion of the BBA is that Aquacell NG Geocellular Unit, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations:



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	H3(3)	Rainwater drainage
Comment:		The product can contribute to satisfying this Requirement. See section 9 of this Certificate.
Regulation:	7(1)	Materials and workmanship
Comment:		The product is acceptable. See sections 8 and 9 and the Annex of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The product can contribute to satisfying this Regulation. See sections 8 and 9 and the Annex of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	3.6	Surface water drainage
Comment:		The product can contribute to satisfying this Standard, with reference to clauses 3.6.1 ⁽¹⁾⁽²⁾ to 3.6.5 ⁽¹⁾⁽²⁾ . See section 9 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The product can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	12	Building standards applicable to conversions
Comment:		Comments made in relation to this product under Regulation 9, Standards 1 to 6 also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ .

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	23(1)(a)(i)	Fitness of materials and workmanship
Comment:	(iii)(b)(i)	The product is acceptable. See sections 8 and 9 and the Annex of this Certificate.
Regulation:	82	Rainwater drainage
Comment:		The product can be used in a construction to satisfy this Regulation. See section 9 of this Certificate.

Additional Information

NHBC Standards 2023

In the opinion of the BBA, Aquacell NG Geocellular Unit, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to NHBC Standards, Chapter 5.3 *Drainage below ground*.

Fulfilment of Requirements

The BBA has judged Aquacell NG Geocellular Unit to be satisfactory for use as described in this Certificate. The product has been assessed as below ground water storage attenuation tanks or soakaways to manage stormwater run-off from impermeable surfaces.

ASSESSMENT

Product description and intended use

The Certificate holder provided the following description for the product under assessment. Aquacell NG Geocellular Unit consists of black polypropylene (PP) injection moulded components:

- base unit — main element with integrated connectors, providing the volume storage
- bottom plate — element forming the base of the tank
- side plates — elements used around the sides of the tank structure prior to enclosing the tank in either a geotextile and/or a geomembrane. The plates include two integrated standard DN160 inlets allowing connection of 160 mm diameter pipes (to BS EN 1401-1 : 2019).

The product has the nominal characteristics given in Table 1.

Table 1 Nominal characteristics of Aquacell NG Geocellular Unit

Characteristic (unit)	Components			
	Base unit (with bottom plate)	Base unit (without bottom plate)	Bottom plate	Side plate
Product code	—	3084334	3084335	3084336
Unit dimensions (nominal) (L x W x H) (mm)	600 x 1200 x 425	600 x 1200 x 400	600 x 1200 x 35	1155 x 60 x 404
Unit volume (nominal) (m ³)	0.306	0.288	0.025	0.028
Storage volume (nominal) (m ³)	0.290	0.275	—	—
Void ratio (%)	95	95	—	—
Nominal mass (kg)	15	11.4	3.6	2.3

Ancillary Items

The following ancillary items are essential to use with the product and have been assessed with the product:

- adaptor — to connect pipework, with diameters other than a standard DN 160 inlet, into the side plates.

The Certificate holder recommends the following ancillary items for use with the product, but these materials have not been assessed by the BBA and are outside the scope of this Certificate:

- connecting pipework
- access/inspection provision
- outlet flow control device (orifice plate, vortex control or small pipe)
- project specific geotextiles conforming
- project specific geomembrane, and protective fleece
- adhesive or double-sided tape
- air vent connection
- silt trap or sediment removal separator.

The product is intended for use in the following situations:

- for a variety of landscaped and trafficked areas, as defined below
- management of rainwater run-off from impermeable surfaces, is utilised as follows:
 - infiltration system (mostly wrapped in geotextiles) — water is stored within the system during rainfall and allowed to drain away by infiltrating into the surrounding ground over a substantial period after the rain has stopped
 - attenuation system (wrapped in geomembranes and/or geotextiles) — water is stored within the system during rainfall and released at a reduced flow rate through a flow control device into an appropriate outfall. This reduces peak flows in the watercourse and, therefore, minimises the risk of flooding
 - a combination of infiltration and attenuation systems
 - rainwater harvesting (wrapped in geomembranes) — water is stored in the tank until required.

Any other applications are outside of the scope of this Certificate.

Definitions for products and applications inspected

Geocellular unit is a thermoplastic cuboid shaped element, with or without sidewalls, used to create modular system made of repeating boxes.

Landscaped areas (further details to be found in CIRIA C737 : 2016, Table 5.6) are defined as:

- small domestic gardens (isolated from access drives/roads), which must be impractical for vehicle access (behind house etc)
- small domestic gardens/landscaped areas (adjacent to drives or roads), where accidental load case for concentrated load must be considered.

Trafficked areas (further details to be found in CIRIA C737 : 2016, Table 5.6) are defined as:

- car parks (with height/width barriers to limit access) with barriers being robust, and permanent
- car parks without barriers, where warning signs should preclude Heavy Goods Vehicles (HGVs) and accidental load case for HGVs being considered
- private roads, or cul-de-sacs, access tracks (<15 mph) with warning signs for maximum speed limit.

Product assessment – key factors

The product was assessed for the following key factors, and the outcome of the assessments are shown below. Conclusions relating to the Building Regulations apply to the whole of the UK unless otherwise stated.

1 Mechanical resistance and stability

Data were assessed for the following characteristics.

1.1 Mechanical properties

1.1.1 Results of impact resistance test are given in Table 2.

Table 2 Characteristics for mechanical properties

Product assessed	Assessment method	Requirement	Result
Unit, bottom plate	Impact resistance (Drop Test) adapted from BS EN ISO 13263 : 2017	If damaged, identified as 'handle with care'	Pass

1.1.2 On the basis of data assessed, the product is deemed to be sufficiently robust to withstand handling, transport, storage and installation.

1.2 Strength and stability

1.2.1 Results of short-term compression and sensitivity to non-rigid loading tests are given in Table 3.

Table 3 Characteristics for strength and stability

Product assessed	Assessment method	Requirement	Result
Unit with bottom plate	Short-term compression strength (as Ultimate strength σ_{max}) to BS EN 17150 : 2019, Method A	Value declared	Vertical: 438.8 kN·m ⁻² Lateral: 111.0 kN·m ⁻²
	Short-term elastic deflection to BS EN 17150 : 2019 (applied load)		Vertical: 1 mm per 37.7 kN·m ⁻² Lateral: 1 mm per 14.7 kN·m ⁻²
	Sensitivity to non-rigid loading to BS EN 17152-1 : 2019, Method A, Annex B for vertical direction	< 25% of average short-term compression strength	Pass

1.2.2 On the basis of data assessed, the product is deemed to be fit for purpose for resistance to soil load including traffic load, both during and after installation.

1.2.3 The short-term compression results given in Table 2 must not to be used to derive design strength directly. Ultimate strength (equal to compression strength to BS EN 17150 : 2019) is the maximum recorded strength or the resistance recorded at strain amplitude of 6%, whichever occurs first.

1.2.4 The partial load and material factors defined in CIRIA C737 : 2016, Table 5.2, may be used in an ultimate limit state design (see Table 4 of this Certificate).

Table 4 Units strength values⁽¹⁾

		Value
Ultimate strength ⁽²⁾ (kN·m ⁻²)		
Vertical		438.8
Horizontal		111.0
Characteristic strength ⁽³⁾ (kN·m ⁻²)		
Vertical	137.5	Design life = 50 years
Horizontal	29.7	
Design strength ⁽⁴⁾ (50 years) (kN·m ⁻²)		
Vertical	76.0	Partial factor $\gamma_m = 1.81$
Horizontal	16.2	Partial factor $\gamma_m = 1.83$
Reference strength ⁽⁵⁾ (20 years) (kN·m ⁻²)		
Vertical	87.8	Partial factor = $\gamma_m = 1.68$
Horizontal	18.2	Partial factor = $\gamma_m = 1.74$

(1) Values given defined against the definitions of CIRIA C737 : 2016, Section 4.2.3, with exception for ultimate strength (see Table 3 above).

(2) Ultimate strength is equal to compression strength as per BS EN 17150 : 2019 and defined as when the unit fails or reaches a limit of 6% strain.

(3) Characteristic strength is derived from creep rupture tests, defined as when the unit fails or reaches a limit of 6% strain.

(4) Design strength is $P_d = P_{ck} / \gamma_m$, where P_{ck} is characteristic strength and γ_m is material factor (CIRIA C737 : 2016, Section 5.3.2).

(5) Reference strength is the characteristic strength at a design life of 20 years, used as a basis to compare different geocellular units' strength.

2 Safety in case of fire

Not applicable.

3 Hygiene, health and the environment

Not applicable.

4 Safety and accessibility in use

Not applicable.

5 Protection against noise

Not applicable.

6 Energy economy and heat retention

Not applicable.

7 Sustainable use of natural resources

The product is manufactured from polypropylene, which can be recycled.

8 Durability

8.1 The potential mechanisms for degradation and the known performance characteristics of the materials in the product were assessed.

Specific test data were assessed for the following.

8.2 Durability

8.2.1 The product was tested for the characteristics for durability as given in Table 5.

<i>Table 5 Characteristics for durability</i>			
Product assessed	Assessment method	Requirement	Result
Unit with bottom plate	Long-term compression σ_r strength to BS EN 17151 : 2019	Vertical $\geq 50 \text{ kN}\cdot\text{m}^{-2}$ Declared value	Vertical: $154.0 \text{ kN}\cdot\text{m}^{-2}$ Lateral: $28.7 \text{ kN}\cdot\text{m}^{-2}$
	Characteristic strength at design life of 50 years derived from long-term compression σ_r strength to BS EN 17151 : 2019	Declared value	Vertical: $137.5 \text{ kN}\cdot\text{m}^{-2}$ Lateral: $29.7 \text{ kN}\cdot\text{m}^{-2}$
	Effects of heating to BS EN ISO 580 : 2005	No delamination, cracks, blisters, opening of weld line	Pass
Polypropylene material	Resistance to chemicals to BS EN 13476-1 : 2018, A.3. For guidance: PD ISO/TR 10358 : 2021	Product conforming to BS EN 17152-1 : 2019	Pass
	Resistance to internal pressure EN ISO 1167-1 : 2006 and EN ISO 1167-2 : 2006	Declared value	> 96 hours
	Flexural creep modulus (500 h) to BS EN ISO 899-2 : 2003 + A1 : 2015	Declared value	> 389 MPa
	Thermal stability (OIT) to BS EN ISO 11357-6 : 2018	Declared value	> 8 min

8.2.2 On the basis of data assessed, the product is deemed to be suitably resistant to soil load and traffic load, both during and after installation, as well as to the chemicals with which it is likely to come into contact in service.

8.2.3 The product has suitable resistance to the chemicals likely to be encountered in service, subject to the water discharged being rainwater, surface water or ground water, excluding chemically contaminated wastewaters, such as industrial discharges. In situations where the product is to be exposed to the excluded influents, specific chemical and temperature resistance must be taken into account by a suitably experienced and competent individual.

8.4 Service life

Under normal service conditions, the product will have a life of at least 50 years, provided it is designed, installed and maintained in accordance with this Certificate and the Certificate holder's instructions.

Information provided by the Certificate holder was assessed for the following factors:

9 Design, installation, workmanship and maintenance

9.1 Design

9.1.1 The design process was assessed by the BBA, and the following requirements apply in order to meet the performance assessed in this Certificate:

9.1.1.1 A classification score, in accordance with CIRIA 737 : 2016, must be established for each project by a suitably experienced and competent individual, but such scores are outside of the scope of this Certificate.

9.1.1.2 Guidance on the design and application of Sustainable Drainage Systems (SUDS) must be followed as given in:

- the Certificate holder's design recommendations
- CIRIA C737 : 2016 structural and geotechnical design of modular geocellular drainage systems
- BPF Guide to designing geocellular drainage systems to CIRIA C737 : 2016
- flood risk and coastal change guidance
- CIRIA C753 : 2015 SUDS Manual.

9.1.2 The design of each project must be preceded by a detailed audit of the proposed site to establish:

- existing factors and considerations applicable to the site (eg soil type, presence of groundwater)
- predicted factors relating to the site's use following the planned development, and the parameters within which the installation is required to function (eg depth cover, surface finishing, type of loading)
- the type of function of application suggested by the audit.

9.1.3 Once the specific project criteria have been established from the site audit, the following design criteria must be established:

9.1.3.1 Hydraulic design

9.1.3.1.1 The outflow from the tank must be controlled to comply with the discharge rate consent of the site. If the anticipated design flow is greater than the hydraulic capacity of a single connection pipe, the flow may be split between a number of pipes from an adjacent manhole. The system designer must ensure that the number and size of the pipe connections is sufficient to convey the anticipated design flow without restriction.

9.1.3.1.2 For infiltration (soakaways) application, either CIRIA Report 156 or BRE Digest 365 : 2016 calculations must be followed. In addition, the soil underlying the installation must have adequate permeability and the seasonally high-water table must be a minimum of 1 m below the base of the installation.

9.1.3.1.3 For attenuation (storage) application, the anticipated total run-off volume from the site must be estimated in the calculation, using the Wallingford Procedure or other acceptable method. The allowable discharge rate from the site to an appropriate outfall must be established, but will normally be set by the Environment Agency, Scottish Environmental Protection Agency or Planning Authorities. Furthermore, for site with a groundwater or high-water table, susceptibility of the tank to float must be taken into consideration.

9.1.3.2 Structural design

9.1.3.2.1 The structural design of each installation incorporating the product must be carried out by an appropriately competent and experienced individual based on the requirements of CIRIA C737 : 2016.

9.1.3.2.2 Consideration must be given to the effects of cumulative deflection in systems comprising several layers of units and care taken when the product is used below trafficked areas and close to structures. It is important to ensure that the infiltrating water will not soften the soils or cause loss of fines and subsequent settlement.

9.1.3.2.3 The engineer responsible for the design of the installation must confirm that the allowable ground-bearing capacity at the formation level is sufficient for the proposed operational loads. In areas of weak or compressible soils, advice should be sought from a geotechnical engineer, but such advice is outside of the scope of this Certificate.

9.1.3.2.4 When the tank is wrapped in an impermeable geomembrane and placed below the groundwater table, flotation may occur. To prevent this, the weight of the soil over the top of the unit must be greater than the uplift force caused by the unit's buoyancy in the water. This can be achieved with most types of fills if the depth of cover fill is equal to, or greater than, the depth of penetration of the units below groundwater level.

9.2 Installation

9.2.1 Installation instructions provided by the Certificate holder were assessed and judged to be appropriate and adequate.

9.2.2 Installation must be carried out in accordance with this Certificate and the Certificate holder's instructions. A summary of instructions and guidance are provided in Annex A of this Certificate.

9.2.3 To achieve the performance described in this Certificate, the product must be installed and tested in accordance with PD CEN/TR 17179 : 2018 and CIRIA C737 : 2016.

9.2.4 Special attention must be paid to temporary work requirements in excavations. The base must be inspected for soft spots in the formation, any present must be excavated and replaced with compacted granular fill material. The construction of final cover layers, such as concrete, bituminous or blockwork surfacing, and other finishes must be delayed as much as possible.

9.2.5 Adequate venting must be provided to the tank, either through high level pipe connections, direct venting to the atmosphere or via access chambers. One 110 mm diameter air vent is required per 7500 m² impermeable catchment area to be drained.

9.3 Workmanship

9.3.1 Practicability of installation was assessed by the BBA, on the basis of the Certificate holder's information. To achieve the performance described in this Certificate, installation of the product must be carried out by a competent general builder, or a contractor, experienced with this type of product.

9.4 Maintenance and repair

9.4.1 Ongoing satisfactory performance of the product in use requires that it is suitably maintained. The guidance provided by the Certificate holder was assessed by the BBA and found to be appropriate and adequate.

9.4.2 The following requirements apply in order to satisfy the performance assessed in this Certificate:

9.4.2.1 The owner of the structure is responsible for its maintenance. For soakaways to individual houses, the only necessary maintenance of the tank is to keep all gullies clear of debris. For large installations or where the receiving waters are environmentally sensitive, a programme of regular inspections and cleaning of all traps and sumps must be established to prevent siltation of the tank and to ensure its correct performance. Paved surface areas above an installation must be inspected at the same time to ensure it continues to provide the required structural support. The tank must also be inspected after every major storm event.

10 Manufacture

10.1 The production processes for the product have been assessed, and provide assurance that the quality controls are satisfactory according to the following factors:

10.1.1 The manufacturer has provided documented information on the materials, processes, testing and control factors.

10.1.2 The quality control operated over batches of incoming materials has been assessed and deemed appropriate and adequate.

10.1.3 The quality control procedures and product testing to be undertaken have been assessed and deemed appropriate and adequate.

10.1.4 The process for management of non-conformities has been assessed and deemed appropriate and adequate. An audit of each production location was undertaken, and it was confirmed that the production process was in accordance with the documented process, and that equipment has been properly tested and calibrated.

† 10.2 The BBA has undertaken to review the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

11 Delivery and site handling

11.1 The Certificate holder stated that the product is delivered to site in packaging bearing the product name, part number, Certificate holder name, batch number and date of manufacture. The main units, bottom plates and side plates are supplied to site in pallets of 28, 56 and 48 units respectively, secured with straps on wooden panels to enable placing and movement by a forklift.

11.2 Delivery and site handling must be performed in accordance with the Certificate holder's instructions and this Certificate, including:

11.2.1 Requirements for transportation, handling and storage at depots and sites in accordance with PD CEN/TR 17179 : 2018.

11.2.2 The pallets must be carefully placed on level ground and not be stacked on site.

11.2.3 The product must be protected from direct sunlight if long-term storage is envisaged.

11.2.4 The product is resistant to damage that could occur with normal handling. However, it must be stored in locations where impact from vehicles and other construction plant activities will be avoided.

11.2.5 Prior to installation, all components of the system must be checked for damage. Damaged or defective components must not be installed.

ANNEX A – SUPPLEMENTARY INFORMATION †

Supporting information in this Annex is relevant to the product but has not formed part of the material assessed for the Certificate.

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

Management Systems Certification for production

The management system of the manufacturer has been assessed and registered as meeting the requirements of ISO/IEC 9001 : 2015 by DNV, KIWA and BSI (Certificates C560794, KSC-K20865/09 and FM00217 respectively).

Additional information on installation

A.1 The hole or trench is excavated to the required depth, dimensions and levels. It must be ensured that the plan area is sufficient (minimum 500 mm is recommended) to allow access around the tank to compact backfill material. The base must be smooth and level without sharp drops or humps. Slopes must be cut to a safe angle or adequately supported and safe access must be provided to allow personnel to enter the excavation. Excavation must be carried out in accordance with BS 6031 : 2009, with particular attention paid to safety procedures.

A.2 The impermeable geomembrane (and geotextile and fleece, if additional protection is required) in the attenuation system and geotextile in the infiltration system are laid over the sand bedding layer and up the sides of the excavation. Joints between adjacent sheets of impermeable membrane must be sealed correctly using proprietary techniques recommended by the manufacturer and in line with PD CEN/TR 17179 : 2018. Jointing with tape is not recommended as the seal becomes reliant on the mechanical properties of the tape to maintain its integrity. The geomembrane is inspected for damage and all welds are tested as required.

A.3 The main unit is mounted onto the bottom plate; a proper connection is ensured through a 'click' sound. The next pre-mounted units are installed in the correct orientation (white circles in line) by sliding the integrated connectors into each other. In the next layers, position of the white circles above each other is not possible. Side panels are installed by inserting hinge pins into the hinge pockets.

A.4 Drainage connections are made to the installation using proprietary adaptors. Pre-formed socket positions for pipe connections must be located at the correct position for receiving pipework. Alternatively, flange adaptors are used attached to the units with adhesive tape and self-tapping screws (flange adaptors cannot be used at the invert of the units into the pre-formed socket). It is recommended that all connections into air vent and storage applications (using a geomembrane) are made using a flange adaptor. Adhesive or double-sided tape must be used between the geomembrane and flange adaptor to ensure a watertight seal. Alternatively, drainage connections are sealed into a pre-formed socket using proprietary seals approved by the geomembrane manufacturer.

A.5 The installation is backfilled with Type 1 or 2 sub-base or Class 6P (side fill only) selected granular material in accordance with the *Manual of Contract Documents for Highway Works* (MCHW), Volume 1 *Specification for Highway Works* (SHW). The backfill is compacted in 150 mm thick layers.

A.6 A coarse sand protection layer, 100 mm thick, should be placed over the top of the units that have been wrapped. Backfilling is continued with:

- trafficked areas (eg car parks) — Type 1 or 2 sub-base material compacted in 150 mm layers in accordance with the MCHW, Volume 1. The mass of compaction plant over the top of the units must not exceed 2300 kg per metre width of roll
- landscaped and non-trafficked areas — selected as-dug material, with size of pieces less than 75 mm, compacted to 90% maximum dry density.

A.7 Pavement construction or landscaping over the product can then be completed.

Additional information on maintenance

A.8 It is recommended that a silt trap or sediment removal separator is installed upstream of the inlet pipework to the system and access (via manhole or similar) to the location of flow control devices is incorporated.

A.9 Further guidance on operation and maintenance of the installation may be obtained from CIRIA C753 : 2016.

Bibliography

BRE Digest 365 : 2016 *Soakaway Design*

BPF Guide to Designing Geocellular Drainage Systems to CIRIA Report C737 — September 2018

BS 6031 : 2009 *Code of practice for earthworks*

BS EN 1401-1 : 2019 *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U) — Specifications for pipes, fittings and the system*

BS EN 13252 : 2016 *Geotextiles and geotextile-related products — Characteristics required for use in drainage systems*

BS EN 13476-1 : 2018 *Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) — General requirements and performance characteristics*

BS EN 17150 : 2020 *Plastics piping systems for non-pressure underground conveyance and storage of non-potable water — Test method for determination of short-term compression strength of boxes*

BS EN 17151 : 2019 *Plastics piping systems for non-pressure underground conveyance and storage of non-potable water — Test method for determination of long-term compression strength of boxes*

BS EN 17152-1 : 2019 *Plastics piping systems for non-pressure underground conveyance and storage of non-potable water — Boxes used for infiltration, attenuation and storage systems — Specifications for storm water boxes made of PP and PVC-U*

BS EN ISO 580 : 2005 *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Methods for visually assessing the effects of heating*

BS EN ISO 899-2 : 2003 + A1 : 2015 *Plastics — Determination of creep behaviour — Flexural creep by three-point loading*

BS EN ISO 1133-1 : 2011 *Plastics — Determination of the melt-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method*

BS EN ISO 1167-1:2006 *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids. Determination of the resistance to internal pressure-General method*

BS EN ISO 1167-2:2006 *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids. Determination of the resistance to internal pressure-Preparation of pipe test pieces*

BS EN ISO 11357-6 : 2018 *Plastics — Differential scanning calorimetry (DSC) — Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

BS EN ISO 13263 : 2017 *Thermoplastics piping systems for non-pressure underground drainage and sewerage — thermoplastics fittings — test method for impact strength*

CIRIA C737 : 2016 *Structural and geotechnical design of modular geocellular drainage systems*

CIRIA C753 : 2015 *The SuDS Manual*

CIRIA Report 156 : 1996 *Infiltration drainage — Manual of good practice*

Flood risk and coastal change guidance — *National Planning Policy Framework* — August 2022

ISO/IEC 9001 : 2015 *Quality management systems — Requirements*

Manual of Contract Documents for Highway Works (MCHW), Volume 1 *Specification for Highway Works*, Series 0500, *Drainage and Service Ducts*, February 2020

PD CEN/TR 17179 : 2018 *Thermoplastics piping and ducting systems — Rainwater infiltration and storage attenuation systems — Practices for underground installation*

PD ISO/TR 10358 : 2021 *Plastics pipes and fittings for industrial applications — Collection of data on combined chemical-resistance*

Conditions of Certificate

Conditions

1 This Certificate:

- relates only to the product that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

3 This Certificate will be displayed on the BBA website, and the Certificate Holder is entitled to use the Certificate and Certificate logo, provided that the product and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product
- actual installations of the product, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to UKCA marking and CE marking.

6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product which is contained or referred to in this Certificate is the minimum required to be met when the product is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

British Board of Agrément

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