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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
15/5200
Product Sheet 2

GRAF STORMWATER MANAGEMENT SYSTEMS

GRAF INFILTRATION TUNNEL SYSTEM

This Agrément Certificate Product Sheet(1) relates to the GRAF Infiltration Tunnel System, recycled polypropylene tunnels used to construct a below-ground infiltration system to manage stormwater run-off from impermeable surfaces.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Hydraulic design — information is included in this Certificate to assist in the design of a stormwater management system (see section 6).

Structural performance — when used in accordance with this Certificate, the system has adequate strength and stiffness to resist short- and long-term loading (see section 7).

Maintenance — information is provided to assist in planning the maintenance of a completed installation of the system (see section 11).

Durability — when installed in accordance with this Certificate, the system will have a service life in excess of 50 years (see section 12).

The BBA has awarded this Certificate to the company named above for the system described herein. This system 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 First issue: 16 February 2017

Brian Chamberlain
Head of Technical Excellence

Claire Curtis-Thomas
Chief Executive

Certificate amended on 22 August 2019 to update address and Table 1.

Regulations

In the opinion of the BBA, the GRAF Infiltration Tunnel System, 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 presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):

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

Requirement:	H3(3)	Rainwater drainage
Comment:		The system can be used in a construction to satisfy this Requirement. See sections 6.1 and 6.2 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The system is acceptable. See section 12 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Durability, workmanship and fitness of materials
Comment:		The system can contribute to satisfying this Regulation. See sections 11 and 12 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	3.6	Surface water drainage
Comment:		The system can contribute to a construction satisfying this Standard, with reference to clauses 3.6.1[(1)(2)] to 3.6.5[(1)(2)]. See sections 6.1 and 6.2 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The system 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.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2012

Regulation:	23(a)(i)(iii)(b)	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 12 and the *Installation* part of this Certificate.
Regulation:	82	Rainwater drainage
Comment:		The system can be used in a construction to satisfy this Regulation. See sections 6.1 and 6.2 of this 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.

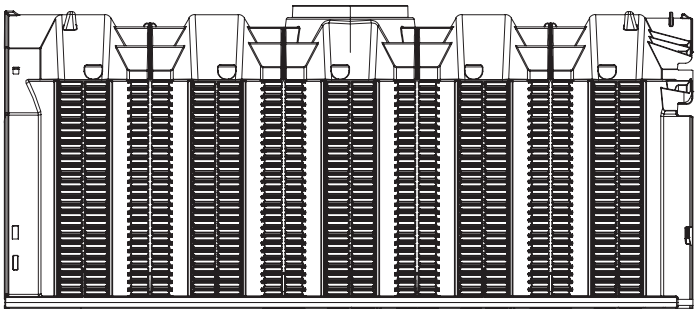
See sections: 3 *Delivery and site handling* (3.1,3.2 and 3.5) and 15 *Procedure* (15.1) of this Certificate.

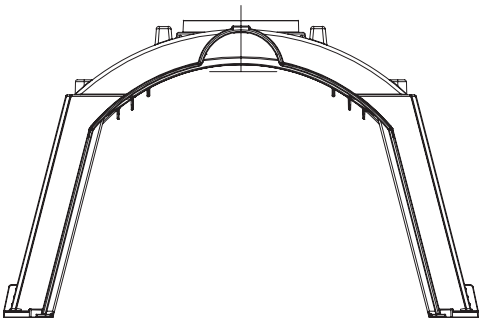
Technical Specification

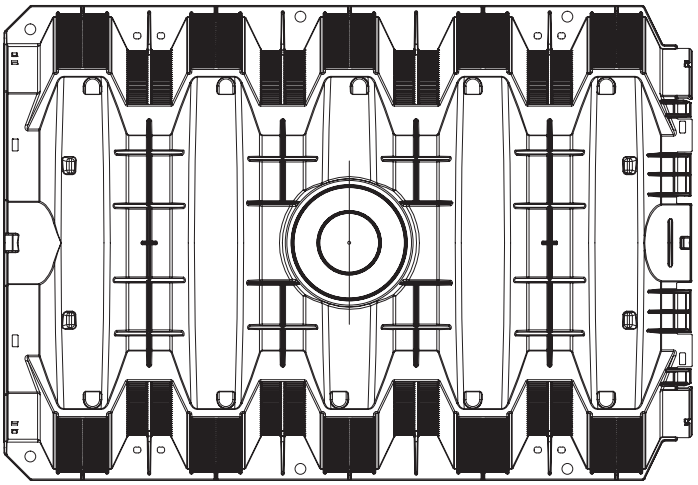
1 Description

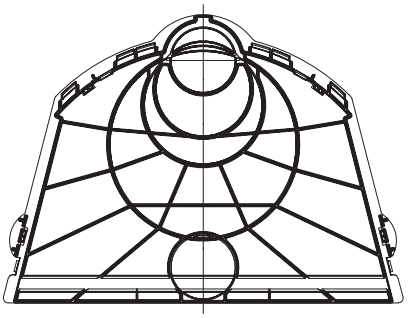
1.1 The GRAF Infiltration Tunnel System consists of interlocking tunnels and end plates, injection-moulded from recycled polypropylene (see Figure 1). The characteristics and material properties of the system components are given in Tables 1 and 2.

Figure 1 System components









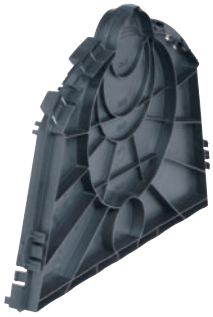


Table 1 Characteristics of system components

Characteristic (unit)	Tunnel	End plate
Overall length (mm)	1200	64
Installed length (mm)	1160	40
Nominal width (mm)	800	674
Nominal height (mm)	510	485
Span (mm)	700	—
Rise (mm)	445	—
Foot width (mm)	100	—
Maximum wall thickness (mm)	5	5
Pitch of corrugations (mm)	225	—
Nominal mass (kg)	10	2
Maximum cut-out diameter for end plate (mm)	—	300
Nominal storage volume (m^3)	0.3	—

Table 2 Material properties of system components

Property	Test method	Infiltration tunnel	End plate
Density ($kg \cdot m^{-3}$)	ISO 1183-3	≥0.91 $g \cdot cm^3$	≥0.91 $g \cdot cm^3$
Tensile strength (MPa)	ISO 527-2	≥24 MPa	≥24 MPa
Tensile modulus (MPa)	ISO 527-2	≥1100 MPa	≥1100 MPa
Tensile strain	ISO 527-2	≥5%	≥5%
Melt flow rate	ISO 1133	5-17 g·10 min	5-17 g·10 min
Charpy impact resistance	ISO 179-1	≥3$kJ \cdot m^2$	≥3$kJ \cdot m^2$
50 year creep modulus (MPa)	ISO 899-1	166 MPa	166 MPa

1.2 The tunnels are designed so that they lock together longitudinally, and are pre-marked on the top for cut-outs 100 and 200 mm in diameter. The end plates are pre-marked to enable 100, 200 and 300 mm diameter holes to be cut.

1.3 The specification for the sub-base and surround material by the Certificate holder is crushed stone to BS EN 13242 : 2013, Grade 8/16.

1.4 Items used with the units to form a stormwater management system, but outside the scope of this Certificate, include:

- surface water connection pipework
- permeable geotextile and fleece
- air vent and ventilation pipework
- silt trap
- infiltration inlet modules
- flow control/chamber devices.

2 Manufacture

2.1 The system components are manufactured by pressure-injection-moulding from recycled polypropylene material, to a defined specification.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out 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.

2.3 The management system of GRAF GmbH has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by DEKRA (Certificate 80613353).

3 Delivery and site handling

3.1 The tunnel modules are supplied to site stacked on pallets of 30 or 40 units (see Figure 2), together with the appropriate number of end plates. Each pallet carries a label stating the product name, part number, quantity, weight (see Table 1), production date and time, and operator's initials.

Figure 2 Units stacked on pallett

3.2 All stacks should be carefully placed on level ground, and must not be stacked on top of each other. Stacks should be dismantled in the vertical orientation.

3.3 The components contain an inhibitor to resist the effects of ultraviolet light for up to 12 months. However, prolonged storage in direct sunlight and high temperatures should be avoided.

3.4 The components should not be stored near fuel bowsers, fuel tanks or other solvents to avoid potential chemical spillages.

3.5 Individual components may be manually handled using normal handling precautions. The weight of the components are given in Table 1.

3.6 The components are resistant to damage likely to be caused during normal handling. However, they should be stored in locations where impacts from vehicles and other construction plant will be avoided.

3.7 Prior to installation, all units should be checked for damage. Damaged or defective units must not be installed.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the GRAF Infiltration Tunnel System.

Design Considerations

4 General

4.1 The GRAF infiltration Tunnel System is satisfactory for the control of stormwater run-off from impermeable and permeable surfaces. It can be used in three main ways:

- infiltration (retention/recharge/soakaway) — stormwater is collected in the system and allowed to drain away by soaking into the surrounding ground over a substantial period of time, during and following a storm event
- temporary storage for excess flows and limiting outflow to sewer, streams and rivers
- combined system — excess flow attenuation with a controlled outlet and soakaway provisions for infiltration of a portion of the total flow.

4.2 The system must be designed in accordance with the Certificate holder's instructions. Guidance on the application of sustainable drainage systems (SUDS) for new developments, such as the GRAF Infiltration Tunnel System, can also be found in the Planning Policy Statement PPS25 Development and Flood Risk.

4.3 Design of the appropriate system for a specific project must always be preceded by a detailed audit of the proposed site, to establish:

- existing factors and consideration applicable to the site
- predicted factors relating to the site's use following the planned development and the parameters within which the installation is required to function
- the type of function of application suggested by this audit.

4.4 Once the project criteria have been established from the site audit, there are two main parts to the design procedure:

- hydraulic design
- structural design.

5 Practicability of installation

The system is designed to be installed by a competent general builder, or a contractor, experienced with this type of system.

6 Hydraulic design

Calculation principles

6.1 There are two approaches, either of which may be adopted: the Construction Industry Research and Information Association (CIRIA) Report R156 *Infiltration drainage — manual of good practice* or BRE Digest 365 : 2016 *Soakaway design*. Further information on the design of SUDS may be obtained from CIRIA Report C697 *The SUDS Manual*.

6.2 A simplified approximate approach can be used on a small site (ie a single-house development), where detailed site infiltration rate information may not be required or available (see Table 3). Approved Document H of the England and Wales Building Regulations allows a storage volume equal to the area to be drained multiplied by 10 mm, for areas up to 25 m^2. Beyond this size, the design should be carried out in accordance with BS EN 752 : 2008 or BRE Digest 365 : 2016. It is suggested in BS EN 752 : 2008 that a storage volume equal to 20 mm multiplied by the area to be drained may be used. In Scotland, guidance for the design of single-house soakaways is given in Mandatory Standard 3.6, clause 3.6.5(1).

(1) Technical Handbook (Domestic).

6.3 The system storage capacity includes both water collected in the tunnel and that retained within the granular surround. It may be calculated by summation of:

- the number of tunnels multiplied by 0.3 m^3, where the latter is the storage volume of the tunnel section
- the internal cross section area of any distribution pipe (m^2) multiplied by the pipe length (m)
- the volume of stone (in m^3) multiplied by the porosity (typically 40%).

Table 3 Storage system capacity(1)

Number of tunnels	Storage volume(2) (m^3)	Maximum area to be drained (m^2)(3)
1	0.69	34.5
2	1.38	69
3	2.07	103.5
4	2.76	138

(1) Based on a minimum foundation depth of 100 mm of crushed stone, and 500 mm between tunnels.

(2) When doubt exists over suitability of ground for infiltration, permeability figures should be derived by test (see BRE Digest 365).

(3) In accordance with BS EN 752 : 2008, clause NA 4.4.8.

Table 4 Volumetric data for infiltration applications

No of rows	Volume(1) ($m^3 \cdot m^{-1}$)	Side area ($m^2 \cdot m^{-1}$)	Base area ($m^2 \cdot m^{-1}$)	End of tunnel area (m^2)
1	0.59	1.22	1.8	1.1
2	1.06	2.44	3.1	1.89
3	1.53	3.66	4.4	2.68
4	2.01	4.88	5.7	3.48
5	2.48	6.1	7.0	4.27

(1) Based on a minimum foundation depth of 100 mm of crushed stone, and 500 mm between tunnels.

Attenuation and Infiltration

Calculation principles

6.4 The anticipated run-off volume (A) from the site must be estimated. The most commonly used method for evaluating storm rainfall events in the UK is the Wallingford Procedure, by which the total rainfall level of storms over defined time periods ranging from five minutes up to 48 hours are assessed. The depth of water (mm) found can be multiplied by the catchment area to assess the size of attenuation systems, and is traditionally based upon a two-hour storm and a return period appropriate for the catchment. The allowable discharge rate from the site to an appropriate outfall is

established, but will normally be set by the Environment Agency or Planning Authorities. The outflow volume (B) to be discharged at this rate over the two-hour period is calculated and subtracted from the run-off volume (A–B). This defines the excess volume (C) to be stored in the infiltration tunnel constructed as an underground tank. The number of tunnels needed to contain this excess is calculated on the basis that the storage volume of the tunnels is in accordance with the values given in Table 4.

Connection

6.5 Connection is made between inlet and outlet manholes with a 300 mm diameter solid pipe through the end plate. The pipework must be sized to ensure unimpeded flow for a design storm event. The inlet should be free of obstructions and, in some applications, it may be necessary to use multiple inlet pipes in a manifold configuration.

6.6 A silt trap or an infiltration filter shaft should be installed upstream of the inlet manhole. An oil separator may also be required where there is a likelihood of contamination or the discharge site is particularly sensitive.

7 Structural performance

7.1 The system may be placed under a wide variety of landscaped or trafficked areas and must be designed to carry all loads that will be applied, including dead and live loads. Minimum and maximum cover depth are shown in Table 5 and the basis for the values are given in Table 6.

Table 5 Minimum and maximum cover depths (m) to the crown of tunnel

Cover depths (m)	Pedestrians	Cars up to 3000 kg (3/3)[2]	Vehicles up to 12000 kg (12/12)[2]	Vehicles up to 30000 kg (30/30)[2]	Vehicles up to 60000 kg (60/30)[2]
Minimum cover for angle of shearing resistance of 35°	0.50[1]	0.50	0.75	1.00	1.00[3]
Minimum cover for angle of shearing resistance of 40°	0.50[1]	0.50	0.75	1.00	1.00
Maximum cover for angle of shearing resistance of 35°	2.90	2.90	2.60	2.60	2.60
Maximum cover for angle of shearing resistance of 40°	2.90	2.90	2.60	2.60	2.60

Notes

(1) It is recommended that 0.5 m minimum cover is used to prevent physical damage to the system by excavation. However, calculations confirm 0.3 m is adequate and could be used at the discretion of the installation design engineer (or suitably qualified person).

(2) Loading category in accordance with DIN 1072.

(3) The minimum cover depth requirement is 1.0 m for locations subject to significant traffic loading.

Table 6 Basis for values given in Table 5

Traffic category	Distributed load (kN·m²)	Wheel load (kN)	Tyre contact area (m)	Density of backfill soil (kN·m³)	Soil friction angle (degrees)
Non-Trafficked	5	1.4	0.15 x 0.15	20	30/40
3000 kg	5	10	0.20 x 0.20	20	30/40
12000 kg	10	40	0.20 x 0.30	20	30/40
30000 kg	10	50	0.20 x 0.40	20	30/40
60000 kg	10	100	0.20 x 0.60	20	30/40

Notes:

Load factors were applied as follows:

- 1.35 for soil loads
- 1.50 for distributed load and wheel loads
- Design load for 50 years (including safety factor of 2): 75 KN·m².

7.2 The imported material used in foundation, surrounding and backfill to the underside of the base course must be clean and well graded crushed stone in compliance with BS EN 13242 : 2013, Grade 8/16.

7.3 A suitably-qualified and designated engineer is responsible for determining the bearing capacity of the subgrade and to verify that the thickness of imported fill in the foundation is adequate. The material at the subgrade level is exposed and evaluated for suitability, on which a 100 mm layer of clean well graded crushed stone (8 to 16 mm) is placed and compacted to give a horizontal solid base for the tunnel sections to be laid on. These are covered with the geotextile fabric, and the rest of the gravel is placed in layers and compacted up to the bottom of the sub-base.

7.4 For small-scale applications, such as soakaways for individual house roof drainage, the system is typically located a minimum of 5 m away from the building beneath the garden.

7.5 For lightly-loaded applications, the bearing capacity of underlying soils should typically not be exceeded by the system, and therefore settlement of the underlying soils should be negligible. The bearing capacity and settlement characteristics should be confirmed by a geotechnical engineer.

8 Geotextiles

8.1 The system requires a geotextile wrapping to:

- allow the water infiltration into adjacent ground
- prevent silt that may be contained in the surface water run-off from contaminating the surrounding soil, in addition to reducing its permeability
- prevent silt entering the units from surrounding soil.

8.2 The selection of suitable geotextile material (see Table 7) for a specific system should be considered carefully, particularly with reference to the surrounding soil properties and performance requirements. The following points are to be considered in the selection:

- pore size — this should be designed and specified to assist infiltration and to prevent migration of fine soil particles
- permeability and breakthrough head — the geotextile should not limit the flow of water in the system and should have a permeability similar to, or greater than, the surrounding ground
- puncture resistance — the geotextile must be able to resist piercing by sharp objects, eg stones in the soil
- tensile strength — the geotextile should have sufficient strength to resist any imposed forces (eg from wheel loads)
- durability
- specialist advice should be sought if surrounding soil characteristics exhibit a high degree of fines/low infiltration capacity and/or there is risk of damage from ground contaminants.

Table 7 Geotextile minimum specification for infiltration

Tested property	Minimum value
Thickness (mm)	1
Mass per unit area ($g \cdot m^{-2}$)	100
CBR puncture resistance (N)	1400
Cone drop test (mm)	34
Peak tensile strength ($kN \cdot m^{-2}$)	8
Opening size (µm)	130
Permeability vertical ($\ell \cdot m^{-2} \cdot s^{-1}$)	110
Material	100% UV-stabilised polypropylene
Description	non-woven mechanically bonded

9 Venting

9.1 Adequate venting must be provided to the system. As a minimum, one 110 mm diameter air vent is required per 7500 m^2 of impermeable catchment area to be drained. Air vent connections and pipework for use with the system are outside the scope of this Certificate.

9.2 Typical air vent connections and pipework are shown in Figure 3. Venting should be positioned in a non-trafficked area, wherever possible. It is recommended that the ventilation pipe is to be attached to the end plate through the template provided. One ventilation pipe would suffice per line.

Figure 3 Typical air vent connections and pipework

10 Resistance to chemicals

10.1 The components of the system are resistant to, and suitable for use in contact with, the normal chemicals likely to be found in surface water.

10.2 An assessment of the suitability for use of the system on brownfield sites should be made only after a suitable site investigation (outside the scope of this Certificate) to determine the possibility for chemical attack. Particular care must be taken where acids and organic solvents are present at high concentrations. Further information can be obtained from the Certificate holder.

11 Maintenance

11.1 The owner of the structure is responsible for maintenance of the system.

11.2 The infiltration system consists of tunnels which allow inspection of the inside of the structure provided adequate access is available. Each tunnel is premarked for cut outs on top to accept a 200 mm pipe, to provide an inspection port. One inspection port for each and every row is recommended.

11.3 For soakaways to individual houses, the only necessary maintenance of the system is to keep all gullies clear of debris, such as leaves and grass.

11.4 For large installations or where the receiving waters are environmentally sensitive, a programme of regular inspections should be established to prevent siltation of the system which, if allowed to develop, would reduce effectiveness. Large installations should also be inspected after every major storm event.

11.5 It is recommended that silt traps, filters or other means of minimising the amount of silt and solids entering the system should be incorporated into the pipework at the inlet to the tank (see Figures 3 and 4). A maintenance plan must be in place to ensure regular cleaning of the trap and correct performance.

Figure 4 Silt Trap

11.6 Paved surface areas above an installation should be inspected at the same time as the system, to ensure that the units continue to provide the required structural support.

12 Durability

The structural properties of the recycled polypropylene used in the components of the system will deteriorate with time, and this should be taken into account at the design stage by the application of suitable material property (see Table 2) safety factors. In the opinion of the BBA, the system, when used in accordance with this Certificate, will have a life in excess of 50 years.

13 Reuse and recyclability

The system components are manufactured from recycled polypropylene material, which is readily recyclable.

Installation

14 General

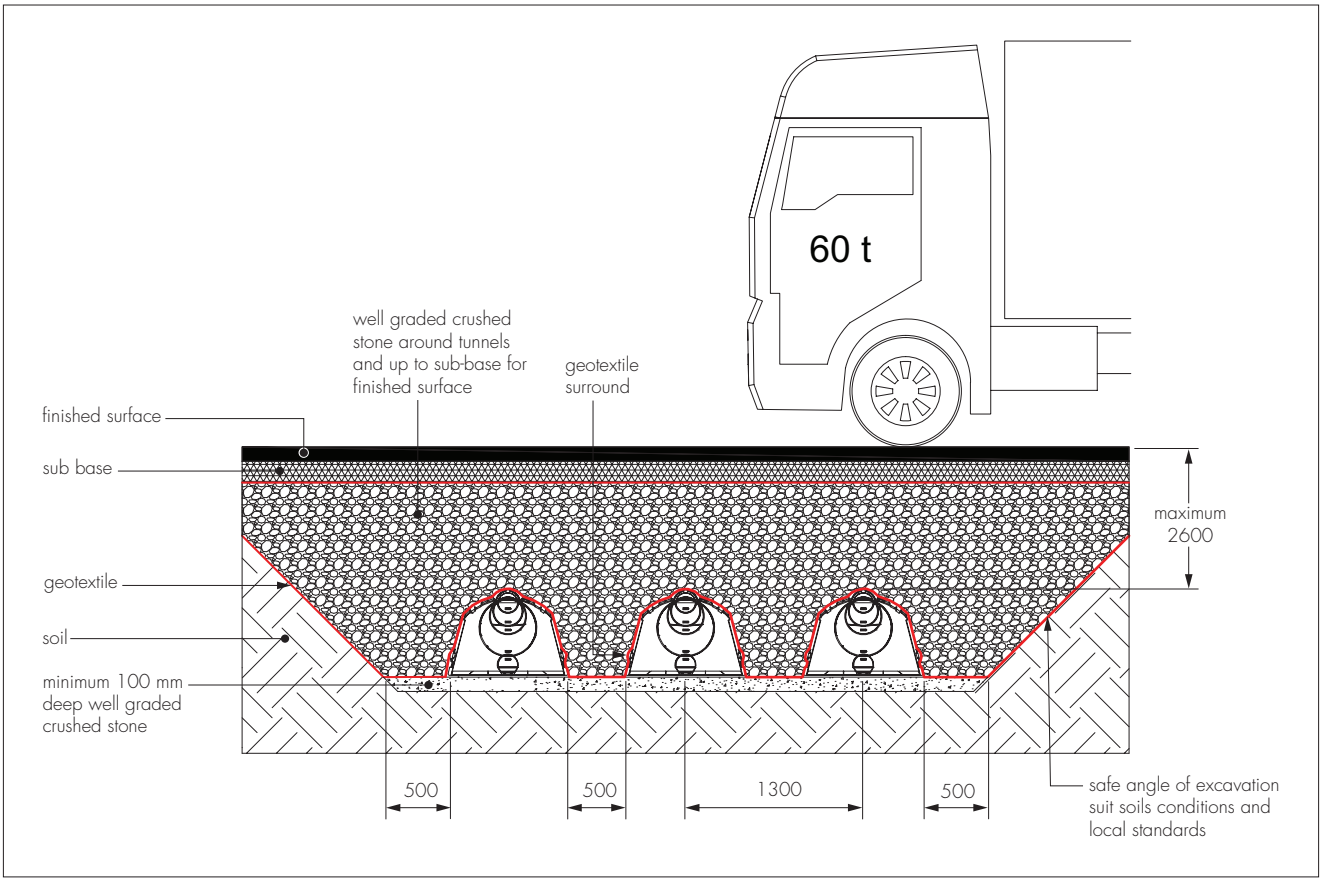
The system must be installed in accordance with the Certificate holder's installation instructions and this Certificate. Special attention must be paid to temporary work requirements in excavations.

15 Procedure

15.1 The hole or trench is excavated to the required plan dimensions and level, ensuring that the excavation will allow installation of connecting pipework. A minimum of 500 mm from the edges of the tunnel units should be provided. The formation must be nominally level with no large undulations. Edges of the excavation must be cut to a safe angle or adequately supported, and safe access must be provided to allow personnel to enter the excavation. Excavation should be carried out in accordance with BS 6031 : 2009, with particular attention paid to safety procedures.

15.2 It must be ensured that the ground-bearing capacity at the formation level is adequate for the design loads.

Figure 5 Typical section of installation for HGV parks



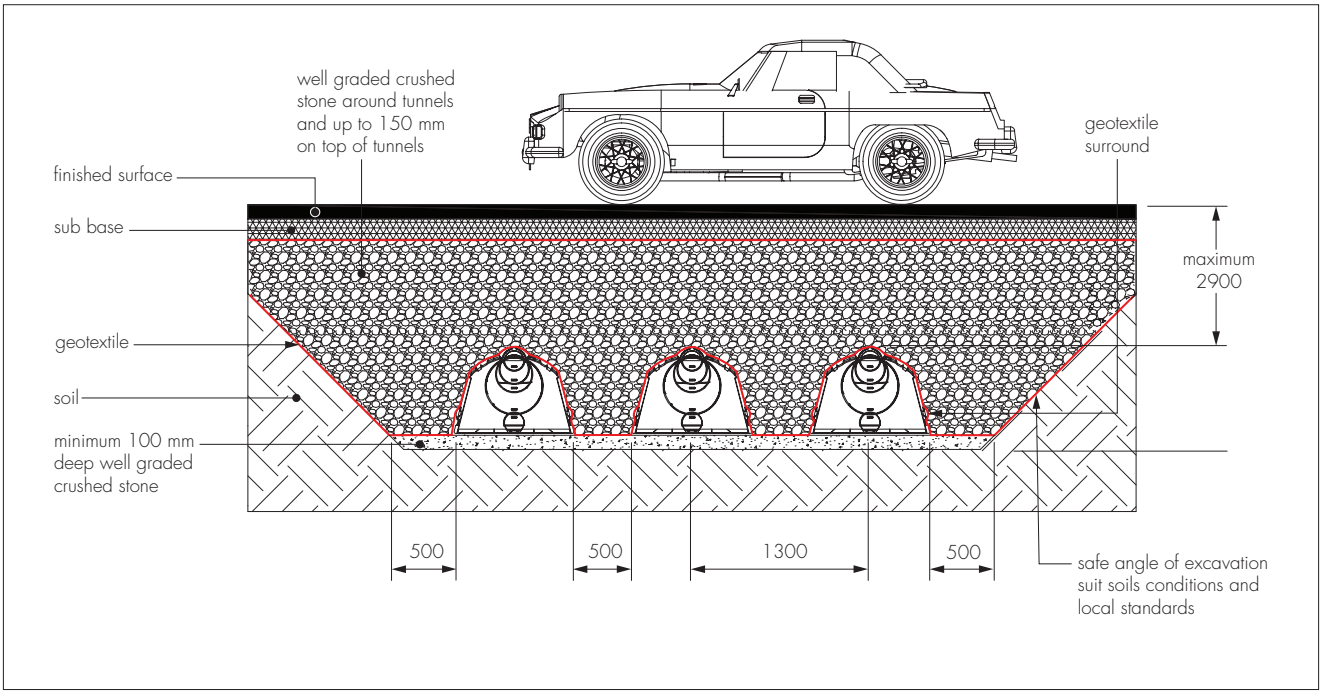
15.3 A bedding layer of compacted crushed stone, size 8/16, is laid on the formation of the excavation to achieve a flat, level surface. Typical thickness of the bedding layer is expected to be a minimum of 100 mm.

15.4 The first tunnel unit, with endplate attached, is placed in position and subsequent tunnels are clipped together to form the first row, the last unit should be fitted with an endplate. If additional rows are required, repeat the process with a gap of 500 mm between rows (see Figure 7).

Connecting the inlet and venting pipes

15.5 The relevant diameter hole is created using the template on the endplate and the pipe inserted. The inlet pipes must extend approximately 150 mm into the tunnel units. To ensure that the water enters the system incorporating multiple rows evenly, every tunnel row should have its own inlet pipe. Typical example installations are shown in Figures 5 and 6.

Figure 6 Typical section of installation for car parks



15.6 The tunnel is covered over with a geotextile fabric for protection, and to prevent ingress of very fine silt and sand. The geotextile fabric should overlap the end of the modules by at least 500 mm.

15.7 After this has been completed, the excavation is back filled steadily and in layers of crushed stones (8/16). The crushed stone is placed in layers of 150 mm over the geotextile fabric, between the tunnel sections, up to 100 mm above the crown level of the tunnels. For 60 tonne vehicle loading, tunnels are placed on a well-consolidated crushed stone bed, in rows with a 500 mm gap between them. For lower loadings, this spacing can be decreased but this is not covered under the scope of this Certificate. The Certificate holder should be contacted for further details. An infiltration tunnel installation in progress is shown in Figure 7.

Figure 7 Installation of infiltration tunnels

Technical Investigations

16 Tests

Tests were carried out on the system and the results assessed to determine:

- short term mechanical characteristic of the raw material
- long term mechanical characteristic of the raw material
- arch stiffness of the unit in the system
- resistance to wheel loads.

17 Investigations

17.1 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained on the quality and composition of the materials used.

17.2 An assessment of the system was made in relation to the material properties and design procedures.

17.3 Calculations were carried out to verify the storage capacity and the safe minimum and maximum cover depths.

17.4 An examination of finite element modelling for stress analysis of the system.

17.5 A site visit was made to assess the practicability and ease of installation and connection.

Bibliography

BS 6031 : 2009 *Code of practice for earthworks*

BS EN 752 : 2008 *Drain and sewer systems outside buildings*

BS EN 13242 : 2013 *Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction*

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

ISO 179-1 : 2010 *Plastics — Determination of Charpy impact properties — Non-instrumented impact test*

ISO 527-2 : 2012 *Plastics — Determination of tensile properties — Test conditions for moulding and extrusion plastics*

ISO 899-1 : 2003 + A1 : 2015 *Plastics — Determination of creep behaviour — Tensile creep*

ISO 1133 : 2005 *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO 1183-3 : 1999 *Plastics — Methods for determining the density of non-cellular plastics — Gas pyknometer method*

BRE Digest 365 : 2016 *Soakaway Design*

18 Conditions

18.1 This Certificate:

- relates only to the product/system 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.

18.2 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.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system 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.

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

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

18.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system 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.

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