


**IRISH AGRÉMENT BOARD
CERTIFICATE NO. 07/0273**

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Mannok Therm Roof Deck Insulation Products

Isolation de murs Wärmedämmung

NSAI Agrément (Irish Agrément Board) is designated by Government to issue European Technical Approvals.

NSAI Agrément Certificates establish proof that the certified products are '**proper materials**' suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997 to 2019**.

PRODUCT DESCRIPTION:

This Certificate relates to the following products:

- Mannok Therm Roof / MFR-PLY (Detail Sheet 1)
- Mannok Therm Flat Roof Insulation Products (Detail Sheet 2)

In the opinion of NSAI, the Mannok Therm Roof Deck Insulation Products, as described in this Certificate and Detail Sheets, comply with the requirements of the Building Regulations 1997 to 2019.

USE:

This is covered in each individual Detail Sheet.

MANUFACTURE AND MARKETING:

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1.1 ASSESSMENT

In the opinion of NSAI Agrément, Mannok Therm Roof Deck Insulation Products if used in accordance with this Certificate and in conjunction with the relevant Detail Sheet, can meet the requirements of the Building Regulations 1997 to 2019, as indicated in Section 1.2 of this Irish Agrément Certificate.

1.2 BUILDING REGULATIONS 1997 to 2019

REQUIREMENTS:

Part D – Materials and Workmanship

D3 – Mannok Therm Roof Deck Insulation Products, as certified in this Certificate, are comprised of 'proper materials' fit for their intended use (see Part 4 of this Certificate).

D1 – Mannok Therm Roof Deck Insulation Products, as certified in this Certificate, meet the requirements of the building regulations for workmanship.

Part B – Fire Safety

B2 – Internal Fire Spread (Linings)

Part B Vol 2 – Fire Safety

B7 – Internal Fire Spread (Linings)

The reaction to fire classifications for the Mannok Therm Roof Deck Insulation Products are listed in their Detail sheets. The performance of the Mannok Therm Flat Roof Insulation Products will be determined by the deck on which it is installed.

B3 – Internal Fire Spread (Structure)

B8 – Internal Fire Spread (Structure)

The reaction to fire classifications for the Mannok Therm Roof Deck Insulation Products are listed in their Detail sheets.

Part C – Site Preparation and Resistance to Moisture

C4 – Resistance to Weather and Ground Moisture

Mannok Therm Roof Insulation Products referred to in this Certificate when installed in compliance with the conditions indicated in Part 3 of the relevant Detail Sheet will not promote the passage of moisture and will minimise the risk of surface or interstitial condensation.

Part J – Heat Producing Appliances

J3 – Protection of Building

In the opinion of NSAI Agrément, the Mannok Therm Roof Deck Insulation Products, if used in accordance with this Certificate and the relevant Detail Sheet, can meet the requirements of Part J of the Building Regulations 1997 to 2019.

Part L – Conservation of Fuel and Energy

L1 – Conservation of Fuel and Energy

Based on the measured thermal conductivity of Mannok Therm Roof Deck Insulation Products, the products can contribute to complying with the requirements of this Regulation.

2.1 PRODUCT DESCRIPTION

Each of the Mannok Therm Roof Deck Insulation Products is given a detailed description in the relevant Detail Sheet.

2.2 DELIVERY, STORAGE AND MARKING

Mannok Therm Roof Deck Insulation Products are supplied palletised in labelled packs and shrink wrapped in polyethylene. Each pack carries a label bearing the CE Marking together with the product description, product characteristics (λ and R values), size, thickness, batch number and date of manufacture, the manufacturer's name, NSAI Agrément identification mark and NSAI Agrément Certificate number for the system.

The product packaging must not be considered adequate for outside protection. Ideally boards should be stored inside the building. If stored outside, the products should be stacked flat on a level base raised off the ground on skids and should be covered with a polythene sheet or protected with weatherproof tarpaulins.

Boards should be protected in transit and in storage from damage caused by ropes and tie straps.

The boards must not be exposed to a naked flame or other ignition sources.

On-site cutting of boards where it is necessary to maintain continuity of insulation around doors, windows or other openings is easily executed using a fine tooth saw or by cutting through the insulation, and paper backing of any plasterboard layer, then snapping the boards face down over a straight edge and cutting the paper facing of the plasterboard on the other side.

Tapered edged boards are jointed and finished in accordance with standard dry lining procedure offering a surface suitable for paper hanging and paint finishes.

Good workmanship and appropriate site procedures are necessary to achieve expected thermal and air tightness performance. Ensure accurate trimming to achieve close butting joints and continuity of insulation.

Adequate protection and safety precautions should be taken.

3.1 GENERAL

This matter is dealt with for each product in their Detail Sheet.

4.1 BEHAVIOUR IN FIRE

Each Detail Sheet contains the relevant information.

4.2 WATER PENETRATION

Mannok Therm Roof Deck Insulation Products referred to in this Certificate are of a closed cell structure, which does not allow water uptake by capillary action. When used in accordance with this Certificate, the products present no significant risk of water penetration.

4.3 THERMAL INSULATION

The aged/design thermal conductivity ' $\lambda_{90/90}$ ' value' of the Mannok Therm Roof Insulation Products has been measured in accordance with I.S. EN 12667^[1] (see each individual Detail Sheet). The high thermal resistance of the Mannok Therm Roof Deck Insulation Products ensures that cold bridging and extra heat loss around the edges of openings can be avoided.

Lintel jamb and cill designs similar to those shown in Diagram 3 of the TGD to Part L of the Building Regulations 1997 to 2019 will be satisfactory to limit thermal bridging.

Uncontrolled leakage of air through the fabric of a building and/or cracks in and around door and window frames, sills, jambs etc. can occur due to wind pressure or air movement due to thermal effects. Details of how to avoid the infiltration of cold air are given in TGD to Part L of the Building Regulations 1997 to 2019, Section 1.6 page 14.

The required maximum U-values for roofs can be obtained from the relevant Detail Sheet.

4.4 LIMITING THERMAL BRIDGING

The linear thermal transmittance ' ψ ' (Psi) describes the heat loss associated with junctions and around openings. Junction design used with Mannok Therm Roof Deck Insulation Products have been assessed and when detailed in accordance with this Certificate can meet the requirements of Table D2 of TGD to Part L of the Building Regulations 1997 to 2019.

When **all** bridged junctions within a building comply with the requirements of Table D2 of TGD to Part L, the improved ' γ ' factor of 0.08 can be entered into the DEAP building energy rating (BER) calculation. If **all** junctions can be shown to be equivalent or better than Acceptable Construction Details published by the DECLG, then the values published in Table D2 apply.

Where either of the above options are shown to be valid, or when the required values cannot be achieved, all relevant details should be recorded on the 'Certificate of Compliance' for that project for use in future BER calculations.

' ψ ' values for other junctions outside the scope of this Certificate should be assessed in accordance with BRE IP1/06^[2] and BRE BR 497^[3] in accordance with Appendix D of TGD to Part L of the Building Regulations 1997 to 2019.

As per Acceptable Construction Details, a minimum thermal resistance of 0.6m²K/W should be provided at window reveals, heads and sills.

4.5 MATERIALS IN CONTACT WITH ELECTRICAL WIRING

Electrical installations should be in accordance with IS 10101^[4]. It is recommended that cables should not be buried in the insulation and carried in a conduit. In relation to recessed spotlights and other luminaries, IS 10101^[4] requires they be not less than the minimum distances from combustible materials as specified in the standard.

4.6 CONDENSATION RISK

The Mannok Therm Roof Deck Insulation Products referred to in this Certificate have a high vapour resistance and are therefore unlikely to be affected by surface or interstitial condensation, provided all joints between boards are filled and taped in accordance with standard dry lining practice. Interstitial condensation analysis for average winter environmental conditions for cavity wall constructions indicate no condensation risk. When insulating buildings the recommendations of BS 5250^[5] should be followed to minimise the risk of condensation within the building elements and structures.

4.7 RESISTANCE TO SOLVENTS, FUNGI AND RODENTS

The Mannok Therm Roof Deck Insulation Products referred to in this Certificate do not promote infestation, as there is no food value in the materials used. They also resist attack by mould and microbial growth. The insulation core is resistant to dilute acids, alkalis, mineral oil and petrol. It is not resistant to some solvent-based adhesive systems, particularly those containing methyl ethyl ketone. Adhesives containing such solvents should not be used in association with the boards. Boards which have been in contact with harsh solvents, petrol, mineral oil or acids or boards that have been damaged in any other way should not be used.

4.8 MAINTENANCE

This matter is dealt with in the Detail Sheets.

4.9 DURABILITY

The Mannok Therm Roof Deck Insulation Products referred to in this Certificate are rot-proof and durable. As insulation for cavity walls, floors and roofs and as dry lining, such products are judged to be stable and will remain effective as an insulation system for the life of the building, so long as it is installed in accordance with this Certificate.

4.10 CE MARKING

The manufacturer has taken responsibility of CE marking the Mannok Therm Roof Deck Insulation Products in accordance with harmonised European Standard IS EN 13165^[6]. An asterisk (*) appearing in this Certificate indicates that data shown is an essential characteristic of the product and declared in the manufacturers Declaration of Performance (DoP).

Reference should be made to the latest version of the manufacturer's DoP for current information on any essential characteristics declared by the manufacturer.

5.1 National Standards Authority of Ireland ("NSAI") following consultation with NSAI Agrément has assessed the performance and method of installation of the product/process and the quality of the materials used in its manufacture and certifies the product/process to be fit for the use for which it is certified provided that it is manufactured, installed, used and maintained in accordance with the descriptions and specifications set out in this Certificate and in accordance with the manufacturer's instructions and usual trade practice. This Certificate shall remain valid for five years from date of latest revision so long as:

- (a) the specification of the product is unchanged.
- (b) the Building Regulations 1997 to 2019 and any other regulation or standard applicable to the product/process, its use or installation remains unchanged.
- (c) the product continues to be assessed for the quality of its manufacture and marking by NSAI.
- (d) no new information becomes available which in the opinion of the NSAI, would preclude the granting of the Certificate.
- (e) the product or process continues to be manufactured, installed, used and maintained in accordance with the description, specifications and safety recommendations set out in this certificate.
- (f) the registration and/or surveillance fees due to NSAI are paid.

5.2 The NSAI Agrément mark and certification number may only be used on or in relation to product/processes in respect of which a valid Certificate exists. If the Certificate becomes invalid the Certificate holder must not use the NSAI Agrément mark and certification number and must remove them from the products already marked.

5.3 In granting Certification, the NSAI makes no representation as to;

- (a) the absence or presence of patent rights subsisting in the product/process; or
- (b) the legal right of the Certificate holder to market, install or maintain the product/process; or

(c) whether individual products have been manufactured or installed by the Certificate holder in accordance with the descriptions and specifications set out in this Certificate.

5.4 This Certificate does not comprise installation instructions and does not replace the manufacturer's directions or any professional or trade advice relating to use and installation which may be appropriate.

5.5 Any recommendations contained in this Certificate relating to the safe use of the certified product/process are preconditions to the validity of the Certificate. However the NSAI does not certify that the manufacture or installation of the certified product or process in accordance with the descriptions and specifications set out in this Certificate will satisfy the requirements of the Safety, Health and Welfare at Work Act, or of any other current or future common law duty of care owed by the manufacturer or by the Certificate holder.

5.6 The NSAI is not responsible to any person or body for loss or damage including personal injury arising as a direct or indirect result of the use of this product or process.


5.7 Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, 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 Certification.

NSAI Agrément

This Certificate No. **07/0273** is accordingly granted by the NSAI to **Mannok Insulation Ltd** on behalf of NSAI Agrément.

Date of Issue: **May 2007**

Signed



Seán Balfe
Director of NSAI Agrément

Readers may check that the status of this Certificate has not changed by contacting NSAI Agrément, NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (01) 807 3800. Fax: (01) 807 3842. www.n Sai.ie

Revisions:

8th January 2018: References to Building Regulations and standards updated, product specifications updated to reflect manufacturer's DoP.

10th September 2021: Change of company and product names, references to Building Regulations and standards updated, bibliography added.

Bibliography

- [1] IS EN 12667:2001 *Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meters method – Products of high and medium thermal resistance.*
- [2] BRE IP1/06 *Assessing the effects of thermal bridging at junctions and around openings.*
- [3] BRE BR 497 *Conventions for calculating linear thermal transmittance and temperature factors.*
- [4] IS 10101:2020+AC1:2020 *National rules for electrical installations (incorporating Corrigendum 1:2020).*
- [5] BS 5250:2011+A1:2016 *Code of practice for control of condensation in buildings.*
- [6] IS EN 13165:2012 *Thermal insulation products for buildings – Factory made rigid polyurethane foam (PU) products – Specification.*
- [7] BS 6229:2018 *Code of practice for flat roofs with continuously supported flexible waterproof coverings.*
- [8] IS EN 13501-1:2018 *Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests.*
- [9] IS EN 1991-1-4:2005 *Eurocode 1: Actions on structures: General actions: Wind actions (including Irish National Annex).*
- [10] IS EN ISO 6946:2017 *Building components and building elements – Thermal resistance and thermal transmittance – Calculation method.*
- [11] IS EN 1991-1-1:2002 *Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings (including Irish National Annex).*
- [12] BS 8217:2005 *Reinforced bitumen membranes for roofing – Code of practice.*
- [13] BS 8218:1998 *Code of practice for mastic asphalt roofing.*

1.1 ASSESSMENT

In the opinion of NSAI Agrément, Mannok Therm Roof / MFR-PLY, if used in accordance with this Detail Sheet, meets the requirements of the Building Regulations 1997 to 2019 as indicated in Section 1.2 of Certificate 07/0273.

1.2 BUILDING REGULATIONS 1997 to 2019

This matter is dealt with in NSAI Agrément Certificate 07/0273.

2.1 PRODUCT DESCRIPTION

This Detail Sheet relates to Mannok Therm Roof / MFR-PLY, a composite insulation board using a Polyisocyanurate (PIR) closed cell rigid insulation manufactured in accordance with IS EN 13165^[6]. A layer of 6mm thick WPB plywood is bonded to the insulation to give additional strength and rigidity, and to provide a suitable substrate for partially bonded built-up waterproofing systems. During the manufacturing process, liquid raw materials expanded by blowing agents are applied between low emissivity composite foil facings. Mannok Therm Roof / MFR-PLY is CFC and HCFC free and therefore has zero ozone depletion potential (zero ODP).

This Detail Sheet certifies compliance with the requirements of the Building Regulations 1997 to 2019.

Length	2400mm
Width	1200mm
Thickness⁺	60-200mm
PIR core density	28-34kg/m ³
Area per board	2.88m ²
Edge profiles	Butt edged
Thermal conductivity*	0.022W/mK
Water vapour resistivity	>300MNs/gm
Compressive strength*	≥150kPa
+ Does not include 6mm plywood board Other sizes are available on request	

Table 1: Product Range & Physical Properties

2.2 MANUFACTURE

Mannok Therm Roof / MFR-PLY is manufactured from a formulation of chemicals, which is poured onto low emissivity composite foil facings subsequently autohesively bonded to the insulation core during manufacture.

2.3 DELIVERY, STORAGE AND MARKING

This matter is dealt with in Section 2.2 of NSAI Agrément Certificate 07/0273.

2.4 INSTALLATION

2.4.1 General

Mannok Therm Roof / MFR-PLY can be installed on 50mm wide joists at 600mm maximum centres on roofs intended for occasional maintenance traffic, or 400mm maximum centres where more frequent traffic is expected.

Mannok Therm Roof / MFR-PLY boards must be supported at all edges, including cut edges at penetrations. 50x50mm cross noggins should be fitted between the joists. The boards must bear at least 20mm on all supporting timbers.

Mannok Therm Roof / MFR-PLY should be fixed with low profile headed screws, long enough to give minimum 35mm embedment into the timbers. Fixings should be at 200mm centres around the board edges (300 centres on any intermediate timbers) and set at least 10mm from board edges and 50mm from corners.

As 96mm is the maximum board thickness which is practicable to install over joists, U-values of 0.20W/m²K and lower should be achieved by fitting additional Mannok Therm MR insulation between the joists (Figure 1). The Mannok Therm MR boards should be cut to fit tightly between

the joists and restrained by battens or part-driven nails.

Thermal bridging at roof-wall junctions must be avoided. At eaves and verges (Figure 2), the joist space should be packed with insulation. At parapets (Figure 3), vertical edge insulation should be applied to the inner face and the wall insulation carried at least 150mm above the surface of the Mannok Therm Roof / MFR-PLY. Insulation on the surrounds of roof windows (Figure 4) should be continuous with Mannok Therm Roof / MFR-PLY.

To prevent condensation building up beneath the waterproofing, a vapour control layer must be provided on the warm side of the insulation. The foil facing on the underside of Mannok Therm Roof / MFR-PLY has a very high vapour resistance and can be formed into a vapour control layer by sealing the joints between the boards. The simplest way to seal the joints is to set the boards onto a wide (30mm) bead of vapour resistant sealant applied to the upper surface of all the joists and cross noggins.

2.4.2 Procedure

Plan the layout of Mannok Therm Roof / MFR-PLY boards. Cut and fit cross noggins.

Apply vapour resistant sealant in a 30mm wide strip to the upper surface of the joists and cross noggins.

Lay Mannok Therm Roof / MFR-PLY boards with long edges following joists and board edges in broken bond.

Fix with screws at 200mm centres around board edges, 300mm at any other cross timbers.

Lay the waterproofing system.

Fixings for adjacent boards should be staggered to the same joist or noggin.

Screw heads should finish flush with the surface of the plywood.

The period between installation of Mannok Therm Roof / MFR-PLY and of the waterproofing system should be minimised. In poor weather, polyethylene sheeting should be used as temporary protection of Mannok Therm Roof / MFR-PLY.

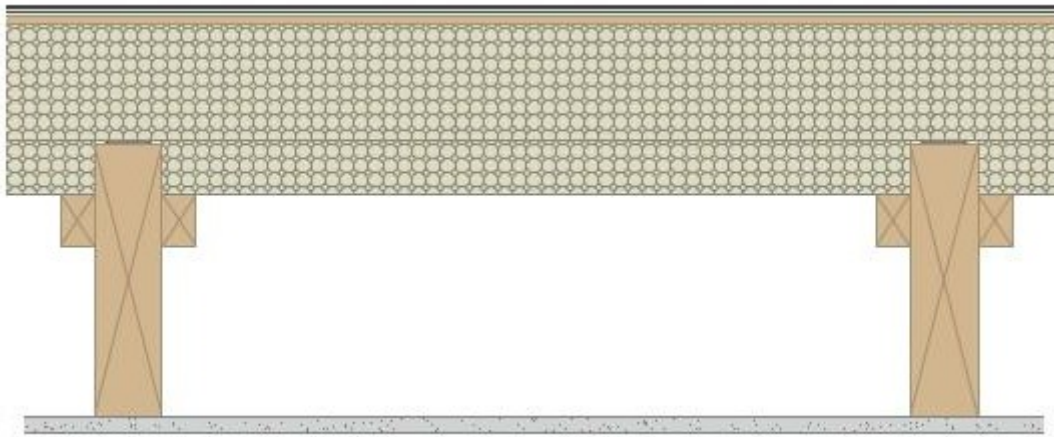


Figure 1: Insulation between joists

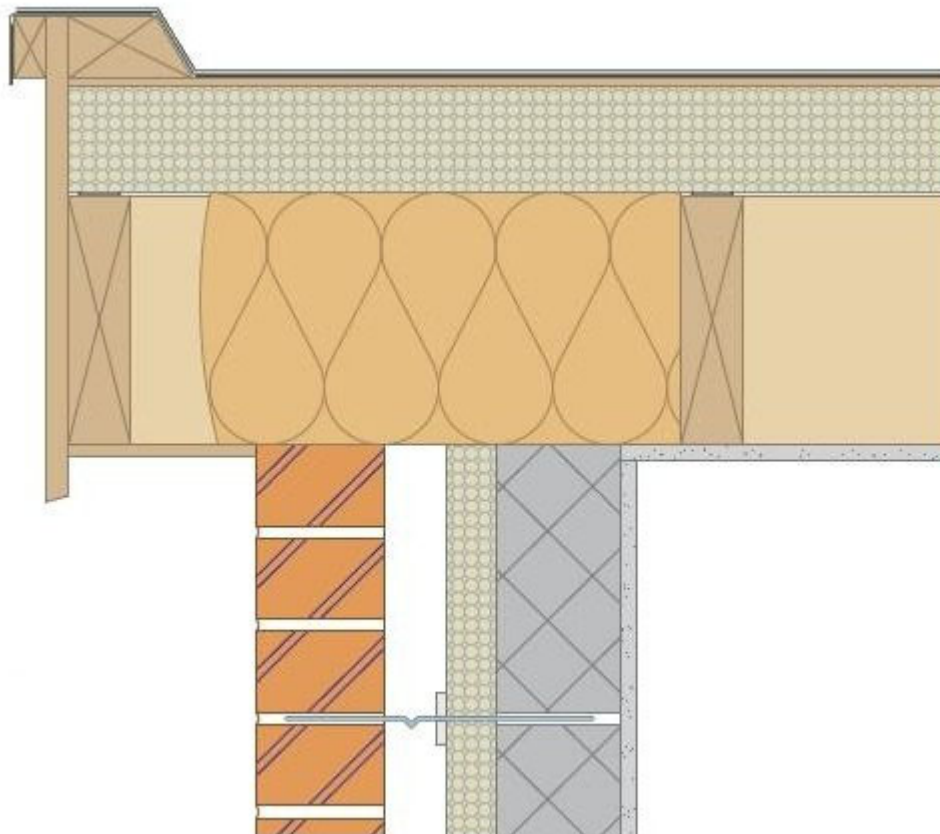


Figure 2: Verge

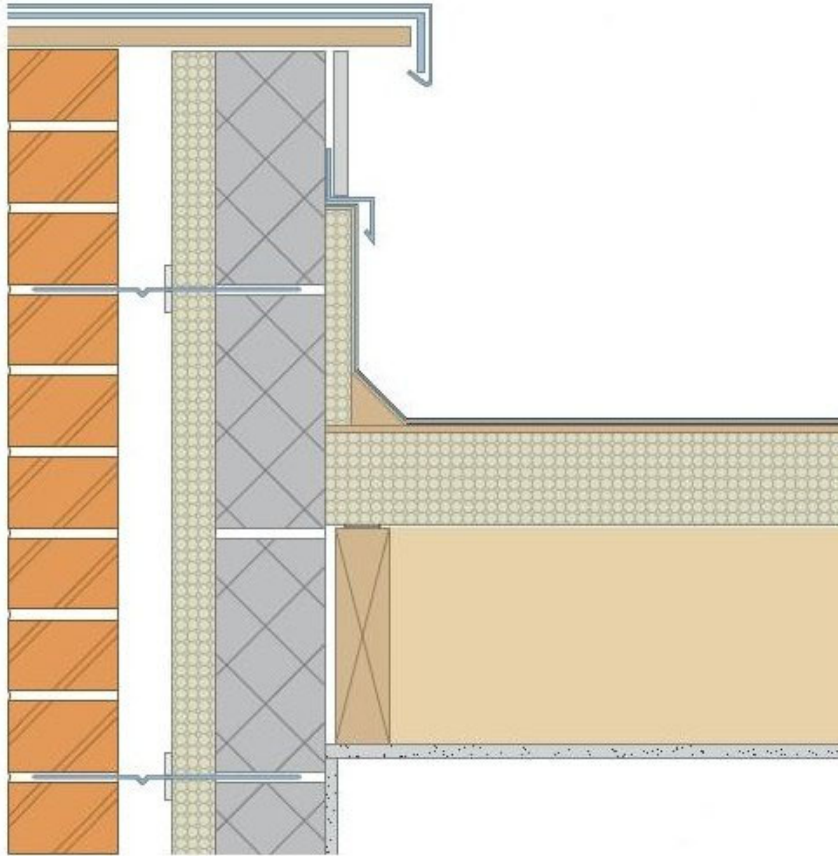


Figure 3: Parapet

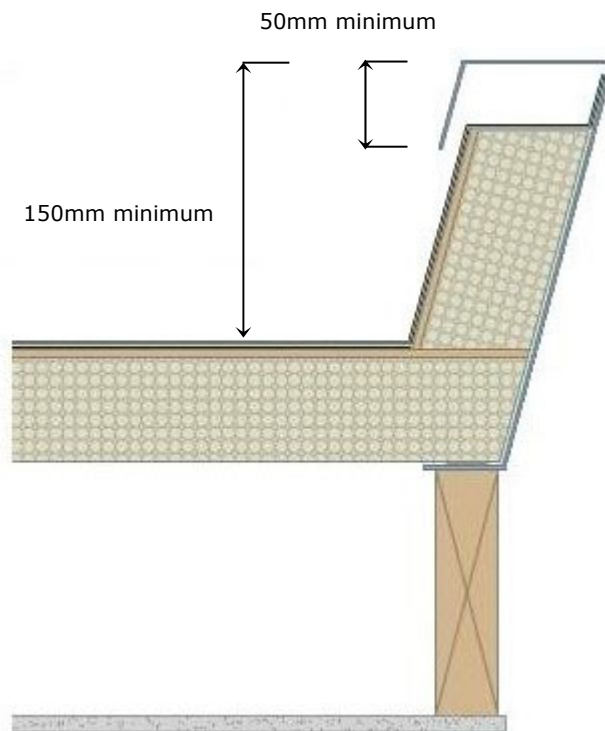


Figure 4: Rooflight penetration

3. GENERAL

3.1 Mannok Therm Roof / MFR-PLY, when installed in accordance with this Detail Sheet, is effective in reducing the U-value (thermal transmittance) of new external flat roof constructions. It is essential that such roofs are designed and constructed to prevent moisture penetration having regard to the Driving Rain Index.

3.2 Roofs subject to the relevant requirements of the Building Regulations 1997 to 2019 should be constructed in accordance with BS 6229^[7].

3.3 During installation, boards must not be walked on except over supporting timbers. The boards have insufficient nail holding ability to be considered as an alternative to timber sarking.

3.4 Roof tile underlays must be approved by the manufacturer or hold a current NSAI Agrément Certificate for such use. Underlays should be installed with and within the limits of that Certificate.

4.1 BEHAVIOUR IN FIRE

Combustibility –Mannok Therm Roof / MFR-PLY is classified as Class E to IS EN 13501-1^[8]. The boards are combustible and must be protected from naked flames and other ignition sources during and after installation.

Toxicity – Negligible when used in a protected roof situation.

Mannok Therm Roof / MFR-PLY is manufactured without the use of CFCs or HCFCs, and there is no release of such gas on burning.

4.2 STRENGTH

Mannok Therm Roof / MFR-PLY, when installed in accordance with the manufacturer's instructions and this Detail Sheet, will resist the loads likely to be met during installation and in service.

4.3 RESISTANCE TO WIND LOAD

The resistance to wind uplift depends on many factors peculiar to each project. The effect of wind loading should be calculated in accordance with IS EN 1991-1-4^[9] using the appropriate basic wind speed shown on the map in Diagram 15 of TGD to Part A of the Building Regulations 1997 to 2019.

When installed in accordance with this Detail Sheet, Mannok Therm Roof / MFR-PLY will have sufficient resistance to wind uplift.

4.4 RESISTANCE TO MOISTURE

Mannok Therm Roof / MFR-PLY will not be adversely affected by rain during installation for a limited time scale or by wind driven snow or rain penetrating the tiling in service.

4.5 CONDENSATION RISK

Mannok Therm Roof / MFR-PLY has a vapour resistivity of greater than 400MNs/gm. The Certificate holder should be contacted for the purpose of calculating a project specific condensation risk analysis.

The risk of condensation on the underside of the sarking will be minimal under normal conditions of use.

4.6 THERMAL INSULATION

The aged/design thermal conductivity ' $\lambda_{90/90}$ ' value of Mannok Therm Roof / MFR-PLY when measured in accordance with IS EN 12667^[1] is 0.022W/mK.

The required maximum U-values for flat roof constructions can be obtained with Mannok Therm Roof / MFR-PLY as indicated in Table 2. For the purpose of the calculations below, all examples are based on a roof construction of 3 layer built-up felt roofing, Mannok Therm Roof / MFR-PLY board, unvented low emissivity cavity, and 12.5mm plasterboard. Calculations were performed to IS EN ISO 6946^[10].

4.7 RESISTANCE TO SOLVENTS, FUNGI AND RODENTS

Mannok Therm Roof / MFR-PLY boards do not promote infestation, as there is no food value in the materials used. They also resist attack by mould and microbial growth. The insulation is not resistant to some solvent-based adhesive systems, particularly those containing methyl ethyl ketone. Adhesives containing such solvents should not be used in association with the boards. Boards which have been in contact with harsh solvents, petrol, mineral oil or acids, or boards that have been damaged in any other way should not be used.

4.8 DURABILITY

Mannok Therm Roof / MFR-PLY is rot proof and durable. As roof insulation, Mannok Therm Roof / MFR-PLY is judged to be stable and will remain effective as an insulation system for the life of the building, so long as it is installed in accordance with this Detail Sheet. Its durability depends upon the supporting structure and the conditions of use.

U-value (W/m ² K)	Joists @ 400mm centres	Joists @ 600mm centres
0.25	70+6mm*	70+6mm*
0.22	90+6mm*	90+6mm*
0.20	110+6mm*	110+6mm*
0.18	110+6mm*	110+6mm*
0.16	125+6mm*	125+6mm*
* Insulation + 6mm plywood		
Concrete Slab Roof		
0.25	85mm	85mm
0.22	100mm	100mm
0.20	110mm	110mm
0.18	120mm	120mm
0.16	135mm	135mm
Metal Deck		
0.25	90mm	90mm
0.22	100mm	100mm
0.20	110mm	110mm
0.18	125mm	125mm
0.16	140mm	140mm

Table 2: Required Thickness of Roof / MFR-PLY for different U-values

4.9 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE THE FOLLOWING:

- Density
- Water vapour resistance
- Long term water absorption
- Dimensional accuracy
- Compressive and cross breaking strength
- Dimensional stability
- Thermal conductivity
- Efficiency of the construction process

4.10 OTHER INVESTIGATIONS

- Existing data on product properties in relation to fire, toxicity, environmental impact and the effect on mechanical strength/stability and durability were assessed. Mannok Therm Roof / MFR-PLY does not contain CFC or HCFC gas and has zero ODP.
- The manufacturing process was examined including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.
- Site visits were conducted to assess the practicability of installation and the history of performance in use of the product.

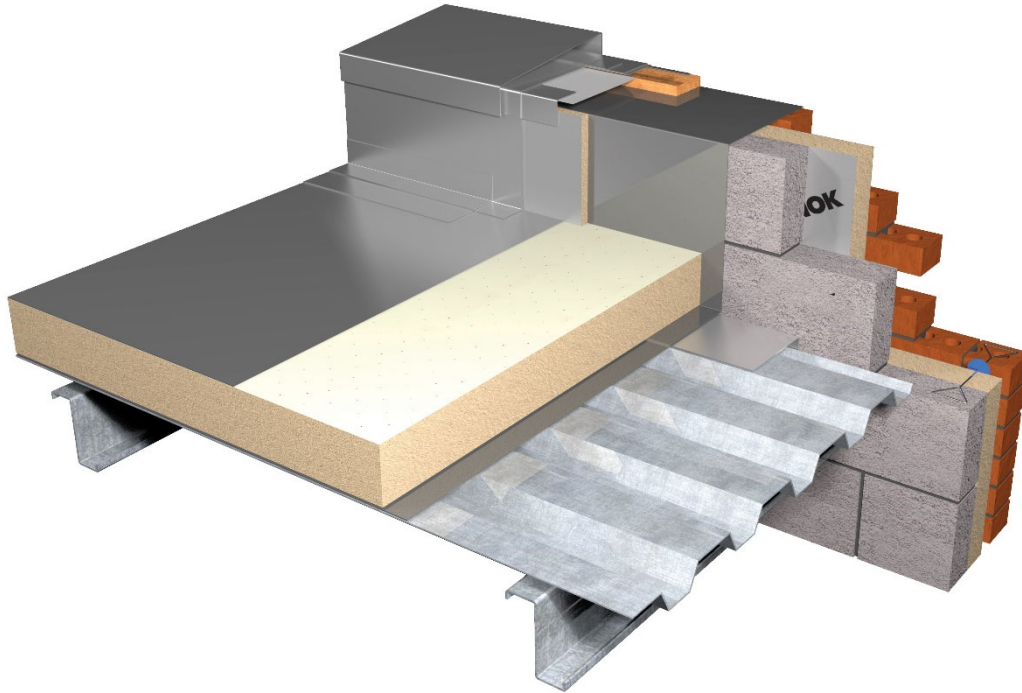


NSAI

Agrément

CERTIFICATE NO. 07/0273
DETAIL SHEET 2

Mannok Therm Flat Roof Insulation



PRODUCT DESCRIPTION:

This Detail Sheet relates to Mannok Therm Flat Roof Insulation, as defined in NSAI Agrément Certificate 07/0273.

USE:

Mannok Therm Flat Roof Insulation is used for the thermal insulation of flat roof decks which comply with BS 6229^[7].

Part One / Certification

1

1.1 ASSESSMENT

In the opinion of NSAI Agrément, the Mannok Therm Flat Roof Insulation products, if used in accordance with this Detail Sheet, meets the requirements of the Building Regulations 1997 to 2019 as indicated in Section 1.2 of Certificate 07/0273.

1.2 BUILDING REGULATIONS 1997 to 2019

This matter is dealt with in NSAI Agrément Certificate 07/0273.

2.1 PRODUCT DESCRIPTION

This Detail Sheet relates to Mannok Therm Flat Roof Insulation using a Polyisocyanurate (PIR) closed cell rigid insulation manufactured in accordance with IS EN 13165^[6]. During the manufacturing process, liquid raw materials expanded by blowing agents are applied between low emissivity composite foil facings. MFR-FFR is a foil faced flat roof board, MFR-GFR is a glass fibre flat roof board and MFR-DPFR is a dual purpose flat roof board consisting of glass fibre on one side and a bitumen fleece facing the other side. Mannok Therm Flat Roof Insulation products are CFC and HCFC free and therefore have zero ozone depletion potential (zero ODP).

This Detail Sheet certifies compliance with the requirements of the Building Regulations 1997 to 2019.

Length	2400mm
Width	1200mm
Thickness	60-200mm
Board density	30-34kg/m ³
Area per board	0.72 or 2.88m ²
Thermal conductivity*	MFR-FFR: 0.022W/mK MFR-GFR & MFR-DPFR: 20-79mm: 0.026W/mK 80-119mm: 0.025W/mK 120-150mm: 0.024W/mK
Water vapour resistivity	>300MNs/gm
Compressive strength*	≥150kPa
Other sizes are available on request	

Table 1: Product Range & Physical Properties

2.2 MANUFACTURE

Mannok Therm Flat Roof Insulation is manufactured from a formulation of chemicals, which is poured onto low emissivity composite foil facings subsequently autohesively bonded to the insulation core during manufacture.

2.3 DELIVERY, STORAGE AND MARKING

This matter is dealt with in Section 2.2 of NSAI Agrément Certificate 07/0273.

2.4 INSTALLATION

2.4.1 Procedure

Mannok Therm Flat Roof Insulation should be installed over a suitable vapour control barrier. The flat roof structure should be clean and free from any large gaps or projections. The decks should be designed in such a way to allow sufficient falls to all rainwater outlets.

The sides and ends of the boards should be sealed using a suitable sealant. All joints should be lightly butted.

The boards should be installed using suitable mechanical fixings. The fixings should be no less than 50mm and no more than 150mm from the edges of the boards. A minimum of 11 fixings should be used per board. The requirement for extra fixings should be assessed in accordance with IS EN 1991-1-1^[11].

Finishes:

- MFR-FFR: The product is for use with a mechanically-fixed single-ply roof waterproofing system, such as PVC, CSM, CPE, FPO (including TPO), VET, PIB or EPDM, which is the subject of a current NSAI Agrément Certificate and laid in accordance with, and within the limitations imposed by, that Certificate.
- MFR-DPFR: The bitumen fleece side of this product is designed for use with torch-applied reinforced bitumen waterproof membranes to BS 8217^[12], which is installed with the bitumen-fleece facing upwards to receive the roof membrane. The glass tissue side is for use as per MFR-GFR description below.
- MFR-GFR: The product is for use with the following waterproofing systems:
 - partially-bonded reinforced bitumen membranes to BS 8217^[12]
 - mastic asphalt membrane to BS 8218^[13]
 - liquid-applied systems which are the subject of a current NSAI Agrément Certificate and laid in accordance with, and within the limitations imposed by, that Certificate
 - single ply membranes (adhesive or mechanically fixed), such as PVC, CSM, CPE, FPO (including TPO), VET, PIB or EPDM, which are the subject of a current NSAI Agrément Certificate and laid in accordance with, and within the limitations imposed by, that Certificate.

2.4.2 Cutting

On-site trimming of boards where necessary is easily executed using a fine tooth saw or by cutting through the insulation, then snapping the board face down over a straight edge.

Good workmanship and appropriate site procedures are necessary to achieve expected thermal and air tightness performance. Ensure accurate trimming to achieve close butting joints and continuity of insulation.

2.4.3 Vapour Permeable Membranes

Vapour permeable membranes for the purposes of this Detail Sheet should be approved for use with the system by the Certificate holder, or may be any other NSAI Agrément certified breather membrane.

3.1 GENERAL

Mannok Therm Flat Roof Insulation, when installed in accordance with this Detail Sheet, is effective in reducing the U-value (thermal transmittance) of new and existing flat roof constructions. It is essential that such roofs are designed and constructed to prevent moisture penetration having regard to the Driving Rain Index.

Roofs subject to the relevant requirements of the Building Regulations 1997 to 2019 should be constructed in accordance with BS 6229^[7].

During installation, boards must not be walked on, except over supporting timbers. The boards have insufficient nail holding ability to be considered as an alternative to timber sarking.

Roof tile underlays must be approved by the manufacturer or hold a current NSAI Agrément Certificate for such use. Underlays should be installed with and within the limits of that Certificate.

4.1 BEHAVIOUR IN FIRE

Combustibility –Mannok Therm Flat Roof Insulation is classified as Class E to IS EN 13501-1^[8]. The boards are combustible and must be protected from naked flames and other ignition sources during and after installation.

Toxicity – Negligible when used in a protected roof situation.

Mannok Therm Flat Roof Insulation is manufactured without the use of CFCs or HCFCs, and there is no release of such gas on burning.

4.2 STRENGTH

Mannok Therm Flat Roof Insulation, when installed in accordance with the manufacturer's instructions and this Detail Sheet, will resist the loads likely to be met during installation and in service

4.3 RESISTANCE TO WIND LOAD

The resistance to wind uplift depends on many factors peculiar to each project. The effect of wind loading should be calculated in accordance with IS EN 1991-1-4^[9] using the appropriate basic wind speed shown on the map in Diagram 15 of TGD to Part A of the Building Regulations 1997 to 2019.

When installed in accordance with this Detail Sheet, Mannok Therm Flat Roof Insulation will have sufficient resistance to wind uplift.

4.4 RESISTANCE TO MOISTURE

Mannok Therm Flat Roof Insulation will not be adversely affected by rain during installation for a limited time scale or by wind driven snow or rain penetrating the tiling in service.

4.5 CONDENSATION RISK

Mannok Therm Flat Roof Insulation has a vapour resistivity of greater than 400MNs/gm. The Certificate holder should be contacted for the purpose of calculating a project specific condensation risk analysis.

The risk of condensation on the underside of the sarking will be minimal under normal conditions of use.

4.6 THERMAL INSULATION

The aged/design thermal conductivity $\lambda_{90/90}$ value of Mannok Therm Flat Roof Insulation products when measured in accordance with IS EN 12667^[1] is 0.022W/mK for MFR-FFR, and either 0.026W/mK, 0.025W/mK or 0.024W/mK

for MFR-GFR and MFR-DPFR depending on the insulation thickness.

The required maximum U-values for flat roof constructions can be obtained with Mannok Therm Flat Roof Insulation as indicated in Table 2. Calculations were performed to IS EN ISO 6946^[10].

Metal Deck*	
U-value (W/m²K)	Thickness (mm)
0.25	95
0.22	105
0.20	115
0.18	130
0.16	145
* Lightweight metal deck, Mannok Therm Flat Roof Insulation, waterproofing membrane, 5 fixings per m ²	
Concrete Deck**	
0.25	85
0.22	100
0.20	110
0.18	125
0.16	140
** 150mm concrete deck, 50mm screed, Mannok Therm Flat Roof Insulation, waterproofing membrane, 5 fixings per m ²	

Table 2: Required Thickness of Mannok Therm Flat Roof Insulation for different U-values

4.7 RESISTANCE TO SOLVENTS, FUNGI AND SOLVENTS

Mannok Therm Flat Roof Insulation boards do not promote infestation, as there is no food value in the materials used. They also resist attack by mould and microbial growth. The insulation is not resistant to some solvent-based adhesive systems, particularly those containing methyl ethyl ketone. Adhesives containing such solvents should not be used in association with the boards. Boards which have been in contact with harsh solvents, petrol, mineral oil or acids, or boards that have been damaged in any other way should not be used.

4.8 DURABILITY

Mannok Therm Flat Roof Insulation is rot proof and durable. As roof insulation, Mannok Therm Flat Roof Insulation is judged to be stable and will remain effective as an insulation system for the life of the building, so long as it is installed in accordance with this Detail Sheet.

4.9 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE THE FOLLOWING:

- Density
- Water vapour transmission
- Long term water absorption
- Dimensional accuracy
- Compressive and cross breaking strength
- Dimensional stability
- Thermal conductivity
- Efficiency of the construction process

4.10 OTHER INVESTIGATIONS

- (i) Existing data on product properties in relation to fire, toxicity, environmental impact and the effect on mechanical strength/stability and durability were assessed. Mannok Therm Flat Roof Insulation does not contain CFC or HCFC gas and has zero ODP.
- (ii) The manufacturing process was examined including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.
- (iii) Site visits were conducted to assess the practicability of installation and the history of performance in use of the product.

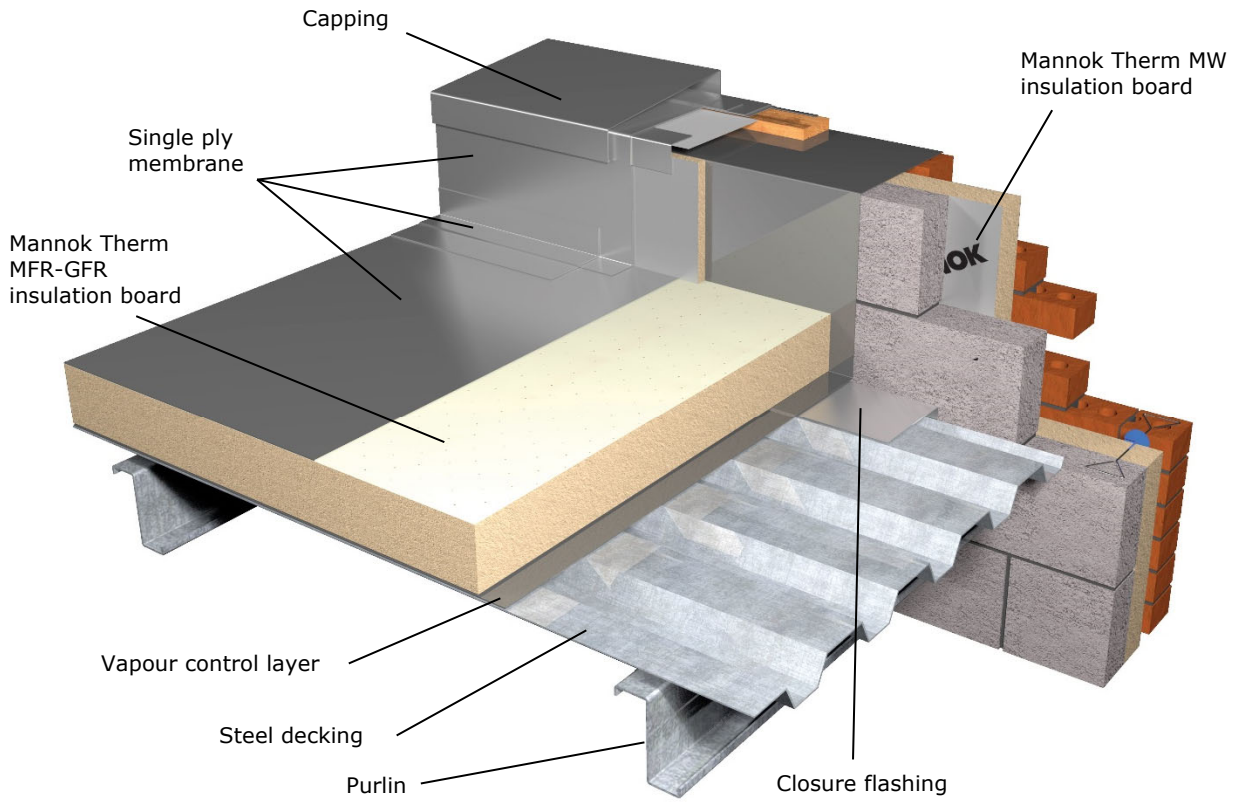


Figure 1: Metal Deck Roof

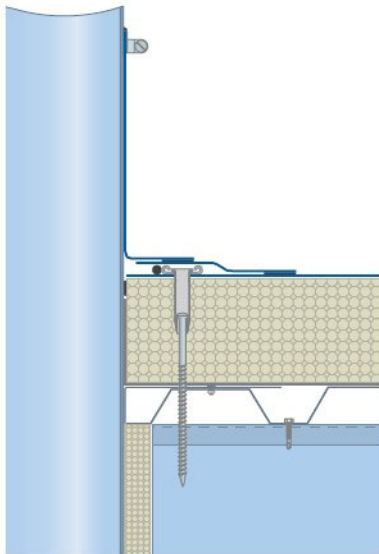


Figure 2: Pipe Penetration

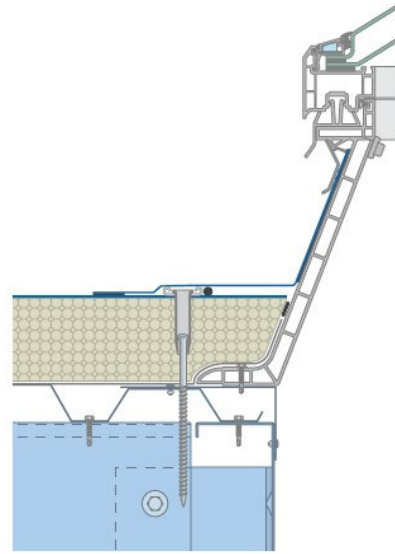


Figure 3: Rooflight Penetration

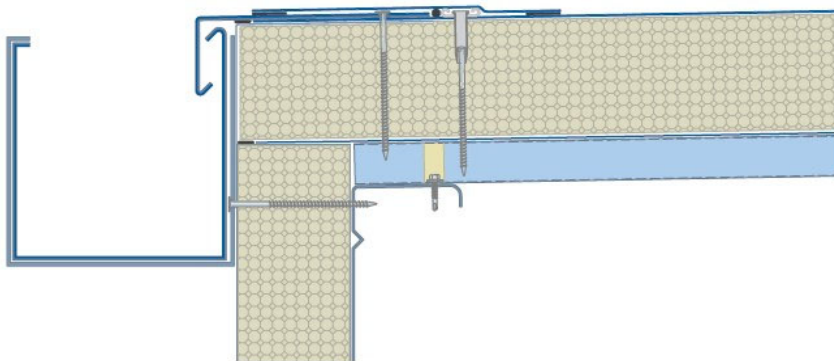


Figure 4: Eaves Gutter

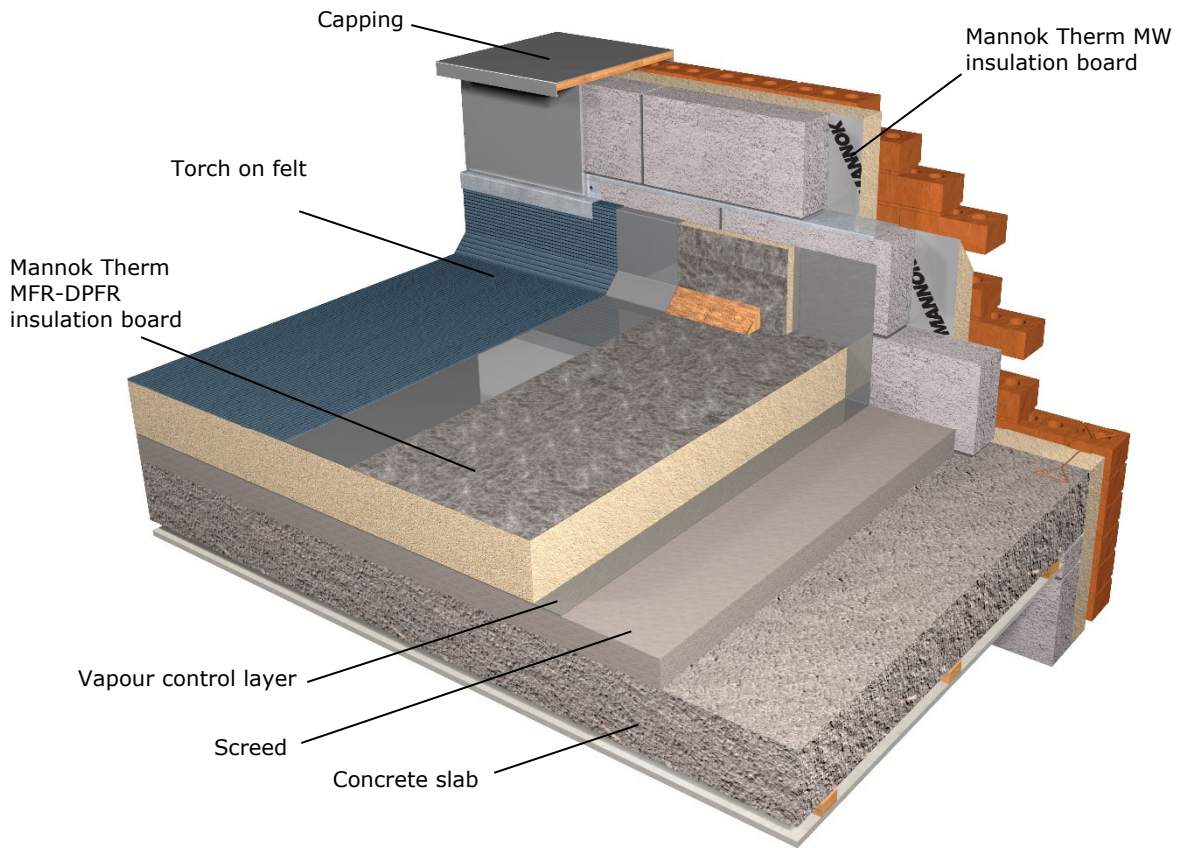


Figure 5: Concrete Deck Roof

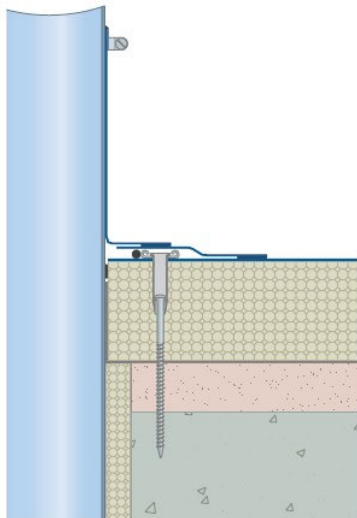


Figure 6: Pipe Penetration

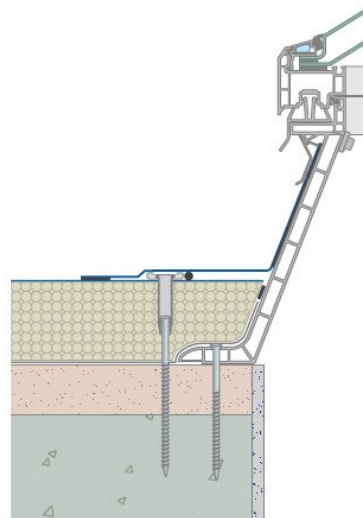


Figure 7: Rooflight Penetration

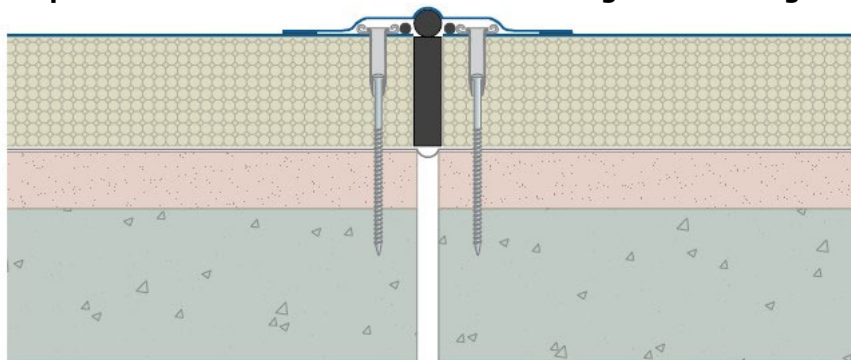


Figure 8: Movement Joint