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Agrément Certificate

20/5769

Product Sheet 1 Issue 2

PROTHERM QUANTUM PLUS+ INVERTED ROOF INSULATION SYSTEM FOR FLAT ROOFS

PROTHERM QUANTUM PLUS+ PURE INVERTED ROOF INSULATION SYSTEM

This Agrément Certificate Product Sheet⁽¹⁾ relates to the ProTherm Quantum PLUS+ Pure Inverted Roof Insulation System, for use as inverted roof insulation on new and existing domestic and non-domestic untrafficked flat and zero fall roofs, and terraces subject to pedestrian access only.

(1) Hereinafter referred to as 'Certificate'.

The assessment includes

Product factors:

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

Process factors:

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

Ongoing contractual Scheme elements†:

- regular assessment of production
- formal 3-yearly review



KEY FACTORS ASSESSED

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

The BBA has awarded this Certificate to the company named above for the 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 Second issue: 26 November 2024

Originally certified on 6 July 2020

Hardy Giesler
Chief Executive Officer

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

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

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

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

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

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SUMMARY OF ASSESSMENT AND COMPLIANCE

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

Compliance with Regulations

Having assessed the key factors, the opinion of the BBA is that the ProTherm Quantum PLUS+ Pure Inverted Roof Insulation System, 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 Building Regulations 2010 (England and Wales) (as amended)

Requirement:	A1	Loading
Comment:		The system can contribute to satisfying this Requirement. See section 1 of this Certificate.
Requirement:	C2(c)	Resistance to moisture
Comment:		The system can contribute to satisfying this Requirement. See section 3 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The system can contribute to satisfying this Requirement. See section 6 of this Certificate.
Regulation:	7(1)	Materials and workmanship
Comment:		The system is acceptable. See sections 8 and 9 of this Certificate.
Regulation:	25B	Nearly zero-energy requirements for new buildings
Regulation:	26	CO₂ emission rates for new buildings
Regulation:	26A	Fabric energy efficiency rates for new dwellings (applicable to England only)
Regulation:	26A	Primary energy rates for new buildings (applicable to Wales only)
Regulation:	26B	Fabric performance values for new dwellings (applicable to Wales only)
Regulation:	26C	Target primary energy rates for new buildings (applicable to England only)
Regulation:	26C	Energy efficiency rating (applicable to Wales only)
Comment:		The system can contribute to satisfying these Regulations. See section 6 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The system is acceptable. See sections 8 and 9 of this Certificate.
Regulation:	9	Building standards - construction
Standard:	1.1(b)	Structure
Comment:		The system can contribute to satisfying this Standard, with reference to clause 1.1.2 ⁽¹⁾⁽²⁾ . See section 1 of this Certificate.
Standard:	3.15	Condensation
Comment:		The system can contribute to satisfying this Standard, with reference to clauses 3.15.1 ⁽¹⁾⁽²⁾ , 3.15.3 ⁽¹⁾⁽²⁾ , 3.15.4 ⁽¹⁾⁽²⁾ , 3.15.5 ⁽¹⁾⁽²⁾ and 3.15.6 ⁽¹⁾⁽²⁾ . See section 3 of this Certificate.
Standard:	6.1(b)(c)	Energy demand
Comment:		The system can contribute to satisfying this Standard with reference to clauses 6.1.1 ⁽¹⁾ , 6.1.2 ⁽²⁾ , 6.1.6 ⁽¹⁾ and 6.1.8 ⁽²⁾ . See section 6 of this Certificate.

Standard: Comment:	6.2	Building insulation envelope The system can contribute to satisfying this Standard, with reference to clauses, 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 ⁽²⁾ , 6.2.9 ⁽¹⁾⁽²⁾ , 6.2.10 ⁽¹⁾ , 6.2.11 ⁽¹⁾⁽²⁾ , 6.2.12 ⁽²⁾ and 6.2.13 ⁽¹⁾⁽²⁾ . See section 6 of this Certificate.
Standard: Comment:	7.1(a)(b)	Statement of sustainability The system 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. In addition, the system 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⁾ and 7.1.6 ⁽¹⁾⁽²⁾ and 7.1.7 ⁽¹⁾⁽²⁾ . See section 6 of this Certificate.
Regulation: Comment:	12	Building standards - conversion All comments given for the system 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: Comment:	23(1)(a)(i) (iii)(b)(i)(ii)	Fitness of materials and workmanship The system is acceptable. See sections 8 and 9 of this Certificate.
Regulation: Comment:	29	Condensation The system can contribute to satisfying this Regulation. See section 3 of this Certificate.
Regulation: Comment:	30	Stability The system can contribute to satisfying this Regulation. See section 1 of this Certificate.
Regulation: Comment:	39(a)(i)	Conservation measures The system can contribute to satisfying this Regulation. See section 6 of this Certificate.
Regulation: Regulation: Regulation: Comment:	40(2) 43(1)(2) 43B	Target carbon dioxide emission rate Renovation of thermal elements Nearly zero-energy requirements for new buildings The system can contribute to satisfying these Regulations. See section 6 of this Certificate.

Additional Information

NHBC Standards 2024

In the opinion of the BBA, the ProTherm Quantum PLUS+ Pure Inverted Roof Insulation System, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards, Chapter 7.1 Flat roofs and balconies*.

Fulfilment of Requirements

The BBA has judged the ProTherm Quantum PLUS+ Pure Inverted Roof Insulation System to be satisfactory for use as described in this Certificate. The system has been assessed for use for use as inverted roof insulation on new and existing domestic and non-domestic untrafficked flat and zero fall roofs, and terraces subject to pedestrian access only.

ASSESSMENT

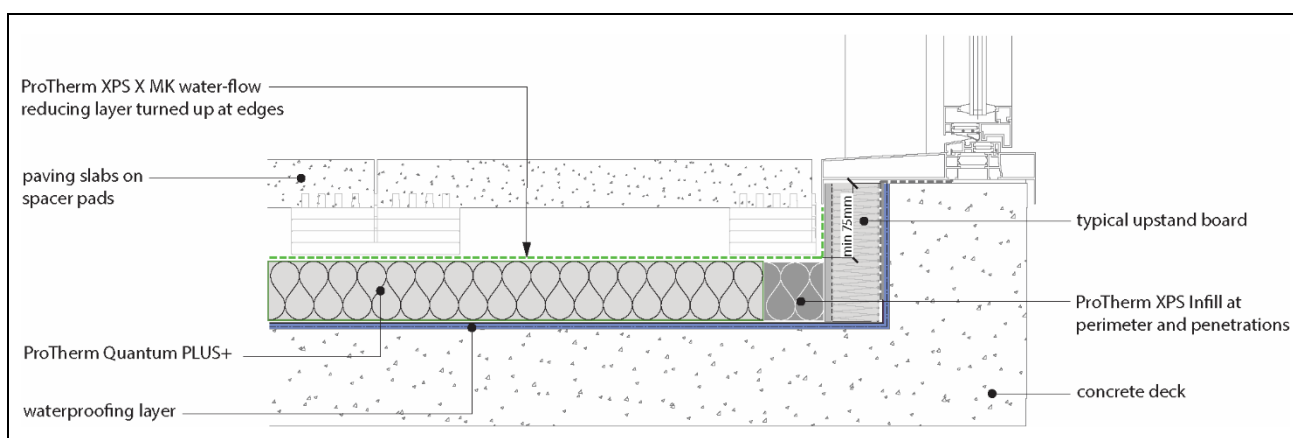
Product description and intended use

The Certificate holder provided the following description for the system under assessment. The ProTherm Quantum PLUS+ Pure Inverted Roof Insulation System consists of:

- ProTherm Quantum PLUS+ — vacuum insulation panels (VIP) with a factory sprayed protective coating
- ProTherm XPS Infill — extruded polystyrene (XPS) insulation (for use at perimeter and service details)
- Regupol RCM — a 3 mm thick rubber crumb protection mat, for use on top of ProTherm Quantum PLUS+ where gravel ballast is to be applied above.
- ProTherm XPS X MK — water-flow-reducing layer.

An illustration of the system is given as Figure 1.

Figure 1 The ProTherm Quantum PLUS+ Pure Inverted Roof Insulation System — typical terrace detail



ProTherm Quantum PLUS+ are rigid insulation panels of micro-porous fumed silica, vacuum-sealed in a multi-layer aluminium foil outer wrapper, which is then factory sprayed with an outer protective coating. The nominal characteristics are given in Table 1.

Table 1 ProTherm Quantum PLUS+ — nominal characteristics

Characteristic (unit)	Value
Length x width (mm)	Standard panel sizes ⁽¹⁾ 202 x 302, 202 x 602, 502 x 602, 302 x 1002, 402 x 1002, 602 x 1002
Finished thicknesses (mm) ⁽²⁾	Standard thicknesses ⁽¹⁾ 22, 27, 32, 42 and 52 47 (20 + 25), 57 (25 + 30), 62 (30 + 30), 72 (30 + 40), 82 (40 + 40), 92 (40 + 50), 102 (50 + 50)
Edge detail	Straight edge – butt jointed

(1) Includes 1 mm sprayed outer coating. Other panel sizes (length and width) can be manufactured to order, subject to quantities.

(2) Thicknesses given in brackets denote thickness of double layer of VIP panels.

The nominal characteristics of ProTherm XPS Infill are given in Table 2.

Table 2 ProTherm XPS Infill — nominal characteristics

Characteristic (unit)	Value
Length (mm) x width (mm)	1250 x 600 panel
Thicknesses (mm)	
Single layer	30, 40, 50, 80
Double layer	60 (30 + 30), 70 (30 + 40), 90 (40 + 50)
Edge detail	15 mm shiplap edge rebated on all four sides ⁽¹⁾
Colour	Grey

(1) Panel to be cut to required infill size.

The nominal characteristics of Regupol RCM are given in Table 3.

Table 3 Regupol RCM — nominal characteristics

Characteristic (unit)	Value
Length (mm) x width (mm)	2250 x 1150
Thickness (mm)	3
Edge detail	Straight edge – butt jointed
Colour	Black

The nominal characteristics of ProTherm XPS X MK are given in Table 4. ProTherm XPS X MK is a high density polyethylene (HDPE) breathable membrane with the nominal characteristics given in Table 4.

Table 4 ProTherm XPS X MK — nominal characteristics

Characteristic (unit)	Value
Roll length (m) x width (m)	100 x 3
Thickness (mm)	0.17
Mass per unit area ($\text{g}\cdot\text{m}^{-2}$)	60
Lap joints (mm) — unsealed	300
Colour	Light grey

Ancillary items

The Certificate holder recommends the following ancillary items for use with the system, but these materials have not been assessed by the BBA and are outside the scope of this Certificate:

- gravel ballast
- paving ballast of minimum 40 mm thickness
- proprietary paving support spacer pads
- separating or cushion layers, if required
- rainwater outlet grilles
- dual-level rainwater outlets
- insulation upstand board
- flashings and skirtings.

Use

The system is suitable for use as thermal insulation in the inverted roof concept (above the roof waterproofing) on new and existing domestic and non-domestic untrafficked flat roofs and terraces subject to pedestrian access only, with either a zero fall or slopes between 1:80 and 1:6, on suitably designed timber, concrete or metal structural decks in conjunction with an appropriate fully supported waterproofing system.

ProTherm Quantum PLUS+ is applied as a single layer (limited to the maximum thickness given in section 1.1.2), and must always be overlaid with ProTherm XPS X MK; a gravel ballast or paving slab finish is then applied on top. Regupol RCM must be installed on top of the ProTherm Quantum PLUS+ VIP where it is to be overlaid with a ballast finish. Regupol RCM is not required when overlaid with a paving slab finish.

Definitions for products and applications inspected

The following terms have been defined for the purpose of this Certificate as:

- flat roof — a roof having a minimum finished fall of 1:80
- zero fall roof — a roof having a minimum finished fall between 0 and 1:80
- pitched roof — a roof having a fall in excess of 1:6
- limited access roof — a roof subjected only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters, etc
- pedestrian access roof — a roof subjected to increased access to that defined for a limited access roof, but not open to vehicular traffic.

Product assessment – key factors

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

1 Mechanical resistance and stability

Data were assessed for the following characteristics.

1.1 Strength and stability

1.1.1 The inverted roof insulation was tested for compressive strength and compressive creep and the results are given in Table 5.

Table 5 Compressive strength and compressive creep

Product assessed	Assessment method	Requirement	Result
ProTherm Quantum PLUS+	Compressive stress at 10% deformation to	CS(10\Y)150 ≥ 150 kPa	Pass
ProTherm XPS Infill	BS EN 826 : 2013	CS(10\Y)300 ≥ 300 kPa	Pass
ProTherm Quantum PLUS+	Compressive creep to	CC(2/1,5/25)50	Pass
ProTherm XPS Infill	BS EN 1606 : 2013 and ETAG 031 : 2010		

1.1.2 On the basis of data assessed, the ProTherm Quantum PLUS+ panels are limited to a maximum installed thickness of 102 mm applied as a single layer (see section 9.2.4). The system has adequate resistance to the loads associated with light maintenance traffic on roofs, and to pedestrian foot traffic on roof terraces.

2 Safety in case of fire

Data were assessed for the following characteristics.

2.1 Reaction to fire

2.1.1 The Certificate holder has not declared a reaction to fire classification to BS EN 13501-1 : 2018 for ProTherm Quantum PLUS+.

2.1.2 ProTherm XPS Infill was tested for reaction to fire and the classification is given in Table 6.

Table 6 Reaction to fire classification

Product assessed	Assessment method	Requirement	Result ⁽¹⁾
ProTherm XPS Infill	NF EN 13501-1 : 2013	Value achieved	E

(1) Test report no RA15-0268 (6 February 2019), issued by CSTB, available from the Certificate holder on request.

2.1.3 When ballasted with a minimum 50 mm depth of aggregate or fully supported cast stone or mineral slabs of at least 40 mm thickness, a roof will be unrestricted with regard to proximity to a relevant boundary by the documents supporting the national Building Regulations.

2.1.4 The classification and permissible areas of use of other specifications must be confirmed in accordance with the documents supporting the national Building Regulations.

2.1.5 Restrictions may apply where the system is laid over a compartment wall.

3 Hygiene, health and the environment

Data were assessed for the following characteristics.

3.1 Water vapour permeability

3.1.1 ProTherm XPS Infill was tested for water vapour resistivity and the result is given in Table 7.

Product assessed	Assessment method	Requirement	Result
ProTherm XPS Infill	BS EN 12086 : 1997	Water vapour resistance factor μ	150
ProTherm XPS X MK	BS EN ISO 12572 : 2016	Water vapour transmission S_d (m)	0.01

3.1.2 For the purposes of assessing the risk of condensation, the water vapour resistivity values may be taken as given in Table 7.

3.2 Resistance to moisture

3.2.1 Long-term water absorption by diffusion for ProTherm XPS Infill is given in Table 8.

Product assessed	Assessment method	Requirement	Result
ProTherm XPS Infill	BS EN 13164 : 2012	WD(V)2 $\leq 2\%$	Pass

3.2.2 The water absorption result is used to determine the design thermal conductivity value (λ_d) for ProTherm XPS Infill as given in Table 10.

3.3 Weathertightness

ProTherm XPS X MK was tested for watertightness and the result is given in Table 9.

Product assessed	Assessment method	Requirement	Result
ProTherm XPS X MK	BS EN 1928 : 2000 and BS EN 13859-1 : 2010	Declared value Class W1 No leakage after 2 hours exposure to 200 mm water column	Pass

4 Safety and accessibility in use

Not applicable.

5 Protection against noise

Not applicable.

6 Energy economy and heat retention

Data were assessed for the following characteristics.

6.1 Thermal conductivity

The inverted roof insulation was tested for thermal conductivity and the results are given in Table 10.

Product assessed	Insulation thickness	Assessment method	Requirement	Result
ProTherm Quantum PLUS+	22 to 102 mm	ETAG 031 : 2010	Design value (moisture corrected) (λ_U)	0.007 W·m ⁻¹ ·K ⁻¹
ProTherm XPS Infill	30 to 80 mm	BS EN 13164 : 2012	Design value (moisture corrected) (λ_U) ⁽¹⁾	0.032 W·m ⁻¹ ·K ⁻¹

(1) The design thermal conductivity value (λ_U) for ProTherm XPS Infill must be calculated using the water absorption result in Table 8.

6.2 Conservation of fuel and power

6.2.1 Using the design thermal conductivity values (λ_U) given in Table 10 and the requirement for precipitation and drainage from section 6.2.2, an example U value calculation has been carried out and is given in Table 11.

6.2.2 Rainfall reaching the roof waterproofing membrane will temporarily affect the rate of heat loss from the roof and must be accounted for by adding a correction (ΔU_r) to the calculated roof U value in accordance with BS EN ISO 6946 : 2017, Annex F.4, as follows (see also BBA Information Sheet No 4) :

$$\Delta U_r = pf\chi (R_1/R_T)^2$$

where:

ΔU_r = correction to the calculated thermal transmittance of the roof element (W·m⁻²·K⁻¹)

p = average rate of precipitation during the heating season (mm·day⁻¹)

f = drainage factor giving the fraction of p reaching the waterproof membrane

χ = factor for increased heat loss caused by rainwater flowing on the membrane (0.04 W·day·m⁻²·K⁻¹·mm⁻¹)

R_1 = thermal resistance of the layer of insulation above the waterproofing membrane (m²·K·W⁻¹)

R_T = total thermal resistance of the construction before application of the correction (m²·K·W⁻¹)

$f\chi$ = 0.001 (system incorporates the ProTherm XPS X MK water-flow-reducing layer).

6.2.3 The U value of a completed roof will depend on the insulation thickness, type of substrate and internal finish. Example U-values are given in Table 11.

Table 11 Example U values⁽¹⁾ for flat roofs

Target U value (W·m ⁻² ·K ⁻¹)	ProTherm Quantum PLUS+ (VIP inverted roof insulation) thickness required ⁽²⁾ (mm)	
	$p^{(3)} = 3$ (mm·day ⁻¹)	$p^{(3)} = 8$ (mm·day ⁻¹)
	0.09	82 (40 + 40)
0.11	72 (40 + 30)	72 (40 + 30)
0.12	62 (30 + 30)	62 (30 + 30)
0.13	57 (30 + 25)	57 (30 + 25)
0.15	47 (25 + 20)	52
0.16	47 (25 + 20)	47 (25 + 20)
0.18	42	42
0.20	42	42

(1) Inverted roof construction — paving or gravel ballast layer; ProTherm XPS X MK ; ProTherm Quantum PLUS+ ; 10 mm bitumen waterproofing layer ($\lambda = 0.23 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$); 150 mm concrete deck ($\lambda = 1.33 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$); 25 mm service void bridged by timber battens (11.8 %, $\lambda = 0.13 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$); 15 mm plasterboard ($\lambda = 0.25 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$). An air gap correction factor (ΔU) of $0.01 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ has been applied to account for gaps between the insulation panels.

(2) Thinnest available ProTherm Quantum PLUS+ thickness (includes 1 mm outer spray coating) or thickness combination to achieve the required U value. Thicknesses in brackets are those of the double layer VIP panels..

(3) Values for p taken as examples of best to worst case for all UK locations, with a $f\cdot\chi$ value of $0.001 \text{ W}\cdot\text{day}\cdot\text{m}^{-2}\cdot\text{K}^{-1}\cdot\text{mm}^{-1}$.

6.2.4 The system can contribute towards a construction satisfying the national Building Regulations in respect of energy economy and heat retention.

7 Sustainable use of natural resources

Not applicable.

8 Durability

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

8.2 Specific test data were assessed as given in Table 12.

Table 12 Durability

Product assessed	Assessment method	Requirement	Declared level/value
ProTherm Quantum PLUS+	Deformation under specified compressive load and temperature conditions to BS EN 1605 : 2013 (40 kPa at 70°C for 168 hours)	$\leq 3\%$	Pass
ProTherm XPS Infill	Dimensional stability to BS EN 1604 : 1996 (70°C and 90-100% RH for 48 hours)	Declared value	DS (70,90)
	Deformation under specified compressive load and temperature conditions to BS EN 1605 : 2013 (40 kPa at 70°C for 168 hours)	$\leq 5\%$	Pass
	Compressive strength to BS EN 826 : 2013 after long term water absorption by diffusion and freeze/thaw resistance to BS EN 12088 : 2013 and BS EN 12091 : 2013	Reduction in compressive stress at 10% deformation of redried specimens after freeze/thaw test $\leq 10\%$	Pass

8.3 Service life

Under normal service conditions, the system will have a life of at least 25 years, provided it is designed, installed and maintained in accordance with this Certificate and the Certificate holder's instructions.

PROCESS ASSESSMENT

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

9 Design, installation, workmanship and maintenance

9.1 Design

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

9.1.2 Concrete, metal or timber roofs must be designed in accordance with the relevant provisions of BS 6229 : 2018, BS 8217 : 2005 and BS 8218 : 1998, in particular to accommodate the weight of the ballast layer.

9.1.3 Separation or cushion layers between the insulation panels and the roof waterproofing may be needed in some circumstances (see section 9.1.10).

9.1.4 Care must be taken to ensure that upgraded roofs are capable of carrying the increased load and depth of the installed system. The structural strength and deformation of both the roof structure and the inverted roof insulation panels must be assessed by a suitably experienced and competent individual, to resist actions due to the combination of the dead load imposed by the paving and gravel ballast finish, and the imposed load from foot traffic, snow and the possible weight of rainwater [should the roof outlet(s) become blocked].

9.1.5 Decks must be covered with one or more of the following roof waterproofing specifications:

- built-up specifications using reinforced bitumen membranes to BS 8747 : 2007 in accordance with the recommendations of Table 5 of this Certificate, and installed to the relevant clauses of BS 8217 : 2005
- mastic asphalt laid in accordance with BS 8218 : 1998
- other waterproofing systems which are the subject of a current BBA Certificate, and laid in accordance with, and within the limitations imposed by, that Certificate.

9.1.6 It is essential that roof falls and drainage paths are correctly designed to avoid ponding (and the subsequent risk of silt build-up) and stresses in freezing conditions, and to reduce water entry in the event of a failure in the waterproofing layer.

9.1.7 The roof must be designed with adequate falls unless the roof waterproofing system has been specifically designed and covered by a valid BBA Certificate for use in a zero fall roof application. For zero fall roofs it is particularly important to identify the correct drainage points, to ensure that drainage is sufficient and effective. Reference must be made to the appropriate clauses of the LRWA Guidance Note No. 7 : 2012 *Specifier Guidance for Flat Roof Falls*, which generally requires surface drainage falls in most situations.

9.1.8 Dual-level roof drainage must be provided in accordance with BS 6229 : 2018 and BS EN 12056-3 : 2000 to drain water off at the level of the ProTherm XPS X MK and also at the level of the roof waterproofing.

9.1.9 Drainage points must be located at the lowest point of the roof, to facilitate the effective removal of rainwater. Care is needed to identify these locations. For example, precast concrete decks will deflect between spans, and mid-span may be the lowest point of the roof rather than roof edges or column supports.

9.1.10 Where there is a risk from plasticiser migration or other contaminants from the roof waterproofing (such as PVC single-ply membranes), a suitable plastic fibre or similar isolating sheet must be interposed between the roof waterproofing and the insulation panels. For loose laid single-layer roof waterproofing membranes, a cushion layer must be interposed.

9.1.11 ProTherm XPS X MK (water-flow-reducing layer) must be installed above the inverted roof insulation, with minimum 300 mm laps and covered with a gravel ballast or paving finish.

9.1.12 The ballasted roof finish may be either gravel ballast or paving, which must be assessed by a suitably experienced and competent individual according to region, exposure and building height. In addition, the dead load imposed by the finish must be allowed for in calculating the total acceptable load on the deck. Care must be taken to ensure that upgraded roofs are capable of carrying the increased load and depth of the installed system. Ballast must not be stacked in one place on the roof unless the roof is capable of supporting it.

9.1.13 Gravel ballast must be washed, rounded and 16 to 32 mm in size (nominal), and laid to a minimum thickness of 50 mm. The minimum size of ballast depends on the wind loads and parapet height to prevent wind scour of the ballast. The ballast must be installed in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex.

9.1.14 Paving finish ballast must comprise a minimum 40 mm thickness of cast stone, mineral or pressed concrete paving slabs. Paving slabs can be either laid fully supported or may be supported using proprietary support/spacer pads, in accordance with the Certificate holder's recommendations.

9.1.15 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.

9.1.16 Roofs will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2021. Further guidance may be obtained from BRE Report BR 262 : 2002.

9.1.17 In England and Wales, roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $0.35 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point and the junctions with walls are designed in accordance with section 9.1.15 of this Certificate.

9.1.18 In Scotland, roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point. Guidance may be obtained from BS 5250 : 2021. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 9.1.15 of this Certificate.

9.2 Installation

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

9.2.2 Installation must be carried out in accordance with this Certificate and the Certificate holder's instructions. A summary of instructions and guidance is provided in Annex A of this Certificate.

9.2.3 It is essential to establish that the roof waterproofing has been installed correctly and that it is weathertight, clean and free from any extraneous matter. Every joint between sheets, flashing and other details must be checked to ensure that the roof covering is suitable for an inverted roof specification.

9.2.4 For the ProTherm Quantum PLUS+ Pure Inverted Roof Insulation System, the ProTherm Quantum PLUS+ is limited to a maximum installed thickness of 102 mm (see section 1.1.2 of this Certificate), applied as a single layer only, and must not be applied multi-layered on site.. The ProTherm XPS Layer and ProTherm XPS Infill panels may, however, be applied as either a single or double layer, to suit the overall thickness required. When using multiple layers the insulation panel joints must be staggered/offset. The Certificate holder must be contacted for further advice on multi-layering, but such advice is outside the scope of this Certificate.

9.3 Workmanship

Practicability of installation was assessed by the BBA, on the basis of the Certificate holder's information. To achieve the performance described in this Certificate, installation of the system must be carried out by a competent general builder, or a contractor, experienced with this type of system.

9.4 Maintenance and repair

9.4.1 Ongoing satisfactory performance of the system in use requires that it is suitably maintained. The guidance provided by the Certificate holder was assessed and found to be appropriate and adequate.

9.4.2 The following requirements apply in order to satisfy the performance assessed in this Certificate:

9.4.3 The inverted roof insulation is confined and has suitable durability and so does not require maintenance.

9.4.4 The other components of the roofing system must be maintained in accordance with conventional good practice.

10 **Manufacture**

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

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

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

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

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

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

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

11 **Delivery and site handling**

11.1 The Certificate holder stated that ProTherm Quantum PLUS+ panels are delivered to site in boxes, with each panel individually wrapped in wax paper. Each box bears the Certificate holder's name and product name, the project name, roof area and board dimensions, and the BBA logo incorporating the number of this Certificate. The box also contains guidance on the installation layout of the panels.

11.2 ProTherm XPS Infill is shrink wrapped in polythene and delivered to site on pallets. Each pack is labelled with the Certificate holder's name, product name and the BBA logo.

11.3 Regupol RCM is delivered to site in sheets (see Table 3).

11.4 ProTherm XPS X MK is delivered to site in rolls wrapped in polythene bearing the Certificate holder's name, product name and the BBA logo.

11.5 Delivery and site handling must be performed in accordance with the Certificate holder's instructions and this Certificate including:

11.5.1 ProTherm Quantum PLUS+ panels must be protected from prolonged exposure to sunlight and stored in their boxes inside a building until ready for installation.

11.5.2 ProTherm Quantum PLUS+ panels must be handled with care to prevent contact with sharp objects, solvents and other chemicals. Panels must not be cut or penetrated; damaged/punctured panels must not be used (see section A.8).

11.5.3 Where large volumes of ProTherm Quantum PLUS+ and ProTherm XPS Infill panels are stored, especially indoors, flammable material and ignition sources should not be permitted in the vicinity and adequate ventilation (at least two air changes per hour) should be ensured.

11.5.4 ProTherm XPS Infill must be stored flat, off the ground on a clean, level surface, and under cover or protected with opaque polythene, to protect the panels from high winds and prolonged exposure to sunlight. Where possible, packs should be stored inside. If outside, the panels must be raised above ground level.

11.5.5 Care must be exercised to avoid crushing the edges or corners of ProTherm XPS Infill. If damaged, the product must be discarded.

11.5.6 ProTherm XPS Infill must not be exposed to open flame or other ignition sources, or to solvents or other chemicals.

11.5.7 Rolls of ProTherm XPS X MK must be stored on their side under cover.

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

Construction (Design and Management) Regulations 2015

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

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

UKCA marking

The Certificate holder has taken the responsibility of UKCA marking ProTherm XPS Infill in accordance with Designated Standard EN 13164 : 2012.

CE Marking

The Certificate holder has taken the responsibility of CE marking ProTherm XPS X MK in accordance with Harmonised Standard EN 13859-2 : 2014.

Management Systems Certification for production

The management system of the manufacturer of ProTherm Quantum PLUS+ has been assessed and registered as meeting the requirements of DIN EN ISO 9001 : 2015 by TÜV SÜD Management GmbH (Certificate 12 100 33056 TMS).

The management system of the manufacturer of ProTherm XPS Infill has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by BSI Management Systems (Certificate Q710649).

Additional information on installation

Installation must be in accordance with the Certificate holder's instructions and this Certificate.

A.1 A roof insulation layout drawing is supplied with ProTherm Quantum PLUS+ panels to illustrate the installation layout pattern. Further installation support, including an on-site 'toolbox talk', is available from the Certificate holder upon request, but such guidance is outside the scope of this Certificate.

A.2 Single-layer roof waterproofing must be the subject of very close scrutiny, and the inspection must include an examination for perforation and for the likelihood of subsequent perforation from beneath (by, for example, uneven decks and protruding nail heads).

A.3 ProTherm Quantum PLUS+ is laid in a brick bond pattern; it is essential that all joints between the panels are tight and that no gaps exist where they meet rooflights, edge details and other services which perforate the roof deck.

A.4 When the system is to be placed over a loose-laid roof covering, they must be installed and ballasted as soon as possible to protect the covering from the effects of wind uplift (see sections 9.1.12 to 9.1.14) and installers must take care not to damage the existing roof waterproofing.

A.5 The system may be installed in any weather but, due to its size, care is required in high winds. Once placed, the insulation must be covered with ProTherm XPS X MK and ballasted as soon as possible.

A.6 The ballast loading layer must be installed in accordance with BS 6399-2 : 1997, BS EN 1991-1-4 : 2005, BRE Digest 295 : 1985 and BRE Digest 311 : 1986.

A.7 The ballast loading layer must be applied as work progresses to protect the insulation and the filter/water-control layer from the effects of wind uplift, solar degradation and foot traffic.

A.8 ProTherm Quantum PLUS+ panels have a factory applied external coating which provides some protection against damage when handled and installed with due care. However, during installation the panels must be protected on top against access damage, using suitable walkway matting/covering or crawl boards, until covered by ProTherm XPS X MK. Care must be taken at all times to ensure ProTherm Quantum PLUS+ panels are not damaged or punctured by sharp tools or other objects. Panels that are damaged or punctured during handling or installation must not be used, and replacement panels must be substituted.

A.9 ProTherm XPS Infill is cut accurately to the required size using a fine-toothed saw or knife, to ensure close-butting joints and continuity of insulation, to fit around the perimeter, penetrations, rainwater outlets, etc in accordance with the layout drawing. Where it abuts walls or ProTherm Quantum PLUS+ panels, any rebated edges in ProTherm XPS Infill must be removed so that a close-butted joint is achieved, to limit any cold-bridging.

A.10 Where there is a gravel ballast finish, ie at perimeter areas and roof service penetrations, the top surface of the ProTherm Quantum PLUS+ must be overlaid with the 3 mm thick Regupol RCM protection mat, to protect it from any possible puncture damage from the gravel ballast. Regupol RCM protection mat is laid with the long edges running perpendicular to the direction of the insulation and butted together without overlaps.

A.11 ProTherm XPS X MK is then loose-laid over the insulation, at right angles to the slope, with 300 mm unsealed laps overlapping in the downward direction of the roof slope, directly on top of the insulation and the Regupol RCM protection mat (where required). At upstands and penetrations, ProTherm XPS X MK must be turned up to finish above the surface of the ballast layer and turned down at drainage outlets.

A.12 The ballast layer (comprising either a gravel ballast or paving slabs) must then be laid over ProTherm XPS X MK as soon as possible, to prevent flotation, wind uplift, UV degradation and damage from foot traffic.

Upgrading roofs

A.13 In existing roofs, the requirements of sections A.2 to A.12 also apply. In addition, the existing roofing and substructure must be examined for degradation and, where necessary, repairs effected. Particular consideration must be given to the condensation risk that the existing roof structure may present.

A.14 Where parapets, details and services have insufficient height to accommodate the increased depth of insulation/protection, a minimum of 150 mm from the top of the gravel to the top of the skirtings must be provided.

A.15 If upgrading involves laying the system on existing inverted roof insulation, the advice of the Certificate holder must be sought, but such advice is outside the scope of this Certificate.

A.16 Rainwater outlets may need to be modified or replaced to suit, eg by the installation of gravel guards.

Paving slab finish

A.17 Standard pressed concrete, cast stone or mineral paving slabs of at least 40 mm thickness (see sections 2.1.3 and 9.1.14) must be carefully placed directly over ProTherm XPS X MK to ensure complete cover is achieved over the entire surface of the system. Paving slabs can either be laid fully supported or may be supported using proprietary support/spacer pads.

Gravel ballast finish

A.18 Where a gravel ballast finish is used, Regupol RCM must be installed first as protection on top of the inverted roof insulation to prevent puncture damage, prior to overlaying with ProTherm XPS X MK.

A.19 The gravel ballast layer is carefully placed directly over ProTherm XPS X MK, to ensure that complete depth and cover is achieved over the entire surface of the system.

A.20 Gravel must not contain excessive fines in order to prevent clogging of gullies and outlets and to discourage organic growth.

A.21 Typical construction details are given in Figures 2 and 3.

Figure 2 Parapet upstand detail — paving/gravel finish

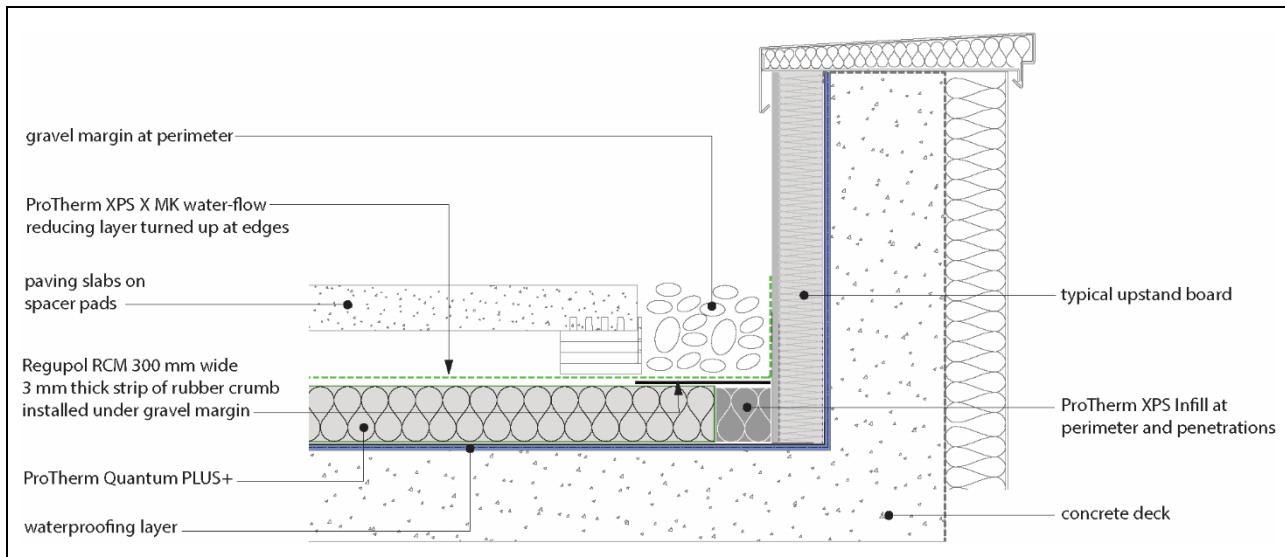
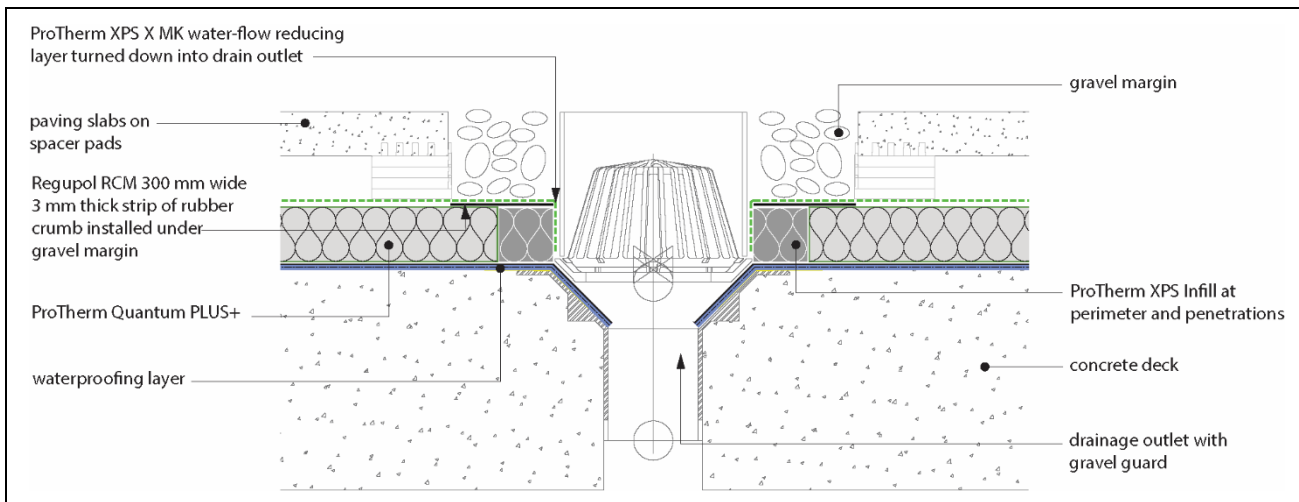


Figure 3 Drainage outlet detail — paving/gravel finish



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Conditions of Certificate

Conditions

1 This Certificate:

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

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

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

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

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

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

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

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

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