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**Agrément
Certificate
No 07/4418**

Designated by Government
to issue
European Technical
Approvals

POLYFOAM ROOFBOARD STANDARD, EXTRA AND SUPER INCORPORATING THE POLYFOAM SLIMLINE SYSTEM

Isolation pour toitures
Dachabdichtungen

Product



• THIS CERTIFICATE REPLACES No 90/2424 AND RELATES TO POLYFOAM ROOFBOARD STANDARD, EXTRA AND SUPER, EXTRUDED POLYSTYRENE INSULATION BOARDS INCORPORATING THE POLYFOAM SLIMLINE SYSTEM.

- The product is for use as a thermally insulating layer on flat roofs in the inverted or protected membrane roof system, and on suitably designed concrete, metal or timber decks.
- The Super and Extra grades can also be used in garden and terrace/patio roofs.

Regulations

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

The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of roof insulation with the Building Regulations. In the opinion of the BBA, Polyfoam Roofboard Standard, Extra and Super incorporating the Polyfoam Slimline System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant Requirements.

Requirement: B4(2) Comment:	External fire spread When used in conjunction with appropriate roof decks and roof finishes, the product is unrestricted under this Requirement. See sections 10.1 and 10.2 of this Certificate.
Requirement: C2(c) Comment:	Resistance to moisture The product will contribute to enabling a roof to meet this Requirement. See sections 13.1 and 13.4 of this Certificate.
Requirement: L1(a)(i) Comment:	Conservation of fuel and power See sections 12.2 and 12.6 to 12.12 of this Certificate.
Requirement: Regulation 7 Comment:	Materials and workmanship The board is acceptable. See sections 15.1 and 15.2 of this Certificate.

continued

- The product, incorporating the Polyfoam Slimline System can reduce the heat loss rate normally experienced during rainfall.

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2 The Building (Scotland) Regulations 2004



In the opinion of the BBA, Polyfoam Roofboard Standard, Extra and Super Incorporating the Polyfoam Slimline System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Mandatory Standards as listed below.

<p>Regulation: 8 Regulation: 8(1) Comment:</p>	<p>Fitness and durability of materials and workmanship Fitness and durability of materials and workmanship The product can contribute to a construction satisfying this Regulation. See sections 15.1, 15.2 and <i>Installation</i> part of this Certificate.</p>
<p>Regulation: 9 Standard: 2.8 Comment:</p>	<p>Building standards — construction Spread from neighbouring buildings When used in conjunction with appropriate roof decks and roof finishes, the product is unrestricted under this Standard, with reference to clause 2.8.1⁽¹⁾⁽²⁾. See sections 10.1 and 10.2 of this Certificate.</p>
<p>Standard: 3.15 Comment:</p>	<p>Condensation The product will contribute to enabling a roof to satisfy this Standard, with reference to clauses 3.15.1⁽¹⁾ to 3.15.4⁽¹⁾. See sections 13.2 and 13.4 of this Certificate.</p>
<p>Standard: 6.2 Comment:</p>	<p>Building insulation envelope The product can enable a roof to achieve the U value required, subject to rainfall corrections, with reference to clauses 6.2.1⁽¹⁾⁽²⁾ to 6.2.4⁽¹⁾⁽²⁾. See sections 12.2, 12.13 and 12.14 of this Certificate.</p>

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

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



In the opinion of the BBA, Polyfoam Roofboard Standard, Extra and Super Incorporating the Polyfoam Slimline System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

<p>Regulation: B2 Comment:</p>	<p>Fitness of materials and workmanship The product is acceptable. See sections 15.1 and 15.2 of this Certificate.</p>
<p>Regulation: C5 Comment:</p>	<p>Condensation The product will contribute to enabling a roof to meet this Regulation. See sections 13.4 and 13.5 of this Certificate.</p>
<p>Regulation: E5(b) Comment:</p>	<p>External fire spread When used in conjunction with appropriate roof decks and roof finishes, the product is unrestricted under this Regulation. See sections 10.1 and 10.2 of this Certificate.</p>
<p>Regulation: F2(a)(i) Comment:</p>	<p>Conservation measures See sections 12.2 and 12.6 to 12.12 of this Certificate.</p>

4 Construction (Design and Management) Regulations 1994 (as amended)

Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See sections: 6 *Delivery to site and storage* (6.3) and 16 *Installation — General* (16.7)

Technical Specification

5 Description

5.1 Polyfoam Roofboard Standard, Extra and Super are rigid, extruded polystyrene insulation boards manufactured in accordance with BS EN 13164 : 2001 Section 4.2 and the relevant parts of Section 4.3.

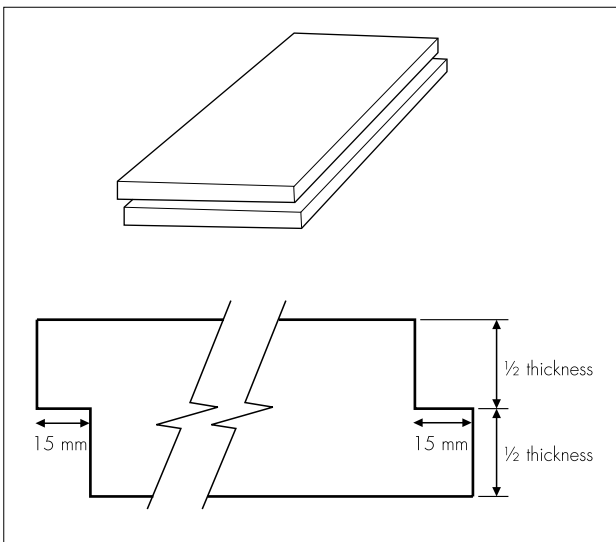
5.2 Characteristics of the boards are given in Table 1.

Table 1 Nominal characteristics

Characteristic (units)	Grade type		
	Standard	Extra	Super
Work size (mm)	1250 x 600	1250 x 600	1250 x 600
Overall size (mm)	1265 x 615	1265 x 615	1265 x 615
Thickness (mm)	35, 50, 60, 75	50, 60, 75, 100 110, 120, 130 140, 150	50, 75, 100
Edge profile (see Figure 1)	rebated all sides		
Compressive strength (minimum) (kPa)	200 ⁽¹⁾	350	500

(1) Suitable for limited access roofs only. See section 7.8.

Figure 1 Rebate detail



5.3 The Polyfoam Slimline System comprises Polyfoam Roofboard and Polyfoam Slimline membrane, which is used as a separating layer between the boards and ballast. The nominal characteristics of the membrane are:

length (m)	100
width (m)	1.5
weight (gm ⁻²)	95
head of water resistance (m)	1.5
water vapour transmission (gm ⁻² day ⁻¹) ⁽¹⁾	≥ 1200

(1) 23°C/85% RH.

5.4 A range of accessories are available but have not been assessed by the BBA and are not covered by this Certificate. A list of suppliers can be

obtained from the Certificate holder. The range includes:

- paving supports
- filter layer

5.5 The protected membrane roof system incorporates the board above the waterproofing membrane, ie an upside-down or inverted roof configuration.

6 Delivery to site and storage

6.1 Boards are delivered to site in packs wrapped in polythene film. Each board shows the product name and manufacturing reference code. Each pack contains a label bearing the BBA identification mark, the number of this Certificate, and:

- product name
- board dimensions
- number of boards in pack
- grade of insulation
- manufacturer's reference codes.

6.2 Boards must be stored flat, off the ground, on a clean, level surface and under cover to protect them from precipitation, high winds and from prolonged exposure to sunlight. Alternatively, light-coloured, opaque polythene sheets can be used as cover.

6.3 Boards must not be exposed to naked flame or other ignition sources. Care must be taken to prevent contact with solvents and liquid bitumen or mastic products.

Design Data

7 General

7.1 Polyfoam Roofboard Standard, Extra and Super Incorporating the Polyfoam Slimline System are for use in the protected membrane roof system as a thermal insulation layer on flat roofs with concrete, timber or metal structural decks.

7.2 The Polyfoam Slimline System reduces heat loss caused by rainwater cooling the roof deck and therefore reduces the necessity for greater insulation thickness (see sections 12.5 to 12.9).

7.3 Roof constructions should be designed in accordance with the relevant clauses of BS 5250 : 2002, BS 8217 : 2005, BS 6229 : 2003 and, where appropriate, NHBC Standards, Chapter 7.1, and Zurich Building Guarantee Technical Manual, Section 4, Superstructure, Sub-section Flat roofs.

7.4 Decks should be covered with one, or more, of the following waterproofing specifications:

- built-up felt roofing laid in accordance with BS 8217 : 2005 using Type 3 and/or Type 5 bitumen felts to BS 747 : 2000

- mastic asphalt laid in accordance with BS 8218 : 1998, on an isolating layer
- other waterproofing systems (including tanking specification or reinforced single-ply membrane) which are the subject of a current Agrément Certificate⁽¹⁾ laid in accordance with, and within the limitations imposed by, that Certificate.

(1) Users are advised to check the BBA website for validity.

7.5 The base construction should be of sufficient strength to support the mass of the insulation system.

7.6 For terrace areas, when calculating the design load, the weight of the ballast as well as the expected dynamic loads should be taken into account. Care should be taken to account for the point loads and spread of any applied loads. The Roofboard Standard would not be suitable in this application.

7.7 Where there is a risk from plasticiser migration, eg from a PVC-based waterproofing layer, or other contaminants from the roof waterproofing, a suitable plastic fibre, or similar, isolating layer must be interposed between the roof waterproofing and the insulation boards in accordance with the Certificate holder's instructions.

7.8 Limited access roofs, are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic, typically for maintenance of the roof covering and cleaning of gutters. Where traffic in excess of this is envisaged, special precautions such as additional protection to the membrane, in accordance with the manufacturer's instructions, must be taken.

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

7.10 For design purposes on flat roofs, twice the minimum finished fall should be assumed unless a detailed analysis of the roof is available, including such details as overall and local deflection, direction of falls.

7.11 The boards must be covered by one of the protective finishes described in section 18, depending on factors such as access to the roof and wind uplift.

8 Resistance to foot traffic

8.1 When covered with one of the ballast systems, the system can accept, without damage, the limited foot traffic and light concentrated loads associated with installation and maintenance operations.

8.2 Where regular foot traffic is envisaged, ie access to lift motor rooms, walkways of paving on suitable support pads must be provided. Where


such traffic cannot be controlled, paving slabs must be used as the loading medium (see section 18).

9 Resistance to plant growth and insects

9.1 The board will not normally support the growth of plants. However, where there is a run-off onto the surface of the roof, the excessive build-up of silt may provide conditions for germination of seeds. Therefore, this type of detail should be avoided. Growth that may occur will be restricted, will not normally affect the performance of the roof, and will be no worse than that which may occur on normal flat roofs.

9.2 Small insects may be found under the board, they will neither attack nor have any effect on the performance or durability of the roof.

10 Behaviour in relation to fire

 10.1 When the boards are ballasted with an aggregate (minimum depth of 50 mm) and the waterproofing layer is of mastic asphalt or built-up felt, the roof may be considered to be of designation AA and, therefore, meets or satisfies the requirements of the national Building Regulations:

England and Wales

Requirement B4(2)

Scotland

Mandatory Standard 2.8, clause 2.8.2⁽¹⁾⁽²⁾

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland

Regulation E5(b).

10.2 The designation of other specifications should be confirmed by test or assessment.

11 Effect on roof coverings

The protected membrane roof system will provide solar protection and also limit the range of temperature to which the waterproofing layer will be subjected. Placing the insulation on top of the roof covering will normally lead to an extended life of the waterproofing layer.

12 Thermal performance

12.1 Calculations of the thermal transmittance (U value) of specific roof constructions should be carried out in accordance with BS EN ISO 6946 : 1997 and BRE⁽¹⁾ report (BR 443 : 2006)

Conventions for U-value calculations, using the declared thermal conductivity ($\lambda_{90/90}$ value) of the boards as shown in Table 2.

(1) Building Research Establishment.

Table 2 Thermal conductivity values

Grade	Thickness (mm)	λ value ($\text{Wm}^{-1}\text{K}^{-1}$)
Standard	35, 50, 60, 75	0.029
Extra	50, 60, 75, 100, 110, 120, 130	0.029
	140, 150, 160	0.031
Super	50	0.029
	75	0.031
	100	0.034



12.2 Rainfall temporarily affects the rate of loss of heat of the roof system but this can be compensated by an increase in the thickness of insulation. The required increase is calculated in accordance with BS EN ISO 6946 : 1997, Annex D, Section D.4, using the following formula:

$$\Delta U_r = pfx (R_i/R_T)^2 \text{ where:}$$

ΔU_r = correction to the calculated thermal transmittance of the roof element ($\text{Wm}^{-2}\text{K}^{-1}$)

$p^{(1)}$ = average rate of precipitation during the heating season (mm day^{-1})

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

x = factor for increased heat loss caused by rainwater flowing on the membrane [$\text{W.day.m}^{-2} (\text{K mm})^{-1}$]

$R_i^{(2)}$ = thermal transmittance of the layer of the insulation above the waterproofing membrane (m^2KW^{-1})

$R_T^{(2)}$ = total thermal transmittance of the construction before application of the correction (m^2KW^{-1})

(1) Specific values of p for different areas of the United Kingdom can be found on the Meteorological Office's website: (www.metoffice.com/climate/uk/averages/19712000/rr/16.gif)

(2) See section 13.3.

The following values may be used for fx :

- 0.03 $\text{W.day.m}^{-2}(\text{K mm}^{-1})$ for open coverings (eg aggregate, pavers)
- 0.02 $\text{W.day.m}^{-2}(\text{K mm}^{-1})$ for green roofs and roof gardens.

12.3 Example roof U values without the Polyfoam Slimline System are given in Table 3, and take into account the calculation procedures in sections 12.1 and 12.2.

Table 3 Typical roof U values — aggregate or paver covering⁽¹⁾ (without Polyfoam Slimline System)

Grade	Insulation thickness (mm)	λ value	Deck type ⁽²⁾	U value ($\text{Wm}^{-2}\text{K}^{-1}$)			
				$p = 1$	$p = 2$	$p = 3$	$p = 8$
Standard	75	0.029	dense	0.38	0.41	0.43	0.56
			insulated	0.32	0.34	0.36	0.45
Extra	110	0.029	dense	0.28	0.30	0.33	0.46
			insulated	0.24	0.26	0.29	0.39
Extra	120	0.029	dense	0.26	0.28	0.31	0.45
			insulated	0.23	0.25	0.27	0.38
Extra	140	0.031	dense	0.24	0.27	0.29	0.43
			insulated	0.21	0.24	0.26	0.37
Extra	150	0.031	dense	0.23	0.25	0.28	0.42
			insulated	0.20	0.23	0.25	0.36
Super	150	0.034	dense	0.24	0.27	0.30	0.43
			insulated	0.22	0.24	0.26	0.37

(1) Values for p taken from the Meteorological Office's website.

(2) Dense deck — a dense concrete roof deck with a 'minimal' thermal resistance of $0.08 \text{ m}^2\text{KW}^{-1}$. Insulated deck — a roof deck with some insulating value, having a thermal resistance of $0.5 \text{ m}^2\text{KW}^{-1}$, but not exceeding 20% of the roof's total corrected R value below the roof waterproofing (see section 13.3).

12.4 The BBA has carried out tests of the Polyfoam Slimline System which confirmed that the incidence of rain (precipitation) is less and therefore brings about an improvement on the thermal performance such that in the formula given in section 12.2 $fx = 0.001$.

12.5 Example roof U values with the Polyfoam Slimline System are given in Table 4, and take into account the calculation procedures in sections 12.1 and 12.2.

Table 4 Typical roof U values — aggregate or paver covering⁽¹⁾ (with Polyfoam Slimline System)

Grade	Insulation thickness (mm)	λ value	Deck type ⁽²⁾	U value ($\text{Wm}^{-2}\text{K}^{-1}$)			
				$p = 1$	$p = 2$	$p = 3$	$p = 8$
Standard	75	0.029	dense	0.36	0.36	0.36	0.36
			insulated	0.30	0.30	0.30	0.31
Extra	110	0.029	dense	0.25	0.25	0.25	0.26
			insulated	0.22	0.22	0.22	0.23
Extra	120	0.029	dense	0.23	0.23	0.23	0.24
			insulated	0.21	0.21	0.21	0.21
Extra	140	0.031	dense	0.21	0.21	0.21	0.22
			insulated	0.19	0.19	0.19	0.20
Extra	150	0.031	dense	0.20	0.20	0.20	0.21
			insulated	0.18	0.18	0.18	0.19
Super	150	0.034	dense	0.22	0.22	0.22	0.22
			insulated	0.20	0.20	0.20	0.20

(1) Values for p taken from the Meteorological Office's website.

(2) Dense deck — a dense concrete roof deck with a 'minimal' thermal resistance of $0.08 \text{ m}^2\text{KW}^{-1}$. Insulated deck — a roof deck with some insulating value, having a thermal resistance of $0.5 \text{ m}^2\text{KW}^{-1}$, but not exceeding 20% of the roof's total corrected R value below the roof waterproofing (see section 13.3).



12.6 For buildings subject to Regulations, the required roof U values may be met, subject to the following parameters:

- magnitude of the U value correction for local rainfall
- the roof deck's thermal resistance

- the performance (fx value)
- roof covering, and
- insulation thickness.



12.7 Roofs cannot achieve the U value of $0.16 \text{ Wm}^{-2}\text{K}^{-1}$ as specified for the 'notional' building in Table R1 of Appendix R of *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* (SAP 2005) or the Simplified Building Energy Model (SBEM)⁽¹⁾.

(1) Published by the Department for Communities and Local Government on its website: www.communities.gov.uk

12.8 However, roofs subject to the parameters outlined in section 12.6 can achieve the following:

- the limit average U value of $0.25 \text{ Wm}^{-2}\text{K}^{-1}$
- the limit U value of $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ for the individual element.

12.9 Additional energy saving measures will be required within the building envelope and/or services for a building to achieve the required overall carbon dioxide emission rate reduction of 'average' improvements of 20% (dwellings) and from 23% to 28% (buildings other than dwellings):

England and Wales

As specified in Approved Documents L1A and L2A

Northern Ireland

As specified in Technical Booklets F1 and F2.

12.10 The product can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between roofs and other building elements. Guidance in this respect, is given in:

England and Wales

Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings TSO 2002.

Northern Ireland

Accredited Construction Details (version 1.0).

12.11 Compliance with the guidance referred to in section 12.10, including airtightness measures, will allow the use of the default psi values from Table 3 of BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings* and Table K1 of SAP 2005 *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* in Target Emission Rate calculations to SAP 2005 or the Simplified Building Energy Model (SBEM).

12.12 When installed on roofs of existing buildings, the product can meet, or contribute to meet, the relevant requirements of the following guidance documents:

England and Wales

As specified in Approved Document L1B, section 2, L2B, section 3

Northern Ireland

As specified in Technical Booklets F1 and F2 section 3.



12.13 Elemental value of $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ or average maximum of $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ (dwellings) and $0.45 \text{ Wm}^{-2}\text{K}^{-1}$ (buildings other than dwellings). For U values greater than $0.25 \text{ Wm}^{-2}\text{K}^{-1}$, the additional heat loss will need to be compensated for, using the Target U value Method or Carbon Index approach, for dwellings, or the Heat Loss Method or Carbon Emissions Method for buildings other than dwellings.

12.14 The product can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between the roof and other building elements. Guidance in BRE report (BR 262 : 2002) *Thermal insulation : avoiding risks* is acceptable.

13 Condensation risk



13.1 Roofs will adequately limit the risk of surface condensation when the U value of the roof does not exceed $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ at any point and junctions and openings are designed in accordance with the relevant requirements of *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings* TSO 2002 or BRE Information Paper IP 1/06.



13.2 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $1.2 \text{ Wm}^{-2}\text{K}^{-1}$ at any point. Guidance may be obtained from section 8 of BS 5250 : 2002 and BRE report (BR 262 : 2002).

Interstitial condensation

13.3 Rainwater seeping below the insulation will temporarily cool the waterproofing membrane and intermittently increase the risk of interstitial condensation. Care, therefore, should be taken to ensure that the proportion of the roof's total thermal resistance below the waterproofing is limited (see also section 12.2).



13.4 Roofs will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2002, Section 8.4 and Annex D.



13.5 For roofs subject to regulations in Northern Ireland, calculations for risk of interstitial condensation should be carried out with a 20% reduction in insulation thickness.

14 Maintenance/upgrading

14.1 The protected membrane roof system should require little or no maintenance other than annual removal of any plants and checking that the gravel loading, if used, has not been displaced, and is not blocking a gully.

14.2 Should a leak occur in the roof waterproofing, access to it is achieved by removal of the protective finish and the boards.

14.3 Protected membrane roofs are able to accept upgrading of the thermal insulation at a later date without difficulty, provided there is sufficient height to parapets and rooflights. Where there is insufficient height, they must be modified to accommodate the additional thickness. More loading may be needed and it must be established that the deck can support it.

14.4 If upgrading involves laying boards on top of the existing boards, rather than replacement with thicker boards, the advice of the Certificate holder should be sought.

15 Durability



15.1 The boards are unaffected by freeze/thaw cycles and water.

15.2 The protected membrane roof system will have a life of at least 20 years under normal circumstances, when a topping of gravel, paving or concrete is used.

15.3 New roof coverings, on which the boards are laid, can be expected to have a life in excess of that obtained when they are used in an exposed situation.

15.4 When used to upgrade existing roofs, the system can be expected to extend the remaining life of the roof waterproofing, provided it is in a sound condition when the boards are laid.

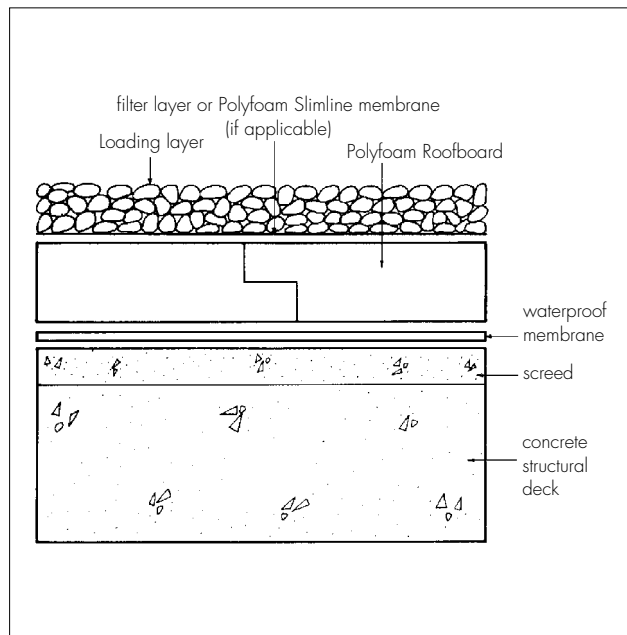
15.5 An estimation cannot be given for the life of a roof garden specification due to the nature of its use.

Installation

16 General

16.1 Polyfoam Roofboard Standard, Extra and Super Incorporating the Polyfoam Slimline System must be installed in accordance with the Certificate holder's instructions on concrete, timber or metal decks. Metal decks must have a covering of a suitable board material to receive the waterproofing layer. A typical installation is given in Figure 2.

Figure 2 Typical arrangement of the protected membrane roof system



16.2 Decks must be designed to take account of the loads imposed by the heavy protective finishes described in section 18.

16.3 Decks must be covered by one of the waterproofing specifications described in section 7.4.

16.4 When using the protected membrane roof system to upgrade an existing roof, it must be established that the deck can support the additional loads.

16.5 If a separation layer or a cushion layer is being used, this is loose-laid and the Polyfoam board is laid in accordance with the Certificate holder's instructions.

16.6 It is essential that all joints between boards are tight and gaps do not exist where they meet rooflights, edge details and other services which penetrate the roof deck. Where required, the boards can be cut easily using a handsaw or knife.

16.7 Boards may be installed in any weather but, due to their size and light weight, care will be needed in high winds. Installers must not carry boards near to parapets or apertures in the deck and, once placed, the boards must be loaded immediately.

16.8 The loading layer should be installed in accordance with BS 6399-2 : 1997 and BRE Digest 311 *Wind scour of gravel ballast on roofs*.

16.9 Temporary heavy loads should not be piled or stacked in one place on the roof deck unless it is strong enough to carry the load.

17 Procedure

New constructions (Figures 3, 4, 5 and 6)

17.1 It is essential to establish that the roof deck waterproofing has been installed correctly and that it is weathertight. Every joint between sheets, flashing and other details, must be checked to ensure that the waterproof covering is suitable for a protected membrane roof specification. Single-layer membranes must be the subject of very close scrutiny, and the inspection must include an examination for perforation and for the likelihood of subsequent penetration from beneath by uneven decks and protruding nail heads.

17.2 The roof waterproof covering must be clean and free from extraneous matter.

17.3 When a single-layer, loose-laid waterproofing membrane is used, a cushion layer should be interposed between the membrane and the roof deck, and a filter layer should be interposed between the boards and the ballast.

17.4 When a tanking specification waterproofing membrane is used the Certificate holder's advice should be sought on the use of a separation layer between the waterproofing and the insulation.

17.5 When waterproofing to roof gardens, the specification must be designed to ensure there is no risk of blistering and it should be fully water tested prior to completion of the roof construction.

17.6 Installers must take care not to damage the roof waterproofing, particularly in the case of thin single-layer membranes.

17.7 Insulation boards are laid, starting at the point of access in a brickbond pattern. The boards are laid in an advancing front to ensure the loading gravel is adequately distributed as soon as possible to protect the membrane, if loose-laid, from the effects of wind uplift and to protect the boards from solar degradation.

17.8 At upstands and other details, an apron flashing up to 150 mm above the gravel should be fitted.

Upgrading existing constructions

17.9 All loose gravel must be removed. Any bonded chippings should be left and covered with a cushion layer, such as Polyfoam Floorfoam.

17.10 All the requirements detailed in sections 17.1 to 17.6 apply and, in addition, the existing roofing and substructure must be examined for degradation and, where necessary, repairs effected.

17.11 Where parapets, details and services, have insufficient height to accommodate the increased depth of insulation/protection, due provisions need to be made (ie a minimum of 150 mm from the top of the gravel to the top of skirtings).

17.12 Rainwater outlets will need to be modified or replaced to suit, eg by the installation of gravel guards. Guidance on this matter and the size of rainwater outlet needed is given in BS EN 12056-3 : 2000.

Figure 3 Gully detail – two level drainage

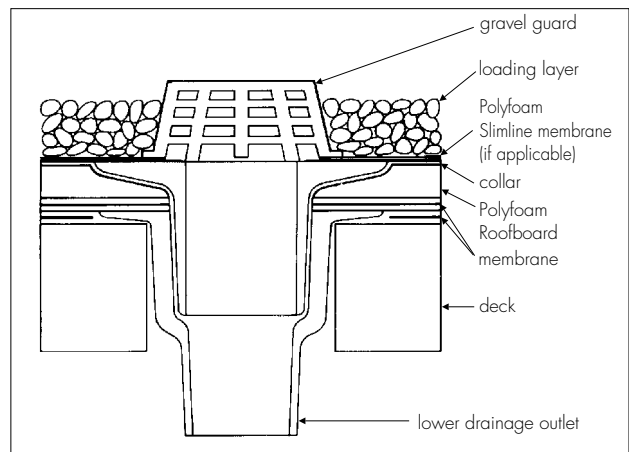


Figure 4 Parapet roof deck detail – tanking specification

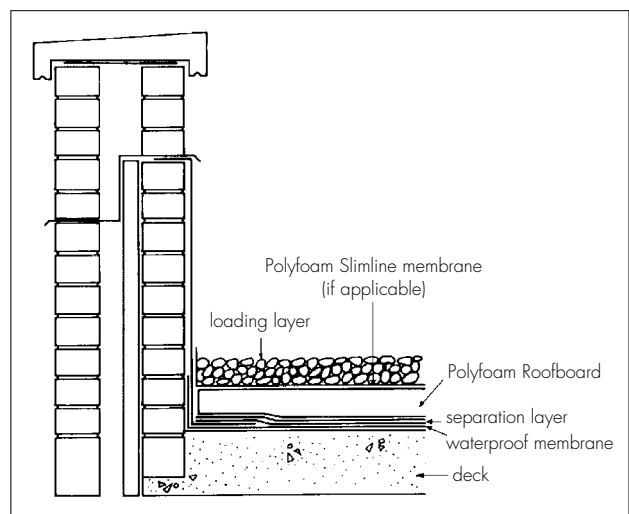


Figure 5 Parapet roof deck detail – bituminous waterproof membrane

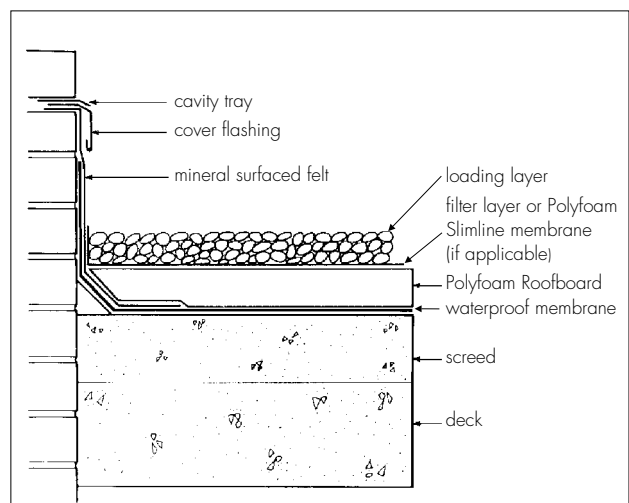
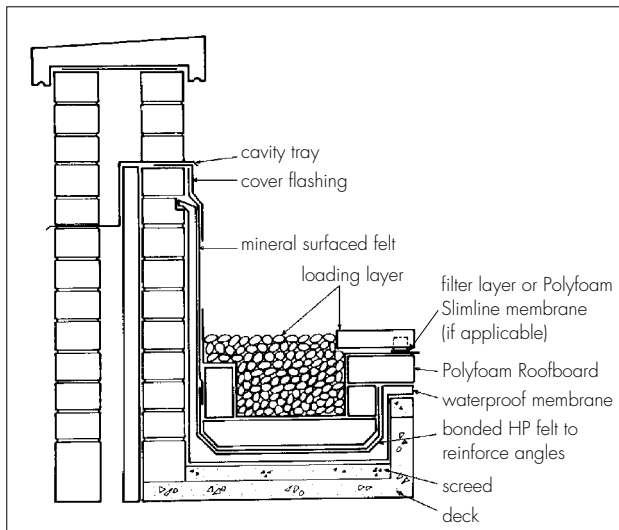


Figure 6 Parapet roof deck gutter detail (mastic asphalt)



18 Protective finishes

Gravel ballast

18.1 If the Polyfoam Slimline System is not used, a filter layer non-woven polyester or polypropylene with a minimum weight of 140 gm^{-2} lapped by 300 mm is laid over the insulation.

18.2 To prevent flotation, wind uplift and UV degradation, boards must be loaded with at least a 50 mm deep layer of washed, rounded gravel, nominal size 20 mm to 40 mm, or washed broken stone of similar size.

18.3 It is essential that the depth and size of gravel are such that complete cover and protection is afforded to the boards.

18.4 The proportion of fines in the aggregate should be kept to a minimum to prevent the risk of gullies being blocked and to discourage organic growth.

18.5 The dead load imposed by a 50 mm overlay of gravel is approximately 80 kgm^{-2} , therefore, the deck must be capable of withstanding this as well as any additional loads, static or imposed.

18.6 The gravel loading specification is used on roofs in sheltered regions or low- to medium-rise buildings up to 10 storeys. When laid in moderate exposure zones, or on buildings of up to 15 storeys, the gravel specification is permitted but the perimeter should be loaded with paving. For severe exposure zones or tall buildings, specialist advice should be sought. BRE Digest 311 should be used when a calculation is required for a specific building project.

Paving slabs

18.7 Depending on factors, such as access to the roof and wind effects, standard pressed concrete paving slabs to BS 7263-1 : 2001 on proprietary

paving spacer supports should be used (see section 18.8).

18.8 The paving slabs should have a minimum thickness of 40 mm on boards 50 mm thick, and 50 mm on thicker boards to prevent flotation of the boards in the event of accidental blockage of the rainwater outlets. A filter layer (as described in 18.1) is used in conjunction with the boards.

18.9 The deck must carry safely the additional dead load of approximately 100 kgm^{-2} for the 40 mm thick slabs or 125 kgm^{-2} for the 50 mm thick slabs.

18.10 The method of laying and bedding will depend upon the form of the roof and the Certificate holder's advice should be sought.

Reinforced screed

18.11 A reinforced concrete screed is cast, in accordance with BS 6229 : 2003, on building paper laid over the insulated board.

18.12 The additional load imposed by this protection can be calculated on the basis that every 10 mm of thickness of concrete will load the roof deck by about 25 kgm^{-2} .

Roof garden

18.13 A root barrier and moisture reservoir is laid on top of the insulation. A filter layer is loose-laid with edges lapped by 75 mm and turned up at all upstands by 300 mm and the soil laid as specified. The loads expected for the soil would be 25 kgm^{-2} per 10 mm thickness and 20 kgm^{-2} for water content.

Technical Investigations

The following is a summary of the technical investigations carried out on Polyfoam Roofboard Standard, Extra and Super Incorporating the Polyfoam Slimline System in the protected membrane roof system.

19 Tests

Tests were carried out by the BBA to determine:

- compressive strength
- dimensional stability under specified temperature and humidity conditions
- water vapour transmission⁽¹⁾
- water flow through an inverted roof
- long-term water absorption by total immersion
- thermal conductivity⁽¹⁾
- bowing under a thermal gradient.

(1) Roofboard only.

20 Investigations

An examination was made of test data to BS EN 13164 : 2001 relating to:

- dimensional stability with temperature
- water vapour permeance
- cohesive strength
- shear strength
- compressive strength
- flexural strength
- density
- λ value (fresh and aged).

21 Other investigations

A re-evaluation was made of data supporting a previous BBA Certificate No 90/2424 for a similar material.

Additional Information

The Certificate holder has declared the designation codes (see Table 5) in accordance with Section 6 of BS EN 13164 : 2001.

Table 5 Certificate holder's declared designation codes/level or class — BS EN 13164 : 2001

Characteristic	Level/classes		
	Standard	Extra	Super
Thickness	T1	T1	T1
Compressive stress (min) at 10% deformation ^{(1) (2)}	CS(10\Y) 200	CS(10\Y) 350	CS(10\Y) 500
Dimensional stability at 23°C/90% RH ^{(1) (2)}	DS(23,90)	DS(23,90)	DS(23,90)
Water absorption by total immersion (%)	WL(T)0.7	WL(T)0.7	WL(T)0.7

(1) Tests carried out by the BBA on one production date.

(2) For 50 mm thicknesses only.

Bibliography

BS 747 : 2000 *Reinforced bitumen sheets for roofing — Specification*

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

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

BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*

BS 7263-1 : 2001 *Precast concrete flags, kerbs, channels, edgings and quadrants — Part 1 — Precast, unreinforced concrete paving flags and complementary fittings — Requirements and test methods*

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

BS 8218 : 1998 *Code of practice for mastic asphalt roofing*

BS EN 12056-3 : 2000 *Gravity drainage systems inside buildings — Roof drainage, layout and calculation*

BS EN 13164 : 2001 *Thermal insulation products for buildings — Factory made products of extruded polystyrene foam (XPS) — Specification*

BS EN ISO 6946 : 1997 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

Conditions of Certification

22 Conditions

22.1 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.

22.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

22.3 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.

22.4 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.

22.5 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.



In the opinion of the British Board of Agrément, Polyfoam Roofboard Standard, Extra and Super Incorporating the Polyfoam Slimline System are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 07/4418 is accordingly awarded to Knauf Insulation Ltd.

On behalf of the British Board of Agrément

Date of issue: 19th February 2007

A handwritten signature in black ink, appearing to read 'G. A. Cooper', is written over a light grey background.

Chief Executive

Electronic Copy

