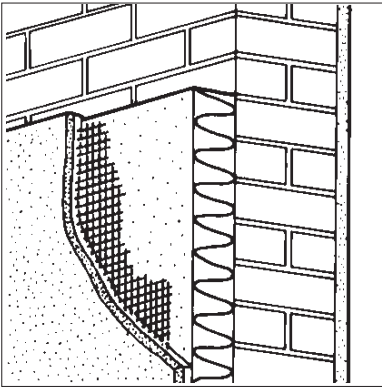


Product



• THIS DETAIL SHEET REPLACES CERTIFICATE No 95/3203 AND RELATES TO THE DRYVIT OUTSULATION SYSTEM (EXTERNAL WALL INSULATION SYSTEM), A SYSTEM EMPLOYING EXPANDED POLYSTYRENE INSULATION, AND GLASS-FIBRE REINFORCING MESH WITH A POLYMER MODIFIED RENDER FINISH.

- The system is applied to the outside of external walls of masonry or dense concrete construction and is suitable for new or existing buildings.
- It is essential that the system is installed and maintained in accordance with the conditions set out in the Design Data and Installation parts of this Certificate.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the system's position regarding the Building Regulations, general information relating to the product, and the Conditions of Certification.

Technical Specification

1 Description

1.1 The Dryvit Outsulation System (External Wall Insulation System) (see Figure 1) comprises:

- (1) Dryvit expanded polystyrene insulation boards — 1219 mm by 610 mm in a range of thicknesses from 20 mm through to 100 mm, with a nominal density of 15 kgm⁻³ and a minimum compressive strength of 70 kNm⁻². Boards are manufactured to comply with the requirements for Grade SD (standard duty), type FRA (flame retardant additive) material to BS 3837 : Part 1 : 1986(1996).
- (2) Dryvit Primus Adhesive/Base Coat — latex emulsion containing aggregate, coalescing and thickening agents. It is mixed on site with Portland cement in the ratio of 1:1 by weight to be used as an adhesive and a base coat.
- (3) Dryvit Standard Plus reinforcing mesh — a woven, polymer coated, glass-fibre mesh of nominal weight 210 gm⁻² and width 1 m.
- (4) Dryvit Panzer 20 heavy duty reinforcing mesh — a woven, polymer coated, glass-fibre mesh of nominal weight 690 gm⁻² and width 1 m.
- (5) Dryvit Corner mesh — a woven, polymer coated, glass-fibre mesh of nominal weight 320 gm⁻² supplied in sections to be fitted at corners.
- (6) Dryvit Quarzputz PMRB and Sandblast PMRB Finishes — acrylic based emulsions

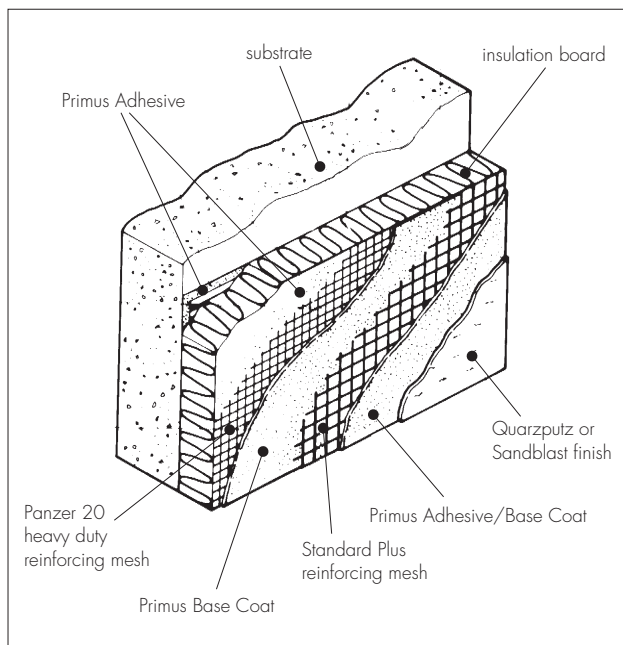
containing aggregate, coalescing and thickening agents.

(7) Ancillary materials — profiles for wall base, sills, corner beads, expansion joints, mechanical fixings, fibre barriers, etc are produced to the specifier's requirements and approved by Dryvit Systems, Inc.

(8) Sealants — two-component polyurethane sealants in accordance with BS 6213 : 1982(1992).

1.2 The insulation boards are fixed to the external surface of the wall using the adhesive. All insulation board edges at openings, penetrations, or other termination points, are wrapped using the mesh and fixed using the adhesive. Allowing a minimum of 24 hours for the adhesive to dry, the base coat is applied to the surface of the insulation board, to a uniform thickness. The reinforcing mesh is immediately embedded with its concave surface to the wall to reduce its tendency to curl. The surface is then smoothed with a trowel, working from the centre toward the edges, until the bare mesh is fully covered and not visible. The reinforcing mesh is also wrapped around the wall corners over the corner mesh, and fixed in position by coating the faces and edges with the adhesive/base coat. After the base coat has dried, which should take a minimum of 24 hours, the finish is applied to a thickness of approximately 1.6 mm. The overall render thickness achieved is 4.1 mm with standard reinforcing mesh and 7.6 mm with the combined standard and heavy duty mesh.

Figure 1 Dryvit Outsulation System (External Wall Insulation System)



1.3 All components are subject to routine quality control.

2 Delivery and site storage

2.1 The insulation is delivered to site wrapped in polyethylene. Each pack carries the product identification and batch numbers.

2.2 Components are delivered to site in the containers and quantities as listed in Table 1. Each container carries the product identification, manufacturer's batch number and the BBA identification mark incorporating the number of this Certificate.

Table 1 Component supply details

Component	Quantity and package
Adhesive/base coat	27 kg pail
Finish coats	32 kg pail
Reinforcing meshes	1.00 metre wide, 50 metre length roll

2.3 The insulation should be stored on a firm, clean, level base, off the ground and under cover until required for use. Care must be taken when handling the insulation to avoid damage.

2.4 The boards must be protected from prolonged exposure to sunlight, either by storing opened packs under cover or re-covering with opaque polyethylene sheeting. Care must be taken to avoid contact with solvents or materials containing volatile organic components such as coal tar, pitch, timber newly treated with creosote, etc. The boards must not be exposed to open flame or other ignition sources.

2.5 The adhesive/base coat and finish coats should be stored in a safe area, under cover, and protected from excessive heat and frost at all times. The minimum temperature for storage should be +5°C. Open drums should be used as soon as possible.

Design Data

3 Strength and stability

3.1 The external wall insulation system has adequate resistance to impact and abrasion where walls are exposed and have some protection, eg walls of private dwellings and walls of communal dwellings above ground-floor level. Where the system may be exposed to severe mechanical or malicious impact, eg walls of public buildings at ground-floor level, appropriate design measures such as supplementary reinforcement should be considered to reduce the risk of damage. Guidance may be obtained from the Certificate holder and BRE Current Paper CP 6 : 81 *Assessment of external walls — Hard Body Impact Resistance*.

3.2 The system as specified in this Detail Sheet can be designed to withstand the thermal stresses and wind pressures (including suction) normally experienced in the United Kingdom. The system can also be designed in accordance with CP 3 : Chapter V : Part 2 : 1972 or BS 6399 : Part 2 : 1995 to withstand the increased wind loads associated with tall buildings (greater than 12 metres) and areas of high exposure. This may require the use of additional mechanical fixings.

4 Properties in relation to fire

4.1 In the opinion of the BBA, the use of the system will not introduce any additional hazard in respect of behaviour in fire when compared with a system using traditional sand/cement render finishes.

4.2 The system is classified Class 0 as described in the national Building Regulations:

England and Wales

Paragraph A12 of Approved Document B.

Scotland

Table 2 of E6.1 in the *Provisions deemed to satisfy* in Part E of the Technical Standards.

Northern Ireland

Paragraph 2.4 of Technical Booklet E.

4.3 The behaviour in fire of external wall insulation systems is the subject of recommendations by the Building Research Establishment which, for this system, makes no restriction on the height of building to be treated provided that:

- (a) fire barriers, eg mineral fibre 100 mm high and of the same thickness as the insulation, are included at every floor level from the third storey
- (b) the reinforcing mesh and surface coating mortar is returned to the masonry at each fire barrier and fixed to restrict possible detachment.

5 Proximity of flues

When the system is installed in close proximity to certain flue pipes the relevant provisions of the national Building Regulations should be met:

England and Wales

Approved Document J.

Scotland

Part F of the Technical Standards.

Northern Ireland

Technical Booklet L.

6 Thermal insulation

6.1 For the purpose of U value calculations to determine if the requirements of the Building (or other statutory) Regulations are met, the thermal conductivity (λ value) of the insulation may be taken as $0.037 \text{ Wm}^{-1}\text{K}^{-1}$.



6.2 The requirement for limiting the heat loss through the building fabric will be satisfied if the U values of the building elements do not exceed the maximum values in the relevant Elemental Approach given in the national Building Regulations:

England and Wales

Approved Document L1. The effect of thermal bridges should be taken into account.

Scotland

Part J of the Technical Standards. The effect of thermal bridges should be taken into account.

Northern Ireland

Technical Booklet F.

6.3 Guidance is also given in these documents on selecting the thickness of insulation required to enable a wall to achieve the desired U value. Alternative approaches are also described which allow for some flexibility in design of U values for individual constructional elements.

6.4 Where the insulation has not been continued into window or door reveals due to a lack of clearance there will be a risk of cold bridging at these points. Where door and window frames are to be replaced it is recommended that their size be adjusted to permit the reveals to be insulated.

6.5 Depending on constructional details, cold bridging can also occur at the eaves and at ground-floor level, and care should be taken to minimise this, eg roof or loft insulation should continue over the wall head, ensuring that ventilation openings are not obstructed.

7 Durability



7.1 The results of accelerated ageing tests in accordance with MOAT No 22 : 1988 indicate that the system is durable. The system should remain effective for at least 30 years, provided any damage to the surface finish is

repaired immediately, and regular maintenance is undertaken including checks on joints in the system and on external plumbing fittings to identify leakage of rainwater into the system, enabling steps to be taken to correct the defects.

7.2 The finishes may become soiled in time, the rate depending on the locality. The appearance may be restored by a suitable powerwash or, if required, by the application of a compatible paint; however, great care should be taken not to adversely affect the water vapour transmission or fire characteristics of the systems. The advice of the Certificate holder should be sought.

Installation

8 Procedure

General

8.1 Application is carried out in accordance with the current installation instructions of Dryvit Systems, Inc.

8.2 Application of coating materials must not be carried out at temperatures below 5°C or above 30°C , nor if exposure to frost is likely, and the coating must be protected from rapid drying. Weather conditions should therefore be monitored to ensure correct curing conditions.

8.3 All rendering should be in accordance with the relevant recommendations of BS 5262 : 1991 and BS 8000 : Part 10 : 1995.

Preparation of adhesive/base coat

8.4 The adhesive and base coat are the same material and are prepared identically. Before use the adhesive/base coat should be thoroughly mixed to a smooth paste. It is then mixed with Portland cement in a ratio of 1:1 (by weight) by adding small quantities and mixing thoroughly each time. Care should be taken not to overmix.

Positioning and securing insulation boards and mesh

8.5 Installation of the boards begins at the base of the wall above the dpc. A firm, horizontal support, eg timber battens, which can be removed after installation, is used to mount the first row of boards.

8.6 A strip of reinforcing mesh is cut to size and bedded along half its width to the wall, using the adhesive.

8.7 The insulation boards are coated with dabs and/or strips of adhesive and pressed firmly against the substrate. Figures 2 and 3 show the target dimensions required to achieve the correct area of coating for each board. The lower edges of the first row are buttered so that the mesh can be wrapped around. After positioning the boards on the support a ribbon of adhesive is applied to the lower faces to receive the mesh wrap (see Figure 4).

Figure 2 Insulation board dab adhesive pattern

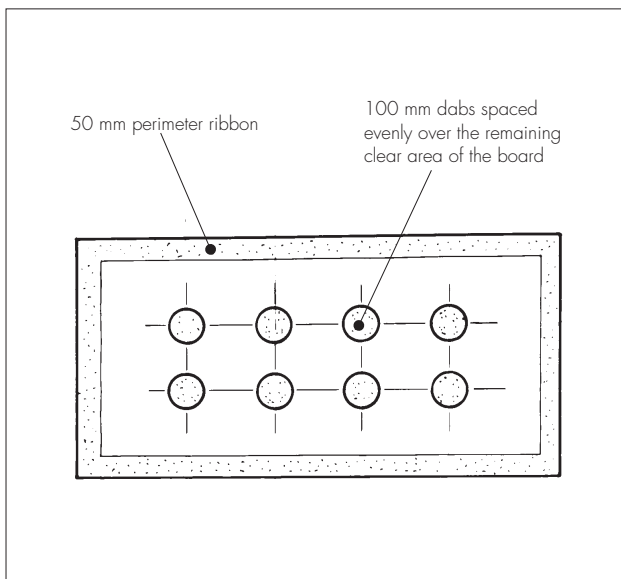


Figure 3 Insulation board ribbon adhesive pattern

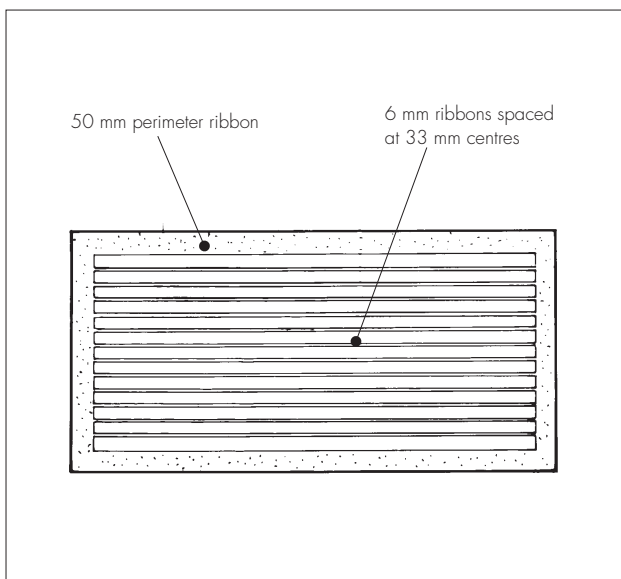
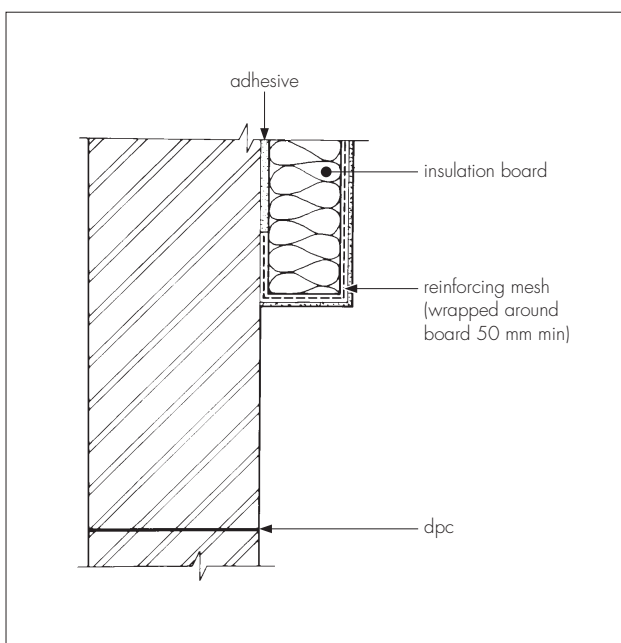
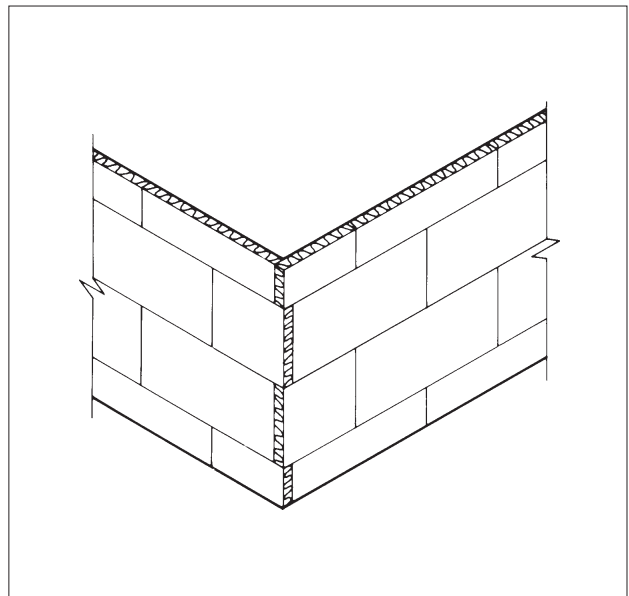


Figure 4 Typical section at base level



8.8 Subsequent rows of boards are positioned so that the board joints are staggered and overlapped at the building corners (see Figure 5). Care should be taken to ensure that all board edges are butted tightly together, and alignment should be checked as work proceeds. Any joints in the system greater than approximately 2 mm should be filled with slivers of insulation board. High spots or irregularities should be removed by lightly planing with a rasp.

Figure 5 Insulation boards corner detail



8.9 When the adhesive has dried for a minimum of 24 hours, a layer of base coat, approximately 2.5 mm in thickness, is applied over the surfaces of the boards to receive the standard reinforcing mesh, which is embedded in the base coat.

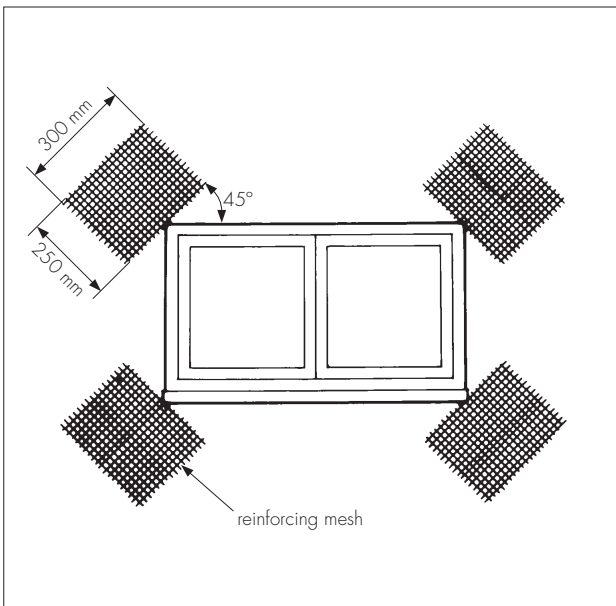
8.10 In situations where the heavy duty mesh is required, a layer of base coat, approximately 3.5 mm in thickness, is applied over the surface of the boards to receive the heavy duty mesh. The drying period for any render will depend on weather conditions; however, the base coat with heavy duty mesh embedded should be allowed to dry for at least 24 hours before application of a second layer of base coat, approximately 2.5 mm in thickness. The standard mesh should be embedded in the second coat immediately.

8.11 When standard mesh is used, joint overlaps should be at least 65 mm. At insulation board edges the mesh should be wrapped around in the same way as at the base. The mesh is continued around the corner. When heavy duty mesh is used within the first base coat, it should not be overlapped but fitted with close butt joints.

8.12 Additional pieces of reinforcing mesh should be used diagonally at the corners of openings, as shown in Figure 6.

8.13 Where corners require additional impact resistance, a corner mesh should be embedded into the adhesive base coat before the overall reinforced base coat is installed.

Figure 6 Additional reinforcement at openings

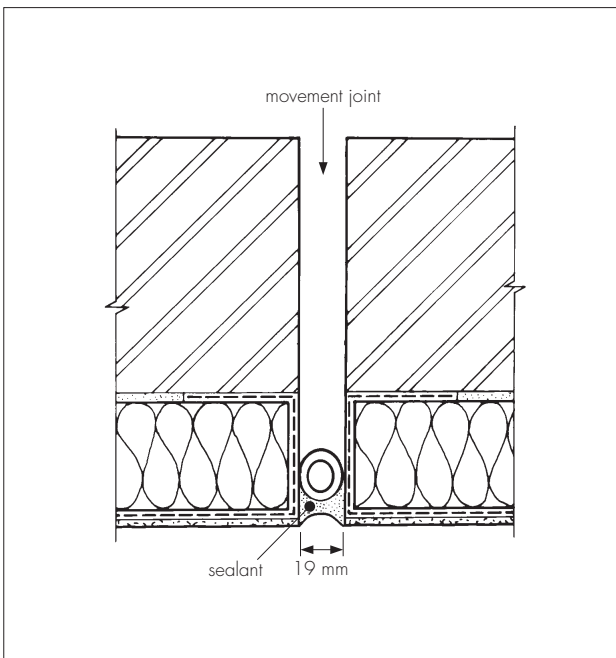


8.14 The reinforced base coat should be left for a minimum of 24 hours to cure and should be hard, dry and free from any irregularities (trowel marks, exposed mesh, etc) before proceeding.

Movement joints

8.15 Movement joints in the substrates should be continued through the system. A vertical joint detail is shown in Figure 7.

Figure 7 Vertical movement joint detail



Finishing

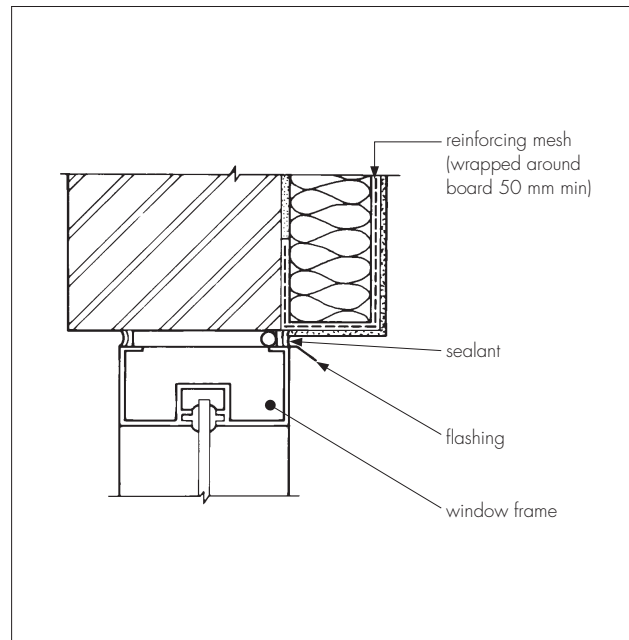
8.16 The Quarzputz PMRB or Sandblast PMRB Finish should be thoroughly mixed to a smooth paste, taking care not to overmix. It is applied directly over the base coat to a thickness of 1.6 mm. Texturing of the surface can be carried out as required.

8.17 Care should be taken to prevent the base and finish coats from either drying too rapidly or

freezing. Continuous surfaces must be completed without a break, eg working to a wet edge.

8.18 Care should be taken in detailing joints and seals around openings and projections (see Figure 8).

Figure 8 Window head detail



8.19 On completion of the installation, external fittings are re-fixed to the substrate.

8.20 At the tops of walls the system should be protected by an adequate overhang or by an adequately sealed purpose-made flashing.

Technical Investigations

The following is a summary of the technical investigations carried out on the Dryvit Outsulation System (External Wall Insulation System).

9 Tests

9.1 Tests were carried out in accordance with MOAT No 22 : 1988 to determine:

- component characterisation
- heat/spray cycling
- resistance to freeze/thaw
- impact resistance.

9.2 An examination was made of data relating to:
fire propagation tests to BS 476 : Part 6 : 1989
surface spread of flame tests to BS 476 : Part 7 : 1997

thermal conductivity to BS 874 : Part 2 :

- Section 2.1 : 1986
- water vapour permeability
- adequacy of fixing system
- durability of finish
- the risk of interstitial condensation.

9.3 The practicability of installation and the effectiveness of detailing techniques were examined.

Bibliography

BS 476 *Fire tests on building materials and structures*

Part 6 : 1989 *Method of test for fire propagation for products*

Part 7 : 1997 *Method for classification of the surface spread of flame of products*

BS 874 *Methods for determining thermal insulating properties*

Part 2 *Tests for thermal conductivity and related properties*

Section 2.1 : 1986 *Guarded hot-plate method*

BS 3837 *Expanded polystyrene boards*

Part 1 : 1986(1996) *Specification for boards manufactured from expandable beads*

BS 5262 : 1991 *Code of practice for external renderings*

BS 6213 : 1982(1992) *Guide to selection of constructional sealants*

BS 6399 *Loading for buildings*

Part 2 : 1995 *Code of practice for wind loads*

BS 8000 *Workmanship on building sites*

Part 10 : 1995 *Code of practice for plastering and rendering*

CP 3 *Code of basic data for the design of buildings*

Chapter V *Loadings*

Part 2 : 1972 *Wind loads*

MOAT No 22 : 1988 *UEAtc Directives for the Assessment of External Insulation Systems for Walls (Expanded Polystyrene Insulation Faced with a Thin Rendering)*



On behalf of the British Board of Agrément

Date of issue: 16th December 1998

A handwritten signature in black ink, appearing to read 'P. C. Hewitt', is written over a light grey background.

Director

1 System

Insulation	SD FRA grade expanded polystyrene boards 1210 mm by 610 mm by 100 mm maximum. Nominal density 15 kgm ⁻³ minimum cross-breaking strength 140 kPa.
Adhesive/base coat	Dryvit Primus Adhesive/Base Coat — latex emulsion containing aggregate, coalescing and thickening agents mixed with Portland cement in the ratio of 1:1 by weight.
Finishes	Dryvit Quarzputz PMRB and Dryvit PMRB Sandblast — ready mixed. Acrylic based emulsions containing aggregate, coalescing and thickening agents.
Reinforcing mesh	Standard Plus mesh — a woven glass-fibre mesh with a polymer coating and nominal weight of 210 gm ⁻² and 1 m wide. Panzer 20 heavy duty mesh — a woven glass-fibre mesh with a polymer coating and nominal weight of 690 gm ⁻² and 1 m wide. Corner mesh — a woven glass-fibre mesh with a polymer coating and nominal weight of 320 gm ⁻² .
Mechanical fixings (if required)	Spit ISO polypropylene or Spit ISOMET stainless steel fixings.

2 Thermal properties

Thermal conductivity of insulation boards

The thermal conductivity value of the insulation boards can be taken as 0.037 Wm⁻¹K⁻¹.

U values

Using values given in Table A15 of Approved Document L1 to the Building Regulations (as amended) (England and Wales), the thermal insulation values for a typical 225 mm brick external wall (density 1700 kgm⁻³) with 10 mm plasterboard:

Insulation thickness (mm)	U value (Wm ⁻² K ⁻¹)
20	0.87
40	0.59
60	0.45
80	0.36
100	0.30

3 Impact resistance

Tests conducted by the BBA indicate that where the system may be exposed to severe malicious or mechanical impact, appropriate design measures should be considered to reduce the risk of damage.

4 Properties in relation to fire

The system is classified Class 0 as defined in the appropriate Building Regulations.

5 Design wind loading and resistance to suction⁽¹⁾

Using CP 3 : Chapter V : Part 2 : 1972, the system can be designed to withstand all expected suction wind loadings.

(1) BS 6399 : Part 2 : 1995 may also be used to generate design calculations.

6 Durability

Oldest installation seen by the BBA

17 years.

Assessed life

At least 30 years (with normal maintenance).

