

HAPAS

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HAPAS Certificate

23/H7046

Product Sheet 1 Issue 1

MACCAFERRI GEOGRIDS

PARAGRID W GEOGRIDS

This Product Sheet⁽¹⁾ is issued by the British Board of Agrément (BBA). The Highways Authorities Product Approval Scheme (HAPAS) is supported by National Highways (NH) (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.

(1) Hereinafter referred to as 'Certificate'.

This Certificate relates to ParaGrid W Geogrids, a range of knitted high tenacity PET geogrids finished with a polymeric coating, for use as reinforcement in embankments with slope angles up to 70°, in accordance with the Manual of Contract Documents for Highway Works (MCHW), Volume 1, Specification for Highway Works (SHW), Series 600, and designated Standards BS EN 13251 : 2016, BS 8006-1 : 2010, PD/ISO TR 20432 : 2007, CIRIA SP123 : 1996 and BS EN 14475 : 2006.



The BBA has awarded this Certificate to the company named above for the products described herein. These products have been assessed as complying with the requirements of the BBA HAPAS Certification Scheme according to the assessments set out in this Certificate.

On behalf of the British Board of Agrément

Date of issue: 20 November 2023

Hardy Giesler
Chief Executive Officer

This BBA HAPAS Certificate is issued under the BBA's accreditation to ISO/IEC 17065 (UKAS accredited Certification Body Number 0113).

Clauses marked † are additional information outside the scope of accreditation.

Readers MUST check the validity and latest issue number of this BBA HAPAS Certificate by 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.

British Board of Agrément

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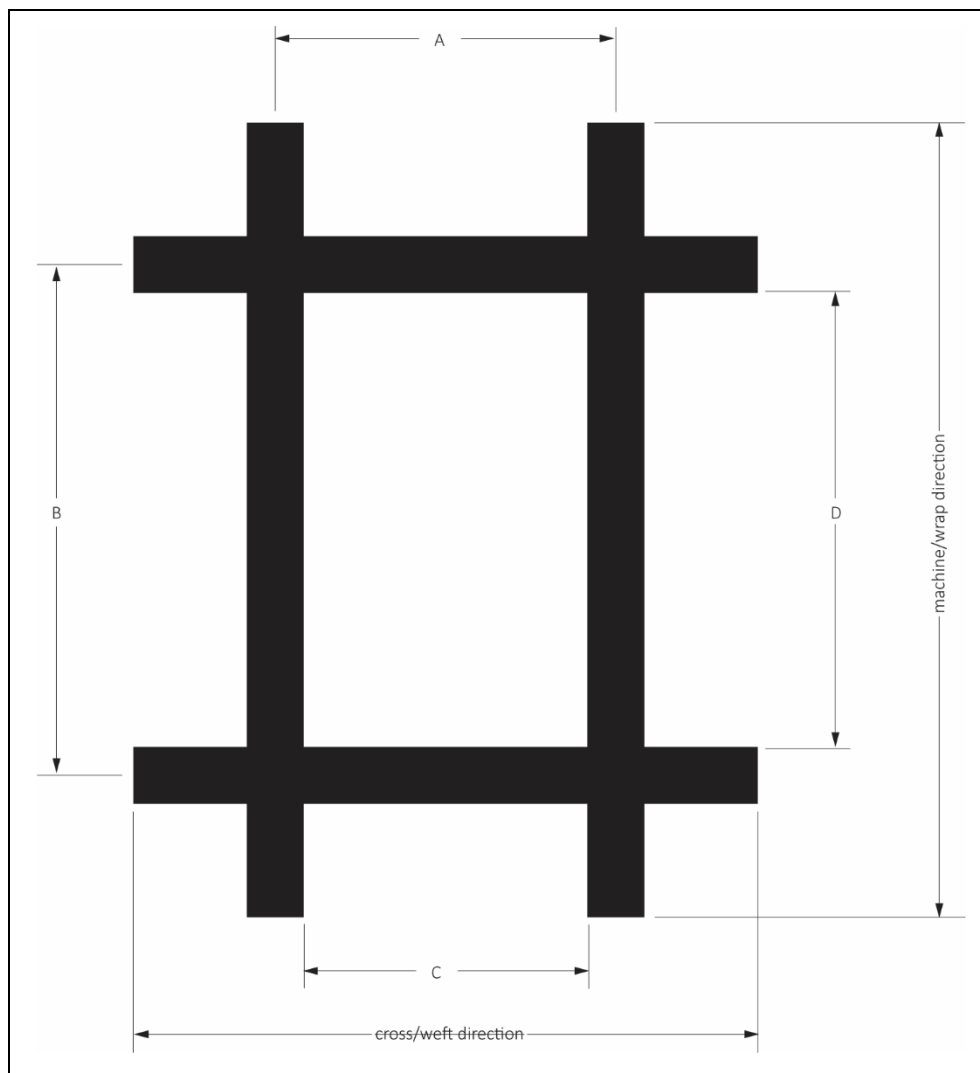
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1 Product Description

1.1 The Certificate holder specifies the products under assessment, ParaGrid W Geogrids, as a range of knitted high tenacity PET geogrids finished with a polymeric coating, for use as reinforcement in embankments with slope angles up to 70° in accordance with the MCHW, Volume 1 (SHW), and designated Standards BS EN 13251 : 2016, BS 8006-1 : 2010, PD/ISO TR 20432 : 2007, CIRIA SP123 : 1996 and BS EN 14475 : 2006.

1.2 The geogrids are manufactured in 10 standard grades of various strengths and mesh sizes. A typical geogrid is illustrated in Figure 1.

Figure 1 Paragrid W Geogrids configuration



1.3 ParaGrid W Geogrids have the characteristics given in Table 1.

Table 1 General specifications for ParaGrid W Geogrids

Grade	Nominal mass ⁽¹⁾ (g·m ⁻²)	Grid size ⁽²⁾ warp/weft A x B (mm)	Aperture size ⁽²⁾ warp/weft C x D (mm)	Nominal roll width (m)	Nominal roll length (m)
W350	127	37 x 68	33 x 64	5.20	100
W450	147	37 x 68	32 x 64	5.20	100
W550	171	37 x 68	31 x 64	5.20	100
W750	198	41 x 68	33 x 64	5.20	100
W900	236	41 x 68	32 x 64	5.20	100
W1150	280	45 x 68	33 x 64	5.20	100
W1400	325	45 x 68	32 x 64	5.20	100
W1700	381	45 x 68	31 x 64	5.20	100
W2000	454	45 x 68	33 x 64	5.20	100
W2300	506	45 x 68	31 x 64	5.20	100

(1) Mass/unit area measured in accordance with BS EN ISO 9864 : 2005.

(2) Mean measured dimensions (see Figure 1 for reference).

2 Requirements

Requirements for the products are outlined in the BBA HAPAS Certification Scheme and Technical Specifications Documents, and have been established from the following specification documents:

- the MCHW⁽¹⁾, Volume 1 (SHW), Series 600
- BS EN 13251 : 2016
- BS 8006-1 : 2010
- PD/ISO TR 20432 : 2007
- CIRIA SP123 : 1996
- BS EN 14475 : 2006.

(1) The MCHW is operated by National Highways (NH) (acting on behalf of the Overseeing Organisations of the Department for Transport; Transport Scotland; the Welsh Government and the Department for Infrastructure, Northern Ireland).

3 Summary of Product Assessment

The product was assessed on the basis of the following characteristics in accordance with HAPAS requirements.

3.1 Short Term Tensile Strength

3.1.1 ParaGrid W Geogrids have the characteristics shown in Tables 2 to 5 and Figure 2.

Table 2 Machine direction tensile strength characteristics of ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
W350	Short Term Tensile test to EN ISO 10319 : 2015	≥30 kN.m ⁻¹	Pass
W450		≥40 kN.m ⁻¹	Pass
W550		≥50 kN.m ⁻¹	Pass
W750		≥65 kN.m ⁻¹	Pass
W900		≥80 kN.m ⁻¹	Pass
W1150		≥100 kN.m ⁻¹	Pass
W1400		≥120 kN.m ⁻¹	Pass
W1700		≥150 kN.m ⁻¹	Pass
W2000		≥175 kN.m ⁻¹	Pass
W2300		≥200 kN.m ⁻¹	Pass

Table 3 Machined direction elongation at minimum tensile strength characteristics of ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
W350	Short Term Tensile test to EN ISO 10319 : 2015	7%(-1/+0)	Pass
W450		7%(-1/+0)	Pass
W550		7%(-1/+0)	Pass
W750		7%(-1/+0)	Pass
W900		7%(-1/+0)	Pass
W1150		7.5%(-1/+0)	Pass
W1400		7.5%(-1/+0)	Pass
W1700		7.5%(-1/+0)	Pass
W2000		8%(-1/+0)	Pass
W2300		8%(-1/+0)	Pass

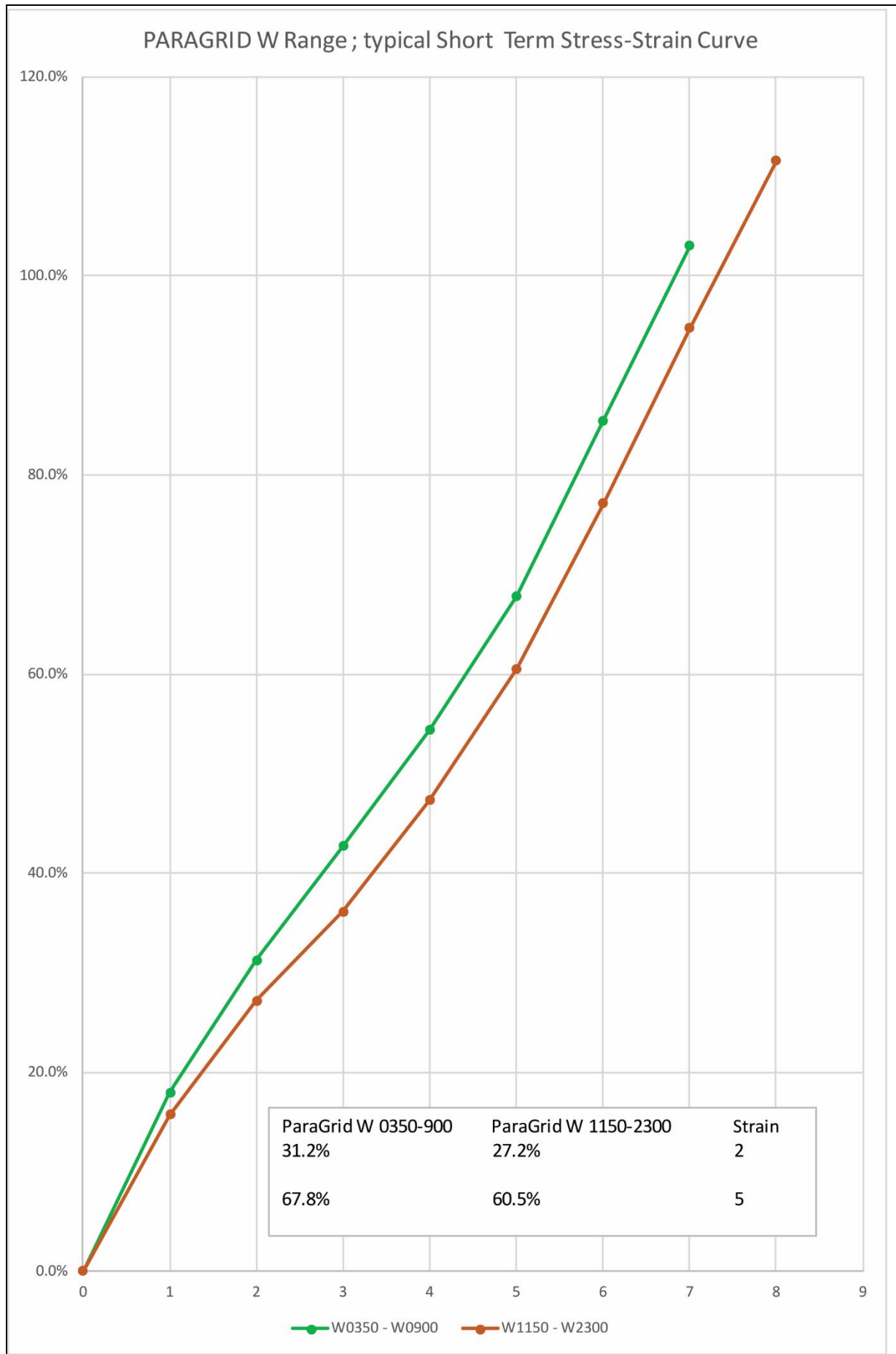
Table 4 Cross machine direction tensile strength characteristics of ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
W350	Short Term Tensile test to EN ISO 10319 : 2015	$\geq 15 \text{ kN.m}^{-1}$	Pass
W450		$\geq 15 \text{ kN.m}^{-1}$	Pass
W550		$\geq 15 \text{ kN.m}^{-1}$	Pass
W750		$\geq 15 \text{ kN.m}^{-1}$	Pass
W900		$\geq 15 \text{ kN.m}^{-1}$	Pass
W1150		$\geq 15 \text{ kN.m}^{-1}$	Pass
W1400		$\geq 15 \text{ kN.m}^{-1}$	Pass
W1700		$\geq 15 \text{ kN.m}^{-1}$	Pass
W2000		$\geq 20 \text{ kN.m}^{-1}$	Pass
W2300		$\geq 20 \text{ kN.m}^{-1}$	Pass

Table 5 Cross machine direction elongation at minimum tensile Strength Characteristics of ParaGrid W

Product assessed	Assessment method	Requirement	Result
W350	Short Term Tensile test to EN ISO 10319 : 2015	10%(+2.5/-2)	Pass
W450		10%(+2.5/-2)	Pass
W550		10%(+2.5/-2)	Pass
W750		10%(+2.5/-2)	Pass
W900		10%(+2.5/-2)	Pass
W1150		10%(+2.5/-2)	Pass
W1400		10%(+2.5/-2)	Pass
W1700		10%(+2.5/-2)	Pass
W2000		10%(+2.5/-2)	Pass
W2300		10%(+2.5/-2)	Pass

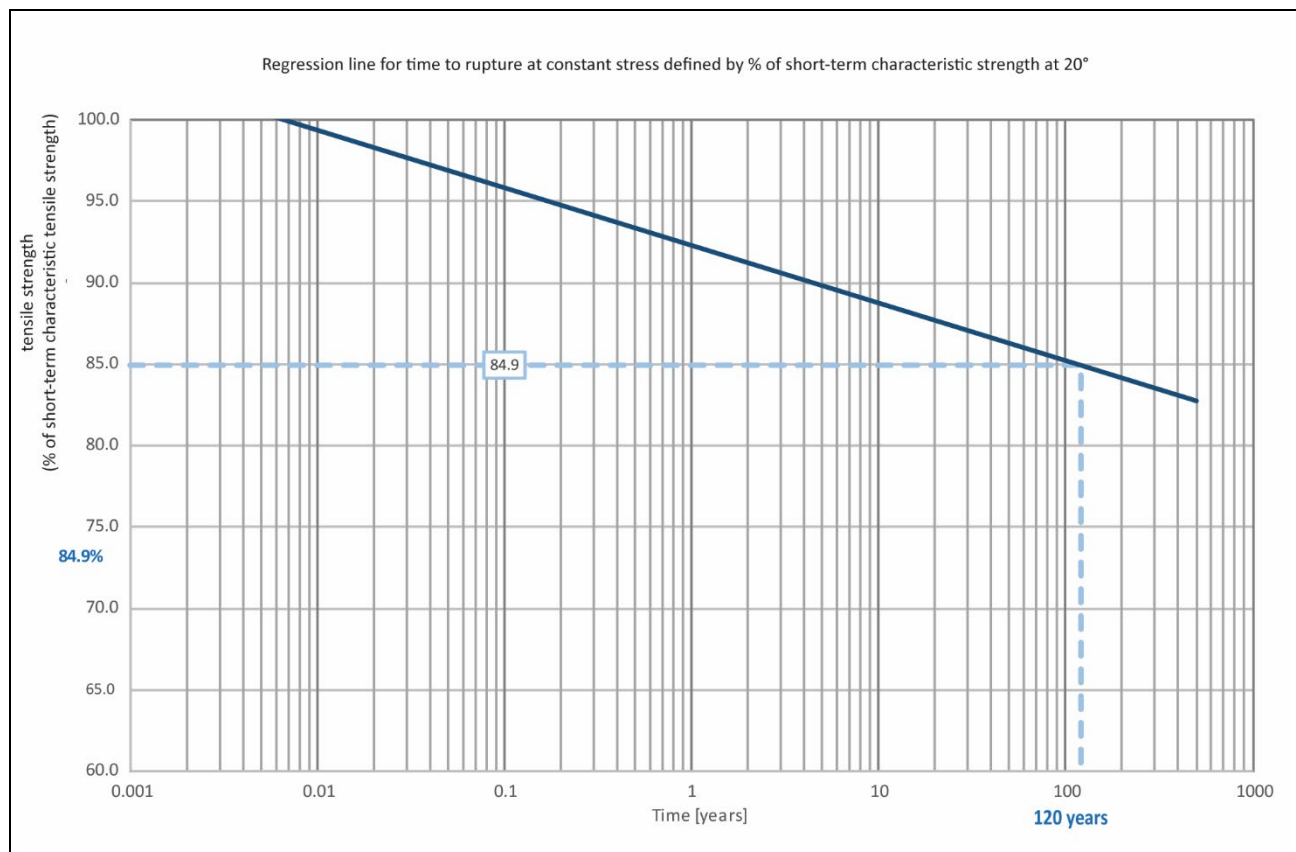
Figure 2 ParaGrid W Geogrids configuration



3.2 Long Term Tensile Strength

3.2.1 The long-term creep performance of the products has been determined in accordance with the principles of PD ISO/TR 20432 : 2007 using conventional test data and stepped isothermal method (SIM) creep rupture test. The resultant creep rupture diagram is shown in Figure 3 of this Certificate.

Figure 3 Regression line for life expectancy at constant stress defined by percentage of characteristic short-term tensile strength at 20°C



3.2.2 Long-term tensile strength (T_{CR}) values for the products can be derived using the formula given in BS 8006-1 : 2010, with the long-term creep reduction factors (RF_{CR}) and R_1 to be determined using the method stated in PD ISO/TR 20432 shown in Tables 6 and 7 of this Certificate.

Table 6 Long term creep reduction factors (RF_{CR}) for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
ParaGrid W1150	Long term creep rupture to PD ISO/TR 20432 : 2007 using conventional test data to EN ISO 13431 : 1999-08 and SIM test data to ASTM D6992 : 2016	60 Years' design Life Design Soil Temperature 20°C	1.16 (86.00 % tensile strength)
		120 Years' design Life Design Soil Temperature 20°C	1.18 (84.93% tensile strength)

Table 7 Long term creep R_1 for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
ParaGrid W	Long term creep rupture to PD ISO/TR 20432 : 2007 using conventional test data to EN ISO 13431 : 1999-08 and SIM test data to ASTM D6992 : 2016	60 Years' design Life Design Soil Temperature 20°C	1.00
		120 Years' design Life Design Soil Temperature 20°C	1.00

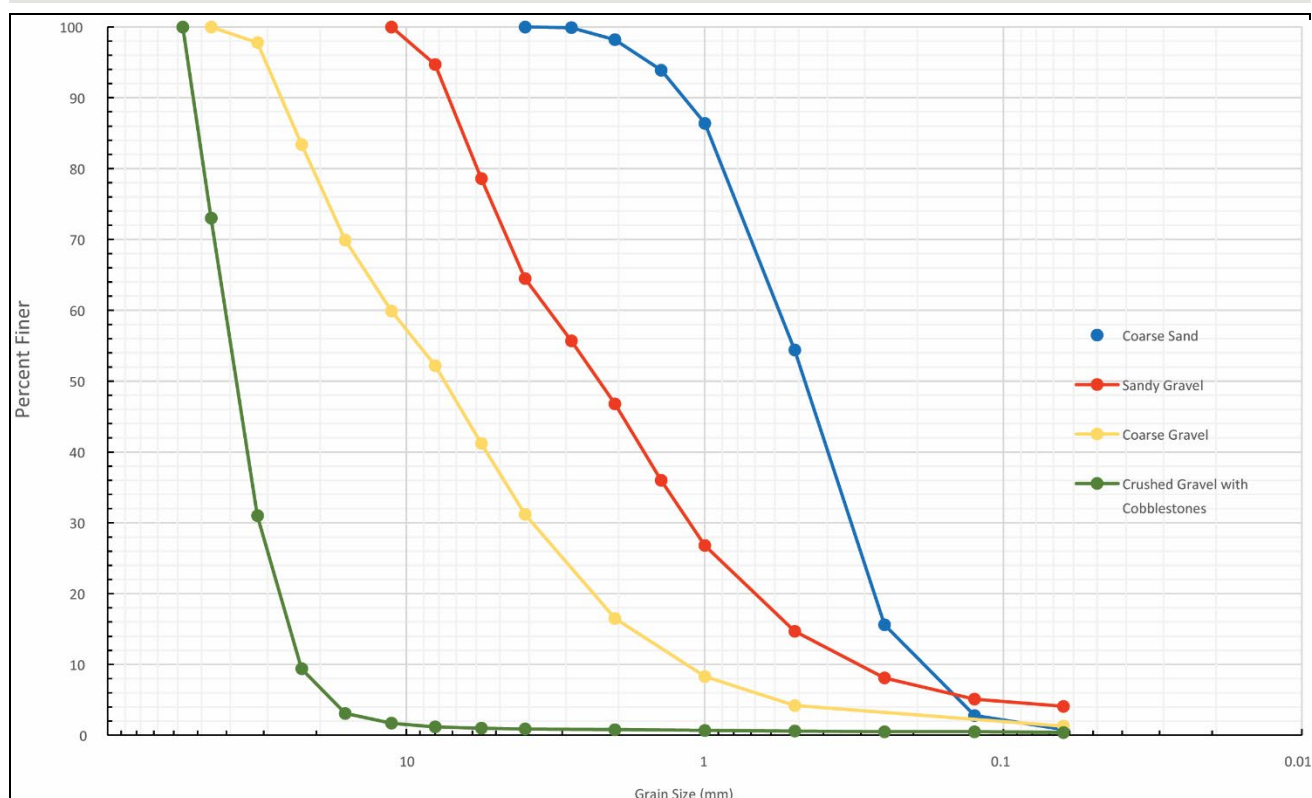
3.3 Installation Damage

To allow for loss of strength due to mechanical damage sustained during installation, the appropriate reduction factor (RF_{ID}) should be selected from Table 8. These reduction factors have been established from full-scale installation damage tests using a range of materials. For soils not covered by Table 8, appropriate values of RF_{ID} may be determined from site-specific trials, or the engineer responsible for the design of the project may exercise engineering judgment to interpolate between the values given.

Table 8 Reduction factors for installation damage (RF_{ID}) for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
ParaGrid W Geogrids	Installation damage to BS 8006-1 : 2010, Annex D and EN ISO 10722 : 2019-12	Sand 0/2 mm (Coarse Sand) $d_{50} \leq 0.46$ (mm)	1.0
		Split 0/32 mm (Coarse Gravel) $d_{50} \leq 7.39$ (mm)	1.0
		Crushed Sand-Split Mixture 0/8 mm (Sandy gravel) $d_{50} \leq 2.25$ (mm)	1.0
		Crushed Gravel with Cobbles 16/56 mm $d_{50} \leq 36.93$ (mm)	1.0
		Sand 0/2 mm (Coarse Sand) $d_{90} \leq 1.17$ (mm)	1.0
		Split 0/32 mm (Coarse Gravel) $d_{90} \leq 26.06$ (mm)	1.0
		Crushed Sand-Split Mixture 0/8 mm (Sandy gravel) $d_{90} \leq 7.18$ (mm)	1.0
		Crushed Gravel with Cobbles 16/56 mm $d_{90} \leq 51.37$ (mm)	1.0

Figure 4 Particle size distributions of soils used in installation damage testing



3.4 Pull out resistance

Table 9 Pull out resistance for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
W450 and W1150	Pull out resistance to DIN EN 13738 : 2005-02	Achieved value	$f_p = 1.23$ Pull-out resistance for a vertical stress ≤ 20 kPa $f_p = 0.84$ pull-out resistance for a vertical stress > 20 kPa

3.5 Weathering (including exposure to UV light)

In accordance with PD ISO/TR 20432 : 2007, section 9.3, if the ParaGrid W Geogrids are exposed for a maximum of 12 hours, no reduction factor needs to be applied. If the exposure time is longer, then the reduction factor RF_W in the Table 10 of this Certificate must be used for the maximum exposure of 2 weeks.

Table 10 Reduction factors for Weathering (RF_W) for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
ParaGrid W	Weathering to EN 12224 : 2000 and PD/ISO TR 20432 : 2007	Periods of exposure are limited to a maximum of 2 weeks	1.27

3.6 Hydrolysis

Table 11 Reduction factors for Hydrolysis (RF_{CH}) for ParaGrid W

Product assessed	Assessment method	Requirement	Result
ParaGrid W	Hydrolysis from PD/ISO TR 20432 : 2007, Table 2. Index test to EN 12224 : 2000	pH range of 4 to 9 for 25 years design lifetime at 25°C service temperature	$RF_{CH} = 1.0$ and $R_2 = 1.0$
		pH range of 4 to 8 for 100 years design lifetime at 25°C service temperature	$RF_{CH} = 1.2$ and $R_2 = 1.0$
		pH range of 8 to 9 for 100 years design lifetime at 25°C service temperature	$RF_{CH} = 1.3$ and $R_2 = 1.0$
		pH range of 4 to 9 for 25 years design lifetime at 35°C service temperature	$RF_{CH} = 1.4$ and $R_2 = 1.0$

3.7 Microbiological degradation

Table 12 Microbiological degradation for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
ParaGrid W	Microbiological degradation to EN 12225 : 2000	No considerable loss of retained tensile strength	Pass

3.8 CEG and molecular weight

Table 13 CEG and Molecular Weight for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
ParaGrid W	Carboxyl end group (CEG) count to ASTM D7409	<30 mmol·kg	Pass
	Molecular weight (M_n) by viscosity to ASTM D4603	≥ 25000 g·mol	Pass

3.9 Screening test for resistance to acid and alkaline liquids

Table 14 Screening test for resistance to acid and alkaline liquids for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
ParaGrid W	Screening test method for determining the resistance to acid and alkaline liquids to EN 14030 : 2001. Test and control specimens were prepared to EN 12226 : 2012	No considerable loss of retained tensile strength	Pass

3.10 Factor of safety for the extrapolation of data (f_s)

Table 15 Factor of safety for the extrapolation of data (f_s) for ParaGrid W Geogrids

Product assessed	Assessment method	Requirement	Result
Paragrid W	The values calculated in accordance with PD ISO/TR 20432 : 2007, using the R_1 and R_2 values given in Tables 7 and 12 of this Certificate.	60 Years' design Life Design Soil Temperature 20°C	1.00
		120 Years' design Life Design Soil Temperature 20°C	1.00

3.11 Durability

When designed and installed in accordance with the requirements of BS 8006-1 : 2010, BS EN 14475 : 2006, PD ISO/TR 20432 : 2007 and this Certificate, ParaGrid W Geogrids will have a service life of up to 120 years, exceeding the typical service life required for reinforced soil embankments.

4 Summary of Process Assessment

Manufacturing process and quality control	Complies with HAPAS requirements
Delivery and site handling	Complies with HAPAS requirements
Installation	Complies with HAPAS requirements

4.1 Manufacture

4.1.1 The BBA has undertaken the following tasks for the assessment of product manufacture and has established that the manufacture complies with BBA HAPAS Certification Scheme requirements:

- the BBA has recorded and evaluated the manufacturer's documentation of the methods adopted for quality control procedures and product testing against HAPAS requirements
- the BBA has assessed the quality control operated over batches of incoming materials and formulations against HAPAS Requirements
- the BBA has evaluated the process for management of non-conforming work
- the BBA has audited the production process and verified that it is in accordance with the documented process
- the BBA has checked that equipment has been properly tested and calibrated.

4.1.2 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.

† 4.1.3 The management system of the manufacturer has been assessed and registered as meeting the requirements of ISO 9001 : 2015 by CSU INTERNATIONAL CERTIFICATION CO.,LTD Register Quality Assurance & Certificate (Certificate Q1800441R1M).

4.2 Delivery and site handling

† 4.2.1 ParaGrid W Geogrids are delivered to site in rolls with the nominal widths, lengths and weights shown in Table 1. Each roll is wrapped for transit and site protection in green tarp [polypropylene (PP) core reinforcement laminated] or black high-density polyethylene film and is labelled with the geogrid grade and identification. The packaging should not be removed until immediately prior to installation.

Figure 5 Label

CE BBA BEUTELBAU VERBODEN TOEGEGANG TOEGEGANG MACCAFERRI 20 PARAGRID W XXXX – 005DOP - 3146 EN 13249:2016, EN 13250:2016, EN 13254:2016, EN 13255:2016, EN 13257:2016 PARAGRID W XXX Intended to be used: reinforcement Intended function: R	<table><tr><th>Essential Characteristics</th><th>Performance</th></tr><tr><td>Tensile strength, MD EN ISO 10319</td><td>YYY(-0) kN/m</td></tr><tr><td>Tensile strength, CMD EN ISO 10319</td><td>YY (-0) kN/m</td></tr><tr><td>Elongation, MD EN ISO 10319</td><td>XX (-/+ X) %</td></tr><tr><td>Elongation, CMD EN ISO 10319</td><td>XX (-2;+2.5) %</td></tr><tr><td>Durability (Annex B)</td><td>can be exposed up to 1 month days durable in natural soil with 4<pH<9 and soil temperature <25°C for a minimum of 100 years service life.</td></tr><tr><td>Product descript.: Polymer: Unit weight: Width: Length: Code Lot Nr Roll Nr</td><td>GG polyester XXX g/m2(±X%) 5.2 m 100 m XXXXXX 1</td></tr></table>	Essential Characteristics	Performance	Tensile strength, MD EN ISO 10319	YYY(-0) kN/m	Tensile strength, CMD EN ISO 10319	YY (-0) kN/m	Elongation, MD EN ISO 10319	XX (-/+ X) %	Elongation, CMD EN ISO 10319	XX (-2;+2.5) %	Durability (Annex B)	can be exposed up to 1 month days durable in natural soil with 4<pH<9 and soil temperature <25°C for a minimum of 100 years service life.	Product descript.: Polymer: Unit weight: Width: Length: Code Lot Nr Roll Nr	GG polyester XXX g/m2(±X%) 5.2 m 100 m XXXXXX 1
Essential Characteristics	Performance														
Tensile strength, MD EN ISO 10319	YYY(-0) kN/m														
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Elongation, CMD EN ISO 10319	XX (-2;+2.5) %														
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Product descript.: Polymer: Unit weight: Width: Length: Code Lot Nr Roll Nr	GG polyester XXX g/m2(±X%) 5.2 m 100 m XXXXXX 1														

4.2.2 To achieve the performance described in this Certificate, delivery and site handing must be performed in accordance with the Certificate holder's instructions and this Certificate, including:

- rolls should be stored in clean, dry conditions and protected from mechanical or chemical damage, exposure to direct sunlight and extreme temperatures. When laid horizontally, the rolls may be stacked up to five high. No other loads should be stored on top of the stack
- toxic fumes are given off if the geogrids catch fire and therefore the necessary precautions should be taken following the instructions given in the material safety data sheet for the products.

4.3 Design

4.3.1 Reinforced soil embankments constructed using ParaGrid W Geogrids should be designed in accordance with BS 8006-1 : 2010 and the MCHW, Volume 1 (SHW), Series 600.

4.3.2 The design tensile strength of reinforcement (T_D), the long-term tensile creep rupture strength (T_{CR}), extrapolated tensile load based on creep strain at the end of the design life (T_{CS}) and the material safety factor (f_m) is calculated in accordance with the methodology set out in BS 8006-1 : 2010.

4.3.3 Recommended values for RF_{CR} , RF_{ID} , RF_W , RF_{CH} and f_s are given in section 3. Conditions of use outside the scope for which the reduction factors are defined are not covered by this Certificate and advice should be sought from the Certificate holder.

4.3.4 CIRIA SP123 : 1996, Sections 4.5 and 4.6, describes the methods for determining resistance to direct sliding and maximum available bond, to which the appropriate partial factors should be applied in accordance with BS 8006-1 : 2010. For detailed design, the resistance to direct sliding should be determined from soil and ParaGrid W Geogrid specific shear box testing.

4.3.5 The designer should specify the relevant properties of fill and the thickness and compaction of the fill material deemed acceptable for the purpose of the design. Acceptable materials should satisfy the requirements of BS 8006-1 : 2010 and the MCHW, Volume 1 (SHW), Series 600 and in line with those conditions used to determine the installation damage partial safety factors in the design.

4.4 Installation

4.4.1 The Certificate holder's instructions for installation of the products were confirmed as meeting the BBA HAPAS Certification Scheme requirements.

4.4.2 To achieve the performance described in this Certificate, the products must be installed by competent ground engineering contractors, familiar with these types of products in accordance with the specifications and construction drawings.

4.4.3 To achieve the performance described in this Certificate, Installation of reinforced soil embankment incorporating ParaGrid W Geogrids should be in accordance with the Certificate's holder's installation instructions, BS 8006-1 : 2010, BS EN 14475 : 2006 and the MCHW, Volume 1 (SHW), Series 600 and HAPAS requirements.

† 4.4.4 The Certificate holder's instructions advise that care should be taken to ensure that the products are laid with the warp (longitudinal) direction parallel to the direction of principal stress. Design drawings should indicate orientation of the products.

4.4.5 Installation procedure

† 4.4.5.1 The products are laid by unrolling manually or mechanically to the length required and cutting with a sharp knife or scissors.

4.4.5.2 Lengths of ParaGrid W Geogrids are laid flat without folds, parallel with widths in contact with each other. Each reinforcing layer must be continuous in the direction of loading without overlapping of adjacent strips. Strip misalignment must not exceed 50 mm over a distance of 5 metres. Pins or a stretching device may be used to control alignment and also to induce a small pre-stressing load prior to filling.

† 4.4.5.3 Particular care should be taken to ensure that the geogrids are adequately covered before compaction or trafficking. Construction traffic will damage unprotected geogrids.

4.4.5.4 Fill material is placed to a minimum compacted depth of 150 mm,

4.4.5.5 The maximum thickness of compaction layers depends on the design, type of fill material and compaction equipment employed, but depths should not exceed 500 mm.

4.4.5.6 The products must be covered with fill within the time specified in the design to prevent degradation caused by UV light.

† 4.4.5.7 Facings are positioned as detailed on the engineer's design drawing and, where the products are used for this purpose, they must be wrapped around and anchored back into the fill. Formwork is used to assist in maintaining the shape of the facing but, whether prefabricated or otherwise, such facings are outside the scope of this Certificate.

4.4.6 Visits were made to installations in progress to assess the practicability and ease of construction of the products.

4.5 Maintenance

As the products are confined within the soil and have suitable durability, maintenance is not required.

5 Fulfilment of Requirements

5.1 The conclusion of this BBA assessment is that ParaGrid W Geogrids, when used in accordance with the provisions of this Certificate complies with the BBA HAPAS Certification Scheme requirements.

5.2 In order for the products to continue to meet Scheme requirements, it must be installed, used and maintained as per the manufacturer's instructions and as detailed in the Certificate.

6 Validity of Certificate

Continuing validity of this Certificate is dependent on the following factors:

- continuing compliance with product or process requirements, as described in the HAPAS Scheme document, and the specification documents referred to therein
- ongoing BBA surveillance of factory production control, to verify that the specifications and quality control being operated by the manufacturer are being maintained
- acceptable results from long-term exposure monitoring
- acceptable data to confirm durability
- formal triennial Review of the Certificate, and Reissue for required technical or non-technical updates
- compliance with ongoing Certificate obligations by the Certificate holder and manufacturer(s).

† 7 Additional 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.

CE marking

The Certificate holder has taken the responsibility of CE marking the products in accordance with Designated Standard BS EN 13251 : 2016.

Annex A

When Paragrid W is used as part of retaining wall system, both serviceability limit state and ultimate limit state design in form of isochronous curves are required. Serviceability limit state and ultimate limit state design in form of isochronous curves must be declared by the Certificate holder, as per the BS 8006-1 : 2010 and approved by the BBA.

8 Bibliography

ASTM D6992 : 2016 *Accelerated creep rupture based on Time Temperature Superposition using Stepped Isothermal Method (SIM)*

ASTM D7409 *Carboxyl end group (CEG) count*

ASTM D7409 *Average Molecular weight*

BS 8006-1 : 2010 + A1 : 2016 *Code of practice for strengthened/reinforced soils and other fills*

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 9864 : 2005 *Geosynthetics — Test method for the determination of mass per unit area of geotextiles and geotextile-related products*

CIRIA SP123 : 1996 *Soil Reinforcement with Geotextiles*, Jewell R.A

DIN EN 13738 : 2005-02 *Geotextiles and geotextile related products — Determination of pullout resistance*

EN 12224 : 2000 *Geotextiles and geotextile-related products — Determination of the resistance to weathering*

EN 12225 : 2000 *Geosynthetics — Method for determining the microbiological resistance by a soil burial test*

EN 12226 : 2012 *Test and control specimens' preparation*

EN 14030 : 2001 *Geotextiles and geotextile-related products — Screening test method for determining the resistance to acid and alkaline liquids*

EN ISO 10722 : 2019-12 *Geosynthetics — Index test procedure for the evaluation of mechanical damage under repeated loading — Damage caused by granular material (laboratory test method)*

EN ISO 10319 : 2015 *Geosynthetics — Wide-width tensile test*

EN ISO 13431 : 1999-08 *Determination of tensile creep behaviour*

ISO 9001 : 2015 *Quality management systems — Requirements*

Manual of Contract Documents for Highway Works, Volume 1, *Specification for Highway Works*

PD ISO/TR 20432 : 2007 *Guidelines for the determination of the long-term strength of geosynthetics for soil reinforcement*

9 Conditions of Certification

9.1 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.

9.2 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.

9.3 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.

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

9.5 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 UKCA marking and CE marking.

9.6 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.

British Board of Agrément

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