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**Agrément
Certificate
No 97/3410**

Designated by Government
to issue
European Technical
Approvals

SWISSPAN EXTERNAL WALL INSULATION SYSTEM

Système d'isolation pour murs extérieurs
Wärmedämmung für Außenwand

Product



Swisspan External Wall Insulation System used at Old Church Gardens, Havering, Essex (inset — before application)

• THIS CERTIFICATE RELATES TO SWISSPAN EXTERNAL WALL INSULATION SYSTEM, CONSISTING OF A GALVANIZED STEEL RAIL SYSTEM, PIR-MODIFIED POLYURETHANE, PHENOLIC OR EXPANDED POLYSTYRENE INSULATION BOARDS AND A GLASS-FIBRE REINFORCING MESH WITH POLYMER MODIFIED FIBRE REINFORCED RENDERS.

• The system is secured to vertical or horizontal structural concrete or steel columns or beams spaced at a maximum of 1250 mm centres or, over masonry, dense or no-fines concrete constructions and is suitable for new or existing buildings.

continued

Regulations

1 The Building Regulations 1991 (as amended 1994) (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 external wall insulation with the Building Regulations. In the opinion of the BBA, Swisspan External Wall Insulation System, if used in accordance with the provisions of this Certificate, will meet the relevant requirements.

Requirement: B4(1)	External fire spread
Comment:	Data obtained by the BBA show that the system is classified Class 0 and therefore meets this Requirement. See section 9.2 of this Certificate.
Requirement: C4	Resistance to weather and ground moisture
Comment:	Tests by the BBA indicate that walls insulated with the system will meet this Requirement. See section 12 of this Certificate.
Requirement: L1	Conservation of fuel and power
Comment:	The system will enable, or contribute towards enabling, a wall to meet the U value requirement. See sections 11.1, 11.2 and 11.3 of this Certificate.
Requirement: Regulation 7	Materials and workmanship
Comment:	The system is acceptable. See sections 15.1 and 15.2 of this Certificate.

continued

- Application and maintenance must be carried out strictly in accordance with the Design Data and Installation parts of this Certificate and the marketing company's instructions by operatives trained and approved by MR Limited.
- The system is marketed by MR Limited.
- All materials and components for use in the system are approved by the BBA and must be obtained from the Certificate holder.
- See the appendix for system summary.

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2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, Swisspan External Wall Insulation System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and Technical Standards as listed below.

Regulation:	10	Fitness of materials
Standard:	B2.2	Selection and use of materials, fittings, components and other manufactured products
Comment:		The system is acceptable.
Regulation:	12	Structural fire precautions
Standard:	D2.3	Non-combustibility
Comment:		The use of the system may be restricted by this Standard in some instances. See sections 9.3 and 9.4 of this Certificate.
Standard:	D2.4	External Wall Claddings
Comment:		The system has a Class 0 surface, as defined in Appendix to Part D of the Technical Standards, and is unrestricted by this Standard. See section 9.2 of this Certificate.
Regulation:	17	Preparation of sites and resistance to moisture
Standard:	G3.1	Resistance to precipitation
Comment:		Tests by the BBA indicate that walls insulated with the system will satisfy this Standard. See section 12 of this Certificate.
Regulation:	22	Conservation of fuel and power
Standard:	J2.3	Elemental approach (Method 1)
Comment:		Data obtained from tests to BS 874 : Part 2 : Section 2.1 : 1986 indicate that when the system is used the walls constructed will satisfy this Standard. See sections 11.1, 11.2 and 11.3 of this Certificate.

3 The Building Regulations (Northern Ireland) 1994 (as amended 1995)



In the opinion of the BBA, Swisspan External Wall Insulation System, if used in accordance with the provisions of this Certificate, will satisfy the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See sections 15.1 and 15.2 of this Certificate.
Regulation:	C5	Resistance to ground moisture and weather
Comment:		Walls insulated with the system will satisfy this Regulation. See section 12 of this Certificate.
Regulation:	E8	External fire spread
Comment:		The system has a Class 0 surface and can satisfy this Regulation. See section 9.2 of this Certificate.
Regulation:	F2	Conservation of fuel and power
Comment:		The system will enable or contribute towards enabling a wall to meet this Regulation. See sections 11.1, 11.2 and 11.3 of this Certificate.

4 Construction (Design and Management) Regulations 1994

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

See sections: 6 *Delivery and site storage* (Table 1) and 18 *Health and safety*.

5 Description

5.1 Swisspan External Wall Insulation System* (see Figure 1) comprises:

(1) Swisspan railing system — a cold formed steel rail system comprising horizontal lipped and standard rails manufactured to BS 5950 : Part 5 : 1987 and post galvanized to BS 729 : 1971(1994) (see Figure 2). The lipped and standard rails are fastened to vertical columns or backgrounds of masonry, dense or no-fines concrete with approved hammer-drive screws. Standard rails are supplied incorporating a urethane foam filler strip.

(2) Swisspan PIR-modified urethane (CFC and HCFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 20 mm and 80 mm with a nominal density of 32 kgm^{-2} and with a minimum compressive strength of 150 kNm^{-2} . Boards of 15 mm thickness are also available for use in window reveals.

(3) Swisspan PIR-modified urethane (CFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 20 mm and 75 mm, with a minimum compressive strength of 175 kNm^{-2} . Boards of 15 mm thickness are also available for use in window reveals.

(4) Swisspan phenolic (CFC and HCFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 20 mm and 80 mm, with a nominal density of 40 kgm^{-3} and a minimum compressive strength of 120 kNm^{-2} . Boards of 15 mm thickness are also available for use in window reveals.

(5) Swisslab phenolic (CFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 20 mm and 80 mm, with a nominal density of 40 kgm^{-3} and a minimum compressive strength of 150 kNm^{-2} . Boards of 15 mm thicknesses are also available for use in window reveals.

(6) Swisspan expanded polystyrene insulation boards — 1200 mm by 480 mm in a range of thicknesses between 15 mm and 100 mm, with a nominal density of 16 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).

(7) Swisspan insulation fixing — a 6.3 mm diameter fluorocarbon coated steel screw with an 80 mm minimum diameter polypropylene retaining plate.

(8) MR bedding and scrim adhesives — polymer modified cement based adhesives, supplied as a powder to which water is added.

(9) MR reinforcing mesh — a mesh of multi-stranded alkali-resistant glass fibres, having a polymer coating and a nominal weight of 150 gm^{-2} or 200 gm^{-2} .

Figure 1 Components of the system

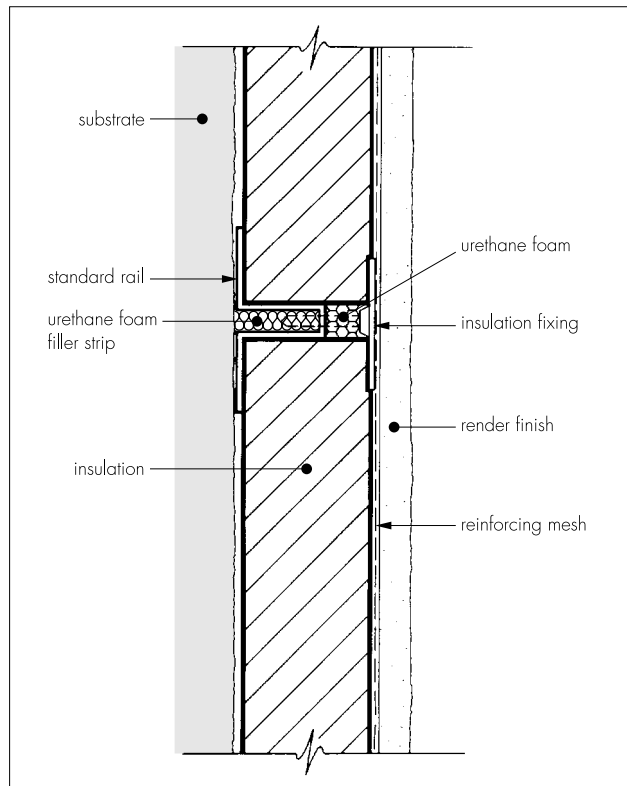
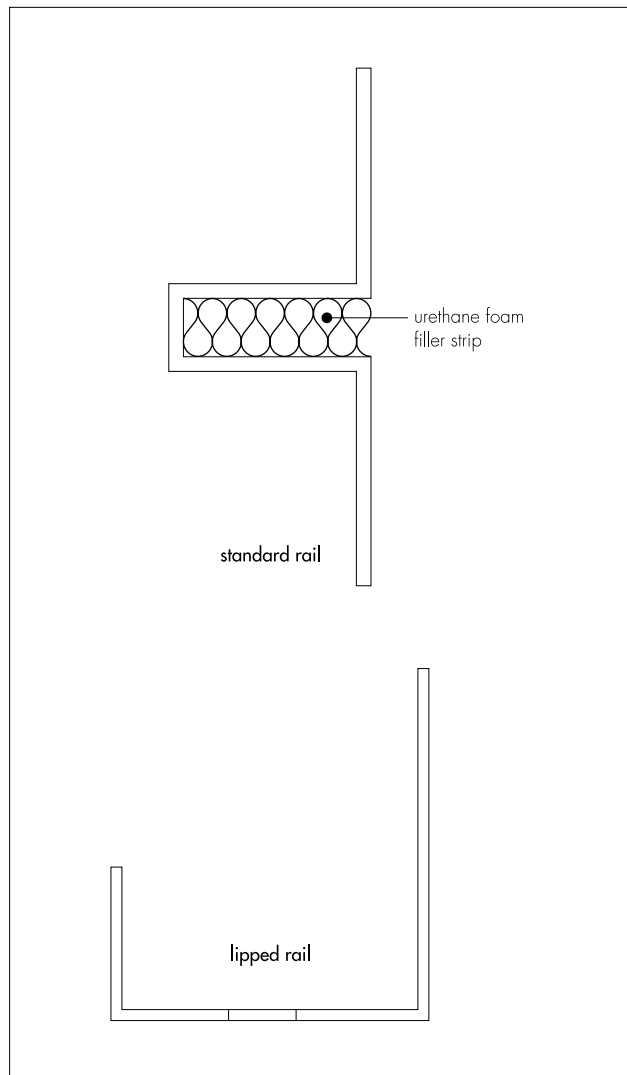


Figure 2 Swisspan rails



(10) MRS7 dashing render — a polymer modified fibre-reinforced cement based mortar supplied as a powder to which water is added, and available coloured white, extra white, salmon, terracotta red, red, burgundy, gold, yellow, peach, grey, Scotland brown, light cream, cream, extra pink or pink. Other colours are available to order.

(11) MR spar-dash aggregate, available in a range of colours to suit the MRS7 render.

(12) MRS4 plain finish render — a polymer modified fibre-reinforced cement based mortar supplied as a powder to which water is added, and available coloured white, extra white, salmon, red, yellow, peach, grey, Scotland brown, cream or pink. Other colours are available to order.

(13) MRS6 smooth finish masonry paint — a polymer based smooth finish decorative coating applied by brush or roller and available in a range of colours to suit MRS4 render.

(14) MR MPM Crepi Rolling Grain (Scratch) Finish and textured SP Finish — polymer based decorative coatings containing synthetic resins and inorganic fillers applied by trowel and available in a range of colours.

(15) Ancillary materials:

MR fungicidal wash

MR stabilising solution/bonding agent

MR polyurethane foam filler

MR profiles — a range of standard profiles for wall base, end stop, corner mesh, expansion joint, etc. Profiles are available in organic polyester coated galvanized steel or stainless steel and are provided to the specifier's requirements and approved by the BBA and MR Limited

MR profile fixings — driven pins with plastic expansion sleeves as approved by the BBA and MR Limited

MR sealant — silicone mastic as approved by the BBA and MR Limited

MR plastic thickness gauge

MR fir-tree fixings.

*Items (2) to (14) also form part of the Swisslab External Wall Insulation Systems which are the subject of Certificate No 93/2914. Reference should be made to the *Index of Current BBA Publications* for the validity status of this Certificate.

5.2 The lipped and standard rails are fixed at 1250 mm maximum centres using the approved hammer-drive screws. The insulation boards are positioned between the rails and secured using the insulation fixings which are drilled into the rail. A polyurethane foam is used to fill the horizontal channel between the insulation boards before application of the render coats and selected finishes.

5.3 All components are subject to routine in-factory quality control.

6 Delivery and site storage

6.1 The lipped rail, standard rails and profiles are delivered to site on pallets and should be stored under cover on a firm, clean, level base in an area where damage will be avoided.

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

6.3 Materials and components are delivered to site in the packages and quantities as listed in Table 1. Material packages carry the product identification, manufacturer's batch number and the BBA identification mark incorporating the number of this Certificate.

Table 1 Materials and component supply details

Materials and components	Quantity and package
Swisspan lipped rail, standard rail and profiles	quantities and lengths can be supplied to order
MR bedding and scrim adhesives	25 kg or 40 kg bags
MRS renders	25 kg or 40 kg bags
MR spar-dash aggregate	25 kg or 40 kg bags
MR mechanical fixings	boxed by manufacturer
MRS6 Smooth Finish Masonry Paint	10 litre drum
MR MPM Crepi Rolling Grain (Scratch) Finish	30 kg drum
MR MPM Crepi Textured SP Finish	30 kg drum
MR fungicidal wash	5 litre drum
MR stabilisation solution/bonding agent	5 litre drum

6.4 The MR reinforcing mesh, one metre wide, is supplied wrapped in polythene in rolls of 50 metres and delivered to site in shrink-wrapped pallets. Storage requirements are as described in section 6.1.

6.5 The insulation boards should be stored on a firm, clean, level base, off the ground and must be protected from prolonged exposure to sunlight either by storing opened packs under cover or re-covering with opaque polythene sheeting.

6.6 Care must be taken when handling the insulation boards to avoid damage. The boards must not be exposed to open flame or other ignition sources.

6.7 Care must be taken to avoid any contact of the expanded polystyrene with solvents or materials containing volatile organic components such as coal tar, pitch, timber newly treated with creosote, etc.

6.8 The MR spar-dash aggregate should be stored off the ground and be protected with opaque polythene sheeting. The MR bedding and scrim adhesives and MRS renders are cementitious materials and must be stored in dry conditions, off the ground, and be protected from frost at all times.

6.9 The MRS6 smooth finish masonry paint, MR MPM Crepi Rolling Grain (Scratch) Finish and MR MPM Crepi textured SP Finish should be stored in a safe area under cover and be protected from excessive heat and frost at all times.

7 General

7.1 Swisspan External Wall Insulation System, when installed in accordance with this Certificate, is effective in reducing the thermal transmittance (U value) of the walls of new and existing buildings. It is essential that the detailing techniques specified in this Certificate are carried out to a high standard if the ingress of water into the insulation is to be avoided and the full thermal benefit obtained from treatment with the system.

7.2 The system will improve the weather resistance of a wall itself and provide a new decorative finish. It may, however, be installed only where other routes for moisture penetration have been dealt with separately. The system can be used to overcome condensation associated with the internal wall surface.

7.3 Existing buildings subject to the national Building Regulations should be suitable when assessed in accordance with the pre-installation survey as detailed in section 16 of this Certificate.

7.4 New buildings subject to the national Building Regulations should be constructed in accordance with the relevant recommendations of BS 5628 : Part 3 : 1985. In particular Clause 21 *Exclusion of moisture*, of the Code of Practice should be followed in that the designer should select a construction appropriate to the local wind-driven rain index, paying due regard to the design detailing, workmanship and materials to be used. The relevant recommendation of BS 5390 : 1976(1984) Section 3 should be followed where the walls incorporate stone or cast stone.

7.5 Other new buildings, not subject to any of the previous requirements, should also be built in accordance with BS 5628 : Part 3 : 1985 and/or BS 5390 : 1976(1984).

8 Strength and stability

8.1 Swisspan 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 impact, eg mechanical or malicious, precautions may be required to reduce the risk of damage. Heavyweight alkali resistant glass-fibre mesh can be used in high risk areas. Further information may be obtained from BRE Current Paper CP 6 : 81 *Assessment of External Walls : Hard Body Impact Resistance*.

8.2 Dynamic wind suction tests conducted by the BBA confirm that Swisspan (dry-fix) system can withstand wind loads up to 4 kPa when installed in accordance with the manufacturer's instruction and

the installation sections of this Certificate.

Application of MR bedding adhesive to bond the insulation boards to the substrate (wet-fix system) will considerably increase the resistance of the system to dynamic wind suction loads.

8.3 For Swisspan (dry-fix) system, the wind suction forces to be resisted on any particular site calculated in accordance with BS 6399 : Part 2 : 1995 or CP 3 : Chapter V : Part 2, including any required safety factor, should be less than 4 kPa. See section 5 of the Appendix to this Certificate, which includes example calculations based on general site assumptions.

9 Properties in relation to fire

9.1 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.



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

England and Wales

Approved Document B, Paragraph A12

Scotland

Technical Standards, Appendix to Part D

Northern Ireland

Technical Booklet E, Paragraph 2.4.



9.3 Fire tests carried out by the Fire Research Station, Building Research Establishment, on MR Limited's external wall insulation systems incorporating MR PIR-modified urethane, and MR phenolic insulants, with MRS renders and MR glass-scrim reinforcement mesh secured to the substrate using stainless steel fixings, showed limited fire spread both on the surface and within the insulation materials. The insulation materials did not contribute to fire propagation within the system and the render finish remained supported to the substrate by the stainless steel fixings. On the basis of these results the Fire Research Station concluded that fire barriers would not be required for the Swisspan system incorporating these MR materials and makes no restriction on the height of the building to be treated, provided there are no cavities between the rear of the face of the insulation and the background.

9.4 The Fire Research Station also concluded that for Swisspan External Wall Insulation System incorporating MR expanded polystyrene, fire barriers should be included at every floor level from the third storey.

10 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

Technical Standards, Part F

Northern Ireland

Technical Booklet L.

11 Thermal insulation



11.1 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 values) of the insulation may be taken as listed in Table 2.

Table 2 Thermal conductivity values

Insulation	λ values ($\text{Wm}^{-1}\text{K}^{-1}$)
PIR-modified urethane (CFC and HCFC free)	0.025
PIR-modified urethane (CFC free)	0.028
phenolic insulation (CFC and HCFC free)	0.019
phenolic insulation (CFC free)	0.018
expanded polystyrene	0.036

11.2 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

Technical Standards, Part J

Northern Ireland

Technical booklet F.

11.3 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.

11.4 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.

11.5 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.

12 Moisture penetration



The assessment has shown that the systems will resist the passage of moisture.

13 Risk of interstitial condensation

13.1 The relevant components of the system have a water vapour resistance such that, under the conditions likely to be found in dwellings in the United Kingdom, interstitial condensation should not occur within the insulation.

13.2 If a system is to be used on the external walls of rooms expected to have continuous high humidities, additional measures may need to be taken to avoid possible problems from the formation of interstitial condensation in the wall.

14 Maintenance

14.1 Regular checks should be made on the installed system, particularly at joints, to ensure that ingress of water does not occur. Necessary repairs should be effected immediately.

14.2 Damaged areas must be repaired using the appropriate Swisspan components and the procedures detailed in the Swisspan installation instructions.

15 Durability



15.1 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.

15.2 MRS4 plain finish render and MRS7 dashing render have been certified for use as part of the Swisslab External Wall Insulation Systems since 1st September 1988. MRS7 has also been certified for use over masonry substrates since 26th August 1988. MRS6 has been certified as a smooth finish masonry paint for use over specified masonry or render substrates (since 23rd September 1988). Reference should be made to the *Index of Current BBA Publications* for the validity status of the relevant Certificate for MRS6.

15.3 The Swisspan decorative finishes may become discoloured in time, the rate depending on the initial colour, the degree of exposure and atmospheric pollution, as well as the design and detailing of the wall. In common with traditional masonry finishes discolouration by algae and lichens may occur in particularly wet areas. The appearance can be restored by a further

application of finish. The advice of the Certificate holder should be sought.

15.4 The spar-dash finish will break up the flow of water on the surface and reduce the risk of discolouration by water runs. The finish may become discoloured with time, the rate depending on the initial colour, the degree of exposure and atmospheric pollution, as well as the design and detailing of the wall. In common with traditional renders, discolouration by algae and lichens may occur in particularly wet areas. The appearance can be restored using traditional cleaning methods (brushing, washing, etc) suitable for sand/cement renders. The advice of the Certificate holder should be sought.

15.5 Render containing Portland cement may be subject to lime bloom. The occurrence of this may be reduced by avoiding application in adverse weather conditions. The effect is transient and is less noticeable on lighter colours.

Installation

16 Site survey and preliminary work

16.1 A pre-installation survey of the property is carried out to determine suitability for treatment and any repairs necessary to the building structure before application of a system. A specification is prepared for each elevation of the building indicating:

the position of rails and beads
additional mesh at corners of openings and reinforcement
detailing around windows, doors and at eaves
dpc level
exact position of expansion joints
areas where flexible sealants are to be used
any alterations to external plumbing
where required, position of fire barriers.

16.2 The survey should include tests conducted on the walls of the building by MR Limited or their approved suppliers to determine the pull-out resistance of the proposed mechanical fixings used to secure the system rails to the substrate. An assessment and recommendation is made on the type and number of fixings required to withstand the building's expected wind loading based on calculations using the site test data and the relevant wind speed data for the site and in the absence of a formal requirement, a safety factor of 3.

16.3 Any unevenness in the background between columns should be filled with dubbing render so that the substrate is flush along the length of each rail.

16.4 All necessary repairs to the building structure are completed before installation of the system is started.

16.5 Surfaces should be sound, clean, and free from loose material. The flatness of surfaces must

be checked; this may be achieved using a straight edge spanning the storey height. Any excessive irregularities, ie greater than 10 mm, must be made good prior to installation to ensure that the insulation boards are installed with a smooth, in-plane finished surface.

16.6 Where surfaces are covered with an existing rendering it is essential that the bond between the background and the render is adequate. All loose areas should be hacked off and reinstated.

16.7 On existing buildings, purpose-made sills must be fitted to extend beyond the finished face of the system. New buildings should incorporate suitably deep sills.

16.8 It is recommended that external plumbing be removed and alterations made to underground drainage, where appropriate, to accommodate repositioning on the finished face of the system.

16.9 New buildings should be of sound masonry or dense concrete construction.

16.10 Internal wet work, eg screeding or plastering, should be completed and allowed to dry prior to the application of the system.

17 Approved installers

Application of the system, within the context of this Certificate, is carried out by approved installers, an approved installer being a firm which:

(1) is employing operatives who have been trained and approved by MR Limited to install the systems and who have been issued with appropriate training cards by MR Limited

(2) has undertaken to comply with MR Limited's application procedure, which contains the requirement for each application team to include at least one member with a training card, and

(3) is monitored by MR Limited. This includes unannounced site inspections.

18 Health and safety

18.1 The fibres as used in MRS renders may irritate the skin. Protective clothing should be worn to avoid contact with both dry unmixed material and with wet mortar. Great care must be taken to avoid contact with the eyes.

18.2 When mixing MR adhesives and renders a filter respirator should be worn.

18.3 Where excessive concentrations of dust may accumulate, the contractor should make an assessment of the risk, in accordance with the Control of Substances Hazardous to Health Regulations 1994.

19 Procedure

General

19.1 Application is carried out in accordance with MR Limited's current installation instructions.

19.2 Application of renders and finishes must not be carried out in rain or mist, at temperatures below 5°C or above 30°C, nor if exposure to frost is likely during drying, nor if the boards or background are already wet or frostbound.

19.3 All rendering should be in accordance with the relevant recommendations of BS 5262 : 1991.

19.4 MR bedding adhesive, scrim adhesive and renders are mixed using a paddle mixer. Conventional concrete mixers are unsuitable.

19.5 Where possible, independent scaffolding should be used to avoid the need to subsequently make good putlog holes and other breaks in the work. Where scaffolding is required to be tied back to the building it is normal to recommend 'box outs' to reduce the incidence of patches left by putlogs and to provide access points for future scaffolding that may be required for maintenance, inspection and repairs.

19.6 The scaffolding must be arranged to allow sufficient access to the whole face of the building. Sufficient clearance for working should be provided between the scaffolding and the finished surface of the system. An allowance should be included for the thickness of the finished system on the face of the building.

19.7 One coat of MR fungicidal wash followed by, if required, one coat of MR stabilising solution/bonding agent is applied by brush, roller, or knapsack spray to the entire wall surface.

Positioning and securing of railing systems

19.8 Lipped and standard rails may be pre-drilled and/or cut to length prior to delivery to site. Any additional cut ends or drilled holes for fixings formed on site should be protected by brush, applying two coats of zinc-rich paint strictly in accordance with the manufacturer's instructions and as supplied by MR Limited.

19.9 Hole positions are marked in the background and drilled prior to installation of the rails. The lipped rail is positioned above the damp-proof course and secured to the structural columns or walls using fixings at maximum 1250 mm centres, inserted into the holes to a minimum depth of 50 mm and driven firmly into position (see Figure 3).

19.10 Insulation boards are positioned horizontally in the lipped rail to accurately determine the location of the first standard rail and to ensure the boards are held tightly in position. Holes are marked and drilled in the background and the horizontal rail is fixed as described above.

Alternatively, for steel frame buildings, rails may be fitted vertically to existing Z-shaped sheeting rails.

19.11 If required, MR bedding adhesive (wet-fix system only) is prepared for use by mixing the contents of each 40 kg bag with 7 to 8 litres of cold, clean water. An electrically driven paddle mixer is used for a minimum of five minutes until a smooth, workable consistency is achieved. The material is left to stand for at least five minutes and again mixed for a further two minutes. A bed coat of MR bedding adhesive is trowel applied to the entire surface between the rails to a minimum thickness of 6 mm and finished with a serrated trowel or comb. When using the wet-fix system boards are positioned between the rails and pressed firmly into the adhesive.

19.12 Self-tapping screws with insulation board retention discs are fixed in the ridge of each standard rail at 400 mm maximum centres, securing the insulation board along the horizontal edges and at each corner of the board (see Figure 4). Alternatively, insulation boards may be arranged vertically. The heads of the screws are covered with dabs of MR silicone sealant.

19.13 Subsequent horizontal rails and boards are secured as described above. Rows of boards are positioned so that the board joints are staggered and overlapped at the building corners and in such a manner that board joints do not occur within 200 mm of the corner of openings (see Figure 5).

19.14 Care must be taken to ensure that all board edges are butted tightly together, and alignment should be checked as work proceeds. The rail will form a horizontal recess, nominal 15 mm in width and depth to suit the thickness of the insulation, between each course. This channel is filled completely by injecting with fire-rated grade polyurethane foam. When the foam has set the excess is removed with a sharp knife so that the surface receiving the MR scrim adhesive coat is flush.

19.15 To fit around details such as doors and windows, insulation boards may be cut with a sharp knife or a fine-tooth saw. If required, purpose-made window sills are fitted. They are designed to prevent water ingress and incorporate drips to shed water clear of the system.

19.16 Installation continues until the whole wall is completely covered including, where appropriate, the building soffits.

19.17 Additional mechanical fixings are required around windows and doors and in stanchions at external corners of buildings. The fixings are positioned at 300 mm centres and are inserted through the insulation and driven firmly into the drilled holes to a minimum depth of 50 mm (see Figure 5).

Reinforcing

Figure 3 Typical section at base level

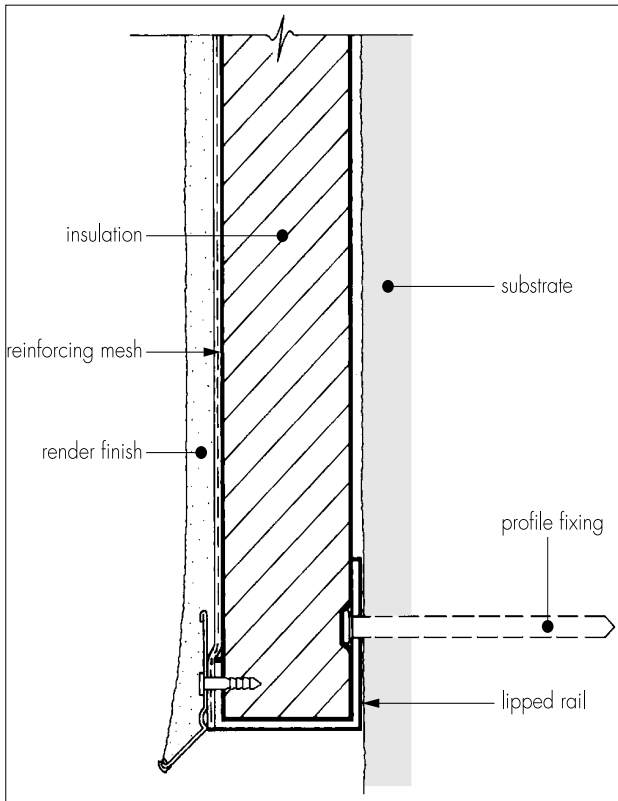
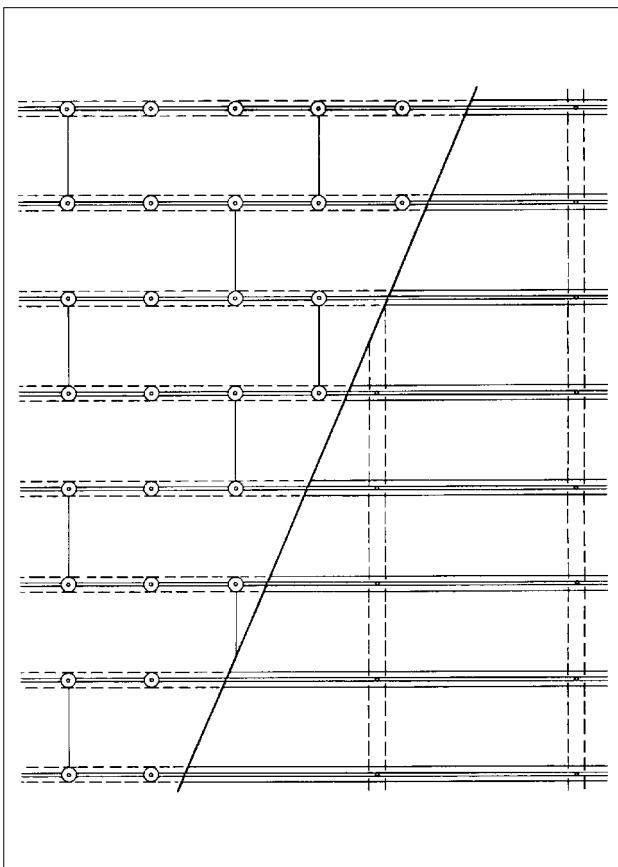


Figure 4 Positioning of insulation board and railing system



Movement joints

19.18 Movement joints in the substrate must be continued through the system. The joint detail using purpose-made metal trims is illustrated in Figure 6.

19.19 MR scrim adhesive is prepared for use as described in section 19.11 of this Certificate. A bed coat is trowel-applied to the surface of the dry insulation boards to a minimum thickness of 3 mm.

19.20 An alkali-resisting glass-fibre mesh is bedded into the adhesive with minimum 75 mm laps at joints. Extra mesh is used around openings (see Figure 5).

19.21 For installations above two storeys, holes are drilled in the substrate at one metre centres or into stanchions at one metre centres vertically, and approved stainless steel fixings are inserted through the mesh and insulation, and driven firmly home. The heads of the stainless steel fixings are then covered with MR scrim adhesive and square pieces of mesh measuring no less than 150 mm by 150 mm.

19.22 If a spar-dash finish is required, a thickness gauge is pressed into the mesh and scrim adhesive while the adhesive is still wet. The gauge is used to determine the thickness of the following render coat. It is designed so that the disc sits on the surface with a small amount of adhesive compressed into the holes (see Figure 7).

19.23 Prior to the render coat, a bead of silicone rubber sealant is gun-applied at window and door frames, overhanging eaves, gas and electric meter boxes, wall vents or where the render abuts any other building material or surface.

19.24 Angle beads are fixed to all building corners and to door and window heads and jambs.

Figure 5 Additional reinforcement and fixings at openings

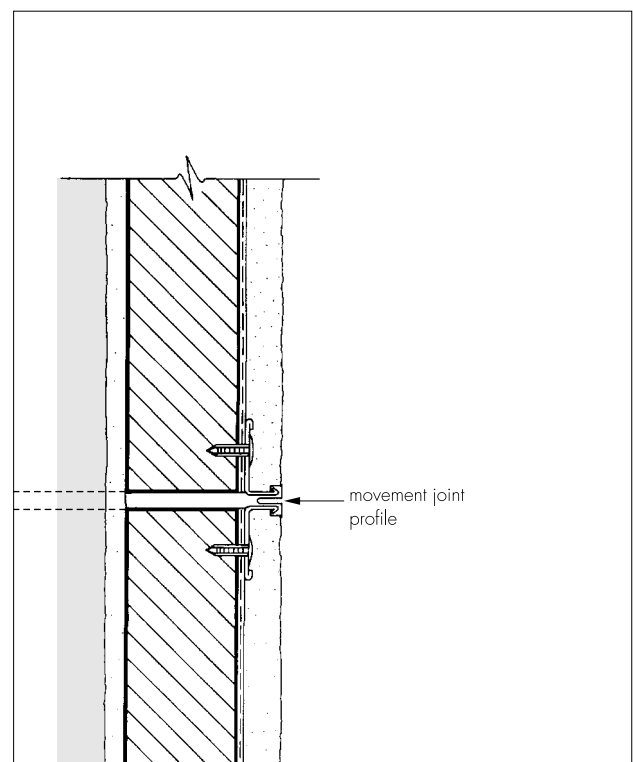


Figure 6 Vertical movement joint detail

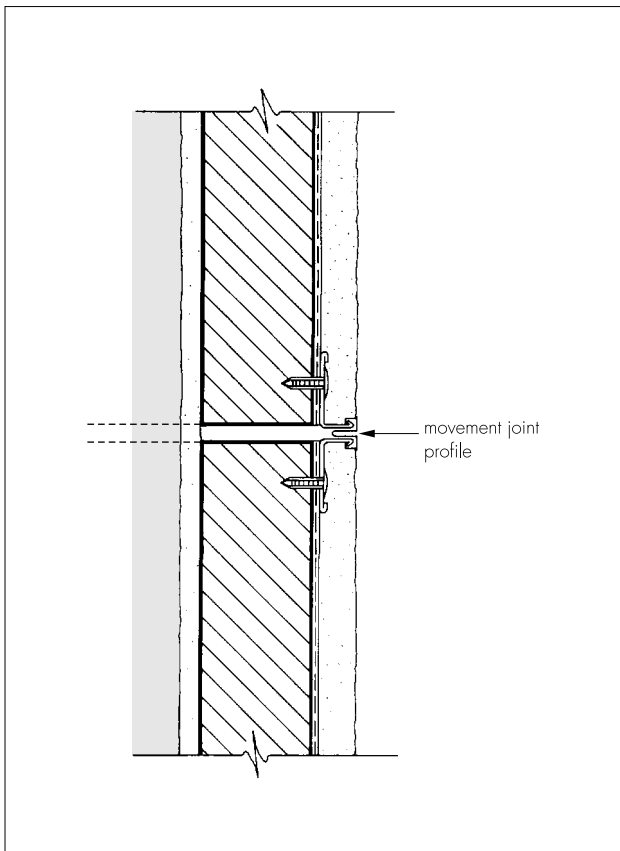
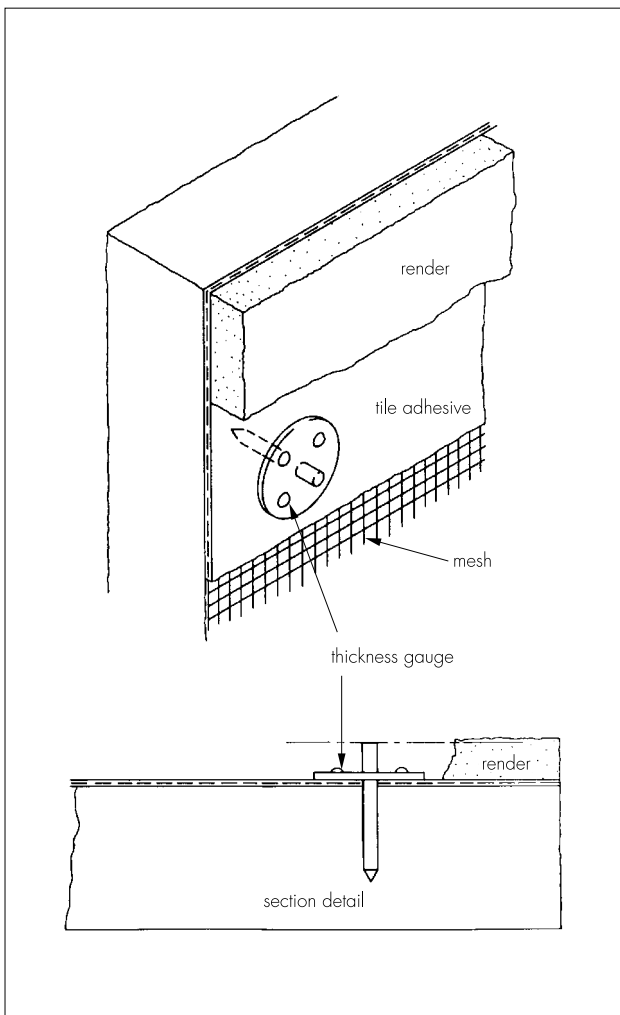


Figure 7 Render thickness gauge



19.25 Expansion beads are fixed vertically in agreed positions. These beads are positioned at approximately seven metre centres along a building, the centres depending on the individual requirements of each job.

19.26 Stop beads are positioned vertically, eg at party wall positions where the adjoining house does not require treatment.

Rendering and finishing

19.27 The drying period of any render will depend on weather conditions; however, the scrim adhesive must be left to harden for at least one day before application of any render coat.

19.28 To prevent the render from drying too rapidly it should not be applied in direct sunlight or onto warm background. Continuous surfaces must be completed without a break.

19.29 After application care must be taken to protect the render from direct sunlight, drying winds, rain, mist and cold (less than 5°C on a falling thermometer) to prevent the drying time from being too rapid or excessively prolonged.

Swisspan Plain Render Finish

19.30 The MRS4 plain finish render is prepared using the same procedures as for the scrim adhesive by mixing the contents of each 40 kg bag with approximately 6 to 7 litres of water. In hot or windy conditions it may be necessary to include a small additional quantity of water during the second mixing stage to allow for loss of water during application. Care must be taken to ensure an even dispersion of the resin and fibre reinforcement.

19.31 One coat of MRS4 is trowel-applied to a minimum thickness of 5 mm. The render coat is lightly scratched and after a minimum of 48 hours drying a second coat, minimum thickness of 5 mm, is applied and finished using a wood or fibre float. The thickness of the second coat should not exceed that of the first.

19.32 MRS4 plain finish render is allowed to dry and any dirt, grease, chalking, etc removed before application of the decorative coat.

19.33 Where MRS6 smooth finish masonry paint is specified, two coats are applied by brush or roller, allowing sufficient drying time between each coat. The drying times will be dependent upon weather conditions. (Refer to Agrément Certificate No 88/2090 for further details.)

19.34 Where MR MPM Crepi Rolling Grain (Scratch) Finish is specified an impression basecoat is applied by brush or roller. The impression base is prepared by diluting the product by 10% with water and applying by brush or roller. Allowing at least 24 hours to dry, a coat of Crepi Rolling Grain (Scratch) Finish is applied by trowel and polished

with a wooden or plastic float which drags the quartz fillers, producing a scratch effect. (Refer to Agrément Certificate No 93/2914, Detail Sheet 14, for further details.)

19.35 Where MR MPM Crepi textured SP Finish is specified the same method is used as for the MR MPM Crepi Rolling Grain (Scratch) Finish. However, the final coat is polished with a wooden or plastic float in a circular motion to produce a light texture. (Refer to Agrément Certificate No 93/2914, Detail Sheet 14, for further details.)

19.36 The decorative finishes should not be applied in wet weather, at temperatures below 5°C, or when frost or rain is expected. Freshly coated work should be protected from rain and frost.

Swisspan Spar-Dash Finish

19.37 The MRS7 dashing render is prepared using the same procedures as for the adhesives by mixing the contents of each 40 kg bag with approximately 8 to 9 litres of water. Care must be taken to ensure an even dispersion of the resin and fibre reinforcement.

19.38 One coat of MRS7 is trowel-applied to a minimum thickness of 8 mm. Several bags of suitable spar-dash aggregate should be emptied into a clean wheelbarrow or tub, mixed thoroughly and while the render is still soft, thrown or sprayed onto the surface. On completion, the surface must be checked to ensure an even coverage of spar-dash has been achieved. Where necessary the aggregate should be lightly tamped to ensure that a good bond is achieved.

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

19.40 Care should be taken in the detailing of the system around openings and projections (see Figures 8, 9 and 10).

19.41 On completion of the installation, external fittings, eg rainwater goods, are re-fixed through the system into the substrate.

Figure 8 External corner detail, insulated window or door reveal

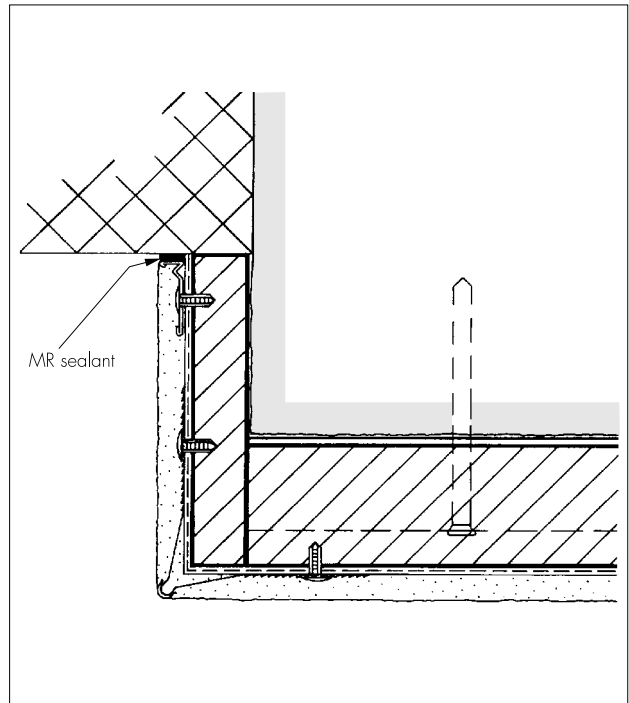


Figure 9 Uninsulated window or door reveal

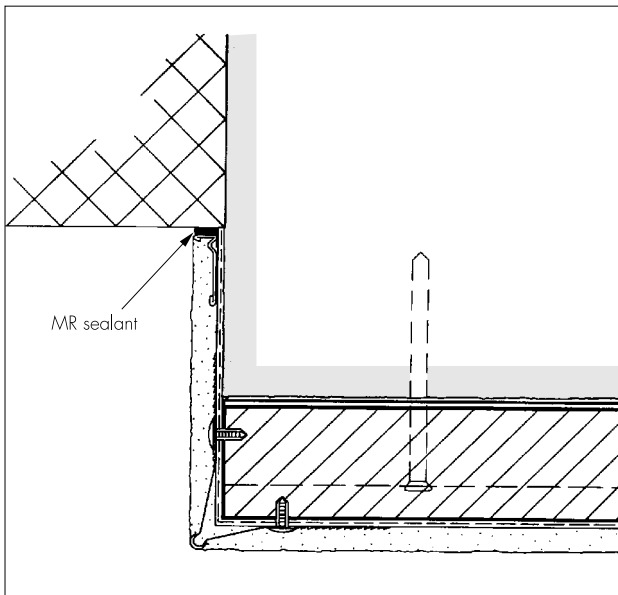
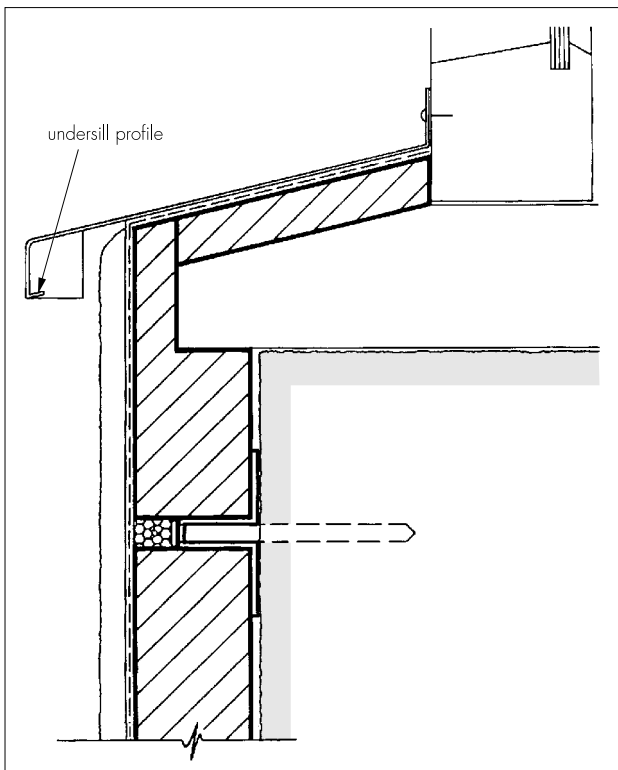


Figure 10 Typical sill detail



Technical Investigations

The following is a summary of the technical investigations carried out on the Swisspan External Wall Insulation System.

20 Tests

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

- component characterisation
- heat/spray cycling
- resistance to freeze/thaw
- impact resistance
- water absorption of render
- water vapour permeability.

20.2 Tests were conducted by the BBA in accordance with the European Organisation for Technical Approvals Draft ETAG No 11 (1996) *Guideline for European Technical Approval of External Thermal Insulation Composite Systems with Rendering* to determine resistance to dynamic wind uplift.

20.3 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 : 1987

- multi-storey fire tests conducted by the Building Research Establishment
- durability of finish

- thermal conductivity to BS 874 : Part 2 : Section 2.1 : 1986.

21 Other investigations

21.1 The manufacturing process, the methods adopted for quality control of manufactured and bought-in components, and details of the quality and composition of the materials used, were examined.

21.2 An assessment of the risk of interstitial condensation was undertaken.

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

21.4 A user survey was conducted to evaluate performance in use.

Bibliography

BS 476 *Fire tests on building materials and structures*

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

Part 7 : 1987 *Method for classification of the surface spread of flame of products*

BS 729 : 1971(1994) *Specification for hot dip galvanized coatings on iron and steel articles*

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 5390 : 1976(1984) *Code of practice for stone masonry*

BS 5628 *Code of practice for use of masonry*

Part 3 : 1985 *Materials and components, design and workmanship*

BS 5950 *Structural use of steelwork in building*

Part 5 : 1987 *Code of practice for design of cold formed sections*

BS 6399 *Loading for buildings*

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

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

Chapter V *Loadings*

Part 2 : 1972 *Wind loads*

MOAT No 22 : 1988 *Directives for the*

Assessment of External Insulation Systems for Walls (Expanded Polystyrene Insulation Faced with a Thin Rendering)

Conditions of Certification

22 Conditions

22.1 Where reference is made in this Certificate to any Act of Parliament, Regulation made thereunder, Statutory Instrument, Code of Practice, British Standard, manufacturer's instruction or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certificate.

22.2 The quality of materials and the method of manufacture have been examined and found satisfactory by the BBA and must be maintained to this standard during the period of validity of this Certificate. This Certificate will remain valid for an unlimited period provided:

- (a) the specification of the product is unchanged; and
- (b) the manufacturer continues to have the product checked by the BBA.

22.3 This Certificate will apply only to the product that is installed, used and maintained as set out in this Certificate.

22.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of patent or similar rights subsisting in the product; and
- (b) the legal right of the Certificate holder to market, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

22.5 It should be noted that any recommendations relating to the safe use of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory or Common Law duties of care, or of any duty of care which exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory or Common Law duties 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 use of this product.



In the opinion of the British Board of Agrément, Swisspan External Wall Insulation System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 97/3410 is accordingly awarded to MR Limited.

On behalf of the British Board of Agrément

Date of issue: 19th December 1997

Director

1 Summary

Swisspan railing system	A cold formed steel rail system comprising horizontal starter and holding rails manufactured to BS 5950 : Part 5 : 1987 and post galvanized to BS 729 : 1971(1994).
Insulation	Swisspan PIR-modified polyurethane (CFC and HCFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 20 mm and 80 mm. Swisspan PIR-modified urethane (CFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 20 mm and 75 mm. Swisspan phenolic (CFC and HCFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 25 mm and 80 mm. Swisspan phenolic (CFC free) insulation boards — 1200 mm by 480 mm in a range of thicknesses between 20 mm and 70 mm. Swisspan expanded polystyrene insulation boards — 1200 mm by 480 mm in a range of thicknesses between 15 mm and 100 mm. Boards of 15 mm thickness are also available for use in window reveals.
MR bedding and scrim adhesives	Polymer modified cement based adhesive, supplied as powders to which water is added.
Reinforcing mesh	MR reinforcing mesh — a one metre wide mesh of multi-stranded alkali-resistant glass fibres, having a polymer coating and a nominal weight of 150 gm ⁻² or 200 gm ⁻² .
Finishes (spar-dash)	MRS7 dashing render — polymer modified fibre-reinforced cement based mortar supplied as a powder to which water is added. Available in a range of colours. MR spar-dash aggregate, available in a range of colours to suit the MRS7 render.
Finishes (plain render)	MRS4 plain finish render — a polymer modified fibre-reinforced cement based mortar supplied as a powder to which water is added. Available in a range of colours. MRS6 smooth finish masonry paint — a polymer based smooth finish decorative coating available in a range of colours to suit MRS4 render. MR MPM Crepi Rolling Grain (Scratch) Finish and textured SP Finish — polymer based decorative coatings containing synthetic resins and inorganic fillers. Available in a range of colours.
2 Thermal properties	The thermal conductivity values for PIR-modified urethane (CFC free and HCFC free), PIR-modified urethane (CFC free), phenolic (CFC and HCFC free) and phenolic (CFC free) and expanded polystyrene insulation can be taken as 0.025 Wm ⁻¹ K ⁻¹ , 0.028 Wm ⁻¹ K ⁻¹ , 0.019 Wm ⁻¹ K ⁻¹ , 0.018 Wm ⁻¹ K ⁻¹ and 0.036 Wm ⁻¹ K ⁻¹ , respectively.
3 Impact resistance	The system is suitable for use where walls are exposed but 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 impact, eg mechanical or malicious damage, precautions may be required to reduce the risk of damage.
4 Properties in relation to fire	The system is not non-combustible to fire to BS 476 : Part 4 : 1970. The system is classified Class 0 as defined in the appropriate Building Regulations. Fire barriers are not required in a system incorporating MR PIR-modified urethane and MR phenolic insulants with MRS renders.

5 Design wind loading and resistance to wind suction

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Assuming sound columns or substrate which will prohibit pull-out of the fixings below the maximum load achieved through dynamic wind load testing (4 kPa). An example of loads applied to the dry-fix system at 10 metres and 50 metres can be calculated as follows:

Previously, wind loading on a particular wall could be calculated in accordance with CP 3 : Chapter V : Part 2 : 1972 *Wind loads*. This code of practice has been replaced by BS 6399 : Part 2 : 1995 *Code of practice for wind loads*. The new procedure involves specific site information and does not facilitate general or 'worst case' calculations. For this reason, this example is based on CP 3 : Chapter V : Part 2. The pressure created by the action of the wind can be calculated from the following formulae:

$$P = (C_{pe} - C_{pi})q \dots\dots\dots (i)$$

$$q = K (V_s)^2 \dots\dots\dots (ii)$$

$$V_s = VS_1 S_2 S_3 \dots\dots\dots (iii)$$

Where:

P = pressure

C_{pe} = external pressure coefficient (-1.0 at 10 m height and -1.1 at 50 m height)

C_{pi} = internal pressure coefficient (0.2 for both 10 m and 50 m heights)

K = a constant

V_s = design wind speed

V = basic wind speed

S_1 = topography value (from CP 3 = 1.0)

S_2 = ground roughness (from CP 3 = 1.0 for 10 m height and 1.4 m for 50 m height)

S_3 = statistical factor (from CP 3 = 1.0)

q = the dynamic pressure

Using the above values and equation (i), (ii) and (iii) maximum wind suction of 1.474 kPa at 10 m and 2.005 kPa at 50 m were calculated using a basic wind speed of 44 Ms⁻¹. The value obtained from dynamic wind load testing on the Swisspan dry-fix systems was 4.0 kPa, which would indicate a minimum safety factor of 2.7 and 2.0 respectively.

Above 10 m the system incorporates MR bedding adhesive (wet-fix) between the insulation and the background, which will considerably increase the resistance to wind suction.

6 Durability Assessed life

At least 30 years (with normal maintenance).