

Installation Guidelines

INOFIN FR

(FPO roofing membrane, with an integrated combination of glass fabric and fleece) according EN 13956.

DE/E1 FPO-BV-V-(GV/GG)-1.5 (-1.8/-2.0)

Version: 11/2015

Installation Guidelines for INOFIN FR

(Roofing membrane based on flexible polyolefins FPO)

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1. Determining the local conditions

1.1 Condition of the deck substrate and requirements for the load-bearing structure

- Inspect and approve the dead loads for the roofing layers.
- Cast-in-situ reinforced concrete decks and precast concrete decks (are to be checked for their suitability before work commences.
- The surfaces should be dry, flat, run continuously without interruption and be free of honeycombing and foreign bodies.
- Joints between prefabricated concrete decks must be fully mortared (exception: building expansion joints).
- Deck substrates such as sarking boards, plywood, trapezoidal steel sheet, etc. must be sufficiently stiff and installed on load-bearing substructure.

Defects arising from the provision of services by other contractors, insofar as they can be identified during a visual inspection and which could negatively influence the design and function of any subsequent work, **must be reported in writing before the provision of your own services**

1.2 Condition of the roofing layers for refurbishment work

In order to be able to determine the condition of the existing roof construction, it will be necessary to cut core samples through the old roof layers. This will facilitate the inspection of the vapour barrier, adhesion to the deck substrate and the adhesion of individual layers to one another, the resistance to moisture penetration of the thermal insulation, any possibly existing cavities, blistering, etc.).

Before issuing an invitation to tender, the builder should commission a roof condition survey of the existing roof construction. Otherwise any necessary additional tasks that are not contained in the project specification may have to be approved based on a supplementary quotation.

Attention:

Thermal insulation materials below the vapour barrier have a negative effect on the dew point location. When carrying out waterproofing measures on hollow core slabs, aerated concrete, pumice concrete or similar, the heat-insulating layer must be augmented so that the point at which condensation may occur is located above the vapour barrier. The dew point location and the water vapour/diffusion conditions must be established!

2. Installing INOFIN FR

2.1 Information on storage

The rolls are to be protected against moisture and frost until they are used. Do not store the rolls directly on the surface of the roof but always raised (pallets).

2.2 Preparing the surfaces

Alongside the previously described requirements for the load-bearing structure, it must be ensured that the surfaces have been thoroughly cleaned and any standing water removed before the subsequent construction of the additional roofing layers.

When laying the membrane directly on rough substrates, concrete, screed or wood, it is always necessary to use a protective / separating layer of WITEC PES protection fleece 300 g/m².

2.3 Loose laying

The INOFIN FR roofing and waterproofing membranes are loose laid, welded at the seams and secured in place with either a ballast of gravel with a grain size of 16/32 mm (min. coverage 50 mm), green roofs or interlocking preformed concrete stone elements (no parquet stones) or concrete slabs on a protective layer or gravel cover secured against wind lift in accordance with EN 1991.

In the case of gravel that does not meet the standard (sharp-edged or sharp pieces of broken gravel) or if the gravel is applied through blasting, a protective layer of e.g. WITEC PES protection fleece (300 g/m²) is to be laid on the waterproofing.

Suitable coverings, which at the same time provide protection against wind lift, can consist of green roofs, preformed concrete stone elements (on a protective layer and a sand bed), concrete slabs (on gravel, support pads or mortar bags) or screed with a tile covering (on sliding support made out of double-laid 0.2 mm thick PE film).

In general, linear fasteners must be fitted in all roof channels (valleys, gulleys), in front of all upstands (such as parapets, walls, roof protrusions, steps, etc.) and on roof trims (see 2.6).

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2.4 Mechanically fixed laying

Loosely lay the INOFIN FR waterproofing membrane and mechanically fix it in place in the area where the seams overlap by at least 10cm using fastening elements (e.g. plate fasteners and screws).

When laying the membrane on flammable insulating materials (EPS), a fire protection layer is not required.

Assessing the required number of mechanical fixings can generally be carried out using a separate calculation of the wind load in accordance with EN 1991 for the specific building.

WOLFEN's technical department can if requested carry out the necessary wind uplift calculations to determine the frequency of mechanical fasteners. Should these calculations be requested they will be made available to the customer once an order has been placed.

Depending on the geometry of the trapezoidal steel sheet, the number of mechanical fixings required may be greater in practice. The INOFIN FR membranes are to be adapted to these requirements. Therefore, it may be necessary, for example, to start with single or multiple strips of the INOFIN FR waterproofing membrane around the outside before the maximum width of the membrane can be used or to additionally fix the INOFIN FR waterproofing membranes in place in the centre of the membrane and to weld a strip of INOFIN FR over this fastener.

It is also generally necessary when using mechanical fixing that linear fasteners are fitted in all roof channels (valleys, gulleys), in front of all upstands (such as parapets, walls, roof protrusions, steps, etc.) and on roof trims (see 2.6).

2.5 Joining techniques and seam overlaps

General: Carry out test welds on the INOFIN FR membrane before completing the welding work!

The INOFIN FR welding instructions must be observed.

2.5.1 Loose laying under ballast

The seam overlap must be at least 40 mm wide and welded to a width of at least 20 mm using hot air welding.

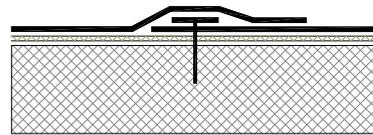
It is absolutely prohibited to use an adhesive.



2.5.2 Mechanically fixed installation

The arrangement of the fastening elements must be carried out so that there is still a clearance of 2 cm to the edge of the membrane. The seams between the individual membranes should be overlapped so that a welding area of at least 4 cm still remains in front of the fastening elements.

In front of the fastening elements, the membrane seams are to be welded to a width of at least 20 mm using hot air welding. It is absolutely prohibited to use an adhesive.



2.5.3 End joints and pre-cut sections

In the case of end joints and pre-cut sections, the membranes are to be welded as previously described. In order to prevent the formation of capillaries where there are multiple overlaps (T-butt joints), the welding areas at the transition to the underlying membrane are to be chamfered and particularly carefully welded. Also see here the INOFIN FR welding instructions.

2.6 Measures for absorbing horizontal forces in the waterproofing layer or additional measures required for changes in the angle of the roof slope over 3° (5.2 %)

At the base of upturned beams, wall connections, roof valleys, roof steps, suspender beams, protrusions and roof trims, mechanical fastening of the roofing membrane is required to absorb horizontal forces. This is preferably to be completed using INOFIN coated metal sheet profiles. Alternatively, it is permitted to fasten the membrane in place using WITEC Rail KF (fastening/spacing in accordance with Table 2.6).

If connections and finishes are completely made out of INOFIN F coated metal sheet profiles, these will also serve at the same time to absorb horizontal forces.

The fasteners used for absorbing the exerted tensile force are to be compatible with the type and strength of the substructures. The fastenings must be assessed for tensile forces of at least 2.5 kN/m.

If auxiliary structures or substructures are required to absorb the tensile forces, these are to be fixed in place

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in such a way that they absorb the tensile forces from the linear fasteners. For this reason, it may be necessary to increase the number of mechanical fixings in comparison to those stated in Table 16 "Information for wooden materials". If required, an individual building-specific calculation is to be carried out.

The types of fastenings listed in Table 2.6 below have proven themselves in practice.

Table 2.6

Proven types of fastening			
To fasten: Substructure	Wooden plank thickness >3 cm width > 8 cm	INOFIN F coated metal steel sheet bracket, hori- zontal arm min. 40 mm	WITEC Rail KF
Reinforced concrete	Dowel 10 mm with screw 8 mm Spacing ≥ 30 cm or Spike twister from SFS intec spacing ≥ 30 cm	Dowel 10 mm with screw 8 mm Spacing ≥ 30 cm or Spike twister from SFS intec spacing ≥ 20 cm	Dowel 10 mm with screw 8 mm Spacing ≥ 21 cm or Spike twister from SFS intec spacing ≥ 21 cm
Lightweight concrete	Nail anchor ≥ 8 mm Spacing ≥ 30 cm	Nail anchor ≥ 8 mm Spacing ≥ 12 cm	Nail anchor ≥ 8 mm Spacing ≥ 21 cm
Wooden beams, wooden sarking, chipboard	Wood screw ≥ 8 mm Spacing ≥ 30 cm	Wood screw 4.5/30 mm Spacing ≥ 15 cm	Wood screw 4.5/40 mm Spacing ≥ 16 cm
Trapezoidal sheet metal	Self-drilling screw Ø 4.5 mm Spacing 20 cm	Steel blind rivet Ø 5 mm Spacing 12 cm	Self-drilling screw Ø 4.5 mm Spacing ≥ 21 cm

Mechanical fixing types that are compatible and approved for the substructure are to be used. The mechanical fixings must be installed so that they do not exert any damaging effect on the waterproofing membranes.

As an alternative to fastening with linear profiles, it is also possible to use approved individual fasteners (plate fasteners and screws) with a maximum spacing of 250 mm on buildings with a height of up to 12 m without internal pressure and not in wind exposed locations.

It is not permitted for these fastenings to be additionally used for protecting the roofing layers against wind lift.

3. INOFIN F coated metal sheet and profile system

3.1 INOFIN F universal coated metal sheet system

INOFIN F coated metal sheet profiles are required as connecting and trim profiles for wall connections, roof trims, etc. when laying INOFIN FR membranes. They are cut and chamfered from INOFIN F coated metal sheet plates.

When installing on cement-based substrates, a separating layer made out of e.g. WITEC protection fleece 300 g/m² should be fitted.

The profile butt joint, 5 mm wide, is sealed over with at least 25 mm wide crepe strips and welded tight with at least 100 mm wide strips of INOFIN F. Joint connectors are additionally required for composite sheet verge flashing.

The required fastening measures for absorbing the horizontal forces are described under Section 2.6.

Coated metal sheet profiles, such as verge flashing profiles, must be connected to the substructure in such a way that they can withstand the relevant wind loads. If required, an individual building-specific calculation is to be carried out in accordance with EN 1991. When installing on cement-based substrates, a separating layer made out of e.g. WITEC protection fleece 300 g/m² should be fitted.

Depending on the width of the external vertical leg of the coated metal sheet profile and the height of the building, it may be necessary to install additional wind tape or continuous flashing.

4. Connections to upstands and roof edges

Connections to walls, angular protrusions, etc. must extend at least 150 mm above the upper edge of the roof covering (gravel cover, panel covering, earth covering, etc.) for roof slopes up to 5° and at least 100 mm for steeper roof slopes.

The height of the roof edge must extend at least 100 mm above the upper edge of the roof covering (gravel cover, panel covering, earth covering, etc.) for slopes up to 5° and at least 50 mm for steeper roof slopes.

The external vertical leg (cover plate) for covers or verge flashing profiles must overlap the upper edge of the rendering or cladding by at least 50 mm for buildings with heights up to 8 m, by at least 80 mm for buildings up to 20 m and by at least 100 mm for buildings over 20 m. The drip edge on the cover plates must be aligned at a distance of at least 20 mm from those building components to be protected. In the case of copper, a distance of at least 50 mm must generally be maintained.

Connections and finishes are generally to be made windtight. A suitable method for achieving this is e.g. to lay wind sealing tape under a coated metal roof trim.

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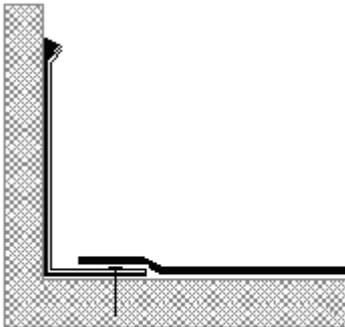
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Roof edges should have a distinct incline to the roof side so that rainwater can run off.

4.1 Connections to upstands with INOFIN F coated metal sheet profiles

Position and install the horizontal leg. The horizontal leg of the profile is bent at an angle of 100° so that its front lip will also nestle against the horizontal surface even if the shape of the substructure is not continuously straight. It is fastened in place on the horizontal leg in accordance with the guidelines in Table 2.6. On the upper vertical edge, the coated metal sheet profile must be additionally fixed in place at a spacing of 250 mm, the fastening points must be welded tight using INOFIN F discs.

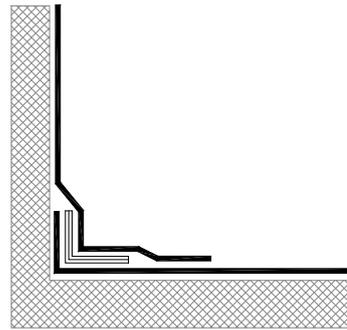
Weld the INOFIN FR waterproofing membrane from the surface of the roof onto the coated metal sheet profile. Protect any water running behind the profiles using a suitable sealant.



4.2.1 Loose installation in the junction between the roof and upstands

Run the INOFIN FR waterproofing membrane from the surface of the roof along the foot of the upstand approx. 8 cm up the vertical plane. Install linear fasteners made out of INOFIN F coated metal sheet (alternatively WITEC Rail KF) in the junction between the roof and the upstand using mechanical fixings that are suitable for the respective substructure in accordance with Table 2.6.

Cut strips of INOFIN FR waterproofing membrane to the required dimensions. Correctly align the connecting membrane and fasten or weld it to the upper flashing. The connection to the waterproofing membrane on the surface of the roof is made using hot air welding.

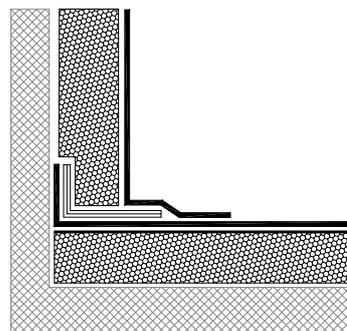


4.2.3 Loose installation in the junction between the roof and thermally insulated upstands

Run the INOFIN FR waterproofing membrane from the surface of the roof along the foot of the upstand approx. 8 cm up the vertical plane.

Install linear fasteners made out of INOFIN F coated metal sheet (horizontal arm at least 5 cm + the thickness of the insulation material) or alternatively WITEC RAIL KF in the junction between the roof and the upstand using mechanical fixings with countersunk heads that are suitable for the respective substructure in accordance with Table 2.6.

Cut strips of INOFIN FR waterproofing membrane to the required dimensions. Correctly align the connecting membrane and fasten or weld it to the upper flashing. The connection to the waterproofing membrane on the surface of the roof is made using hot air welding.



4.3 Intermediate fastening

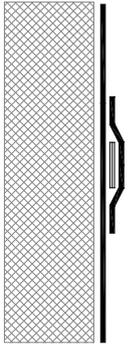
In the case of connection height greater than 50 cm (loose laid connecting membranes) and greater than 100 cm (connecting membranes laid with adhesive), it is necessary to fit an additional intermediate fastening halfway up the connection height or every 50cm/100cm.

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4.3.1 Intermediate fastening to upstands

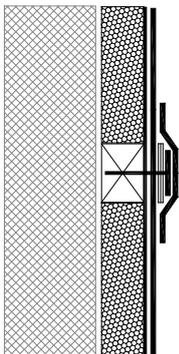
A strip of coated metal sheet (cut to a length of 7 cm, at least 1 cm on both sides folded over by 180°) or a WITEC Rail KF is to be installed half way up the connection height or every 50cm/100cm (max. fastening distance 21 cm). A strip of INOFIN FR waterproofing membrane is to be welded over this intermediate fastening.



4.3.2 Intermediate fastening to thermally insulated upstands

An auxiliary construction consisting of a timber section (dimensions: at least 5 cm x the thickness of the installed vertical layer of thermal insulation) or similar is required half way up the connection height.

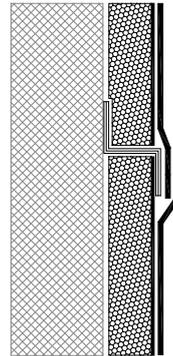
A strip of coated metal sheet (cut to a length of 7 cm, at least 1 cm on both sides folded over by 180) or a WITEC Rail KF is then to be installed (fastening distance in accordance with Table 2.6). A strip of INOFIN FR waterproofing membrane is to be welded over this intermediate fastening.



4.3.3 Intermediate fastening to thermally insulated upstands

A Z-shaped coated metal sheet profile is to be installed half way up the connection height (fastening distance

20 cm). The two-pieces of the connecting membrane are to be welded on to it.

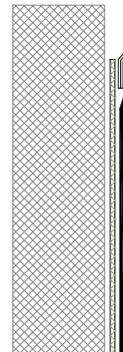


4.4 Flashing on upstands

4.4.1 Flashing with coated metal sheet

The upper flashing of the connection is created by fitting INOFIN F coated metal sheet profiles (fastening distance 20 cm), together with elastic sealing to prevent any water running behind the profiles using a suitable sealant.

The INOFIN FR vertical waterproofing membrane is then welded in this case to the coated metal sheet profile.

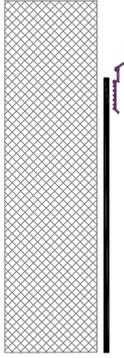


4.4.2 Flashing with termination profiles

The upper flashing of the connection is created by fitting termination profiles, together with elastic sealing to prevent any water running behind the profiles using a suitable sealant.

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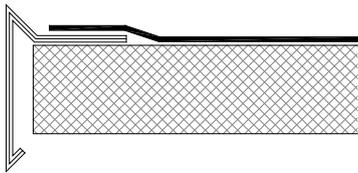


4.5 Roof edges

4.5.1 Roof edges for eaves

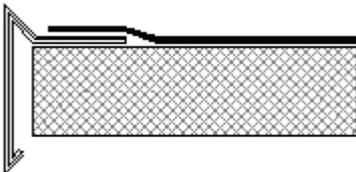
Install INOFIN F coated metal sheet eave profiles of a suitable shape and fit flush to the external edge of the building (fix the horizontal leg in accordance with Table 2.6).

Weld the INOFIN FR waterproofing membrane from the surface of the roof onto the horizontal leg and over the fastening points on the leg.



4.5.2 Roof edges with INOFIN F coated metal sheet profiles

Install INOFIN F coated metal sheet verge flashing profiles of a suitable shape and fit flush to the external edge of the building (fix the horizontal leg in accordance with Table 2.6). Depending on the height of the building and/or the height of the cover plate, it may be necessary to install wind tape or continuous flashing. Weld the INOFIN FR waterproofing membrane that runs to the edge of the building onto the horizontal leg and over the fastening points on the leg.



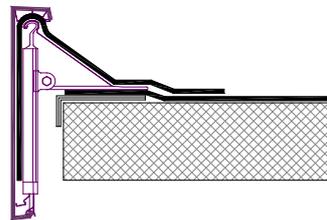
4.5.3 Roof edges with multi-piece metal clamping profiles

Install INOFIN F coated metal sheet brackets (e.g. 3/7cm) professionally and flush to the external edge of the building (press the 3 cm high vertical leg to the exterior of the building and fasten the 7 cm wide horizontal leg at least every 25 cm).

Weld the INOFIN FR waterproofing membrane that runs to the edge of the building onto the horizontal leg and over the fastening points on the leg.

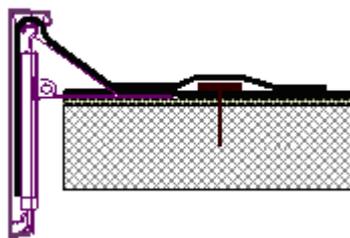
Install the basic structure of the multi-piece metal clamping profile onto at least 3 mm thick NEOPRENE discs according to the manufacturer's instructions so that the screw protrusions cannot cause any leaks in the waterproofing (also install rigid waterproof plates between the screw head and the profile mount).

Clamp the strip of INOFIN F designed to hang in the profile in place using the corresponding mechanism and weld the free section of the waterproofing membrane.



In the case of existing multi-piece metal clamping profiles immediately in front of the basic structure of the clamping profile, fasten a strip of INOFIN F coated metal sheet (cut to a length of 7 cm, at least 1 cm on both sides folded over by 180°) into the substructure at least every 20 cm along the INOFIN FR waterproofing membrane that runs to the profile.

Clamp the strips of INOFIN F designed to hang in the profile in place using the corresponding mechanism and weld together the free section of the waterproofing membrane and the strips of coated metal sheet.



The fastening and installation of the profile is to be carried out in accordance with the instructions issued by the relevant manufacturer.

4.5.4 Roof edges with wall capping profiles

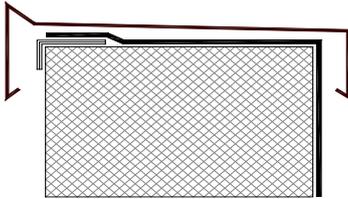
Install INOFIN F coated metal sheet brackets (e.g. 3 cm/7cm legs) flush to the external edge of the building (press the 3 cm high vertical leg to the exterior of the building and fasten the 7 cm wide horizontal leg at least every 25 cm).

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Weld the INOFIN FR waterproofing membrane that runs to the edge of the building onto the horizontal leg and over the fastening points on the leg.

Install the wall capping profile mount onto at least 3 mm thick NEOPRENE discs according to the manufacturer's instructions so that the screw protrusions cannot cause any leaks in the waterproofing at the top of the parapet (also install rigid waterproof plates between the screw head and the profile mount).



5 Enclosing the bases for skylights and square-edged mounted parts

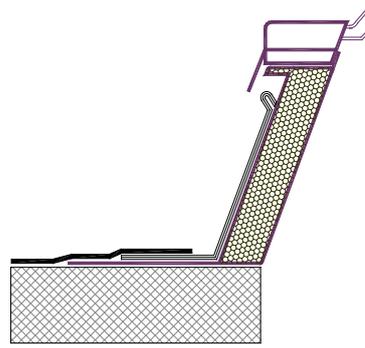
5.1 Enclosing with INOFIN F coated metal sheet profiles

Fit INOFIN F coated metal sheet profiles, bent 3 times, to the vertical or slanting base. Cut the outer edges to length where required. Apply a strip of WOLFINATOR onto the primer coating on the upper edge of the base, press the INOFIN F coated metal sheet profile into the elastic sealing and fix the at least 50 mm wide horizontal leg using mechanical fixings suitable for the respective substructure at a distance of at least every 150 mm through the horizontal flange of the base. Seal the faces and corners of the profile with 25 mm wide separating strips and weld 150 mm wide strips of INOFIN F over them.

When the base for the skylight is fitted with flashing, the vertical or slanting legs are pushed underneath or clamped in place. If the flashing is rainproof, there is no need for the elastic sealing.

Weld the INOFIN FR waterproofing membrane from the surface of the roof onto the horizontal leg and over the fastening points on the leg.

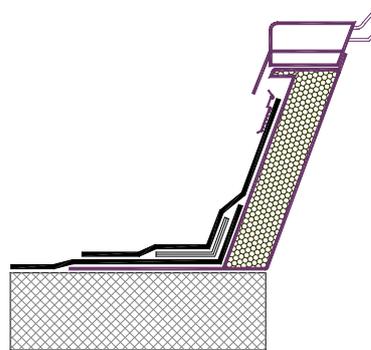
When the base for the skylight is fitted with flashing, the vertical or slanting legs are pushed underneath or clamped in place. If the flashing is rainproof, there is no need for the elastic sealing.



5.2 Enclosing with INOFIN FR waterproofing membrane

Run the INOFIN FR waterproofing membrane from the surface of the roof approx. 8 cm up the base for the skylight, install linear fasteners out of INOFIN F coated metal sheet or WITEC Rail KF in the junction between the roof and the upstand through the horizontal flange of the base for the skylight using mechanical fixings with countersunk heads that are suitable for the respective substructure.

Cut strips of INOFIN FR waterproofing membrane to the required dimensions. Align and run the connecting strips onto the waterproofing membrane on the surface of the roof and weld together. For the upper connection, see section for flashing on upstands.



6. Connecting to drains

The standard method is to connect the INOFIN FR waterproofing membrane to INOFIN stainless steel drainage elements or drainage elements with a flange out of INOFIN membrane or to drainage elements constructed with screw flanges. When creating the flange, the connection to the waterproofing membrane on the surface of the roof must be made with a separate INOFIN F membrane sleeve. The relevant processing guidelines issued by the manufacturer must be observed.

Note: National standards must be observed.

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7. Enclosing pipes

The standard method for connecting INOFIN FR waterproofing membrane to the penetrating pipes is to use sections of INOFIN F membrane cut to size.

A base sleeve of INOFIN F membrane or a heat formed flange with an opening in the middle that has been made after warming is firstly pulled over the pipe and welded together with the waterproofing membrane on the surface of the roof around the pipe. Then fit the pipe with an INOFIN F membrane covering with an edge that has been made after warming and weld tight vertically in the overlapping areas. Finally, connect to the base sleeve by welding (if necessary, reduce the welding temperature). The upper flashing is achieved using a hose clamp suitable for the circumference of the pipe and sealed.

8. Building expansion joints

Expansion joints are construction joints that need to be carefully taken into account when waterproofing the roof and selecting the roofing layers. The vapour barrier as well as insulation, waterproofing and, where relevant, usable surface layers need to be installed so that they can accommodate movements in all three possible dimensions without causing any damage. Depending on the type and size of the movements, it is necessary to differentiate between Type I joints and Type II joints.

Type I joints

are joints for slow, unique or rare movements

- of 15 mm exclusively vertically to the waterproofing
- of 20 mm exclusively parallel to the waterproofing, although only 10 mm when shearing also occurs in the waterproofing level.
- of 15 mm with a combination of settling and expanding, although only 10 mm when shearing also occurs in the waterproofing level

In these cases, it is possible to run the waterproofing layer across the joint when laying the membrane loosely. If the waterproofing layer is laid directly over the joint, protective strips are to be arranged under the waterproof layer. The protective strips can be omitted if there is an effective separating layer fitted between the waterproofing layer and the substrate. Depending on the range of the movement, the waterproofing membranes are to be supported in the area around the joint.

Type II joints

are joints with quickly moving and often repetitive movements, as well as joints according to Type I where the stated dimensions have been exceeded.

Joints of Type II are to be individually planned in each case and adapted to the local conditions and requirements. Joints of Type II are generally to be raised out of the water-carrying level using insulating wedges or upturned beams. Parts of the roof surface that are separated due to the arrangement of a Type II expansion joint are to be drained independently of one another.

Please contact our Technical Department when Type II expansion joints need to be created. We will submit a building-specific design proposal that is based on the expected movement and the type of installation used for the waterproofing membranes.

9. Notes

The current INOFIN FR / FR V Installation Guidelines are to be observed for the skilled handling of INOFIN FR waterproofing membranes and INOFIN system parts.

The above information corresponds to the latest technical standards, as is documented, for example, in the German Flat Roof Guidelines for DIN 18531 and DIN 18338. Furthermore, they correspond to our current state of knowledge gained through the development and production of INOFIN FR, as well as the findings from the practical use of the product.

Other local conditions or the use of a combination of materials that are not described in these installation guidelines may have an influence on the functionality of the product. Sufficient practical tests should be carried out.

Any fitting of the waterproofing membranes that deviates from these guidelines as a result of changed local conditions or combinations of materials requires our written approval, otherwise we accept no liability for the suitability of our waterproofing membranes for the described applications.

All previous versions become invalid upon publication of these installation guidelines.

If any questions arise, you should seek expert advice.

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