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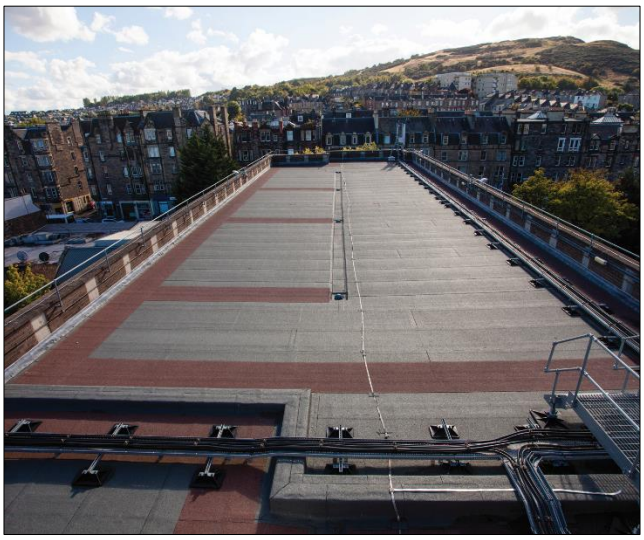
Agrément Certificate
09/4688
Product Sheet 3

IMPER ITALIA TOTAL ROOF WATERPROOFING SYSTEMS

PARAFLEX ROOF WATERPROOFING SYSTEMS

This Agrément Certificate Product Sheet[1] relates to Paraflex Roof Waterproofing Systems, for use as single-ply and multi-ply roof waterproofing systems on flat and pitched roofs with limited or pedestrian access.

(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

Weathertightness — the systems will resist the passage of moisture to the interior of the building (see section 6).
Thermal performance — the systems can be used to improve the thermal performance of a roof (see section 7).
Condensation risk — roofs incorporating the systems will adequately limit the risk of interstitial and surface condensation (see section 8).
Properties in relation to fire — in the opinion of the BBA, the systems, when used in a suitable specification, will enable a roof to be unrestricted under the Building Regulations (see section 9).
Resistance to wind uplift — the systems will enable a roof to be unrestricted under Building Regulations (see section 10).
Resistance to foot traffic — the systems will accept, without damage, the limited foot traffic and loads associated with installation and maintenance (see section 11).
Durability — under normal service conditions the systems will provide a durable waterproof covering with a service life in excess of 25 years (see section 13).

The BBA has awarded this Certificate to the company named above for the systems described herein. These systems 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 First issue: 6 February 2017

John Albon – Head of Approvals Construction Products

Claire Curtis-Thomas
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.

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Regulations

In the opinion of the BBA, Paraflex Roof Waterproofing Systems, 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:	**B4(2)**	**External fire spread**
Comment:		On a suitable substructure, the use of the systems can enable a roof to be unrestricted under this Requirement. See section 9 of this Certificate.
Requirement:	**C2(b)**	**Resistance to moisture**
Comment:		The system membranes, including joints, will enable a roof to meet this Requirement. See section 6.1 of this Certificate.
Requirement:	**C2(c)**	**Resistance to moisture**
Comment:		The systems can contribute to enabling a roof to satisfy this Requirement. See sections 8.1, 8.3 and 8.4 of this Certificate.
Requirement:	**L1(a)(i)**	**Conservation of fuel and power**
Comment:		The systems can contribute to a construction meeting this Requirement. See sections 7.1 and 7.2 of this Certificate.
Regulation:	**7**	**Materials and workmanship**
Comment:		The systems are acceptable. See section 13.1 and the *Installation* part of this Certificate.
Regulation:	**26**	**CO_2 emission rates for new buildings**
Comment:		The systems can contribute to a construction satisfying the requirements of this Regulation. See sections 7.1 and 7.2 of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	**8(1)(2)**	**Durability, workmanship and fitness of materials**
Comment:		The use of the systems satisfies the requirements of this Regulation. See sections 12.1 and 13.1 and the *Installation* part of this Certificate.
Regulation:	**9**	**Building standards applicable to construction**
Standard:	2.8	Spread from neighbouring buildings
Comment:		The systems, when applied to a suitable substructure, can be regarded as having low vulnerability under clause 2.8.1[(1)(2)] of this Standard. See sections 9.1, 9.2 and 9.4 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The use of the system membranes, including joints, will enable a roof to meet the requirements of this Standard, with reference to clauses 3.10.1[(1)(2)] and 3.10.7[(1)(2)]. See section 6.1 of this Certificate.
Standard:	3.15	Condensation
Comment:		The systems can enable a roof to satisfy this Standard, with reference to clauses 3.15.1[(1)], 3.15.3[(1)], 3.15.5[(1)] and 3.15.6[(1)]. See sections 8.1, 8.3 and 8.5 of this Certificate.

Standard:	6.1	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		The systems can contribute to satisfying the requirements of these Standards, with reference to clauses, or parts of, 6.1.2[(2)], 6.1.6[(1)], 6.2.1[(1)(2)], 6.2.3[(1)], 6.2.4[(2)], 6.2.5[(2)], 6.2.6[(1)], 6.2.7[(1)], 6.2.8[(1)(2)], 6.2.9[(1)(2)], 6.2.10[(1)(2)], 6.2.11[(1)(2)], 6.2.12[(2)] and 6.2.13[(1)(2)]. See sections 7.1 and 7.2 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The systems can contribute to meeting 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. In addition, the systems can contribute to a construction meeting a higher level of sustainability as defined in this Standard, with reference to clauses 7.1.4[(1)(2)] [Aspects 1[(1)(2)] and 2[(1)]], 7.1.6[(1)(2)] [Aspects 1[(1)(2)] and 2[(1)]] and 7.1.7[(1)(2)] [Aspect 1[(1)(2)]]. See sections 7.1 and 7.2 of this Certificate.
Regulation:	**12**	**Building standards applicable to conversions**
Comment:		Comments in relation to the systems 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)**	The systems are acceptable. See section 13.1 and the *Installation* part of this Certificate.
Regulation:	**28(b)**	**Resistance to moisture and weather**
Comment:		The system membranes, including joints, will enable a roof to meet the requirements of this Regulation. See section 6.1 of this Certificate.
Regulation:	**29**	**Condensation**
Comment:		The systems can contribute to a roof meeting this Regulation. See sections 8.1 and 8.3 of this Certificate.
Regulation:	**36(b)**	**External fire spread**
Comment:		On suitable substructures, the use of the systems can enable a roof to be unrestricted under the requirements of this Regulation. See section 9 of this Certificate.
Regulation:	**39(a)(i)**	**Conservation measures**
Regulation:	**40(2)**	**Target carbon dioxide Emissions Rate**
Comment:		Roofs incorporating the systems can contribute to a construction satisfying these Regulations. See sections 7.1 and 7.2 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: 1 *Description* (1.2) and 3 *Delivery and site handling* (3.1, 3.5 and 3.6) of this Certificate.

Additional Information

NHBC Standards 2017

NHBC accepts the use of Paraflex Roof Waterproofing Systems, provided they are installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies*.

CE marking

The Certificate holder has taken the responsibility of CE marking the systems in accordance with harmonised European Standards EN 13165 : 2012, EN 13707 : 2013 and EN 13970 : 2011. An asterisk (*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Paraflex Roof Waterproofing Systems consist of:

- Paraflex ARD/HS — a polyester-reinforced, SBS-modified bitumen membrane, with a lower surface finish of thermofusible film and an upper surface finish of slate granules
- Paraflex ARD/S — a polyester-reinforced, SBS-modified bitumen membrane, with a lower surface finish of thermofusible film and an upper surface finish of slate granules
- Paraflex NT3 — a polyester-reinforced, SBS-modified bitumen membrane, with a lower surface finish of thermofusible film and an upper surface finish of thermofusible film
- Paraflex NT4 — a polyester-reinforced, SBS-modified bitumen membrane, with a lower surface finish of thermofusible film and an upper surface finish of thermofusible film
- Paraflex W3 — a glass-reinforced, SBS-modified bitumen membrane, with a lower surface finish of thermofusible film and an upper surface finish of thermofusible film
- Paratorch — a composite board consisting of a polyisocyanurate insulation faced with a bitumen-impregnated fibreboard, available in falls of 1:80 and 1:60 and flat
- Paratherm T — a polyisocyanurate insulation board with bitumen glass-tissue facings on both sides, available in falls of 1:80 and 1:60 and flat
- Imper Italia VCLs — a range of polymer-modified bitumen vapour control layers, reinforced with either polyester or glassfibre and/or a foil core, with a thickness range of 2 mm to 4 mm.

1.2 The membranes are supplied in rolls and are manufactured to the nominal characteristics given in Table 1.

Table 1 Nominal characteristics of membranes

Characteristic (unit)	**Paraflex ARD/HS**	**Paraflex ARD/S**	**Paraflex NT3**	**Paraflex NT4**	**Paraflex W3**	**Vapobar 1**(1)
Standard CE marked against	EN 13707	EN 13707	EN 13707	EN 13707	EN 13707	EN 13970
Thickness* (mm)	4(2)	3(2)	3	4	3	2
Length *(m)	8	10	10	10	10	20
Width* (m)	1	1	1	1	1	1
Mass per unit area ($kg \cdot m^{-2}$)	5.5	4.5	3.5	4.5	3.5	2
Roll weight (kg)	44	45	35	45	35	40
Watertightness*(3)	pass	pass	pass	pass	pass	pass
Water vapour resistance factor – μ*	20000	20000	20000	20000	20000	≥ 500000
Tensile strength*(N per 50 mm)						
longitudinal	800	800	800	800	300	420
transverse	600	600	600	600	200	315
Elongation at break* (%)						
longitudinal	50	50	50	50	2	2
transverse	50	50	50	50	2	2
Nail tear* (N)						
longitudinal	160	160	160	160	NPD	NPD
transverse	180	180	180	180	NPD	NPD
Dimensional stability* (%)	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3	NPD	NPD
Dynamic indentation* (mm) –method B	1250	NPD	NPD	1250	NPD	NPD
Static indentation* (kg)	25	NPD	NPD	25	NPD	10
Low temperature flexibility* (°C)	–25	–25	–25	–25	–25	–10
Heat resistance* (°C)	100	100	199	100	100	120

(1) Thinnest of the range of vapour control layers used in the system.
(2) Excluding mineral finish.
(3) Tested at 60 kPa.

1.3 The insulation boards are supplied to site with the nominal characteristics shown in Table 2.

Table 2 Nominal characteristics of insulation boards

Characteristic (unit)	**Paratorch**(1)	**Paratherm T**(1)
Standard CE marked against	EN 13165	EN 13165
Length (mm)	2400, 1200 and 600	1200
Width (mm)	1200	1200
Thickness (mm)	40 to 150 in 10 mm increments	25 to 145 in 10 mm increments
Compressive strength at 10% compression* (kPa)	150	150
Density ($kg \cdot m^{-3}$)	32	32
Declared thermal conductivity* ($W \cdot m^{-1} \cdot K^{-1}$)	0.026 (<80 mm) 0.025 (80 – 119 mm) 0.024 (≥ 120 mm)	0.026 (<80 mm) 0.025 (80 – 119 mm) 0.024 (≥ 120 mm

(1) Board sizes other than those shown may be available on request.

1.4 Other items or components which may be used with the system, but which are outside the scope of this Certificate, are:

- Impertene Primer — a solvent-based, bituminous primer for use on cementitious substrates, applied by either brush or roller
- various mechanical fasteners (including a countersunk plate) — for use in securing insulation boards to the substrate
- angle fillet — an insulated profile for use at upstands and kerbs above the insulation boards, to aid formation of membrane edge details.

2 Manufacture

2.1 The membranes are manufactured using the same conventional continuous bitumen coating techniques as traditional bituminous felts.

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 being operated by the manufacturer are being maintained.

2.3 The management system of Imper Italia Srl has been assessed and registered as meeting the requirements of EN ISO 9001 : 2008 by Bureau Veritas (Certificate 209130).

3 Delivery and site handling

3.1 The system membranes are delivered to site in rolls with either paper wrappers or tape bands bearing the product name and production code. The rolls are packed on pallets and shrink-wrapped in UV-protective (white) polythene.

3.2 The insulation boards are delivered to site packaged shrink-wrapped in plastic.

3.3 Rolls must be stored upright on a clean, level surface, away from excessive heat and under cover.

3.4 The insulation boards must be kept dry, on pallets, off the ground and under cover.

3.5 The Certificate holder has taken the responsibility of classifying and labelling the system components 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 Sheet(s).

3.6 Impertene Primer containers must be kept tightly sealed and stored under cool and dry conditions, away from sources of ignition.

Assessment and Technical Investigations

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

Design Considerations

4 General

4.1 Paraflex Roof Waterproofing Systems are satisfactory for use as single-ply and multi-ply roof waterproofing systems on flat and pitched roofs with limited access or pedestrian access with additional protection.

4.2 Only Paraflex ARD/HS and Paraflex NT4 are suitable for use as single-ply waterproofing systems.

4.3 The granular surfaced membrane may be used as an exposed cap sheet or in detail work, where appropriate.

4.4 Limited access roofs are defined for the purposes of this Certificate as those subjected only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters, etc. Where traffic in excess of this is envisaged, such as on pedestrian access roofs, additional protection must be provided (see sections 11 and 14.6 of this Certificate, and the relevant clauses of the Certificate holder's installation instructions).

4.5 Pedestrian access roofs are defined for the purposes of this Certificate as those not subjected to vehicular traffic.

4.6 Flat roofs are defined for the purposes of this Certificate as those having a minimum finished fall of 1:80. Pitched roofs are defined for the purpose of this Certificate as those having falls greater than 1:6. When designing flat roofs, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available including, for example, overall and local deflection and direction of falls.

4.7 Structural decks to which the systems are to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, *NHBC Standards* 2017, Chapter 7.1 *Flat roofs and balconies*.

5 Practicability of installation

The systems must only be installed by contractors who have been trained and approved by the Certificate holder or their appointed agent.

6 Weathertightness

6.1 The waterproofing membranes, including joints, when completely sealed and consolidated, will adequately resist the passage of moisture to the inside of the building and so meet the requirements of the national Building Regulations.

6.2 The membranes are impervious to water and will give a weathertight roofing capable of accepting minor structural movements without damage.

7 Thermal performance

7.1 Calculations of thermal transmittance (U value) must be carried out in accordance with BS EN ISO 6946 : 2007 and BRE Report BR 443 : 2006 *Conventions for U-value calculations*, using the declared thermal conductivity (λ_D value) of the insulation components as shown in Table 3.

Table 3 Declared thermal conductivity (λ_D values)

Insulation thickness (mm)	Declared thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)
< 80	0.026
≥ 80 < 120	0.025
≥ 120	0.024

7.2 The U value of a completed roof will depend on the thickness of insulation used, the number and type of fixings and the insulating value of other roof components/layers. Example U values of roofs incorporating the systems are shown in Tables 4 and 5.

Table 4 Example U values — Paratherm T insulation boards

U value requirement ($W \cdot m^{-2} \cdot K^{-1}$)	Deck construction/insulation thickness (mm)		
	Concrete(1)(2)	Timber(1)(3)	Metal(1)(4)
0.13	215	215	225
0.16	175	175	185
0.18	155	155	165
0.20	140	135	145
0.25	110	110	120

(1) Includes 5.55 steel fixings per m^2 and 3.55 steel waterproofing fixings per m^2, with a 4.8 mm cross sectional head diameter and full insulation penetration depth.
(2) Concrete decking 2.0 $W \cdot m^{-1} \cdot K^{-1}$, 38 mm timber battens (15%), VCL, 7 mm waterproofing membranes, 12.5 mm plasterboard.
(3) 18 mm plywood decking, 150 mm timber joists (12.5%) with 150 mm airspace (87.5%), VCL, 7 mm waterproofing membranes, 12.5 mm plasterboard.
(4) Metal deck (not included in calculation), VCL, 7 mm waterproofing membranes.

Table 5 Example U values — Paratorch insulation boards

U value requirement ($W \cdot m^{-2} \cdot K^{-1}$)	Deck construction/insulation thickness (mm)		
	Concrete(1)(2)	Timber(1)(3)	Metal(1)(4)
0.13	215	215	225
0.16	175	175	185
0.18	155	155	165
0.20	140	135	145
0.25	110	110	120

(1) Includes 5.55 steel fixings per m^2 and 3.55 steel waterproofing fixings per m^2, with a 4.8 mm cross sectional head diameter and full insulation penetration depth.
(2) Concrete decking 2.0 $W \cdot m^{-1} \cdot K^{-1}$, 38 mm timber battens (15%), VCL, 7 mm waterproofing membranes, 12.5 mm plasterboard.
(3) 18 mm plywood decking, 150 mm timber joists (12.5%) with 150 mm airspace (87.5%), VCL, 7 mm waterproofing membranes, 12.5 mm plasterboard.
(4) Metal deck (not included in calculation), VCL, 7 mm waterproofing membranes.

7.3 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.

8 Condensation risk

Interstitial condensation

8.1 Roofs incorporating a VCL with a vapour resistance of at least 250 $MN \cdot s \cdot g^{-1}$ will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2011, Annex H, Sections H.4 and H.9, and BRE Report BR 262 : 2002 *Thermal insulation: avoiding risks* in England and Wales.

8.2 For the purposes of assessing the risk of interstitial condensation, the vapour resistivity of the insulation boards may be taken as approximately 306 $MN \cdot s \cdot g^{-1} \cdot m^{-1}$.

8.3 Where an effective VCL cannot be guaranteed, eg owing to a large number of penetrations through the layer, the risk of condensation must be assessed in accordance with BS 6229 : 2003, Annex A.

Surface condensation

8.4 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point. Guidance may be obtained from BS 5250 : 2011, Annex H, Sections H.4 and H.9. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 7.3.

8.5 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point. Guidance may be obtained from BS 5250 : 2011, Annex H, Sections H.4 and H.9, and BRE Report BR 262 : 2002.

9 Properties in relation to fire

9.1 When tested to DD CEN/TS 1187 : 2012 and classified in accordance with BS EN 13501-5 : 2016, a system comprising an 18 mm plywood substrate, a layer of Paraflex NT3 vapour control layer torch-applied, a 40 mm thick board of Paratherm T, a layer of Paraflex NT3 as a base layer and a layer of Paraflex ARD/HS achieved a B_{ROOF}(t4) rating.

9.2 The membranes, when used in protected specifications for pedestrian use including an inorganic covering listed in the Annex of Commission Decision 2000/553/EC, can be considered to be unrestricted under the national Building Regulations.

9.3 When the systems are used on flat roofs with one of the surface finishes defined in Part iii of Table A5 of Appendix A of The Building Regulations (England and Wales), or Technical Booklet E, Table 5.6, Part IV of The Building Regulations (Northern Ireland), and listed below, the roof is also deemed to be unrestricted:

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

9.4 The designation of other specifications (eg on combustible substrates) should be confirmed by:

England and Wales — test or assessment in accordance with Approved Document B, Appendix A, clause 1
Scotland — tests to confirm compliance with 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.

10 Resistance to wind uplift

10.1 The adhesion of the bonded membranes is sufficient to resist the effects of wind suction, elevated temperature and thermal shock conditions likely to occur in practice.

10.2 For mechanically-fastened insulation installations, the requirement for the number of fixings should be assessed in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex. The minimum fixing patterns are given in section 16.5.

11 Resistance to foot traffic

11.1 The systems can accept the limited foot traffic and light concentrated loads associated with installation and maintenance. For pedestrian access roofs or access for maintenance of plant, suitable protection must be provided, for

example using concrete slabs supported on bearing pads. Reasonable care must be taken to avoid puncture of the membranes by sharp objects or concentrated loads.

11.2 For design purposes, the insulation boards may be assumed to have an allowable compressive strength of 150 kPa at 10% compression.

11.3 The insulation boards have not been assessed for use with permanent distributed or concentrated loads, such as air conditioning units, mechanical plants, water tanks, etc. Such loads must be supported directly on the roof construction or design support system.

11.4 When profiled decking is used, boards will need to span ribs. Maximum permissible spans between ribs for various board thicknesses are shown in Table 6.

Table 6 Maximum clear span

Maximum clear span (mm)	Minimum board thickness (mm)
< 75	25
> 75 ≤ 100	30
> 100 ≤ 125	35
> 125 ≤ 150	40
> 150 ≤ 175	45
> 175 ≤ 200	50
> 200 ≤ 225	55
> 225 ≤ 250	60

12 Maintenance

12.1 The systems must be the subject of annual inspections and maintenance to ensure continued performance. Maintenance should include checks and operations to ensure that, where applicable:

- adequate ballast is in place and evenly distributed over the membrane
- protection layers are in good condition
- exposed membrane is free from the build-up of silt, and other debris and unwanted vegetation are cleared.

12.2 Where damage has occurred to the waterproof layer, it should be repaired in accordance with section 18 and the Certificate holder's instructions.

12.3 The other components of the systems, once installed, do not require any regular maintenance and have suitable durability, provided the roof waterproofing layers are maintained as described above.

13 Durability

13.1 The systems will have a service life in excess of 25 years.

13.2 When using the mineral-finished membranes, it is possible that some localised loss of granular surfacing may occur after some years in areas where complex detailing of the roof design is incorporated.

Installation

14 General

14.1 Installation of Paraflex Roof Waterproofing Systems must be carried out in accordance with the relevant clauses of BS 8000-4 : 1989, BS 8217 : 2005, the Certificate holder or appointed agent's instructions, and this Certificate.

14.2 Substrates to which the systems are to be applied must be sound, dry and clean, and free from sharp projections such as nail heads and concrete nibs. Wet insulation boards must not be used. For the tapered boards to be effective in providing a uniform fall, it is essential that the structural deck is true and even. Any hollows, depressions or backfalls found in the roof deck must be rectified prior to laying the insulation.

14.3 Installation must not be carried out during inclement weather (eg rain, fog or snow). When the temperature is below 5°C, suitable precautions against surface condensation must be taken.

14.4 Detailing must be formed in accordance with the Certificate holder's instructions.

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

14.6 If the roof is likely to be subjected to uncontrolled pedestrian access, the substructure must meet the requirements of BS 8217 : 2005, and to prevent damage to the roof covering one of the appropriate surface finishes referred to in clause 6.12 of that Standard must be used.

14.7 At falls in excess of 1:11, the provision for mechanical fixings as required by BS 8217 : 2005 should be observed.

14.8 On completion of the roof, the surface of the Paraflex NT4 membrane must always be protected when used as an exposed top layer.

14.9 The other membranes may also have a surface finish applied in accordance with BS 8217 : 2005, clause 8.19, including:

- stone aggregate in dressing compound
- precast concrete paving slabs
- proprietary tiles on bonding compound.

14.10 Insulation boards can be cut to fit around projections through the roof, using either a sharp knife or a fine-toothed saw.

15 Procedure (vapour control layer)

15.1 Before the VCL is adhered, the deck must be treated with Impertene Primer.

15.2 The VCL is fully torch-bonded to the deck with side laps of 80 mm and end laps of 100 mm, or loose-laid if used in conjunction with mechanically-fastened insulation.

15.3 At perimeters and penetrations the VCL is detailed to envelop the insulation boards.

16 Procedure (insulation)

16.1 The insulation boards are installed in a close-butted break-bonded pattern.

16.2 On metal decks the boards are laid either with the long axis at right angles to the corrugations of the metal deck or diagonally across the corrugations of the deck, ensuring that all end joints and corners are sufficiently supported on the crown flats of the decking. The thickness of the board to be used is dependent on the width of the trough openings of the metal deck as indicated in Table 6.

Fully bonded

16.3 The installed boards are bonded to the VCL using hot bitumen (maximum temperature 240°C) or a polyurethane adhesive.

Mechanically-fastened

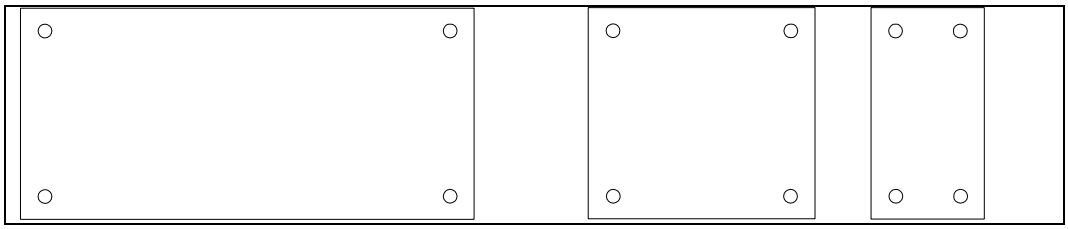
16.4 The boards are secured to the substrate by means of mechanical fastenings.

16.5 Each fixing must incorporate a minimum 50 mm by 50 mm square or 50 mm diameter circular plate countersunk washer, which must not restrain more than one board. The minimum number of fixings for each board size is given in Table 7 and fixing layouts are shown in Figure 1, with the requirement for additional fixings assessed by a suitably-experienced and competent individual in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex. Fixings are placed within the individual board area and sited more than 50 mm, but less than 150 mm, from the edges and corners of the board, giving a minimum fixing rate of 5.55 fixings per square metre for 1200 mm by 600 mm boards.

Table 7 Minimum number of fixings

Board dimensions (mm)	Minimum number of fixings
2400 x 1200	6
1200 x 1200	4
1200 x 6000	4

Figure 1 Fixing layouts — minimum fixing numbers (for solely mechanically-fixed specification)



17 Procedure (membrane)

17.1 Bonding is achieved by melting the lower surface by torching and pressing the membrane down. Care must be taken not to overheat the coating.

17.2 Side laps must be a minimum of 80 mm, and end laps a minimum of 100 mm. Where used partially bonded, the membrane must be fully bonded to the substrate at least one metre immediately before and after the end lap. A bead of molten material must extrude from all laps to indicate a satisfactory seal, and must be levelled out using a heated, rounded-tip trowel.

17.3 Detailing is carried out in accordance with the Certificate holder's installation instructions. Angle fillets are used at all horizontal and vertical abutments.

18 Repair

In the event of damage, repairs can be carried out by cleaning the area around the damage and applying a patch as described in the Certificate holder's instructions.

Technical Investigations

19 Tests

An assessment was made of data for the waterproofing membranes in relation to:

polyester reinforcements
- mass per unit area
- tensile strength
- elongation

coating mass
- fines content
- ring and ball softening point
- elastic recovery

the membranes

- thickness
- width
- mass per unit area
- watertightness
- tensile strength
- elongation at break
- nail tear
- low temperature flexibility
- heat resistance
- dimensional stability
- static indentation (soft and rigid support)
- dynamic indentation (soft support)
- resistance to slump
- peel resistance of joint
- adhesion of granules
- heat ageing for 168 days at 70°C (low temperature flexibility and heat resistance).

20 Investigations

20.1 An assessment was made of data for the insulation in relation to:

- density
- dimensional stability with temperature
- water vapour resistance/resistivity
- dimensional changes owing to variations
- effect of concentrated load under a free span
- fire rating
- compressive strength
- thermal conductivity (unaged and aged)
- dimensional accuracy
- dimensional variations in unrestrained panels
- behaviour under distributed load and increased in humidity temperature
- effect of immersion and heat ageing on compressive and tensile strength
- resistance to peel
- condensation risk
- adhesion
- resistance to wind uplift.

20.2 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.

20.3 Data relating to the external fire performance were evaluated.

20.4 CE marking data for the vapour control layers were evaluated.

Bibliography

BS 5250 : 2011 + A1 : 2016 *Code of practice for control of condensation in buildings*

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

BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*

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

BS EN 1991-1-4 : 2005 + A1 : 2010 *Actions on structures — General actions — Wind actions*
NA to BS EN 1991-1-4 : 2005 + A1 : 2010 UK National Annex to *Actions on structures — General actions — Wind actions*

BS EN 13501-5 : 2016 *Fire classification of construction products and building elements — Classification using data from external fire exposure to roofs tests*

BS EN ISO 6946 : 2007 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

DD CEN/TS 1187 : 2012 *Test methods for external fire exposure to roofs*

EN 13165 : 2012 + A2 : 2015 *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PU) products — Specification*

EN 13707 : 2013 *Flexible sheets for waterproofing — Reinforced bitumen sheets for roof waterproofing — Definitions and characteristics*

EN 13970 : 2011 *Flexible sheets for waterproofing — Bitumen water vapour control layers — Definitions and characteristics*

EN ISO 9001 : 2008 *Quality management systems — Requirements*

21 Conditions

21.1 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.

21.2 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.

21.3 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.

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

21.5 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:

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- 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.

21.6 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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