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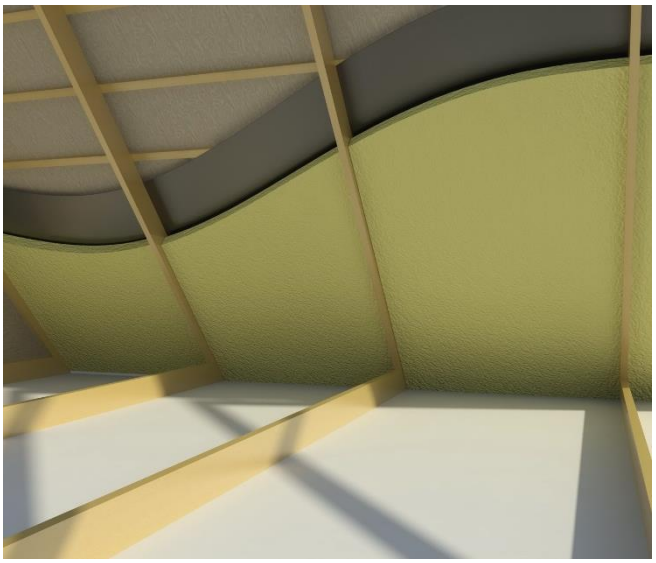
Agrément Certificate
20/5846
Product Sheet 4

ICYNENE H_2 FOAM LITE E (LD-C-50 v8E) INSULATION

H_2 FOAM LITE E (LD-C-50 v8E) FOR PITCHED ROOFS WITH HR UNDERLAYS

This Agrément Certificate Product Sheet(1) relates to H_2 Foam Lite E (LD-C-50 v8E) for Pitched Roofs with HR Underlays, a spray-applied in-situ thermal insulation for use between and under timber rafters in existing domestic pitched roofs with high vapour resistant (HR) roof tile underlays.

(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

Thermal performance — the product has a declared thermal conductivity value (λ_D) of 0.039 $W \cdot m^{-1} \cdot K^{-1}$ (see section 6).

Condensation — the product has a water vapour resistance factor (μ) of 3.3 and can contribute to limiting the risk of surface condensation; however, the risk of interstitial condensation will depend on the roof construction and should, therefore, be assessed for each project. An air and vapour control layer (AVCL) should also be used (see section 7).

Behaviour in relation to fire — the product has a Class E reaction to fire to EN 13501-1 : 2007 (see section 8).

Durability — the product is durable, rot proof and sufficiently stable to remain effective as an insulation for the life of the roof (see section 12).

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.

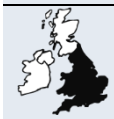
On behalf of the British Board of Agrément

Date of First issue: 26 November 2021

Hardy Giesler
Chief Executive Officer

Regulations

In the opinion of the BBA, H_2 Foam Lite E (LD-C-50 v8E) for Pitched Roofs with HR Underlays, 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: **C2(c)** **Resistance to moisture**
Comment: The product can contribute to satisfying this Requirement. See sections 7.1, 7.2 and 7.5 of this Certificate.

Requirement: **L1(a)(i)** **Conservation of fuel and power**
Comment: The product can contribute to satisfying this Requirement; however, compensating fabric measures will be required. See sections 6.1 and 6.2 of this Certificate.

Regulation: **7(1)** **Materials and workmanship**
Comment: The product is acceptable. See section 12 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation: **8(1)** **Durability, workmanship and fitness of materials**
Comment: The product is acceptable. See section 12 and the *Installation* part of this Certificate.

Regulation: **9** **Building standards applicable to construction**
Standard: 3.15 Condensation
Comment: The product can contribute to satisfying this Standard, with reference to clauses 3.15.1(1), 3.15.3(1), 3.15.4(1), 3.15.5(1) and 3.15.7(1). See sections 7.1, 7.2 and 7.6 of this Certificate.

Standard: 6.2 Building insulation envelope
Comment: The product can contribute to satisfying this Standard; however, compensating fabric measures will be required, with reference to clauses, or parts of, 6.2.1(1), 6.2.3(1), 6.2.4(1), 6.2.6(1), 6.2.7(1), 6.2.9(1), 6.2.10(1), 6.2.11(1) and 6.2.13(1). See sections 6.1 and 6.2 of this Certificate.

Standard: 7.1(a) 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 at least a bronze level of sustainability as defined in this Standard. See sections 6.1 and 6.2 of this Certificate.

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) and Schedule 6(1).

(1) Technical Handbook (Domestic).

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

Regulation: **23(a)(b)** **Fitness of materials and workmanship**
Comment: The product is acceptable. See section 12 and the *Installation* part of this Certificate.

Regulation:	**29**	**Condensation**
Comment:		The product can contribute to satisfying this Regulation. See sections 7.1 and 7.2 of this Certificate.
Regulation:	**39(a)(i)**	**Conservation measures**
Comment:		The product can contribute to satisfying this Regulation; however, compensating fabric measures will be required. See sections 6.1 and 6.2 of this Certificate.

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

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

See sections: 3 *Delivery and site handling,* 8 *Behaviour in relation to fire* (8.2) and 14 *Precautions* of this Certificate.

Additional Information

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 14315-1 : 2013.

Technical Specification

1 Description

1.1 H_2 Foam Lite E (LD-C-50 v8E) for Pitched Roofs with HR underlays is an in-situ formed spray-applied, open-cell, water-blown, low-density semi-rigid polyurethane foam insulation.

1.2 The product is prepared from two liquid components, isocyanate and resin, and is yellow in colour.

1.3 The product is applied with a fixed ratio (1:1) volumetric displacement pump in layers, until the final design thickness (not exceeding 200 mm) is achieved.

1.4 Ancillary items used with this product, but outside the scope of this Certificate, include:

- high vapour resistant (HR) roof underlays
- fire-resistant lining board
- timber battens
- spray equipment
- air and vapour control layer (AVCL).

2 Manufacture

2.1 The two components of the product are manufactured in a conventional batch blending process, and mixed on site via a spray-gun.

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

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

- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Icynene has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by The Registrar Company (TRC) (Certificate TRC 00714).

3 Delivery and site handling

3.1 The isocyanate and resin components are delivered to site in drums (of up to 250 kg capacity) bearing the product name, batch number and BBA Certificate number.

3.2 Drums should be stored in a well-ventilated area, between 15 and 32°C, and must be protected from frost.

3.3 The product must be protected from naked flames and other ignition sources during and after installation.

3.4 The Certificate holder has taken the responsibility of classifying and labelling the product under the *CLP Regulation (EC) No 1272/2008* on the *classification, labelling and packaging of substances and mixtures.* Users must refer to the relevant Safety Data Sheets.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on H_2 Foam Lite E (LD-C-50 v8E) for Pitched Roofs with HR Underlays.

Design Considerations

4 Use

4.1 H_2 Foam Lite E (LD-C-50 v8E) for Pitched Roofs with HR Underlays is satisfactory for use in reducing the thermal transmittance (U value) of roofs and loft spaces of existing domestic buildings.

4.2 The product is applied in layers, until the final design thickness (not exceeding 200 mm) is achieved.

4.3 The product can be used as insulation:

- between, or between and under, timber rafters in a habitable warm pitched roof with a HR underlay (room in the roof) — insulation at rafter level only, with or without counter battens
- between, or between and under, timber rafters in a non-habitable warm pitched roof with a HR underlay (loft space) — insulation at rafter level only, with or without counter battens

4.4 Pitched roofs are defined for the purpose of this Certificate as tiled or slated roofs with a pitch of between 10° and 70°.

4.5 In all applications other than in a non-habitable loft space, the product must be covered by a fire-resistant lining board manufactured in accordance with the requirements of BS EN 520 : 2004 (see also section 8.3).

4.6 Constructions must be designed and constructed in accordance with the relevant recommendations of:

- BS 5250 : 2021
- BS 5534 : 2014
- BS 8103-3 : 2009
- BS EN 351-1 : 2007
- BS EN 1995-1-1 : 2004 and its UK National Annex.

4.7 A pre-installation survey must be carried out to ensure that the construction is suitable for the application of the product.

4.8 It is essential that construction elements are designed and constructed to incorporate the normal precautions against moisture ingress before the application of the product.

4.9 Existing constructions must be in a good state of repair, with no evidence of rain penetration or damp. Defects must be made good prior to installation.

4.10 In addition, if present, mould or fungal growth must be treated. The Certificate holder can advise on suitable treatments.

4.11 Installation must not be carried out unless the moisture content of any roof timber framing is less than 20% by mass.

4.12 The product must not come into direct contact with flue pipes, chimneys or other heat-producing appliances (see section 9).

4.13 The product forms a strong bond with clean, dry substrates. This should be taken into account when specifying the product or anticipating future alterations.

4.14 When spraying the product, care must be taken to ensure the integrity of the roof tile underlay drape (refer to the *Icynene Installer Training Manual* issued to installers).

5 Practicability of installation

The product must only be installed by installers who have been trained and approved by the Certificate holder (see section 13).

6 Thermal performance

6.1 Calculations of the thermal transmittance (U value) of a roof should be carried out in accordance with BS EN ISO 6946 : 2017 and BRE Report BR 443 : 2019 using the declared thermal conductivity value (λ_D) of 0.039 $W \cdot m^{-1} \cdot K^{-1}$.

6.2 The U value of a completed roof will depend on the insulation thickness, its structure and its internal finish. Example constructions are given in Table 1. For improved energy or carbon savings, designers should consider appropriate fabric and/or services measures.

Table 1 U values — warm pitched roofs (insulation at rafter level only, with sloping ceiling)(1)

Design U value ($W \cdot m^{-2} \cdot K^{-1}$)	**H_2 Foam Lite E (LD-C-50 v8E) thickness**
0.23	150 mm between rafters + 50 mm below battens
0.25	150 mm between rafters + 30 mm below battens
0.35	115 mm between rafters

(1) Pitched roof construction — tiles on 25 mm timber tile battens on high-resistance (HR) bituminous roof tile underlay on 47 by 150 mm timber rafters at 400 mm centres (13.5%), with additional battens as required (λ = 0.13 $W \cdot m^{-1} \cdot K^{-1}$) at 400 mm centres (13.5%); insulation; AVCL; and 12.5 mm plasterboard (λ = 0.25 $W \cdot m^{-1} \cdot K^{-1}$).

Junctions

6.3 Care must be taken in the overall design and construction of junctions with other elements and openings to minimise thermal bridges and air infiltration. Detailed guidance can be found in the documents supporting the national Building Regulations.

7 Condensation

Interstitial condensation

7.1 The product has a water vapour resistance factor (μ) of 3.3.

7.2 The construction described in Tables 2 and 3 of this Certificate has been assessed to EN 15026 : 2007. The report(1) concluded that the interior vapour control layer was sufficient to keep the construction at an uncritical moisture level, both concerning moisture content in the insulation itself and in the wooden construction elements.

(1) Fraunhofer IBP, report ref HTB-002/2020 Issue 1, 10 February 2020. Copies can be obtained from the Certificate holder.

Table 2 EN 15026 : 2007, construction description (1)

Outside layer	Red concrete tiles
Battens	25 mm timber battens/air layer
Underlay	Roof tile underlay (s_d = 90 m)
Icynene H_2 Foam Lite E LD-C-50 v8E insulation thickness	150 mm (between 150 mm rafters at 600 cc) plus 80 mm (between cross battens at 600 cc)
AVCL	Vapour control layer (s_d = 90 m or 50 m)

(1) All materials described, with the exception of Icynene H_2 Foam Lite E LD-C-50 v8E, are outside the scope of this Certificate

Table 3 EN 15026 : 2007, climatic conditions

Climate locations	London Plymouth Manchester Aberdeen
Orientation	North
Inclination	40°
Temperature / Relative Humidity	Normal moisture load according to EN 15026
Occupancy	Normal occupancy according to EN 15026

7.3 In situations where the construction components and/or climate conditions differ from the above simulation, a condensation risk assessment will need to be undertaken. This assessment should be carried out by a competent person, using a dynamic hygrothermal simulation software package that complies with EN 15026 : 2007. Particular attention should be given to the following components:

- Waterproofing layer – material type, thickness, condition, colour
- Roof tile underlay – material type, thickness, moisture content
- Insulation – exact thickness installed, ratio of timber to insulation
- Timber rafters – condition, moisture content
- AVCL – water vapour permeability value, number of penetrations, airtightness, quality of installation
- Internal finish – material type, thickness, condition, surface finish
- Project-specific climate location
- Building orientation
- Project-specific topography
- Building use – internal moisture load, occupancy rate, ventilation rate
- Solar radiation on the building.

7.4 It is essential that roof design, construction and maintenance not only limit opportunities for vapour migration by diffusion but also by convection through gaps, cracks and laps in AVCLs and through penetrations.

Surface condensation

7.5 Roofs and loft spaces will limit the risk of surface condensation adequately where the thermal transmittance (U value) does not exceed 0.35 $W \cdot m^{-2} \cdot K^{-1}$ at any point and the junctions with other elements are designed in accordance with the guidance referred to in section 6.3 of this Certificate.

7.6 For buildings in Scotland, constructions will be acceptable where the thermal transmittance (U) value of the roof does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point, and roofs are designed and constructed in accordance with the relevant parts of BS 5250 : 2021, and this Certificate. Further guidance may be obtained from BRE Report BR 262 : 2002.

8 Behaviour in relation to fire

8.1 The product is classified(1) as Class E reaction to fire to EN 13501-1 : 2007.

(1) Centrum stavebního inženýrství a.s., report ref PK-18-060, issue number 1/2, 13 April 2018. Copies can be obtained from the Certificate holder.

8.2 The product must be protected from naked flames and other ignition sources during and after installation.

8.3 Once installed, except for the non-habitable loft application, the product must be contained by a fire-resistant lining board, manufactured in accordance with BS EN 520 : 2004, with joints fully sealed and supported by rafters, noggings or battens.

8.4 Elements must incorporate cavity barriers at edges, around openings and at junctions with fire-resisting elements, and the maximum dimensions of any cavity in any direction must meet the requirements of the documents supporting the national Building Regulations. The design and installation of cavity barriers must take into account any anticipated differential movement.

9 Proximity of flues and appliances

Detailed guidance can be found in the documents supporting the national Building Regulations for the provisions that are applicable when the system is installed in close proximity to certain flue pipes and/or heat-producing appliances.

10 Materials in contact — wiring installations

10.1 The product is compatible with PVC materials in contact.

10.2 De-rating of electric cables should be considered in areas where the product restricts the flow of air. The use of suitable conduit or trunking is recommended.

10.3 Where recessed lighting is used, provision should be made to prevent the fitting overheating, or ventilated fittings must be used in accordance with the manufacturer's instructions.

11 Maintenance

Once installed, the product does not require any regular maintenance and has suitable durability (see section 12), provided the tiles and slates are maintained in a weathertight condition.

12 Durability

The product is durable, rot-proof and sufficiently stable to remain effective as an insulation for the life of the roof.

Installation

13 Approved installers

The Certificate holder operates an Approved Installer Scheme for this product, under which the installers are approved, registered and regularly reviewed by the Certificate holder to demonstrate that they are competent to carry out installation of the product in accordance with their instructions and this Certificate. Details of Approved Installers are available from the Certificate holder.

14 Precautions

14.1 To comply with the requirements of Section 4 of the *Health and Safety at Work Act* 1974, it is essential that there is an exchange of information between the client and the installer before spray operations commence on any site. Existing health hazards and those brought into the premises by the installer should be discussed, and measures agreed to deal with them effectively.

14.2 The process for the installation of the product may produce a build-up of harmful vapours. The requirements of the *Icynene Installer Training Manual* and the product safety data sheets issued to installers, must be followed at all times.

14.3 The building should be well-ventilated during the spraying process.

14.4 If vapour levels need to be measured, methods should be those recommended by the Health and Safety Executive. Certain applications, eg confined roofs, require the use of extractor fans as recommended by the Certificate holder.

14.5 Whilst spraying, care should be taken to minimise the degree of 'overspray', a fine mist of particles that can travel considerable distances and adhere strongly to surfaces they land on.

14.6 To prevent the product from entering an occupied space, the loft hatch/cover must be kept closed during the spraying process. Protective covers must be placed over water tanks to prevent contamination and blockage during application, which should not be removed until sufficient time has elapsed for potentially harmful vapours to be ventilated from the roof space.

14.7 To minimise the hazards of spraying, the following points should be observed:

- the installer must wear appropriate protective gear, including a full-face NIOSH-approved fresh air respirator, protective overalls, gloves and boots
- other than the installer, individuals must be kept away from the application area. No unprotected individuals should be in the structure where the application is being conducted
- the spray gun should never be left unattended
- the spray gun should only be pointed at the surface or, when not in use, at the floor
- the product should not be installed if wind is a concern – tarpaulins or other measures should be used to block it
- cleaning the spray gun requires use of a solvent to break down and/or remove the reacted components; therefore, to prevent exposure to the components and the solvent, proper protection should be worn.

15 Procedure

General

15.1 Building elements to be insulated must be assessed for suitability, and any necessary repairs carried out. Elements must be weathertight before application of the product. The positioning and access to services should also be considered.

15.2 Access boards and lighting should be positioned in the roof void.

15.3 The product should be stored, handled and applied in accordance with the Certificate holder's instructions and this Certificate.

15.4 The product should be spray-applied to clean and dry substrates and built up in layers, up to a maximum thickness of 200 mm.

15.5 Care must be taken not to apply the product to flue pipes or electrical cables.

15.6 The product can be applied directly to a non-breathable roof underlay when a counter-batten is fitted above the underlay.

15.7 When spraying to non-breathable roof tile underlays without counter battens, the product must be applied in accordance with the Certificate holder's installation instructions, to ensure the integrity of the roof tile drape.

15.8 After completion, a survey should be performed to check that electrical cables and flues are not obstructed. Corrective measures must be taken to clear any such obstruction.

Non-habitable roof applications

15.9 Once cured, the product is trimmed flat with care using a saw.

15.10 In cases of non-habitable roof constructions, an AVCL can be installed either directly below the insulation in the pitch or at horizontal ceiling level. The ceiling should be well sealed.

Habitable roof applications

15.11 In habitable roof scenarios, the product is sprayed into the cavity formed by the rafters, or rafters and counter battens. When cured, the excess foam is trimmed flush with the rafters, with care, and the fire-resistant lining board installed with an AVCL with lapped and sealed joints (see Figure 1).

Figure 1 Pitched roof construction: habitable room in the roof

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Technical Investigations

16 Tests

Results of tests were assessed, to determine:

- adhesion to timber, and 1F felt substrates after heat ageing and water immersion
- thermal conductivity
- density
- corrosion-developing capacity
- water absorption

- dimensional stability
- water vapour permeability.

17 Investigations

17.1 Existing data on durability and properties in relation to fire were evaluated.

17.2 The Certificate holder's training arrangements were evaluated.

17.3 An assessment of the practicability of installation was carried out.

17.4 A calculation was undertaken to confirm the declared thermal conductivity value (λ_D).

17.5 A condensation risk analysis was evaluated.

17.6 A series of U value calculations was carried out.

17.7 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.

Bibliography

BRE Report (BR 262 : 2002) *Thermal insulation: avoiding risks*

BRE Report (BR 443 : 2019) *Conventions for U-value calculations*

BS 5250 : 2021 *Management of moisture in buildings - Code of practice*

BS 5534 : 2014 + A2 : 2018 *Slating and tiling for pitched roofs and vertical cladding — Code of practice*

BS 8103-3 : 2009 *Structural design of low-rise buildings — Code of practice for timber floors and roofs for housing*

BS EN 351-1 : 2007 *Durability of wood and wood-based products — Preservative-treated solid wood — Classification of preservative penetration and retention*

BS EN 520 : 2004 + A1 2009 *Gypsum plasterboards — Definitions, requirements and test methods*

BS EN 1995-1-1 : 2004 + A2 : 2014 *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*
NA to BS EN 1995-1-1 : 2004 + A1 : 2008 UK National Annex to *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*

BS EN 14315-1 : 2013 *Thermal insulating products for buildings — In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products — Specification for the rigid foam spray system before installation*

BS EN ISO 6946 : 2017 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

BS EN ISO 9001 : 2015 *Quality management systems — Requirements*

EN 13501-1 : 2007 + A1 : 2013 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

EN 15026 : 2007 *Hygrothermal performance of building components and building elements — Assessment of moisture transfer by numerical simulation*

18 Conditions

18.1 This Certificate:

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

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

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

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

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

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

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

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

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