HAPAS

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HAPAS Certificate
15/H230
Product Sheet 1

TOBERMORE RETAINING WALL SYSTEM

SECURA GRAND CONCRETE BLOCK WALL SYSTEM FOR REINFORCED SOIL RETAINING WALLS AND BRIDGE ABUTMENTS

This HAPAS Certificate Product Sheet(1) is issued by the British Board of Agrément (BBA), supported by Highways England (HE) (acting on behalf of the Overseeing Organisations of the Department for Transport; Transport Scotland; the Welsh Government and the Department for Infrastructure, Northern Ireland), the Association of Directors of Environment, Economy, Planning and Transport (ADEPT), the Local Government Technical Advisers Group and industry bodies. HAPAS Certificates are normally each subject to a review every three years.
(1) Hereinafter referred to as 'Certificate'.

This Certificate relates to to the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments, comprising modular concrete block facing units, Fortrac Geogrids, graded granular material and compacted fill. The system is used for the construction of reinforced soil and retaining walls and bridge abutments up to a maximum height of 9 metres.

CERTIFICATION INCLUDES:

- factors relating to compliance with HAPAS requirements
- factors relating to compliance with Regulations 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

Mechanical properties — the method of connection between the geogrids and concrete block facing units has been assessed and long-term connection strength values determined for various wall heights and concrete block/geogrid combinations. The interface shear capacity between adjacent concrete block facing units in between layers of geogrid reinforcement has been assessed and is satisfactory (see section 7).

Performance of geogrids — the short- and long-term tensile strength of the geogrids, resistance to installation damage, weathering and environmental effects and soil/geogrid interaction have been assessed. Data and reduction factors for use in design are given in Certificate 13/H197, Product Sheet 1.

Durability — when designed and installed in accordance with the provisions of this Certificate, the system will have adequate durability for its intended use as a retaining wall or bridge abutment (see section 9).

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 Second issue: 3 October 2018

Originally certificated on 18 March 2015

Paul Valentine
Technical Excellence Director

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body – Number 113.
The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk
Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.
Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

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Requirements

In the opinion of the BBA, the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments, when designed and installed in accordance with the provisions of this Certificate, will meet the requirements of the UK Highway Authorities for the design and construction of reinforced soil retaining walls and bridge abutments.

Regulations

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: 1 *Description* (1.2), 3 *Delivery and site handling* (3.1 and 3.3) and the *Installation* part of this Certificate.

Additional Information

CE marking

The Certificate holder has taken the responsibility of CE marking the concrete block facing units in accordance with harmonised European Standard BS EN 771-3 : 2011. The supplier of the geogrids has taken the responsibility of CE marking the geogrids in accordance with harmonised European Standard BS EN 13251 : 2016. An asterisk (*) appearing in this Certificate indicates that data shown are given in the manufacturers' Declarations of Performance.

Technical Specification

1 Description

1.1 The Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments comprises:

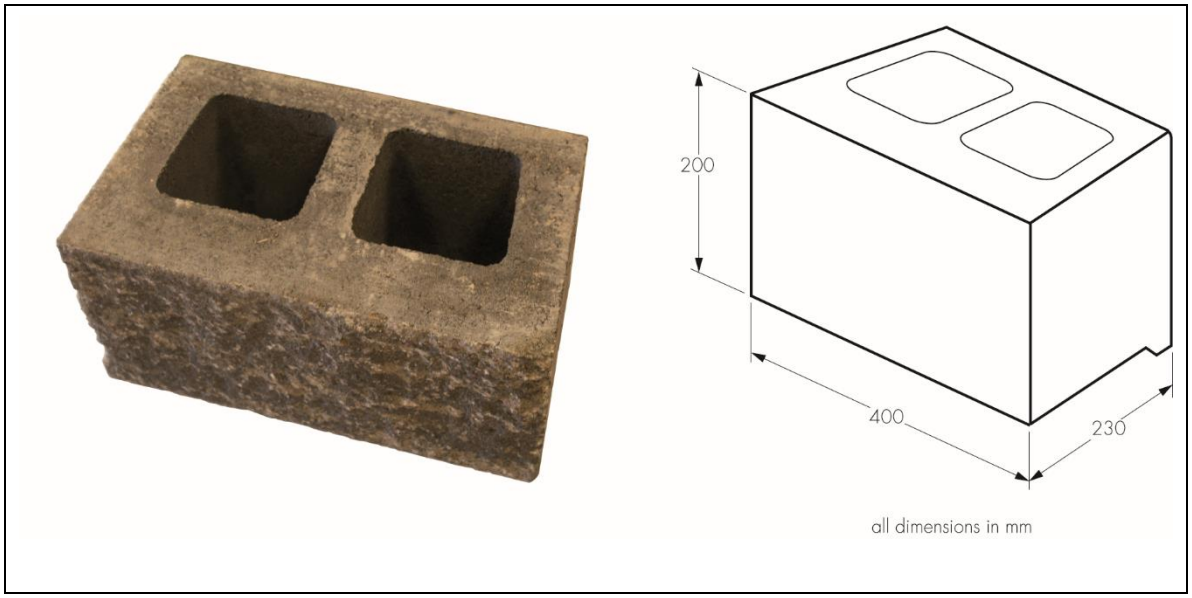
- Secura Grand Modular Concrete Block Facing Units
- Fortrac 35T, 55T and 80T Geogrids(1)
- granular material — used to fill the voids in, around and behind the concrete block facing units
- compacted fill material.

(1) Covered under Certificate 13/H197, Product Sheet 1.

Concrete block facing units

1.2 Modular Secura Grand Concrete Block Facing Units have a height of 200 mm, a depth of 230 mm and a width of 400 mm (see Figure 1). The weight of each block is 27 kg. The setback of the wall made using the system is 7.12°.

Figure 1 Secura Grand Modular Concrete Block Facing Units



1.3 The blocks are made with a split concrete finish and are available in three colours: Bracken, Heather and Slate. All pigments used for the coloration comply with BS EN 12878 : 2014.

1.4 The blocks are manufactured from concrete with a minimum 28 day compressive strength of 40 $N \cdot mm^{-2}$ and satisfy the HE requirements for durability of class XF2 exposure in accordance with BS 8500-1 : 2015.

1.5 The blocks conform to BS EN 771-3 : 2011 and have the essential characteristics given in Table 1 of this Certificate, as declared by the manufacturer.

Table 1 Secura Grand Modular Concrete Block Facing Units — essential characteristics in accordance with BS EN 771-3 : 2011

Characteristic (unit)	Manufacturer's declared value (*)
Dimensions (mm)	As stated in the technical data sheets
Configuration	Soil and void
Compressive strength ($N \cdot mm^{-2}$) (at 7 days)	30
Reaction to fire	Euroclass A1
Gross dry density ($kg \cdot m^{-3}$)	2161

1.6 Corner blocks are available to form internal and external corners at 90°, and have the same unit and void size as the standard blocks. The front face and one side face have the same colour and finishing pattern as the standard blocks.

Geogrids

1.7 The following grades of Fortrac Geogrids(1) have been assessed by the BBA for use with the system:

- Fortrac 35T
- Fortrac 55T
- Fortrac 80T.

(1) Covered under Certificate 13/H197, Product Sheet 1.

Granular material

1.8 The material used to fill the voids in, around and behind the concrete block facing units must be well graded, angular, granular material with a maximum size of 20 mm without fines.

Compacted fill material

1.9 The compacted fill material must comply with the requirements set out in BS 8006-1 : 2010 and the *Manual of Contract Documents for Highway works* (MCHW), Volume 1.

2 Manufacture

2.1 The concrete block facing units are manufactured to an agreed specification by the Certificate holder. The ingredients are weighed by a computer controlled weight batcher system. The concrete mix is placed in moulds and hydraulically pressed to get the initial base block shape. Once pressed, the blocks are cured before being split to give the final face finish.

2.2 The geogrids are manufactured by Huesker Synthetic GmbH. Further details are given in Certificate 13/H197, Product Sheet 1.

2.3 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.

2.4 The manufacturer's management system for the concrete block facing units has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by BSI (Certificate FM 11763). The manufacturer's management system for the geogrids has been assessed and registered as meeting the requirements of ISO 9001 : 2008 by by TÜV NORD CERT GmbH, Germany (Certificate 04 100 970084).

3 Delivery and site handling

Concrete block facing units

3.1 The concrete block facing units are delivered to site shrink-wrapped on pallets and secured with plastic straps. They carry a manufacturer's label identifying the product type and batch code. Pallets should not be stacked more than two high.

3.2 To prevent damage, care should be taken in transit and handling. Damaged blocks must not be used. During prolonged periods of storage on site, the blocks should remain covered on pallets.

Geogrids

3.3 The geogrids are delivered and should be handled and stored as detailed in Certificate 13/H197 Product Sheet 1.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments.

Design Considerations

4 Use

4.1 When designed and installed in accordance with this Certificate, the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments is satisfactory for the construction of reinforced soil retaining walls and bridge abutments up to a maximum height of 9 metres. Walls above this height require special consideration and are outside the scope of this Certificate.

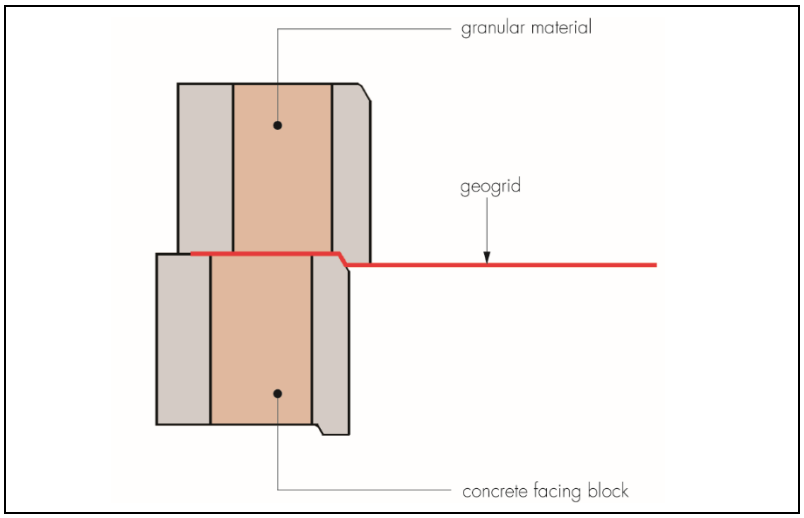
4.2 Structural stability of the wall system is achieved through:

- interface shear capacity between adjacent rows of blocks
- the connection strength between the blocks and geogrid layers at each layer of geogrid
- the tensile strength of the geogrids

- the embedment and resistance to sliding and pull out of the geogrids from the compacted fill material.

4.3 The connection between the geogrids and concrete block facing units is achieved by friction between the blocks and the geogrid, interlock between the geogrid and the granular material used to fill the hollow core of the blocks, and the concrete lips at the bottom of each block (see Figure 2). It is critical that construction of the connection is carried out and is closely supervised (see the *Installation* part of this Certificate).

Figure 2 Method of connecting geogrid to concrete block facing units



4.4 Prior to the commencement of work, the designer must satisfy the design approval and certification procedures of the relevant Highway Authority.

4.5 The BBA has not assessed the structures for supporting parapet loading caused by vehicle collision at the top of the blocks.

4.6 Reinforced soil structures constructed using the system should be protected with suitable barriers, to protect the structure against potential damage from vehicle impact and vehicle fires.

4.7 In addition to the factors covered in section 6, attention must also be paid in design to:

- site preparation
- compacted fill material properties
- the specification for placing and compaction of the compacted fill material
- drainage behind the wall
- protection of the geogrid against damage during installation.

4.8 It is considered that with correct design and workmanship, and by following the recommendations of this Certificate, normally accepted tolerances of line and level for the construction of retaining walls, as defined in BS 8006-1 : 2010 Table 18, can be achieved.

4.9 Particular attention should be paid to changes in direction of walls where overlapping of the geogrids may occur. BS 8006-1 : 2010 also gives guidance on typical layout plans for the geogrids (reinforcing elements) in bridge abutments.

4.10 Where the wall height is not gradually reduced to zero over the length of the wall, the design must include edge restraint. This can be achieved by means of a short section of wall constructed at 90 degrees to the main wall.

5 Practicability of installation

The system is designed to be installed by trained contractors in accordance with the specifications and construction drawings (see the *Installation* part of this Certificate).

6 Design

Methodology

6.1 Reinforced soil retaining walls and bridge abutments constructed using the system must be designed in accordance with BS 8006-1 : 2010 and the MCHW, Volume 1.

6.2 In accordance with BS 8006-1 : 2010 Annex B, the required design life for permanent walls and bridge abutments is 120 years.

6.3 The design must consider the following issues relating to the performance of the geogrids and concrete block facing units:

- the long-term design strength and post construction creep strain for the geogrids
- the length of embedment of the geogrids
- the connection strength between the geogrid and concrete block facing units
- the interface shear capacity of the blocks between layers of geogrid reinforcement.

Design strength of geogrids [ultimate limit state (ULS)]

6.4 The designer must carry out design checks to ensure that the geogrids have adequate long-term tensile strength at each layer of reinforcement, to satisfy ULS design criteria as defined in BS 8006-1 : 2010. Short- and long-term tensile strength values and material reduction factors for use in the design of the geogrids are given in Certificate 13/H197, Product Sheet 1.

Length of embedment of geogrids

6.5 The designer must carry out design checks to ensure that the geogrids have sufficient length of embedment within the compacted fill material to prevent pull-out of the geogrid. Soil/geogrid interaction coefficients for use in the design are given in Certificate 13/H197, Product Sheet 1.

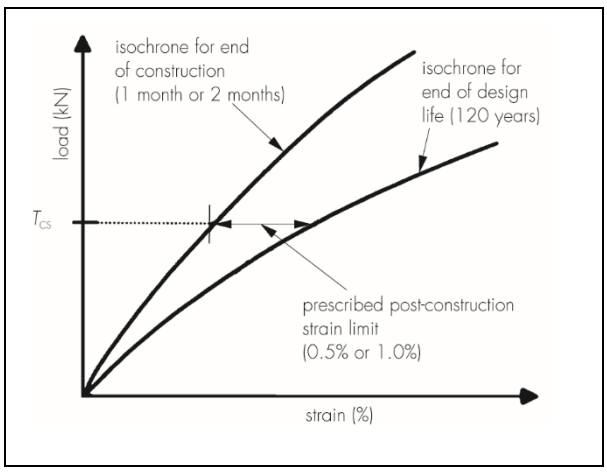
Design strength of geogrids [serviceability limit state (SLS)]

6.6 The SLS design strength of the geogrid ($T_{D\,(SLS)}$), should be taken as T_{CS}/f_m, where:

- T_{CS} is the tensile load in the reinforcement which induces the prescribed limit value of post-construction strain in the geogrid
- f_m is the partial material factor.

6.7 The prescribed post-construction strain limit and the tensile load that would create the prescribed post-construction strain (T_{CS}) are illustrated in Figure 3.

Figure 3 Definition of T_{cs}



6.8 The prescribed maximum allowable post-construction creep strains allowed by BS 8006-1 : 2010 for the SLS of reinforced soil retaining walls and bridge abutments are shown in Table 2.

Table 2 *Serviceability limits on post-construction internal strains for bridge abutments and retaining walls*

Structure	Strain (%)	Design period for the purposes of determining limiting strain
Bridge abutments and retaining walls with permanent structural loading	0.5	2 months to 120 years
Retaining walls with no applied structural loading, ie transient live loadings only	1.0	1 month to 120 years

6.9 Post-construction strain can be related to the average load in the reinforcement. The average SLS design load T_{avj} that the geogrid must resist is calculated in accordance with BS 8006-1 : 2010. The average load in the *j*th level T_{avj}, is related to the maximum load in the reinforcement (T_j) by a factor *k* such that $T_{avj} = T_j/k$. The factor *k* has a minimum value of unity and generally falls in the range of 1.0 to 2.0. Where the distribution of tensile load along the loaded length of the reinforcement is not proven by field measurements, the factor *k* should be taken as unity. In all cases $T_{avj} \leq T_{D(SLS)}$.

6.10 Isochronous curves, design values for T_{CS} and reduction factors for determination of $T_{D(SLS)}$ are given in sections 7.2 to 7.5.

Connection strength between the geogrids and concrete block facing units

6.11 The design connection strength between the geogrids and concrete block facing units (T_{Dconn}) should be determined for the ULS and checks should be made to ensure that it is not exceeded by the design load (T_j) at each level, ie $T_j \leq T_{Dconn}$. Particular care should be taken during the design of bridge abutments to ensure that adequate reinforcement is provided and adequate connection strengths are achieved at the top of the wall and in front of bank seats.

6.12 The design connection strength (T_{Dconn}) is determined using the formula $T_{Dconn} = T_{conn}/f_m f_n$ where:

- T_{conn} is the long-term connection strength derived from testing (see section 7)
- f_m is the material safety factor for the geogrid (see section 7)
- f_n is the partial factor for ramification of failure in accordance with BS 8006-1 : 2010, Table 9.

6.13 The minimum value of load factor used in determining the design load should be 1.5 for all designs using the wall system.

Interface shear capacity between concrete block facing units

6.14 The system has adequate interface shear capacity when designed and installed in accordance with this Certificate.

Specification of compacted fill material

6.15 The designer should specify the relevant properties of the compacted fill material for the reinforced soil structure deemed acceptable for the purposes of the design. Acceptable materials should meet the requirements of BS 8006-1 : 2010 and the MCHW, Volume 1, Series 600.

7 Mechanical properties

Long-term tensile strength of geogrids

7.1 Short- and long-term strength values and reduction factors required for design of the geogrids are given in Certificate 13/H197, Product Sheet 1. These include:

- characteristic short-term tensile strengths (T_{char})
- long-term creep rupture strengths (T_{CR})
- reduction factors for installation damage (RF_{ID}), weathering (RF_W) and environmental degradation (RF_{CH})
- factors of safety for extrapolation of data (f_s).

Soil/geogrid interaction

7.2 Soil/geogrid interaction coefficients for use in design are given in Certificate 13/H197, Product Sheet 1.

Post construction strain in geogrids

7.3 Values for T_{CS} may be estimated from the appropriate isochronous curves. A typical set of isochronous curves for the Fortrac Geogrid product range is shown in Figure 4. Values of T_{CS} for Fortrac 35T, Fortrac 55T and Fortrac 80T are given in Table 3.

Figure 4 Iscochronour curves — Fortrac Geogrids

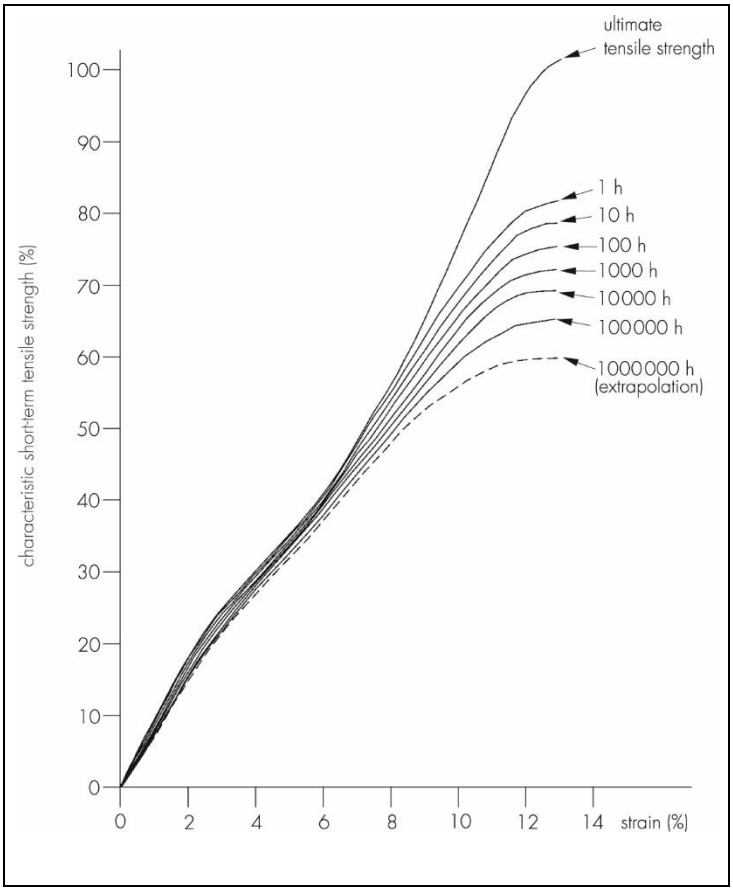


Table 3 Tensile load (T_{CS}) inducing prescribed post-construction strain limits

Geogrid grade	T_{CS} (kN·m^{-1}) prescribed post construction strain limits	
	0.5%	1.0%
Fortrac 35T	17.1	18.5
Fortrac 55T	26.9	29.1
Fortrac 80T	39.2	42.4

7.4 Long-term connection strength values (T_{conn}) for the wall system have been derived from short-term tests in line with the National Concrete Masonry Association *Design Manual for Segmental Retaining Walls* (*Second edition 2002*) and ASTM D6638-11. Connection efficiencies determined from these tests have been applied to the long-term creep rupture strength (T_{CR}) values for the geogrids approved for use with the system, to determine the relevant long-term connection strengths (T_{conn}). The results are shown in Table 4 and can be used to determine the design connection strength (T_{Dconn}) as set out in section 6.

Table 4 Long-term connection strength for Fortrac geogrids (T_{conn})[1][2]

Geogrid grade	T_{CR} (kN·m^{-1})	Height of wall above geogrid layer (m)	T_{conn} (kN·m^{-1})
Fortrac 35T	21.9	0.7≤H<2.3	6.1
		2.3≤H<5.0	9.2
		5.0≤H<6.5	9.4
		6.5≤H<8.2	10.5
Fortrac 55T	34.4	0.7≤H<2.3	7.1
		2.3≤H<5.0	12.9
		5.0≤H<6.6	13.3
		6.6≤H<8.1	14.5
Fortrac 80T	50.1	1.7≤H<3.3	8.9
		3.3≤H<6.6	12.7
		6.6≤H<8.2	15.7
		8.2≤H<9.0	20.3

(1) For a design life of 120 years and at a design temperature of 20°C.
(2) Assumes a density of 1500 kg·m^{-3} for the graded granular material used to fill the hollow core of the concrete block facing units.

7.5 The reduction factors and factors of safety shown in Table 5 should be used to determine the material factor (f_m) required for calculation of the ULS design connection strength (T_{Dconn}), where $f_m = RF_{ID} \times RF_W \times RF_{CH} \times f_s$.

Table 5 Reduction factors for determination of T_{Dconn}

Reduction factor	Value and conditions of use/limitations
RF_{ID}	A value of 1.00 can be used for all grades of geogrid, as short-term installation damage at the point of connection is already taken into account during the full scale connection strength tests
RF_W, RF_{CH}, f_s	As set out in Certificate 13/H197 PS1 according to geogrid specification selected and conditions of use[1]

(1) pH levels within and immediately behind the wall are assumed to be the same as those in the compacted fill material.

8 Maintenance

The exposed faces of the concrete block facing units may require periodic maintenance, to remove dirt build up, mould and moss growth. All other components are confined within the wall and/or compacted fill and do not require maintenance.

9 Durability

9.1 When designed and installed in accordance with this Certificate, the system will have adequate durability for the required 120 year design life of a retaining wall and bridge abutment in the conditions likely to be encountered in the UK.

9.2 Where the blocks are to be embedded in potentially aggressive soils, the guidance given in BS 8500-1 : 2015 and BRE Special Digest 1 : 2005 should be followed.

10 Reuse and recyclability

The concrete block facing units can be crushed and re-used as aggregate. The compacted fill material can also be reused.

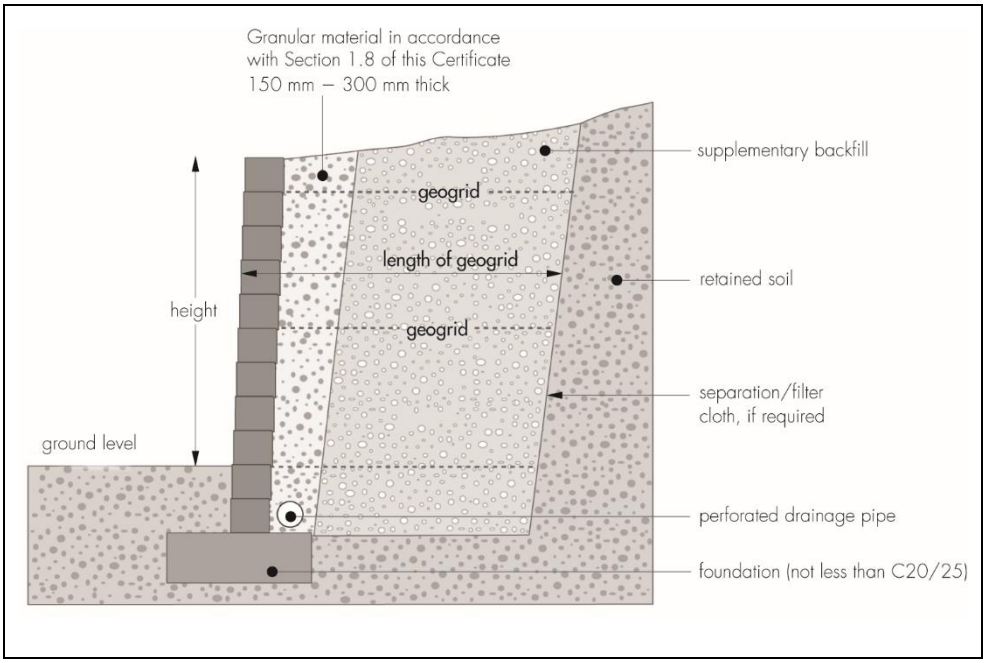
Installation

11 General

11.1 Installation of the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments should be in accordance with BS 8006-1 : 2010 and BS EN 14475 : 2006. Detailed information on installation can be found in the Certificate holder's Installation Guide.

11.2 A typical cross section of a reinforced wall is shown in Figure 5.

Figure 5 Typical cross section through reinforced soil retaining wall



11.3 Close supervision is required, particularly during construction of the geogrid to concrete block facing unit connection.

12 Procedure

12.1 The blocks are laid on a levelling pad composed of either well-graded, good compactable material (DTP Type 1) or a suitable plain concrete foundation (not less than C20/25). The foundation should have a minimum thickness of 100 mm and should be set at a level to accommodate two blocks below ground level.

12.2 It is important that the first course of concrete block facing units is laid accurately to the correct line and level to avoid compounding errors in alignment as the wall is built. When laying the first course, the nib from the base of the blocks needs to be removed. This can be achieved using a bolster chisel and club hammer.

12.3 The blocks should be positioned with a gap of 2 to 3 mm between blocks to maintain vertical alignment and to allow for any movement of the ground. Blocks should be laid with a staggered bond.

12.4 Granular material as specified in section 1.8 is placed and compacted into the hollow cores of the blocks up to the top of the blocks and to a thickness of 150 to 300 mm width behind the blocks. Compacted fill material meeting the requirements of section 6.15 is placed behind the granular material.

12.5 A perforated drainage pipe is laid at the back of the wall along the trench to a suitable outfall and should be vented to a daylight or stormwater system.

12.6 The compaction requirements for the compacted fill depend on the fill type selected, but can be found in the MCHW, Volume 1, Clause 612. Heavy plant exceeding one tonne should not operate within two metres of the face of the wall, and a vibrating plate compactor of less than one tonne must carry out compaction within this zone. Frequent

checks must be made to the alignment of the face to ensure that any disturbance from the compaction process is promptly corrected.

12.7 A suitable length of geogrid is cut from the roll and laid on top of the block course 25 mm back from the block face. The geogrid should be placed with the machine direction perpendicular to the wall face and pulled back over the compacted area.

12.8 The next course of blocks is then laid on the first, with each block pushed forward into position, ensuring that the vertical joints are offset to achieve a staggered bond.

12.9 The geogrid is pulled at the back to remove any slack and the corners staked to hold the back edge in place. The geogrid is tensioned at right angles to the plane of the facing, within a tolerance of ± 50 mm in a 5 m length.

12.10 Filling of the hollows in the blocks and behind the wall facing is then completed as described in section 12.4.

12.11 The frequency of the geogrid layers depends on the design and should be indicated on the design drawings. The distance between the geogrid layers should not be greater than four courses.

12.12 Compacted fill should be placed by mechanical plant with an opening bucket, avoiding trafficking of unprotected geogrids, and should cover the grid reasonably uniformly.

12.13 During construction it is particularly important to ensure that:

- fill is properly compacted, especially close to blocks
- at each construction stage, the level of the compacted fill coincides with the level of the block connection to prevent the risk of voids occurring below the geogrid.

12.14 The general construction procedure is repeated until the required level for the coping unit is reached.

12.15 Convex and concave curves (on plan) can be formed using standard blocks. Internal and external 90° corners can be formed using corner blocks (see section 1.6). Further guidance on curves and corners, including the placement of the geogrids, can be found in the Certificate holder's installation instructions.

12.16 Where accurate cutting of blocks is required on site, disc-cutting techniques may be used, for which appropriate precautions must be taken to mitigate against hazards associated with dust.

Technical Investigations

13 Investigations

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

13.2 An examination was made of test data relating to:

- the compressive strength and gross dry density of the blocks
- durability
- performance of the retaining wall system under fire test conditions
- the connection strength between the geogrids and blocks
- interface shear capacity between the blocks.

13.3 An assessment was made of the method of installation to assess the practicability and ease of construction of the system.

13.4 Dimensional check tests were carried out on the blocks.

Bibliography

ASTM D 6638-11 S*tandard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)*

BRE Special Digest 1 : 2005 *Concrete in aggressive ground*

BS 8006-1 : 2010 + A1 : 2006 *Code of practice for strengthened/reinforced soils and other fills*

BS 8500-1 : 2015 + A1 : 2016 *Concrete — Complementary British Standard to BS EN 206-1 — Method of specifying and guidance for the specifier*

BS EN 771-3 : 2011 + A1 : 2015 *Specification for masonry units — Aggregate concrete masonry units (dense and lightweight aggregates)*

BS EN 12878 : 2014 *Pigments for the colouring of building materials based on cement and/or lime — Specifications and methods of test*

BS EN 13251 : 2016 *Geotextiles and geotextile-related products — Characteristics required for use in earthworks, foundations and retaining structures*

BS EN 14475 : 2006 *Execution of special geotechnical works — Reinforced fill*

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

Manual of Contract Documents for Highway Works, Volume 1 *Specification for Highway Works*, BRE Special Digest 2005 : 2001

14 Conditions

14.1 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 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.

14.2 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.

14.3 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.

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

14.5 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.

14.6 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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