Linear Composites Limited
Vale Mills
Oakworth
Keighley
West Yorkshire BD22 0EB

Tel: 01535 643363
e-mail: mail@linearcomposites.com
website: www.linearcomposites.com

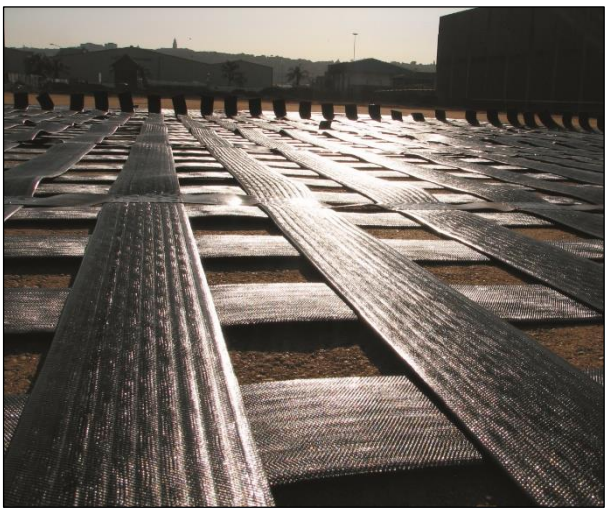
Agrément Certificate
03/4065
Product Sheet 1 Issue 4

LINEAR COMPOSITES SOIL REINFORCEMENT PRODUCTS

PARALINK GEOCOMPOSITES

This Agrément Certificate Product Sheet(1) relates to Paralink(2) Geocomposites, comprising an open network of integrally connected straps of high tenacity polyester yarn coated with polyethylene, for use as basal reinforcement in embankment foundations.

(1) Hereinafter referred to as 'Certificate'.
(2) Paralink is a registered trademark.



The assessment includes

Product factors:

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

Process factors:

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

Ongoing contractual Scheme elements†:

- regular assessment of production
- formal 3-yearly review

KEY FACTORS ASSESSED

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

The BBA has awarded this Certificate to the company named above for the products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Fourth issue: 27 June 2024
Originally certified on 3 December 2003

Hardy Giesler
Chief Executive Officer

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

The BBA is a UKAS accredited Inspection Body (No. 4345), Certification Body (No. 0113) and Testing Laboratory (No. 0357).

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

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

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

SUMMARY OF ASSESSMENT AND COMPLIANCE

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

Compliance with Regulations

In the opinion of the BBA, the use of Paralink Geocomposites is not subject to the national Building Regulations.

Fulfilment of Requirements

The BBA has judged Paralink Geocomposites to be satisfactory for use as described in this Certificate. The product has been assessed as basal reinforcement in embankment foundations.

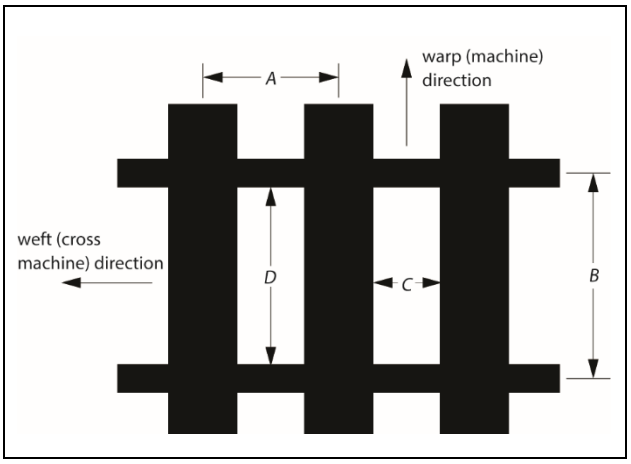
ASSESSMENT

Product description and intended use

The Certificate holder provided the following description for the products under assessment. Paralink Geocomposites consist of a regular array of composite geosynthetic straps, nominally interconnected laterally to form soil reinforcement materials with high unidirectional strength. The main loadbearing geosynthetic straps comprise cores of polyester tendons encased in a polyethylene sheath.

The Paralink Geocomposites grades covered by this Certificate are listed in Table 1, and the associated performance characteristics are shown in Table 2. The configuration of the geocomposites is illustrated in Figure 1.

Figure 1 Paralink Geocomposites



The products have the nominal characteristics given in Table 1.

Table 1 Nominal characteristics of Paralink Geocomposites

Grade	Nominal mass[1] ($g \cdot m^{-2}$)	Grid size[2] warp/weft A x B (mm)	Aperture size[2] warp/weft C x D (mm)	Nominal roll mass (for standard 4.5 m wide roll) (kg)	Standard roll[3] length (m)
100	425	180 x 1000	98 x 940	440	200
150	515	180 x 1000	95 x 940	520	200
200	590	180 x 1000	95 x 940	590	200
250	697	180 x 1000	95 x 940	690	200
300	789	180 x 1000	92 x 940	770	200
350	890	180 x 1000	91 x 940	660	150
400	1014	180 x 1000	90 x 940	750	150
450	1124	180 x 1000	90 x 940	720	130
500	1219	180 x 1000	90 x 940	780	130
550	1410	180 x 1000	90 x 940	700	100
600	1507	180 x 1000	90 x 940	750	100
650	1681	180 x 1000	89 x 940	830	100
700	1835	180 x 1000	89 x 940	480	50
750	1970	150 x 1000	59 x 940	510	50
800	2135	150 x 1000	59 x 940	550	50
850	2221	125 x 1000	34 x 940	570	50
900	2351	125 x 1000	34 x 940	600	50
950	2543	125 x 1000	34 x 940	640	50
1000	2616	125 x 1000	34 x 940	660	50
1050	2695	100 x 1000	9 x 940	680	50
1100	2829	100 x 1000	9 x 940	710	50
1150	3018	100 x 1000	9 x 940	750	50
1200	3171	100 x 1000	9 x 940	790	50
1250	3254	100 x 1000	9 x 940	800	50
1300	3475	100 x 1000	9 x 940	860	50
1350	3674	100 x 1000	9 x 940	900	50
1500	3785	100 x 1000	9 x 940	930	50
1600	4005	100 x 1000	9 x 940	980	50

(1) Mass/unit area measured in accordance with BS EN ISO 9864 : 2005.
(2) Mean measured dimensions (see Figure 1 for reference).
(3) Non-standard lengths can be produced on request.

Product assessment – key factors

The products were assessed for the following key factors, and the outcome of the assessment is shown below. Conclusions relating to the Building Regulations apply to the whole of the UK unless otherwise stated.

1 Mechanical resistance and stability

Data were assessed for the following characteristics.

1.1 Short-term tensile strength

1.1.1 The products were tested for short-term tensile strength and the results are given in Tables 2 to 6.

1.1.2 A typical short-term stress/strain curve is shown in Figure 3. Short-term strain at varying percentages of characteristic strength is given in Table 7.

Table 2 Machine direction mean short term tensile strength characteristics

Product assessed	Assessment method	Requirement	Result
100	Short term tensile strength	Values achieved	103 $kN \cdot m^{-1}$
150	test to		154 $kN \cdot m^{-1}$
200	BS EN ISO 10319 : 2015		206 $kN \cdot m^{-1}$
250			257 $kN \cdot m^{-1}$
300			309 $kN \cdot m^{-1}$
350			360 $kN \cdot m^{-1}$
400			412 $kN \cdot m^{-1}$
450			463 $kN \cdot m^{-1}$
500			515 $kN \cdot m^{-1}$
550			566 $kN \cdot m^{-1}$
600			612 $kN \cdot m^{-1}$
650			669 $kN \cdot m^{-1}$
700			721 $kN \cdot m^{-1}$
750			772 $kN \cdot m^{-1}$
800			826 $kN \cdot m^{-1}$
850			875 $kN \cdot m^{-1}$
900			927 $kN \cdot m^{-1}$
950			980 $kN \cdot m^{-1}$
1000			1038 $kN \cdot m^{-1}$
1050			1081 $kN \cdot m^{-1}$
1100			1133 $kN \cdot m^{-1}$
1150			1184 $kN \cdot m^{-1}$
1200			1236 $kN \cdot m^{-1}$
1250			1287 $kN \cdot m^{-1}$
1300			1339 $kN \cdot m^{-1}$
1350			1390 $kN \cdot m^{-1}$
1500			1545 $kN \cdot m^{-1}$
1600			1648 $kN \cdot m^{-1}$

Table 3 Machine direction mean short term tensile strength tolerance characteristics

Product assessed	Assessment method	Requirement	Result
100	Short term tensile strength	-2.4	Pass
150	test to	-3.2	Pass
200	BS EN ISO 10319 : 2015	-4.9	Pass
250		-5.6	Pass
300		-7.4	Pass
350		-8.1	Pass
400		-9.8	Pass
450		-10.5	Pass
500		-12.3	Pass
550		-13.0	Pass
600		-8.8	Pass
650		-15.5	Pass
700		-17.2	Pass
750		-18.0	Pass
800		-21.7	Pass
850		-20.5	Pass
900		-22.1	Pass
950		-23.4	Pass
1000		-24.8	Pass
1050		-25.4	Pass
1100		-27.1	Pass
1150		-27.8	Pass
1200		-29.5	Pass
1250		-30.0	Pass
1300		-32.0	Pass
1350		-32.8	Pass
1500		-36.9	Pass
1600		-39.4	Pass

Table 4 Machine direction mean strain at maximum tensile strength characteristics

Product assessed	Assessment method	Requirement	Result
100	Short-term tensile strength	10.5 (±1) %	Pass
150	test to	10.5 (±1) %	Pass
200	BS EN ISO 10319 : 2015	10.5 (±1) %	Pass
250		10.5 (±1) %	Pass
300		10.5 (±1) %	Pass
350		10.5 (±1) %	Pass
400		10.5 (±1) %	Pass
450		10.5 (±1) %	Pass
500		10.5 (±1) %	Pass
550		10.5 (±1) %	Pass
600		10.5 (±1) %	Pass
650		10.5 (±1) %	Pass
700		10.5 (±1) %	Pass
750		10.5 (±1) %	Pass
800		10.5 (±1) %	Pass
850		10.5 (±1) %	Pass
900		10.5 (±1) %	Pass
950		10.5 (±1) %	Pass
1000		10.5 (±1) %	Pass
1050		10.5 (±1) %	Pass
1100		10.5 (±1) %	Pass
1150		10.5 (±1) %	Pass
1200		10.5 (±1) %	Pass
1250		10.5 (±1) %	Pass
1300		10.5 (±1) %	Pass
1350		10.5 (±1) %	Pass
1500		10.5 (±1) %	Pass
1600		10.5 (±1) %	Pass

Table 5 Machine direction characteristic strength (T_{char}) values

Product assessed	Assessment method	Requirement(1)	Result
100	BS EN 13251 : 2016	≥ 100 kN·m^{-1}	Pass
150		≥ 150 kN·m^{-1}	Pass
200		≥ 201 kN·m^{-1}	Pass
250		≥ 251 kN·m^{-1}	Pass
300		≥ 301 kN·m^{-1}	Pass
350		≥ 351 kN·m^{-1}	Pass
400		≥ 402 kN·m^{-1}	Pass
450		≥ 452 kN·m^{-1}	Pass
500		≥ 502 kN·m^{-1}	Pass
550		≥ 553 kN·m^{-1}	Pass
600		≥ 603 kN·m^{-1}	Pass
650		≥ 653 kN·m^{-1}	Pass
700		≥ 703 kN·m^{-1}	Pass
750		≥ 754 kN·m^{-1}	Pass
800		≥ 804 kN·m^{-1}	Pass
850		≥ 854 kN·m^{-1}	Pass
900		≥ 904 kN·m^{-1}	Pass
950		≥ 956 kN·m^{-1}	Pass
1000		≥ 1013 kN·m^{-1}	Pass
1050		≥ 1055 kN·m^{-1}	Pass
1100		≥ 1105 kN·m^{-1}	Pass
1150		≥ 1156 kN·m^{-1}	Pass
1200		≥ 1206 kN·m^{-1}	Pass
1250		≥ 1257 kN·m^{-1}	Pass
1300		≥ 1307 kN·m^{-1}	Pass
1350		≥ 1357 kN·m^{-1}	Pass
1500		≥ 1508 kN·m^{-1}	Pass
1600		≥ 1608 kN·m^{-1}	Pass

(1) The characteristic short-term tensile strength (Tchar) values are the mean short-term tensile strength minus 1 x the tolerance value.

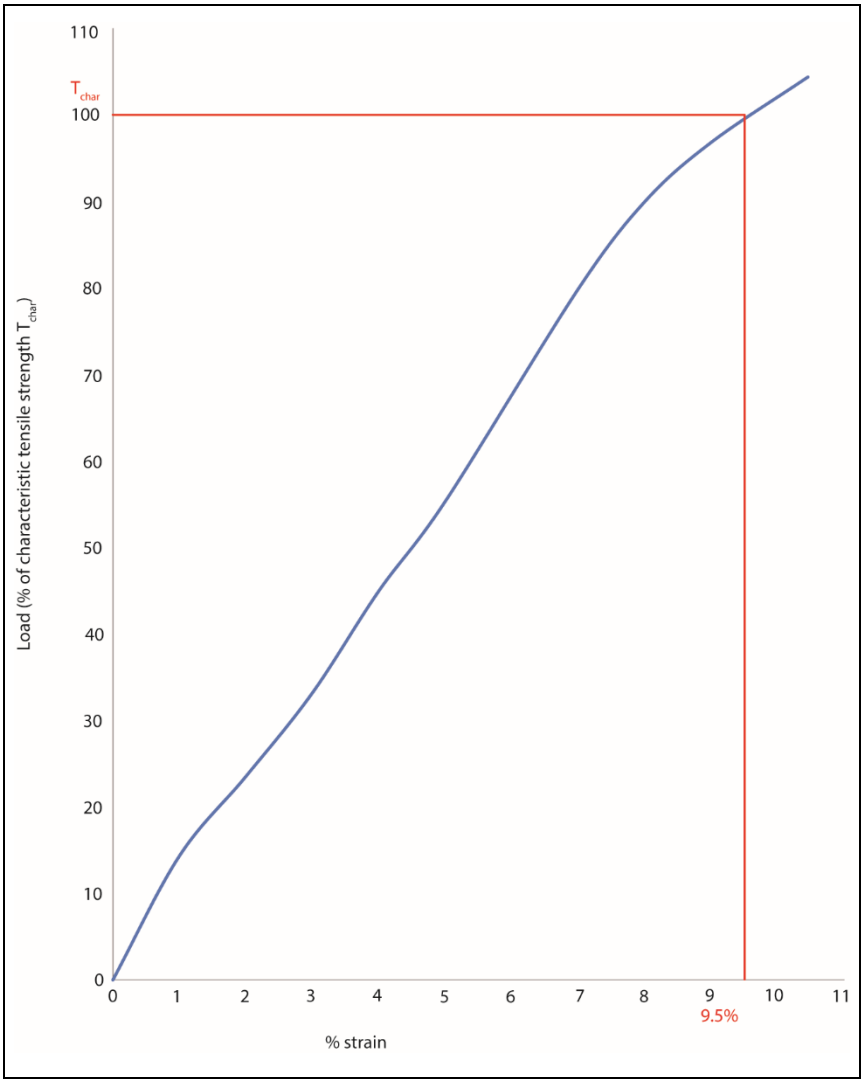
Table 6 Machine direction nominal strain at (T_{char}) load values

Product assessed	Assessment method	Requirement	Result
100	Machine direction nominal strain at *(T_{char}) load* to BS EN 13251 : 2016	9.5 %	Pass
150		9.5 %	Pass
200		9.5 %	Pass
250		9.5 %	Pass
300		9.5 %	Pass
350		9.5 %	Pass
400		9.5 %	Pass
450		9.5 %	Pass
500		9.5 %	Pass
550		9.5 %	Pass
600		9.5 %	Pass
650		9.5 %	Pass
700		9.5 %	Pass
750		9.5 %	Pass
800		9.5 %	Pass
850		9.5 %	Pass
900		9.5 %	Pass
950		9.5 %	Pass
1000		9.5 %	Pass
1050		9.5 %	Pass
1100		9.5 %	Pass
1150		9.5 %	Pass
1200		9.5 %	Pass
1250		9.5 %	Pass
1300		9.5 %	Pass
1350		9.5 %	Pass
1500		9.5 %	Pass
1600		9.5 %	Pass

Table 7 Typical short-term strain against load (as percentage of the ($T_{(char)}$)

Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	Short term strain against load as percentage of the *($T_{(char)}$) to* BS EN 13251 : 2016 and BS 8006-1 : 2010	Strain at 2%	23
		Strain at 3%	34
		Strain at 4%	45
		Strain at 5%	55
		Strain at 6%	69

Figure 2 Typical short-term stress/strain curve for Paralink Geocomposites



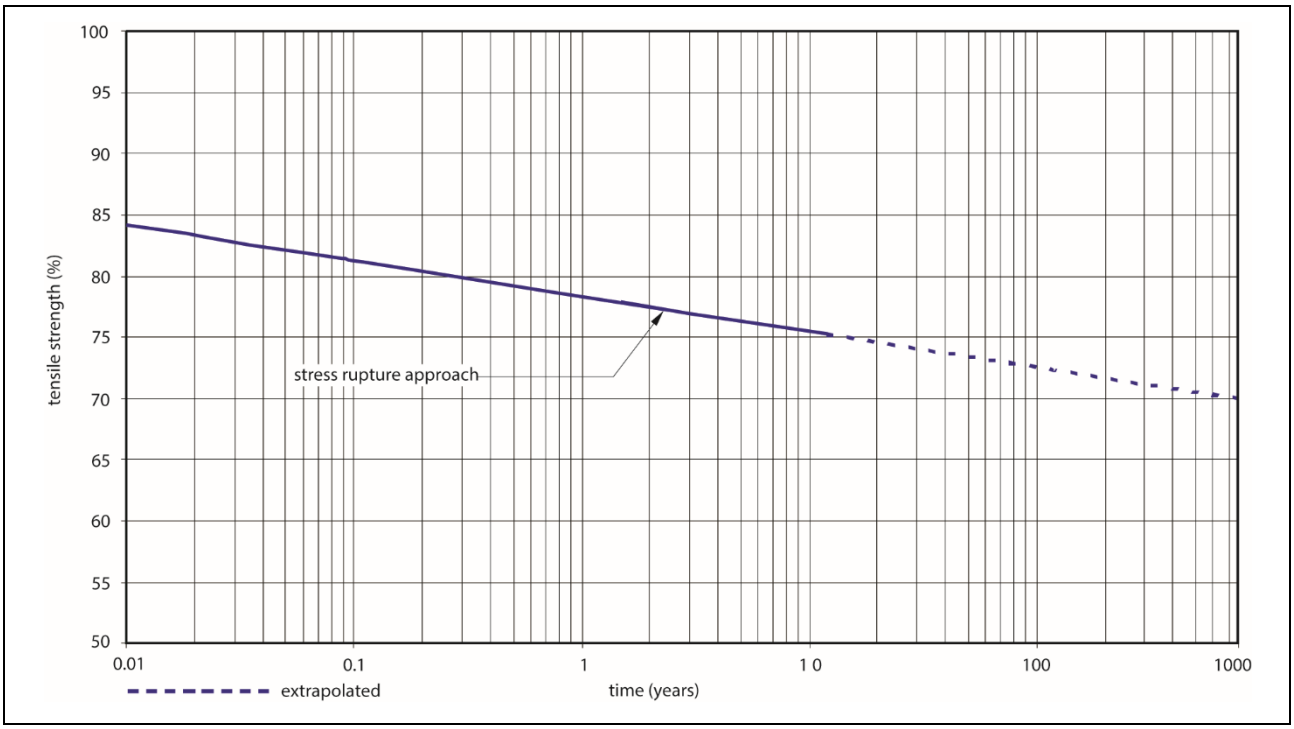
1.1.3 The results given in Tables 2 to 7 may be used to design an appropriate solution for a particular installation, using an appropriate material safety factor.

1.2 Long-term tensile strength

1.2.1 The products were tested for long-term tensile strength and the results are given in Tables 8 and 9.

1.2.2 The long-term tensile creep rupture strength performance of Paralink Geocomposites has been determined in accordance with the principles of PD ISO/TR 20432 : 2007. A stress rupture line (see Figure 3) has been determined using conventional long-term creep rupture test data (up to 41,945 hours) and time-shifted stepped isothermal method (SIM) test data (up to 7.8 x 106 hours) for a design temperature of 20°C. From this graph, the value of the tensile creep rupture strength (T_{CR}) can be determined for the appropriate design life. By applying temperature-shift factors determined for Paralink Geocomposites, tensile creep rupture strength values (T_{CR}) can be determined for other design temperatures.

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



1.2.3 Long-term tensile strength (T_{CR}) for Paralink Geocomposites can be derived for 2, 60 and 120 year design lives and design temperatures of 0, 20, 25, 30 and 40°C, using the instructions given in section 9.1 and the long-term creep reduction factors (RF_{CR}) shown in Table 8.

Table 8 Long-term creep reduction factors (RF_{CR})

Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	Long term creep rupture to PD ISO/TR 20432 : 2007	2 Years' design Life	
		Design Soil Temperature 0°C	1.22
		Design Soil Temperature 20°C	1.29
		Design Soil Temperature 25°C	1.31
		Design Soil Temperature 30°C	1.33
		Design Soil Temperature 40°C	1.37
		60 Years' design Life	
		Design Soil Temperature 0°C	1.28
		Design Soil Temperature 20°C	1.37
		Design Soil Temperature 25°C	1.39
		Design Soil Temperature 30°C	1.41
		Design Soil Temperature 40°C	1.46
		120 Years' design Life	
		Design Soil Temperature 0°C	1.30
		Design Soil Temperature 20°C	1.38
		Design Soil Temperature 25°C	1.40
		Design Soil Temperature 30°C	1.43
		Design Soil Temperature 40°C	1.48

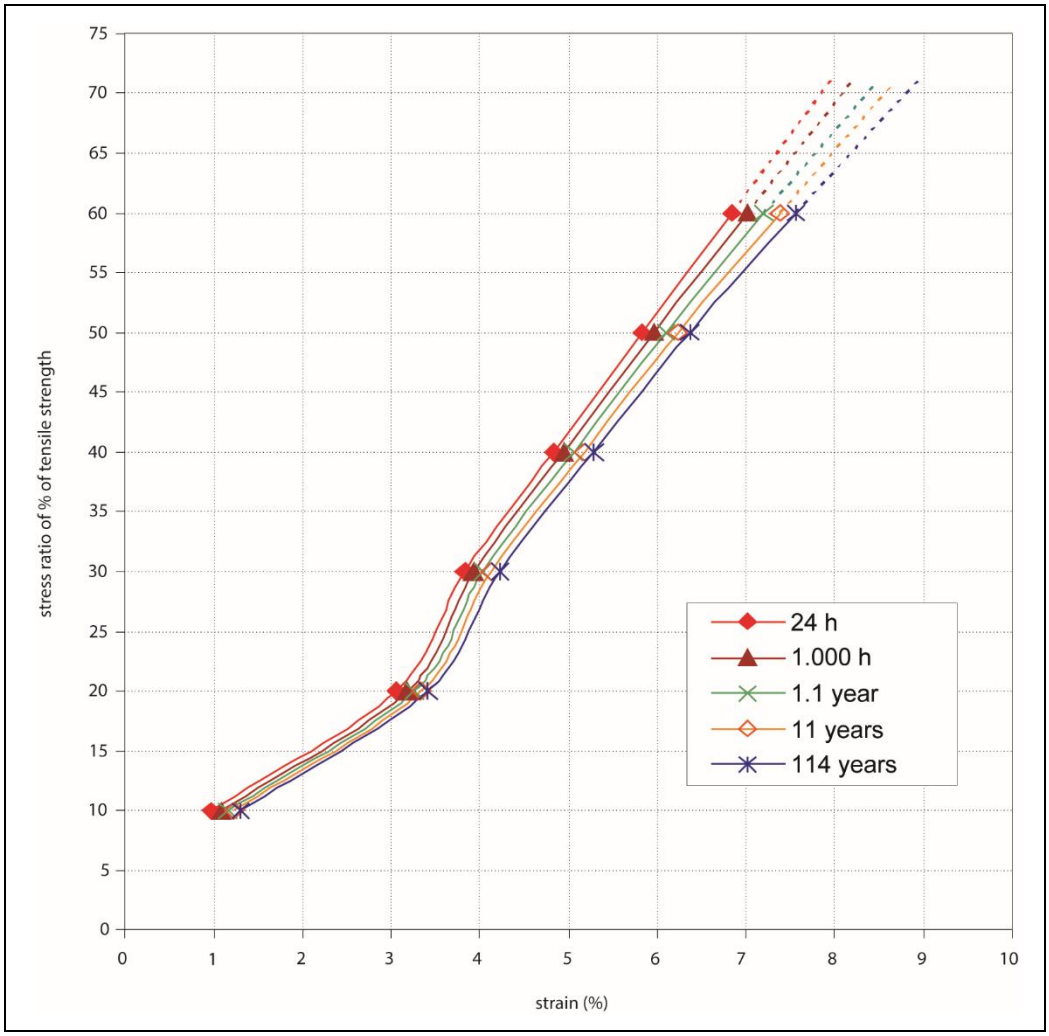
Table 9 Factor R_1

Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	Extrapolation of creep rupture data to PD ISO/TR 20432 : 2007	2 Years' design Life	1.00
		60 Years' design Life	1.00
		120 Years' design Life	1.00

1.3 Serviceability limit strain (SLS)

The maximum allowable tensile load for the SLS design check and the post construction creep strain for Paralink Geocomposites may be calculated from the isochronous curves given in Figure 4. The curves are for a design temperature of 20°C.

Figure 4 Stress/strain isochronous curves for Paralink Geocomposites



1.4 Installation damage

1.4.1 The products were tested for installation damage and the results are given in Table 10.

1.4.2 To allow for loss of strength owing to mechanical damage that might be sustained during installation, the appropriate value for RF_{ID} may be selected from Table 10. These reduction factors have been established from full-scale installation damage tests using a range of materials, the gradings of which can be seen in Figure 5. For soils not covered by Table 10, appropriate values of RF_{ID} should be determined from site specific trials.

Table 10 Reduction factors for installation damage (RF_{ID})

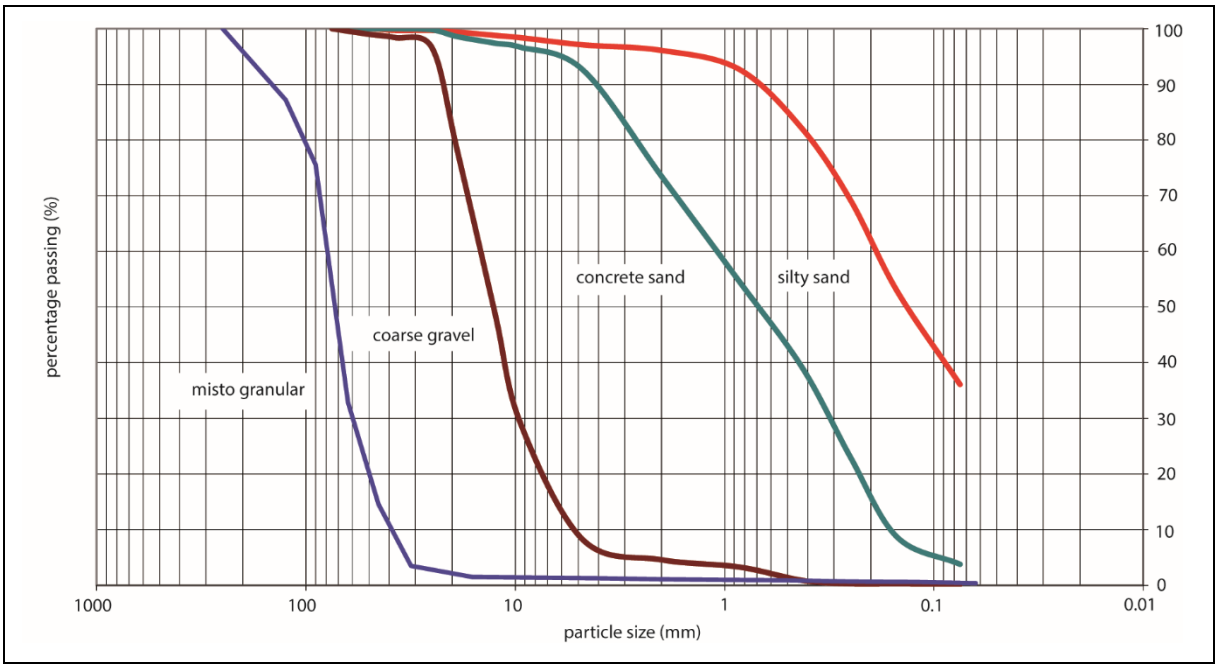
Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	Installation damage to EBGEO, Chapter 2.2.4.6, 2nd edition, 2010	Values achieved: Silty sand(2) D_{50} particle size(1) 0.15 mm D_{90} particle size(1) 0.7 mm	
		Paralink Geocomposites 300 – 450	1.01
		Paralink Geocomposites 500 – 650	1.01
		Paralink Geocomposites 700 – 1600	1.00
		Values achieved: Concrete sand(2) D_{50} particle size(1) 1 mm D_{90} particle size(1) 4 mm	
		Paralink Geocomposites 300 – 450	1.02
		Paralink Geocomposites 500 – 650	1.02
		Paralink Geocomposites 700 – 1600	1.01
		Values achieved: Coarse gravel(2) D_{50} particle size(1) 13 mm D_{90} particle size(1) 23 mm	
		Paralink Geocomposites 300 – 450	1.05
		Paralink Geocomposites 500 – 650	1.03
		Paralink Geocomposites 700 – 1600	1.02
		Values achieved: Misto granular(3) D_{50} particle size(1) 75 mm D_{90} particle size(1) 150 mm	
		Paralink Geocomposites 300 – 450	1.25
		Paralink Geocomposites 500 – 650	1.05
		Paralink Geocomposites 700 – 1600	1.01

(1) Detailed particle size distributions are shown in Figure 5.

(2) Depth of soil layer before compacting: 200 mm; weight of vibrating roll: 1600 $kg \cdot m^{-1}$; number of passes: 8.

(3) Depth of soil layer before compacting: 500 mm; weight of vibrating roll: 3240 $kg \cdot m^{-1}$; number of passes: 6 (2 times without vibration, 4 with).

Figure 5 Particle size distributions of fills used in installation damage testing



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

For Paralink Geocomposites, the factor of safety for the extrapolation of data (f_S) must be as shown in Table 11.

Table 11 Factor of safety for the extrapolation of data (f_s)

Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	The values calculated in accordance with PD ISO/TR 20432 : 2007, using the R_1 and R_2 values given in Tables 9 and 14 of this Certificate.	2 Years' design Life	1.00
		60 Years' design Life	1.02
		120 Years' design Life	1.05

2 Safety in case of fire

Not applicable.

3 Hygiene, health and the environment

Data were assessed for the following characteristics.

3.1 Weathering (including exposure to UV light)

The products were tested for resistance to weathering and the results are given in Table 12.

Table 12 Reduction factors for weathering (RF_W)

Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	Weathering to EN 12224 : 2000 and PD ISO/TR 20432 : 2007	Periods of exposure are limited to a maximum of 1 month	1.00

3.2 Chemical/environmental effects

The products were tested for hydrolysis and the results are given in Table 13.

Table 13 Reduction factors for Hydrolysis (RF_{CH})

Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	Hydrolysis to PD ISO/TR 20432 : 2007	Design temperature 20°C	
		2 year service life	
		4<pH<9	1.00
		9.1<pH<9.5	1.00
		9.6<pH<11	1.01
		60 year service life	
		4<pH<9	1.02
		9.1<pH<9.5	1.03
		9.6<pH<11	1.07
		120 year service life	
		4<pH<9	1.03
		9.1<pH<9.5	1.05
		9.6<pH<11	1.12
		Design temperature 25°C	
		2 year service life	
		4<pH<9	1.00
		9.1<pH<9.5	1.00
		9.6<pH<11	1.01
		60 year service life	
		4<pH<9	1.03
		9.1<pH<9.5	1.05
		9.6<pH<11	1.09
		120 year service life	
		4<pH<9	1.07
		9.1<pH<9.5	1.09
		9.6<pH<11	1.15
		Design temperature 30°C	
		2 year service life	
		4<pH<9	1.01
		9.1<pH<9.5	1.01
		9.6<pH<11	1.02
		60 year service life	
		4<pH<9	1.06
		9.1<pH<9.5	1.10
		9.6<pH<11	1.14
		120 year service life	
		4<pH<9	1.15
		9.1<pH<9.5	1.17
		9.6<pH<11	1.25

Table 14 Factor R_2 for Paralink Geocomposites

Product assessed	Assessment method	Requirement	Result
Paralink Geocomposites	Extrapolation of chemical data to PD ISO/TR 20432 : 2007	2 Years' design Life	1.00
		60 Years' design Life	1.02
		120 Years' design Life	1.05

3.3 Microbiological degradation

The products were tested for microbiological degradation and the results are given in Table 15.

Table 15 Microbiological degradation for Paralink Geocomposites

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

4 Safety and accessibility in use

Not applicable.

5 Protection against noise

Not applicable.

6 Energy economy and heat retention

Not applicable.

7 Sustainable use of natural resources

Not applicable.

8 Durability

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

8.2 Service life

Under normal service conditions, the product will have a life of up to 120 years, provided it is designed, installed and maintained in accordance with this Certificate and the Certificate holder's instructions.

PROCESS ASSESSMENT

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

9 Design, installation, workmanship and maintenance

9.1 Design

9.1.1 The design process was assessed by the BBA and the following requirements apply in order to satisfy the performance specified in this Certificate.

9.1.2 Paralink Geocomposites must be designed and installed as basal reinforcement in embankment foundations in accordance with BS 8006-1 : 2010, BS EN 14475 : 2006 and the provisions of this Certificate where the following foundation conditions exist:

- soft foundation soils
- piled foundations
- areas prone to subsidence.

9.1.3 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}), ultimate limit state (ULS) ($T_{D(ULS)}$), serviceability limit state (SLS) ($T_{D(SLS)}$) and the material safety factor (f_m) are calculated in accordance with the methodology set out in BS 8006-1 : 2010.

9.1.4 During the design process, particular attention must be given to:

- site preparation and foundation construction
- fill material properties
- specification for placing and compacting the fill
- drainage
- protection of the geocomposites against damage during installation
- stability of existing adjacent structures.

9.1.5 This Certificate does not cover the use of Paralink Geocomposites in embankments within the foundation zone of a building.

9.1.6 Recommended values for RF_{CR}, RF_{ID}, RF_{W}, RF_{CH} and f_S are given in sections 1 and 3. Conditions of use outside the scope for which the reduction factors are defined are not covered by this Certificate and advice must be sought from the Certificate holder, but such advice is outside of the scope of this Certificate.

9.1.7 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 must be applied in accordance with BS 8006-1 : 2010. For detailed design, the resistance to direct sliding must be determined from soil and Paralink Geocomposites specific shear box testing.

9.1.8 The designer must 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 in line with those conditions used to determine the installation damage partial safety factors in the design.

9.2 Installation

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

9.2.2 Installation must be carried out in accordance with this Certificate, the Certificate holder's instructions, BS EN 14475 : 2006 and the details shown on the construction drawings for the project. A summary of instructions and guidance is provided in Annex A.

9.2.3 Care must be taken to ensure that the geocomposites are laid with the longitudinal direction parallel to the direction of principal stress. Design drawings must indicate the orientation of the product.

9.2.4 Rolls must be placed on the formation in the position where the length of Paralink Geocomposites is required to start and with the roll as close as possible at right angles to the line of the run. Accurate alignment at the start is essential to ensure a satisfactory positioning of the laid material.

9.2.5 To ease the laying and proper performance of the run, the formation on which it is to be laid must be flat without ruts and sharp undulations.

Procedure

9.2.6 The run of Paralink Geocomposites must be straight and all strip elements flat and untwisted. Undulations must not be evident.

9.2.7 Fill material in immediate contact with Paralink Geocomposites must be placed and spread in the longitudinal direction only. If this results in some undulations of the product, the secured end must be released, and the undulations removed by pulling the free end.

9.2.8 Site vehicles must not be allowed to traffic over the laid, unprotected Paralink Geocomposites.

9.2.9 The products are a structural material and, where joints are necessary in their longitudinal direction, these must be full structural joints capable of carrying the full design tensile force. This will normally be shown as a full anchorage bond length on the drawings. The anchorage bond length depends on the depth of cover and type, and characteristics of the fill in which the products are being used. Where pile caps are spanned, this length is unlikely to be less than the distance across three pile caps. Where the products are being used to span subsidence voids, the length will depend upon the size of the void anticipated by the designer.

9.3 Workmanship

Practicability of installation was assessed by the BBA, on the basis of the Certificate holder's information.
To achieve the performance described in this Certificate, the product must be installed by competent ground engineering contractors, familiar with this type of product

9.4 Maintenance and repair

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

10 Manufacture

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

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

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

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

10.1.4 The process for management of non-conformities has been assessed and deemed appropriate and adequate.

10.1.5 An audit of each production location was undertaken, and it was confirmed that the production process was in accordance with the documented process, and that equipment has been properly tested and calibrated.

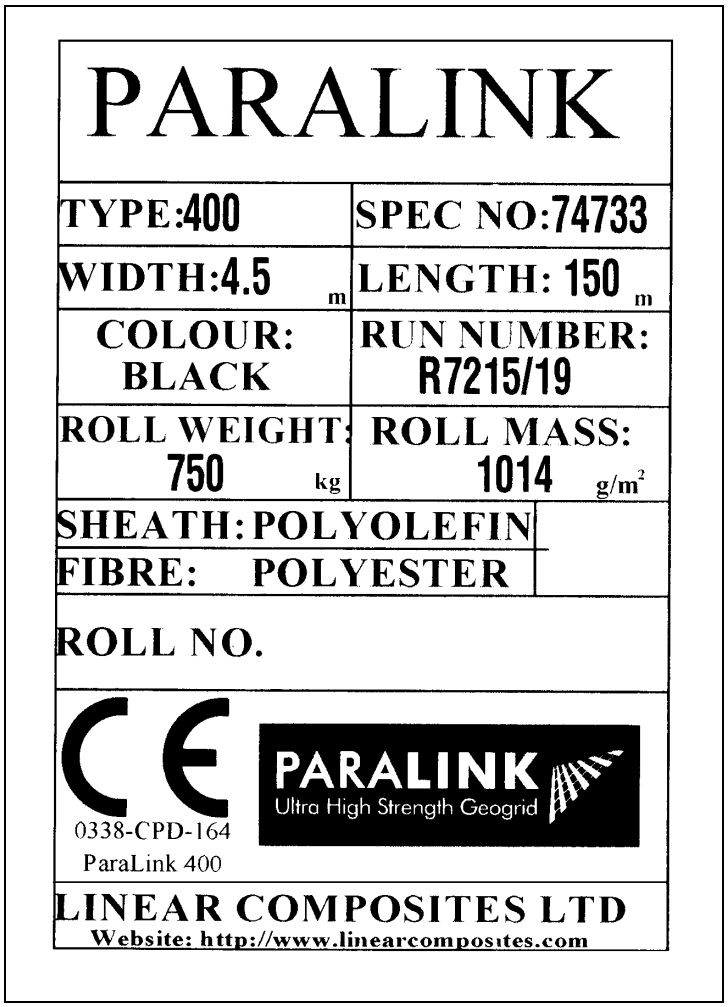
† 10.2 The BBA has undertaken to review the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

11 Delivery and site handling

11.1 The Certificate holder stated that Paralink Geocomposites are delivered to site in rolls nominally 4.5 m wide(1) (edge to edge of roll) and approximately 4.6 m wide (end to end of the central lifting tube). Each roll is wrapped in a black polythene bag for transit and site protection and labelled with the grade and identification (see Figure 6). The packaging must not be removed until immediately prior to installation. Each roll has the product grade printed at regular intervals.

(1) Other sizes are available on request.

Figure 6 Label



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

11.2.1 To prevent damage, care must be taken in the handling and lifting of the rolls. The weight of the rolls is such that mechanical lifting arrangements are necessary (see Table 1).

11.2.2 Rolls must be stored in clean, dry conditions and protected from mechanical or chemical damage and site temperatures in excess of 30°C. When laid horizontally, the rolls may be stacked up to three high. Other loads must not be stored on top of the stack.

11.2.3 Toxic fumes are given off if the geocomposites catch fire and, therefore, precautions must be taken, in accordance with the material safety data sheet for the products.

ANNEX A – SUPPLEMENTARY INFORMATION †

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

Construction (Design and Management) Regulations 2015
Construction (Design and Management) Regulations (Northern Ireland) 2016

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

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard EN 13251 : 2016.

Management Systems Certification for production

The management system of the manufacturer has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by Lloyd's Register Quality Assurance (Certificate 10070947).

Additional Guidance

A.1 The construction drawings should show the correct orientation of Paralink Geocomposites.

Additional information on installation

A.2 The roll is unwound a small amount by pushing the roll in the direction of the run. The loose end of the product now exposed is secured by weighting or pinning to the formation. The roll is unwound carefully, avoiding slack or undulations wherever possible; laying must not continue until corrections are made. When the roll is completely unwound, the free end of the product is hand tensioned and secured by weighting or pinning.

A.3 Where the product is to be used in two layers at right angles to each other, the edge joints will normally be simple butt joints. The drawings must be consulted to verify this, as certain circumstances may dictate otherwise.

A.4 Where a number of rolls are to be laid at one time, rolls are arranged in a slightly staggered formation, to avoid the lifting tubes interfering with one another.

Bibliography

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 9001 : 2015 *Quality management systems — Requirements*

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

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

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

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

EN 12225 : 2000 *Geotextiles and geotextile-related products — Method for determining the microbiological resistance by a soil burial test*

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

EBGEO 2010 *Recommendations for Design and Analysis of Earth Structures using Geosynthetic Reinforcements*

Conditions

1 This Certificate:

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

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

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

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

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

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

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

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

British Board of Agrément
1st Floor, Building 3, Hatters Lane
Croxley Park, Watford
Herts WD18 8YG
tel: 01923 665300
clientservices@bbacerts.co.uk
www.bbacerts.co.uk