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Agrément Certificate

02/3975

Product Sheet 1

STYRENE LOW DENSITY EXPANDED POLYSTYRENE COMPRESSIBLE FILL

STYLITE CLAYFILL

This Agrément Certificate Product Sheet⁽¹⁾ relates to Stylite Clayfill, a low-density expanded polystyrene (EPS) board for use below concrete ground beams in piled foundation construction and at the vertical face of deep trench foundations to reduce the pressure exerted on the concrete by expansion of clay soils (clay heave) during the life of the structure.

(1) Hereinafter referred to as 'Certificate'.

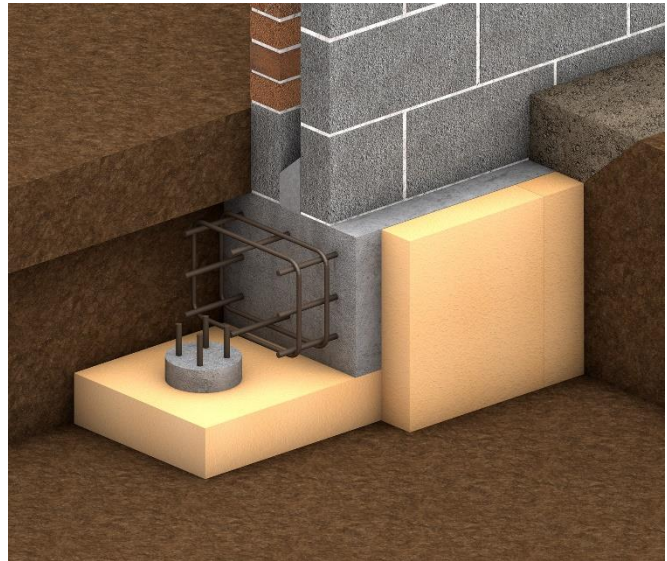
CERTIFICATION INCLUDES:

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

KEY FACTORS ASSESSED

Resistance to pressure — the product has short-term load resistance to support the weight of the reinforced concrete (see section 6).

Durability — the product will continue to perform effectively as a compressive material to reduce the effects of clay heave for the life of the building (see section 9).



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

On behalf of the British Board of Agrément

Paul Valentine
Technical Excellence Director

Claire Curtis-Thomas
Chief Executive

Date of Third issue: 30 July 2018

Originally certificated on 23 December 2002

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.
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British Board of Agrément

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Regulations

In the opinion of the BBA, Stylite Clayfill, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



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

Requirement: A2 **Ground movement**
Comment: The product helps to reduce the pressure exerted on reinforced concrete beams or on the vertical face of concrete foundations caused by the expansion of clay soil. See section 6 of this Certificate.

Regulation: 7 **Materials and workmanship**
Comment: The product is acceptable. See section 9 and the *Installation* part of this Certificate.



The Building (Scotland) Regulations 2010 (as amended)

Regulation: 8(1)(2) **Durability, workmanship and fitness of materials**
Comment: The product can contribute to a construction satisfying this Regulation. See section 9 and the *Installation* part of this Certificate.

Regulation: 9 **Building standards applicable to construction**
Standard: 1.1(b) **Structure**
Comment: The product contributes to satisfying the relevant requirements of this Standard, with reference to clause 1.1.1⁽¹⁾⁽²⁾. See section 6 of this Certificate.

Standard: 7.1(a)(b) **Statement of sustainability**
Comment: The product can contribute to satisfying the relevant Requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.

Regulation: 12 **Building standards applicable to conversions**
Comment: Comments in relation to the product under Regulation 9, Standards 1 to 6 also apply to this Regulation, with reference to clause 0.12.1⁽¹⁾⁽²⁾ and Schedule 6⁽¹⁾⁽²⁾.

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).



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

Regulation: 23(a)(i) **Fitness of materials and workmanship**
Comment: (iii)(b)(i) The product is acceptable. See section 9 and the *Installation* part of this Certificate.

Regulation: 30 **Stability**
Comment: The product contributes to satisfying the relevant requirements of this Regulation. See section 6 of this Certificate.

Construction (Design and Management) Regulations 2015

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

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

See section: 3 *Delivery and site handling* (3.4) of this Certificate.

Additional Information

NHBC Standards 2018

In the opinion of the BBA, Stylite Clayfill, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapters 4.2 *Building near trees*, 4.3 *Strip and trench fill foundations* and 4.4 *Raft, pile, pier and beam foundations*.

Technical Specification

1 Description

1.1 Stylite Clayfill consists of low-density, EPS boards, coloured orange.

1.2 The boards are available in the standard sizes⁽¹⁾ of:

thickness (mm)	50, 100, 150 and 200
length (mm)	2000 or 2400
width (mm)	1000 or 1200.

(1) Special sizes are available if required.

2 Manufacture

2.1 The product is manufactured from blocks of EPS using a bead-expansion moulding process and hot-wire cutting.

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

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

3 Delivery and site handling

3.1 The board packs are normally delivered to site shrink-wrapped. Each pack carries a label bearing the Certificate holder's name, product description, essential instructions for installation and handling, and the BBA logo incorporating the number of this Certificate.

3.2 The product must be stored flat and protected from high winds and prolonged exposure to sunlight.

3.3 Contact with solvents and organic-based materials should be avoided.

3.4 The product must not be exposed to flame or ignition sources. Careful consideration should also be given to the management of fire when in storage.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Stylite Clayfill.

Design Considerations

4 General

4.1 Stylite Clayfill, when designed and installed in accordance with the recommendations of BS 8000-0 : 2014, BS EN 1997 -1 : 2004 and this Certificate, is effective in reducing the pressure exerted on concrete by expansion of clay soils (clay heave) during the life of the structure. The product is suitable for use on ground beams of a maximum depth of 600 mm in piled construction, and on the vertical face of trench-fill foundations up to 2 m deep.

4.2 It is essential that the correct minimum thickness is calculated from the expected expansion, and that the board is installed in accordance with the *Installation* part of this Certificate.

4.3 It is important that the whole area of the underside of the concrete is protected with Stylite Clayfill, to prevent differential loading on the member.

4.4 Each installation must be designed from the following information:

For ground beams and pile caps

- the maximum likely vertical ground movement due to clay heave (H mm), established from the site investigation
- the acceptable upward pressure on the concrete ($P \text{ kN}\cdot\text{m}^{-2}$), as used in the concrete design.

For trench-fill foundations

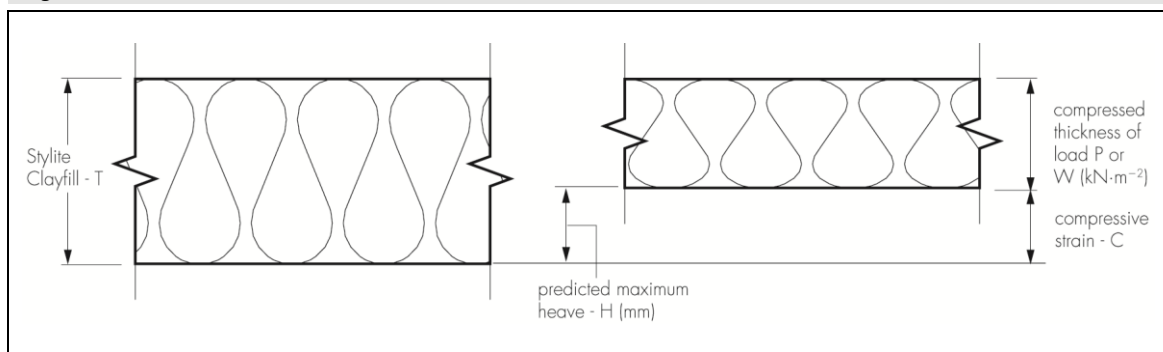
- the expected lateral movement due to clay heave (H mm), established from the site investigation
- the maximum acceptable lateral pressure on the foundation, as used in the concrete design [$W \text{ kN}\cdot\text{m}^{-2}$ (W must not exceed $40 \text{ kN}\cdot\text{m}^{-2}$)].

4.5 The thickness is then established (see Figure 1) by:

- finding the value of the compressive strain (C %) from Figure 2 (using design value for P or W, see section 6.2), and
- calculating the thickness required (T mm), from the formula:

$$T = 100 \frac{H}{C} + 10$$

Figure 1 Thickness



5 Practicability of installation

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

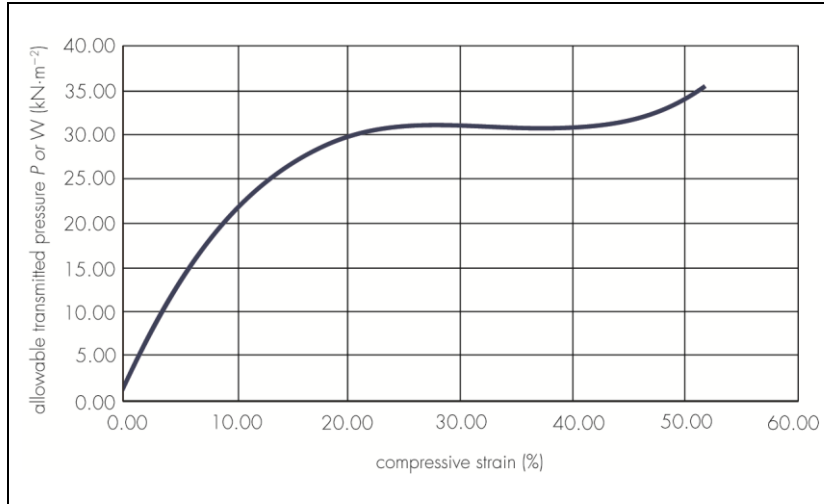
6 Resistance to pressure



6.1 The pressure transmitted/strain relationship of the product is given in Figure 2, and is based on a strain rate of 2% per day.

6.2 The product must not be used where the depth of in-situ concrete is greater than 600 mm.

Figure 2 Pressure transmitted/strain relationship



7 Thermal performance

Although Stylite Clayfill will contribute to the thermal insulation of the floor, it has not been assessed by the BBA for this purpose.

8 Maintenance

As the product is confined underneath concrete ground beams, is placed at the vertical face of deep trench foundations and has suitable durability, maintenance is not required.

9 Durability



The product is dimensionally stable under varying conditions of temperature and humidity. It is rot-proof and water resistant and will remain effective as a compressible fill for the life of the building.

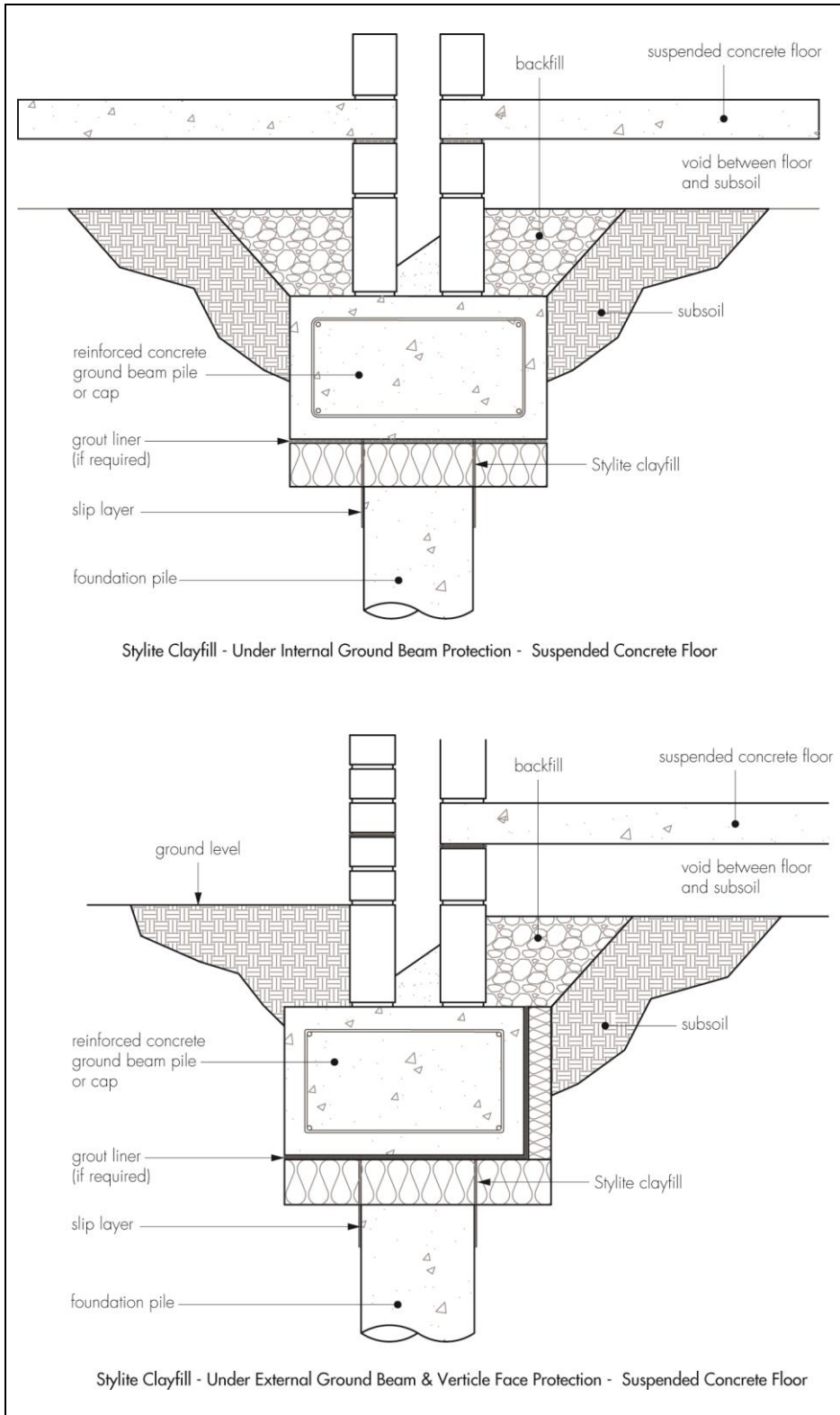
10 Reuse and recyclability

The product is made of polystyrene, which can be recycled.

11 Procedure

Reinforced concrete ground beams and pile caps in piled construction (see Figure 3).

Figure 3 Stylite Clayfill — piled construction



11.1 The trenches are excavated as normal, but taking account of the required thickness.

11.2 The bottom of the excavation must be flat, even and properly compacted. In certain situations, this may require blinding the trench bottom with concrete or granular material.

11.3 The boards are laid closely butted on the prepared excavation, ensuring that the whole area of the ground beam is covered. Small gaps between boards must be backfilled with as-dug or granular material.

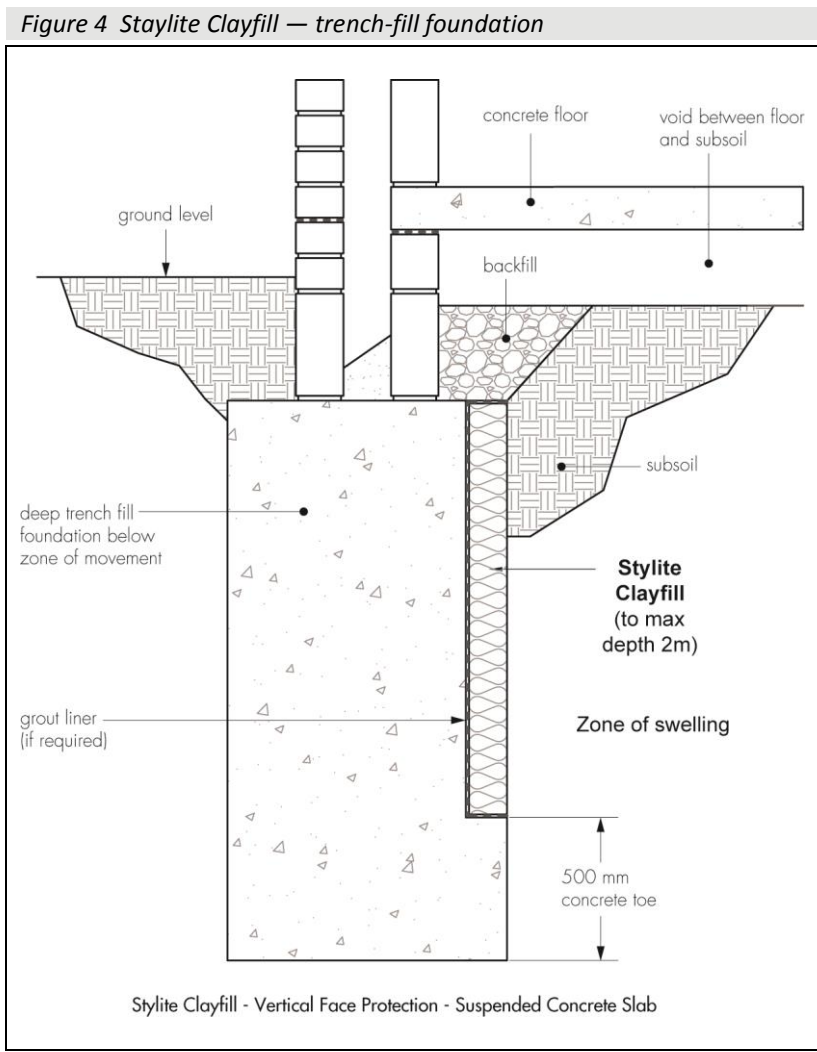
11.4 Where concrete piles protrude into the trench, the boards should be cut to suit with a fine-toothed saw.

11.5 Sufficient concrete spacing blocks must be used to ensure that the correct depth of concrete cover to the reinforcement is achieved. The quantity and type of spacers (typically 75 by 75 mm blocks at 500 mm centres) must ensure that the point load transmitted does not exceed $15 \text{ kN}\cdot\text{m}^{-2}$ and penetration into the boards is prevented.

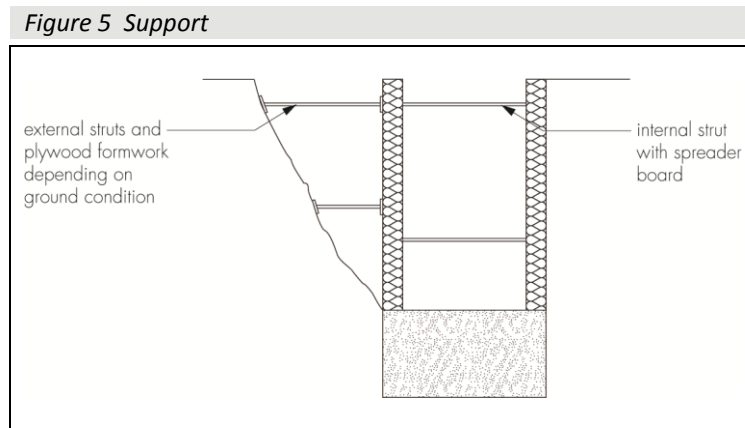
11.6 Where boards are required to protect the beam from lateral pressure, they can be positioned either abutting the lower board or supported upon it, depending on the overall width (see Figure 3). Where the boards are not adequately supported by the trench wall, suitable shuttering must be used to protect the boards during backfilling of the void, prior to the concrete pour.

Vertical faces of trench-fill foundations (see Figure 4)

11.7 The excavation must be founded below the movement zone of the clay and the board positioned in accordance with NHBC requirements, ie 500 mm above the bottom of the trench on the zone-of-swelling side of the excavation.



11.8 To ensure that the board remains in the correct position and to prevent breakage, it should be adequately supported on both faces prior to concreting (see Figure 5).



11.9 Internal support must be provided in the form of struts with adequate spreader plates.

11.10 External support may be provided by the face of the excavation, except in flinty or boulder clay where sharp projections may cause damage and/or where the trench sides do not provide adequate support (see Figure 5).

11.11 The boards must be adequately restrained to prevent uplift during concrete placement.

11.12 Small infill panels must be securely fixed in position.

Technical Investigations

12 Tests

Tests were carried out and the results assessed to determine:

- density
- dimensional accuracy
- effect of density on pressure transmitted
- the pressure transmitted through the board when subjected to constant strain of 2% per day
- load capacity
- reduction in pressure transmitted when subjected to 50% compression
- compression under sustained loading.

13 Investigations

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

13.2 Site visits were carried out to assess the practicability of installation.

13.3 An assessment was made of the performance characteristics and durability of the product.

Bibliography

BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*

BS EN 1997-1 :2004 + A1 : 2013 *Eurocode 7 — Geotechnical design — General rules*

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.