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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

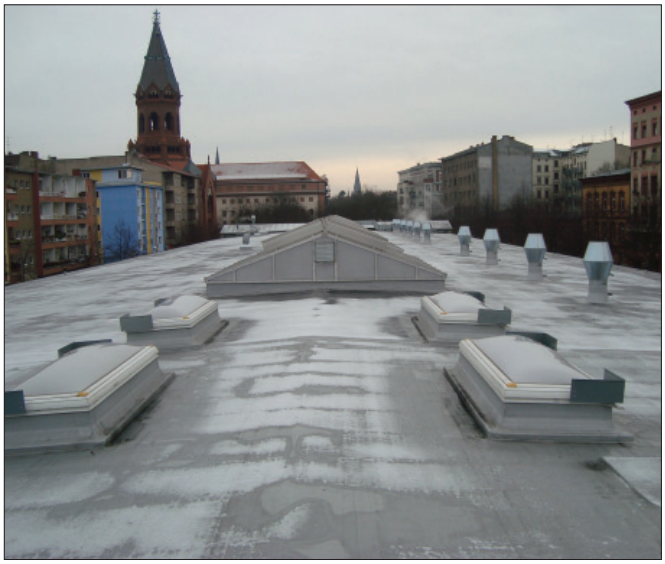
Agrément Certificate
09/4653
Product Sheet 1

PARAFLEX ROOF WATERPROOFING SYSTEMS

PARAFLEX FD ROOF WATERPROOFING SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the Paraflex FD Roof Waterproofing System, a flexible unsaturated polyester roof waterproofing membrane.



AGRÉMENT 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 investigation
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Weathertightness — the system will resist the passage of moisture into the building (see section 5).

Properties in relation to fire — tests indicate that the system will enable a roof to be unrestricted under Building Regulations (see section 6).

Adhesion — the adhesion of the system is sufficient to resist the effects of any likely wind suction and the effects of thermal or other minor movement likely to occur in practice (see section 7).

Resistance to foot traffic — the system will accept the limited foot traffic and loads associated with installation and maintenance of the system without damage (see section 8).

Durability — under normal service conditions the unprotected system will provide a durable waterproof covering with a service life of at least 35 years (see section 10).

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

On behalf of the British Board of Agrément

Date of First issue: 20 April 2009

Simon Wroe
Head of Approvals — Materials

Greg Cooper
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

Regulations

In the opinion of the BBA, the Paraflex FD Roof Waterproofing System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:

The Building Regulations 2000 (as amended) (England and Wales)

Requirement:	B4(2)	External fire spread
Comment:		Test data to BS 476-3 : 2004 indicate that on suitable substructures the use of the system will enable a roof to be unrestricted under this Requirement. See sections 6.1 to 6.4 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Tests for water resistance on the system, including joints, indicate that the system meets this Requirement. See section 5.1 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. See section 10.1 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The system can contribute to a construction meeting this Regulation. See sections 9.1, 9.2 and 10.1 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		Test data to BS 476-3 : 2004 indicate that the system when applied to a non-combustible substrate, can be regarded as having low vulnerability under clause 2.8.1[1][2] of this Standard. See sections 6.1, 6.2 and 6.4 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance of the system indicate that the use of the system will enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1[1][2] and 3.10.7[1][2]. See section 5.1 of this Certificate.
Regulation:	12	Building standards — conversions
Comment:		All comments given for this system under Regulation 9 also apply to this Regulation, with reference to clause 0.12[1][2] and Schedule 6[1][2].

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

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 10.1 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Fitness of materials and workmanship
Comment:		The system is acceptable. See sections 9.1 and 9.2 of this Certificate.
Regulation:	C4(b)	Resistance to ground moisture and weather
Comment:		Tests for water resistance of the system, including joints, indicate that the use of the system will enable a roof to satisfy the requirements of this Regulation. See section 5.1 of this Certificate.
Regulation:	E5(b)	External fire spread
Comment:		Test data to BS 476-3 : 2004 indicate that on suitable substructures the use of the system will enable a roof to be unrestricted under the requirements of this Regulation. See sections 6.1 to 6.4 of this Certificate.

Construction (Design and Management) Regulations 2007
Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 2 *Delivery and site handling* (2.2 and 2.3) and 12 *Precautions* (12.1 and 12.2).

Non-regulatory Information

NHBC Standards 2008

NHBC accepts the use of the Paraflex FD Roof Waterproofing System, when installed and used in accordance with this Certificate, as meeting Technical Requirement R3 in relation to *NHBC Standards* Chapter 7.1 *Flat roofs and balconies.*

In the opinion of the BBA, the Paraflex FD Roof Waterproofing System, when installed and used in accordance with this Certificate, satisfies the requirements of the *Zurich Building Guarantee Technical Manual*, Section 4 *Superstructure*, Sub-section *Flat roofs*.

Technical Specification

1 Description

1.1 The Paraflex FD Roof Waterproofing System is a three-part, unsaturated, polyester resin reinforced with polyester fleece.

1.2 Paraflex FD resin has the nominal characteristics of:

Specific gravity (gcm^{-3})	1.013
Curing with accelerator (mins)	
time to rain resistant	20
time to foot-traffic accessibility	30
Flashpoint (°C)	34
Colour	anthracite and light grey

1.3 Other materials used with the system include:

- reinforcement — a non-woven polyester fleece for use in reinforcing the membrane
- Paraflex Hardener — for use in curing
- Paraflex Accelerator — for use in curing
- Paraflex Primer — a polyurethane used for preparing substrates prior to the application of the main system.

1.4 Quality control checks are carried out during manufacture and on the final product. Quality control checks on the final product include:

- viscosity
- low-temperature flexibility
- cure time.

2 Delivery and site handling

2.1 Paraflex FD is delivered to site in 10 kg and 20 kg cans bearing the product's name, health and safety data, the manufacturer's name and the BBA identification mark incorporating the number of this Certificate.

2.2 The resin components, accelerator and primer must be kept tightly sealed and should be stored in a cool, ventilated place and away from ignition sources and other chemicals. Storage temperatures of between 0°C and 25°C will give the product a shelf-life of six months, at higher temperatures the shelf-life will reduce progressively.

2.3 The resin components, accelerator and primer are all classified under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002* (CHIP3) and bear the appropriate hazard warning label. The flashpoints and classifications are given in Table 1.

Table 1 Flashpoints and hazard classification

Material	Flashpoint (°C)	Classification
Paraflex FD		
resin component	34	harmful, irritant, flammable[1]
hardener component	77	corrosive, dangerous to the environment[2]
Paraflex Accelerator	210	harmful, irritant
Paraflex Primer	<15	harmful, irritant, highly flammable[1]

(1) These components should be stored in accordance with the *Highly Flammable Liquids and Liquefied Petroleum Gases Regulations* 1972.

(2) Harmful to aquatic organisms.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Paraflex FD Roof Waterproofing System.

Design Considerations

3 Use

3.1 The Paraflex FD Roof Waterproofing System is satisfactory for use as a waterproofing layer in:

- warm or cold exposed roofs on flat and pitched roofs with limited access

- inverted roof specifications using aggregate ballast on flat roofs, including completely flat roofs with limited access
- protected inverted roof specifications using pavers or other suitable protection on flat roofs, including completely flat roofs with limited or pedestrian access
- green roof specifications on flat roofs, including completely flat roofs with limited or pedestrian access or pitched with limited access
- roof garden specifications on flat roofs, including completely flat roofs with limited or pedestrian access.

3.2 The system is suitable for use on the following substrates:

- concrete
- plastic
- wood
- metal
- reinforced bitumen membranes (including mineral surfaced)
- PUR or PIR insulation boards
- mineral wool insulation batts.

3.3 Limited access roofs are defined for the purposes of this Certificate as those roofs subjected only to pedestrian traffic for maintenance of the roof covering and cleaning of gutters, etc. Where traffic in excess of this is envisaged, special precautions, such as additional protection to the membrane, must be taken, for example: carborundum grit anti-slip finish incorporated into final coat.

3.4 Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80. Completely flat roofs are defined for the purpose of this Certificate as those roofs having a finished fall of less than 1:80. Pitched roofs are defined as those having falls in excess of 1:6.

3.5 When designing flat roofs, twice the minimum finished fall should be assumed unless a detailed analysis of the roof is available, including overall and local deflection, direction of falls, etc.

3.6 Structural decks for green roofs and roof gardens to which the system is to be applied must be suitable to transmit the dead and imposed loads experienced in service. Dead loads, wind loading and imposed loads are calculated in accordance with BS 6399-1 : 1996, BS 6399-2 : 1997 and BS 6399-3 : 1998, respectively. Dead loads could also be dramatically increased if the drains become partially or completely clogged causing waterlogging of the drainage soil layers.

3.7 Insulation systems or materials used in conjunction with the system must be suitable for the specification and either be:

- as described in BS 8217 : 2005, or
- the subject of a current BBA Certificate and be used in accordance with, and within the limitations of, that Certificate.

3.8 Decks to which the product is to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, *NHBC Standards* 2008, Chapter 7.1, or the *Zurich Building Guarantee Technical Manual* 2007, Section 4 *Superstructure*, Sub-section *Flat roofs* pages 268 to 270.

4 Practicability of installation

The system should only be installed by contractors who have been trained and approved by the Certificate holder.

5 Weathertightness

5.1 Test data confirm that the system will adequately resist the passage of moisture to the inside of the building and so meet or comply with the relevant requirements of the national Building Regulations:

England and Wales — Approved Document C, Requirement C2(b), Section 6

Scotland — Mandatory Standard 3.10, clauses 3.10.1and 3.10.7

Northern Ireland — Regulation C4(b).

5.2 The system is impervious to water and, when used as described, will give a weathertight roofing capable of accepting minor movement without damage (see section 16, Table for *Physical properties*).

5.3 To achieve a weathertight coating it is essential that the application rate is as quoted in the Certificate holder's literature for the relevant system.

6 Properties in relation to fire

6.1 When tested in accordance with BS 476-3 : 2004, a system comprising a plywood deck (approximately 18 mm thick), primed with Paraflex Primer and the Paraflex FD system applied in two coats reinforced with a non-woven polyester, achieved an EXT.F.AC.X rating[1].

(1) The suffix 'X' indicates failure of one specimen substrate after 65 minutes of the test.

6.2 In the opinion of the BBA when used in irrigated roof gardens or green roofs the use of the membranes will be unrestricted under the national Requirements:

England and Wales — Requirement B4(2)

Scotland — Mandatory Standard 2.8, clause 2.8.1

Northern Ireland — Regulation E5(b).

6.3 Exposed areas of the capsheet when used with one of the surface finishes detailed in Part iii of Table A5 of Appendix A of Approved Document B of the Building Regulations (England and Wales) or Technical Booklet E, Table 4.6, Part iv of the Building Regulations (Northern Ireland) (listed below), would be deemed to be of designation AA:

Surface finishes

- bitumen-bedded stone chippings covering the whole surface to a depth of not less than 12.5 mm
- bitumen-bedded tiles of non-combustible materials
- sand and cement screed, or
- macadam.

6.4 The designation of other specifications, eg when used on combustible substrates, should be confirmed by:

England and Wales — Test or assessment in accordance with Approved Document B, Appendix A, Clause 1

Scotland — Test to conform to Mandatory Standard 2.8, clause 2.8.1

Northern Ireland — Test or assessment by a UKAS accredited laboratory, or an independent consultant with appropriate experience.

7 Adhesion

Tests indicate that the adhesion of the system to concrete, asphalt, bitumen felts, timber, plastic and metal is sufficient to resist the effects of any wind suction, elevated temperatures, thermal shock or minor movement likely to occur in practice (see section 16, Table for *Physical properties*).

8 Resistance to foot traffic

Tests indicate that the system can accept, without damage, the limited foot traffic and light concentrated loads associated with installation and maintenance operations. However, reasonable care should be taken to avoid puncture by sharp objects or concentrated loads (see section 16, Table for *Physical properties*).

9 Maintenance

9.1 The system should be subjected to regular annual inspections and roof drains kept clear as is good practice with all membrane and liquid-applied roofing systems. In the case of inverted roofs, plants must be removed and displaced gravel redistributed.

9.2 Should a leak occur in the waterproofing layer, access to it is achieved by removing the ballasting layer, filter layer and boards.

10 Durability

10.1 Accelerated weathering tests confirm that a satisfactory retention of properties is achieved. All available evidence indicates that the system should achieve an initial life expectancy of at least 35 years (see section 16, Table for *Physical properties* and section 17.3). When fully protected and subject to normal service conditions in an inverted roof specification with an open covering (eg aggregate pavers), the system can provide an effective barrier to the transmission of liquid water and water vapour for the design life of the roof in which it is incorporated.

10.2 However, in situations where maintenance, or repair of any of the components in the roof structure are necessary (eg protection layer, insulation), the durability of the membrane maybe reduced. In these circumstances the Certificate holder should be consulted.

10.3 An estimation cannot be given for the life of green roof and roof garden specifications due to the nature of use, however, under normal circumstances, it should be significantly greater than for open coverings.

Installation

11 General

11.1 Installation of the Paraflex FD Roof Waterproofing System must be carried out only by specialist roofing contractors trained and approved by the Certificate holder and UK marketing company.

11.2 The system must be applied when the air and substrate temperatures are greater than –5°C. Special precautions may be necessary when temperatures exceed 35°C, as shown in the Certificate holder's *Technical Data* sheets.

11.3 Detailing (eg upstands), should be carried out in accordance with the Certificate holder's instructions.

11.4 Soil or other bulk material should not be stored on one area of the roof prior to installation, to ensure that localised overloading does not occur.

12 Precautions

12.1 Vapours from the system may cause sensitisation and irritation to the respiratory system, eyes and skin. The system should be used only in areas with sufficient ventilation to prevent the build-up of vapours. Contact with the skin, eyes and clothing must be avoided. The supplier's instructions and the relevant safety regulations for working procedures must be adhered to at all times.

12.2 The system must not be allowed to get into the waste drainage system. Care must also be taken to prevent vapours entering the inside of the building, eg by closing doors, windows.

13 Site and surface preparation

13.1 Substrates on which the system is applied must be properly prepared in accordance with the Certificate holder's instructions.

13.2 Adhesion to substrates will depend on the condition and cleanliness of the substrate. Substrates must be visibly dry, sound and free from loose materials or contamination (eg moss, algae).

13.3 High pressure sand-blasting or water-jetting may be used to remove loose or flaking materials, but the substrate must be visibly dry before application of the system.

13.4 Damaged areas of the substrate (eg broken fibre-cement sheets, blistered bitumen, roofing felt) must be removed, replaced or repaired.

13.5 Deck surfaces should be free from sharp projections, such as protruding fixing bolts, concrete nibs.

13.6 Gutters and outlets should be checked to ensure that they are, and remain, clear of all debris.

13.7 The substrate should be primed with Paraflex Primer prior to application of the system at a coverage rate of from 300 gm^{-2} to 500 gm^{-2}.

14 Application

14.1 The system is mixed on site by adding the hardener to the resin in the correct proportion and the accelerator in the proportion given in Table 2 in respect to the surface/air temperature, and stirred in accordance with the mixing instructions.

Table 2 Accelerator proportion

Surface and/or air temperature	Approximate amount of Paraflex Accelerator per kg of Paraflex FD (g)	Pot life (mins)
–5–0	30	30–40
1–5	25	25–35
6–10	20	20–30
11–15	15	20–25
16–20	10	15–20
21–35	5	10–20

14.2 The first coat of Paraflex FD should be applied using a lambswool roller and spread evenly. The polyester reinforcement is rolled into the wet resin and pressed free of trapped air using the roller. The reinforcement should have an overlap of at least 50 mm and sufficient resin should be beneath the reinforcement to maintain the system's bond.

14.3 A second layer of Paraflex FD is applied and evenly spread.

14.4 The total coverage of the system is between 2.4 kgm^{-2} and 30 kgm^{-2} giving a finished cured thickness of 2.3 mm.

15 Repair

The repair of minor damage to the system can be achieved effectively by cleaning back to the unweathered material and recoating the damaged area with the membrane at the total application rate stated in section 14.

Technical Investigations

16 Tests

Tests were carried out by Materialprüfungsansalt für das Bauwesen Braunschweig on behalf of the Deutsches Institut für Bautechnik (DIBt). The results of these tests, which show typical results for the materials, are summarised in Table 3.

Table 3 Physical properties

Test (units)	Mean result	Method[1]
Water vapour diffusion resistance coefficient (μ)	47.25	EN ISO 12572
Tensile strength (Nmm^{-2})		EN ISO 527-3
unaged	12.2	
heat aged[2]	19.2	
UV aged[3]	20.8	
prepared at –5°C	18.4	
prepared at 40°C	24.5	
Elongation (%)		EN ISO 527-3
unaged	22.6	
heat aged[2]	19.2	
UV aged[3]	20.8	
prepared at –5°C	19.8	
prepared at 40°C	24.4	
Watertightness	pass	EOTA TR 003
Tensile bond strength (MPa)		EOTA TR 004
unaged		
concrete	2.66	
steel	1.05	
bitumen sheet	0.37	
conifer wood	1.62	
plastic	0.86	
day joint	1.14	
water exposure[4]		
concrete	0.71	
Dynamic indentation		EOTA TR 006
unaged		
mineral wool	I_4	
concrete	I_4	
tested at –20°C		
concrete	I_4	
heat aged[2]		
concrete	I_4	
UV aged[3]		
concrete	I_4	
Static indentation		EOTA TR 007
unaged		
mineral wool	I_4	
concrete	I_4	
water exposure[4]		
concrete	I_4	
Fatigue cycling		EOTA TR 008
unaged 1000 cycles at –10°C	pass	
heat aged 50 cycles at –10°C	pass	
Root resistance	pass	DIN 4062, Section 4.7

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to the sections/parts of the various documents.
(2) Heat aged 200 days at 80°C.
(3) UV aged to EOTA TR 010 for 1000 MJm^{-2} severe conditions.
(4) 180 days at 60°C to EOTA TR 012.

17 Investigations

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

17.2 Data on fire performance to BS 476-3 : 2004 were examined.

17.3 Visits to existing sites of over 30 years old were carried out to access the durability of the system.

Bibliography

BS 476-3 : 2004 *Fire tests on building materials and structures — Classification and method of test for external fire exposure to roofs*

BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*

BS 6399-1 : 1996 *Loading for buildings — Code of practice for dead and imposed loads*
BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*
BS 6399-3 : 1999 *Loading for buildings — Code of practice for imposed roof loads*

BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*

EN ISO 527-3 : 1996 *Plastics — Determination of tensile properties — Test conditions for films and sheets*

EN ISO 12572 : 2001 *Hygrothermal performance of building materials and products — Determination of water vapour transmission properties*

DIN 4062 : 1978 *Cold processable plastic jointing materials for sewer drains; jointing materials for prefabricated parts of concrete, requirements, testing and processing*

EOTA Technical Report TR 003 (May 2004), *Liquid Applied Roof Waterproofing Kits (LARWK) — Determination of the resistance to dynamic indentation*

EOTA Technical Report TR 004 (May 2004), *Liquid Applied Roof Waterproofing Kits (LARWK) — Determination of the resistance to dynamic indentation*

EOTA Technical Report TR 006 (May 2004), *Liquid Applied Roof Waterproofing Kits (LARWK) — Determination of the resistance to dynamic indentation*

EOTA Technical Report TR 007 (May 2004), *Liquid Applied Roof Waterproofing Kits (LARWK) — Determination of the resistance to static indentation*

EOTA Technical Report TR 008 (May 2004), *Liquid Applied Roof Waterproofing Kits (LARWK) — Determination of the resistance to fatigue movement*

EOTA Technical Report TR 010 (May 2004), *Liquid Applied Roof Waterproofing Kits (LARWK) — Exposure procedure for artificial weathering*

EOTA Technical Report TR 012 (May 2004), *Liquid Applied Roof Waterproofing Kits (LARWK) — Exposure procedure for accelerated ageing by hot water*

Conditions of Certification

18 Conditions

18.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- 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 and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant 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 In granting this Certificate, the BBA is not responsible for:

- 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
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

18.5 Any information relating to the manufacture, supply, installation, use and maintenance 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 and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date 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. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.

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