BMI WOLFIN

Wolfin

Installation instructions
Last updated 07/2020

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Content

Installation guidelines

Wolfin membranes are bitumen-resistant polymer plasticised synthetic roofing and waterproofing membranes.

For applications and physical values, see Pt. 2 and the current technical information for the respective type of membrane.

1. DETERMINATION OF LOCAL CONDITIONS

1.1 CONDITION OF THE ROOF SUBSTRATE AND REQUIREMENTS FOR THE LOAD-BEARING STRUCTURE

- Load from the roofing layers tested and approved by structural designer.
- Cast-in-situ reinforced concrete ceilings and precast concrete ceilings are to be checked for their suitability (in accordance with the national requirements) before work commences.
- The surfaces should be dry, rubbed down, run continuously without interruption and be free of gravel and foreign particles.
- Joints between prefabricated concrete ceilings must be fully mortared (exception: building expansion joints).
- Roof substrates such as timber formwork, wooden composite boards, trapezoidal steel sheet, etc., must be sufficiently stiff and installed on a 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 layers in the roof construction, it will be necessary to create roof openings (inspection of the vapour barrier, adhesion to the roof substrate and the adhesion of individual layers to one another, degree of moisture penetration in the thermal insulation, any possibly existing cavities, blistering, etc.).

When refurbishing old roofs on substrates susceptible to vibrations (e.g. trapezoidal steel load-bearing layers), the existing roofing layers should be fixed to the substrate. This can be achieved by fixing the new roofing layers mechanically to secure the waterproofing in place. When refurbishing old bitumen roofs, corrosion-resistant screws must be used to fix the waterproofing in place.

Other roof structures, such as the refurbishing of synthetic roof waterproofing, should be clarified in detail with the respective application technique office.

WARNING

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 positive moisture balance of the construction must be verified and proven by means of calculation where necessary!

2. MEMBRANE TYPES AND PROCESSING

The following membrane types are available in the Wolfin membrane range for various applications and installation types.

TYPE	MEMBRANE CHARACTERISTIC	APPLICATION	TYPE OF INSTALLATION
Wolfin IB	Homogeneous membrane	Waterproofing membrane/ detail points (e.g. pipe edging, metal composite sheet joints)	■ Loose laid under ballast
Wolfin M	Central reinforcement	Waterproofing membrane/ connections and trims	■ Loose laid under ballast ■ Mechanically fixed
Wolfin M FR	Central reinforcement and additional flame protection equipment	Waterproofing membrane/ connections and trims	■ Mechanically fixed
Wolfin GWSK / GWSK DA	Central inlay and self-adhesive layer on the bottom side	Waterproofing membrane/ connections and trims	■ Bonded with self-adhesive layer
Wolfin PBS	Central inlay and torchable bitumen layer on the bottom side	Waterproofing membrane, absolutely fully adhered	■ Bonded with torchable bitumen layer

A separate installation guideline is available for Wolfin PBS.

2.1 WELDING TECHNIQUE AND SEAM OVERLAP

Wolfin synthetic roofing and waterproofing membranes can be connected in a permanently waterproof manner with hot air (warm gas) and solvent welding (Tetrahydrofuran). Test welding should always be undertaken before welding the roofing membranes!

The minimum joint width of waterproofing and connecting membranes is:

- min. 20 mm with hot air welding
- min. 30 mm with cold welding

More information and specifications on welding can be found in the Wolfin welding instructions chapter from page 31.

The minimum overlap depends on the type of installation and the type of membrane and can be found in the following table:

MEMBRANE TYPE	TYPE OF INSTALLATION	MIN. OVERLAP
Wolfin IB	Loose laid under ballast	40 mm
Wolfin M / M FR	Loose laid under ballast (only M)	40 mm
	Mechanically fixed	100 mm
Wolfin GWSK / GWSK DA	Bonded with self-adhesive layer	55 mm
Wolfin PBS	see separate installation guideline	

Membranes laminated on the bottom side (Wolfin GWSK/GWSK DA) are overlapped by approx. 20 mm in the head butt area and welded over with a strip of Wolfin M or IB at least 15 cm wide.

3. INSTALLATION

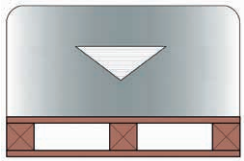
When installing Wolfin roofing and waterproofing membranes, additional measures are required for installation at temperatures below +5 °C.

These can include:

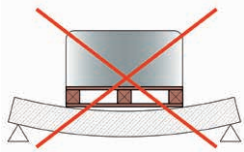
- Storage of the membranes at room temperature
- Warming of the prepared installation surface
- Immediate installation of preheated membranes

3.1 INFORMATION ON STORAGE

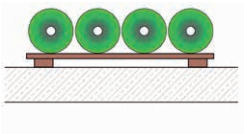
The rolls are to be protected from moisture until they are used. Do not store the rolls directly on the surface of the roof but instead always raised (pallets).



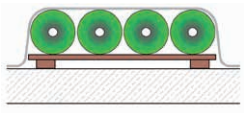
Pallet weight up to 1,200 kg, depending on membrane type. Intermediate storage on the roof in rolls, protected from moisture.



Check the load-bearing capacity of the roof. Take special care with trapezoidal sheet and wooden structures.



Keep rolls dry. Raise rolls, for example, on boards.



Cover rolls in the event of rain. Damp membranes can lead to problems during welding.

3.2 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 further roofing layers.

When laying the membrane directly onto rough substrates, such as concrete, screed or wood, it is always necessary to use a suitable separation or protection layer (e.g. Witec PES 300 g/m² protection fleece).

For GWSK/GWSK DA type:
To ensure flawless bonding on the substrate, adhesive substrates must be completely dry and the surface must be level (no bubbles, wrinkles, recesses, etc.). If this is not the case, any unevenness should be removed. Depending on the substrate, the application of a suitable levelling layer (e.g. Witec laminated layer SK, Witec underlay membrane or suitable bitumen membrane) is necessary as an adhesive substrate.

For the direct bonding of Wolfin GWSK/GWSK DA membranes to insulation layers, these must be laid level. Joints should be filled in, height differences should be levelled. It is advisable to cover significant unevenness (joints, height differences) with a membrane strip of Witec underlay membrane SK or Witec laminated layer SK. Unevenness from the substrate can also become apparent on the surface of the membranes due to the full-surface bonding. Direct bonding of Wolfin GWSK to insulation material is only permitted if the insulation material is bonded securely with the insulation adhesive Teroson EF TK 395. Direct bonding of Wolfin GWSK DA to insulation material is not approved.

The use of PU adhesive foams from other manufacturers is not permitted for warranty reasons.

Table 1 lists the possible adhesive substrates and their pre-treatment.

Wolfin adhesive primer and Wolfin special adhesive primer can be used for Wolfin GWSK /GWSK DA black. The quantity of both adhesive primers used is approx. 0.3 kg/m².

Only the special adhesive primer can be used for Wolfin GWSK grey.

Table 1

SUBSTRATE	SURFACE CHARACTERISTICS	WOLFIN SPECIAL ADHESIVE PRIMER REQUIRED?
Bitumen membranes	coated with talcum powder, mineral-coated	yes
APP bitumen membranes	Unsuitable as a substrate for bonding	
Old bitumen	weathered/cracked and/or soiled	yes
Concrete	rubbed smooth	yes
Metal	grease-free, dust-free	no
EPS-DAA dh / dm	dust-free	no
Mineral fibreboard with mineral fleece lamination	dust/fibre-free	yes*
PUR/PIR, laminated with mineral fleece	dust/fibre-free	yes*
PUR/PIR, laminated with aluminium	grease-free, dust-free	no*
Wooden composite board in accordance with EN 13986 (OSB/3 or OSB/4)	Dust-free, with decoupling strip (width approx. 50 mm) over the board joint	yes

* Approval of the insulation material manufacturer required

The installation of self-adhesive membranes at temperatures below 8 °C (surface temperature) may have a negative impact on the visual appearance and the initial bonding. Additional measures, called winter construction measures, should thus be taken at low temperatures.

3.3 FIRE PROTECTION/EXTERNAL FIRE

For all roof structures, the specifications regarding "protection against spreading fire and radiant heat" (external fire) must be observed. Tested superstructures can be requested from the Technical Support department.

3.4 METHODS OF SECURING THE POSITION

3.4.1 LOOSE LAYING UNDER BALLAST

The synthetic roofing and waterproofing membranes are laid loosely and welded at the seams. A protective layer made from e.g. Witec PES protection fleece (300 g/m²) or Witec KV pro is laid on the waterproofing. The membrane is secured against wind lift using ballast (e.g. gravel with a grain size of 16/32 mm, green roof, etc.).

EN 1991 1-4 and additional national requirements have to be observed.

For green roofs, the dry weight of the substrate is always decisive for securing the roof against wind lift.

3.4.2 MECHANICALLY FIXED INSTALLATION

The synthetic roofing and waterproofing membranes (Wolfin M/M FR) are laid loosely, mechanically fixed in place in the area where they overlap using fixing elements (e.g. type BMI Drill-Tec) and welded at the seams. The edge of the retaining plate must be min. 20 mm from the outer edge of the membrane due to the homogeneous membrane edge. For cut membranes without a homogeneous edge, the distance to the outer edge of the membrane is at least 10 mm.

The fixing plate must not impede proper, tight welding.

EN 1991 1-4 and additional national requirements have to be observed.

3.4.3 FULL-SURFACE BONDING WITH SELF-ADHESIVE LAYER

The self-adhesive roofing and waterproofing membranes (Wolfin GWSK/GWSK DA) are bonded onto the entire surface of the substrate and pressed on. The membranes are then welded in the seam area. The following variants can be applied for installing the membranes and removing the protective film on the back:

Version 1
Roll out the membranes, align them, half roll them back, scratch the separating film slightly, peel off and then immediately press on the membranes, e.g. with a wide broom, without leaving any cavities. Roll back the unbonded half of the membrane and affix as described above.

Version 2
Roll out the membranes, align them, pull out the separating film sideways and then immediately press on the membranes, e.g. with a wide broom, without leaving any cavities.

EN 1991 1-4 and additional national requirements have to be observed.

3.5 REQUIREMENT TO WITHSTAND HORIZONTAL FORCES

To withstand horizontal forces, a continuous, linear fixing must fundamentally be installed made of coated metal profiles (e.g. angled coated metal profile, cut section min. 100 mm, horizontal leg min. 50 mm), Witec bar KF or single fixings with screw and plate. The number of fixings to be used can be found in the respective table (Tables 2 and 3).

This is to be implemented for:

- Change in roof pitch > 4°
- Before upstands, or light domes
- Roof edge profiles

In the case of round roof penetrations (e.g. drainage elements, outlet vents, etc.), single fixings should be arranged evenly around the penetration. The number of fixing elements depends on the diameter of the penetration and is as follows for a diameter of:

- ≥ 60 mm min. 3 pieces.
- ≥ 100 mm min. 4 pieces.

3.5.1 COVING FIXATION WITH COATED METAL PROFILE OR WITEC BAR KF

The fixing to withstand any tensile forces must have a friction-type connection to the substructure. The fixings must be suitable for the substrate and must not adversely affect the waterproofing. Nails are fundamentally unsuitable for fixing.

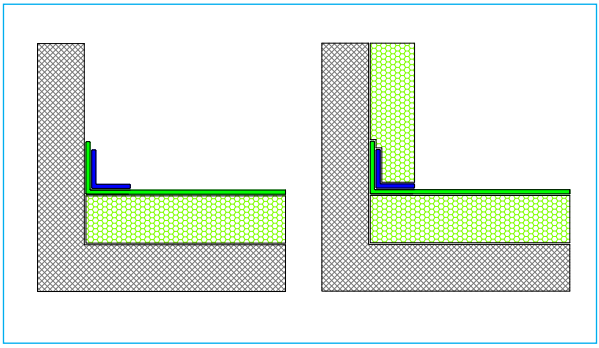
When using coated metal profiles/angles sheets and the Witec bar KF, the fixings are to be calculated for tensile forces of min. 2.5 kN/m.

Table 2

Spacing of fixings for coated metal profiles and Witec bar KF

SUBSTRUCTURE	METAL COMPOSITE ANGLE	WITEC BAR KF
Reinforced concrete	≤ 150 mm	≤ 225 mm
Solid wood Wood materials	≤ 150 mm (min. wood screw 4.5/30 mm)	≤ 225 mm
Steel (min. 0.75 mm)	≤ 150 mm	≤ 225 mm

The membrane is raised by approx. 60 mm at the upstand. The coated metal angle/profile is mounted in such a way that the membrane is clamped at an angle. The coated metal angles/profiles are installed in the joint area with a joint of approx. 5 mm.



3.5.2 UPSTAND ANGLE WITH SINGLE FIXINGS

When using single fixing elements to withstand horizontal forces, **only single fixings (plate and screw) made from solid metal may be used.**

The fixation is not allowed to be placed in the vertical area. The number of single fixings to be used per metre depends on the thickness of the insulation material.

Table 3
Number of single fixings

INSULATION THICKNESS	NUMBER OF FIXINGS
≤ 120 mm	min. 4 pcs/m
≤ 160 mm	min. 5 pcs/m
≤ 200 mm	min. 6 pcs/m
> 200 mm	only approved with coated metal angle or Witec bar KF

The membrane is raised by approx. 60 mm at the upstand and the single fixings in the coving area are fixed in place underneath in the substrate. A joint with single fixings vertically is not permitted.

3.6 COATED METAL SHEET AND PROFILE SYSTEM

Coated metal profiles are used for coving fixing and as connecting and trim profiles for wall connecting, roof trims, etc. They are cut and bended from coated metal sheet plates. Wolfin coated metal sheets are used. In order to ensure that the temperature-related length changes of the coated metal sheets can be withstood by the overlying membrane at coated metal sheet joints without any damage, care must be taken that the membrane is not or cannot be welded to the coated metal sheet approx. 25 mm wide in the joint area. A 25 mm wide crepe strip can be affixed centrally to the metal composite sheet joint here as a guide.

When manufacturing the angled coated metal sheets or wall connection profiles, it has been shown that these are bent with an open angle (approx. 100°) in such a way so that the horizontal leg nestles against the waterproofing membrane even if the shape of the substructure is not continuously straight. The fixing takes place in the vertical or horizontal direction with suitable fixing elements. For the spacings between the fixings, see Table 2.

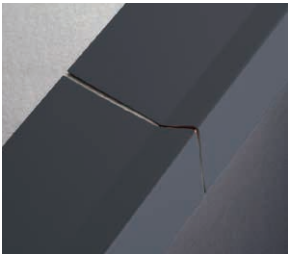
3.6.1 INSTALLATION OF COATED METAL PROFILES

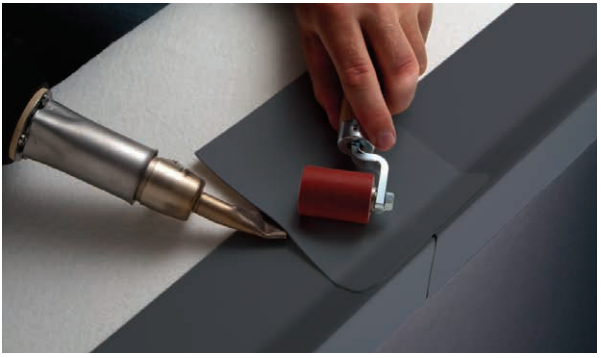
The profiles must be fixed onto a load-bearing (solid) substrate. Solid substrates are, e.g.: Concrete, solid brick masonry, limestone full brick masonry, wooden planks, timber formwork, wooden composite boards, steel, etc.

A separating layer made from e.g. Witec PES protection fleece is to be provided when installing on alkali, e.g. cement-based or calcareous, substrates.

The fixings are to be coordinated with the substrate and, if necessary, determined with the manufacturer. Fixing elements must be provided in such a way that no damaging effect is exerted on the waterproofing membrane.

The profiles must be installed in the joint area with a min. 5 mm joint and tightly welded with a min. 120 mm wide strip of homogeneous material (Wolfin IB). It should be ensured that there is an unwelded area at least 25 mm wide in the joint area. A 25 mm wide crepe strip can be affixed centrally to the joint here as a guide.





4. CONNECTIONS AND TRIMS, ENCLOSURE OF ROOF PENETRATIONS

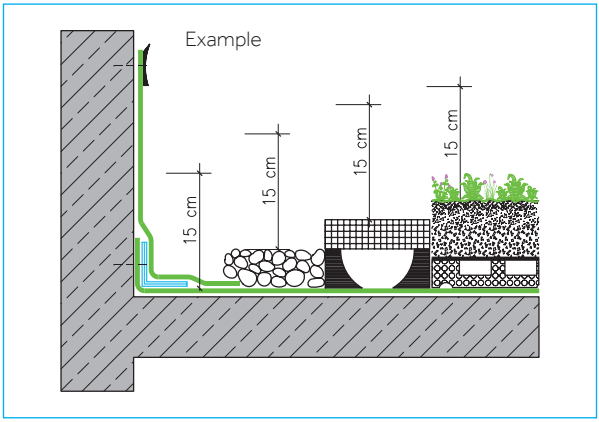
4.1 BASIC RULES

Connections and trims are to be formed according to the national requirements (height, overlap, spacing from the structure, etc.) in the local roofing and waterproofing rules and plumbing work. When using ridge or eaves profiles made from coated metal, additional joint connectors may be required; it may also be

necessary to install a wind stop or continuous flashing, depending on the fascia height, building geometry and wind load.

Observe local specialist rules:

Connection heights always from upper edge of last layer



EXAMPLE OF CONNECTION AND TRIM HEIGHTS		≥ CM
Roof trims	Roof pitch < 5°	10
	Roof pitch > 5°	5
Connections at upstands and roof penetrations	Roof pitch < 5°	15
	Roof pitch > 5°	10
Connections at doors	–	15
Connections at doors with additional measures, e.g. drainage grate		5

Accessible transitions are special constructions.

In the case of exterior wall claddings that are not rainproof, the connection must be raised up the wall behind them. In the case of facing brickwork, thermal insulation composite systems, exposed concrete or plaster layers, water must be prevented from running behind the waterproofing. Z-shaped moisture barriers, recessed overhanging strips and Z-profiles, for example, are suitable for this.

Connections and trims are generally to be made windproof. A suitable method for achieving this is e.g. to lay wind sealing tape under a metal composite profile.

In order to withstand horizontal forces, the waterproofing membrane must be fixed in front of upstands, at roof edges and around roof protrusions (see Pt. 3.5).

For wall connecting and roof penetrations (such as light domes), the upper trim is created as described in Pt. 4.4 (Flashing on upstands).

4.2 CONNECTIONS TO UPSTANDS/ANGULAR ROOF PENETRATIONS WITH METAL COMPOSITE PROFILES

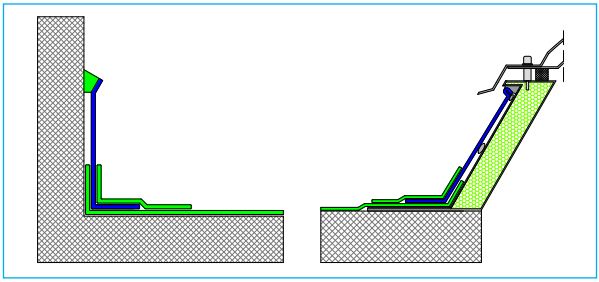
Raise the waterproofing membrane made from Wolfin approx. 60 mm vertically. The wall connection profile made from coated metal sheet is to be positioned on to the waterproofing membrane and then fixed (see Pt. 3.5 to 3.6.1).

The coated metal profiles are also affixed at the upper edge. The spacing between the fixings is ≤ 250 mm. Additional mechanical fixing to the upper edge can be avoided if the metal composite sheets are bonded to the substrate with Wolfinator. Requirements for this can be found in the Wolfinator technical data sheet.

The passage from the waterproofing membrane to the coated metal sheet should be created with a membrane strip of Wolfin M or IB membrane.

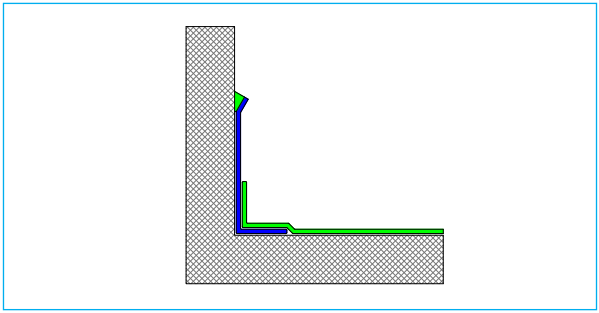
Fixing points should be welded over with a separate patch made from Wolfin M or IB if necessary.

Protect against any water running behind using an elastic sealant, e.g. Teroson F173.



Alternatively, for Wolfin M and IB, the waterproofing membrane can also be welded directly to a profile made from coated metal. For this purpose, the coated metal profile is positioned and fitted with the horizontal leg (at least 40 mm) on the substrate. The

membrane is raised at least 40 mm vertically and welded on the horizontal leg. Then the welding takes place in the vertical area.

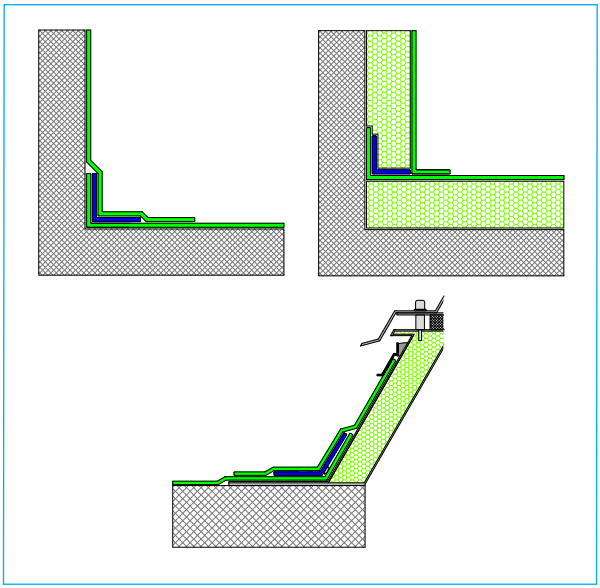


4.2.1 CONNECTIONS WITH LOOSELY LAID MEMBRANES

Raise waterproofing membrane at the component as described in Pt. 3.5 "Requirement to withstand horizontal forces" and fix in place.

Then place the membrane (Wolfin M/M FR) min. 50 mm wide onto the waterproofing membrane and weld tightly. The coving fixation area should be sufficiently covered.

Pt. 4.3 must be observed for heights > 0.5 m.



4.2.2 CONNECTION WITH FULLY BONDED CONNECTING MEMBRANES

Raise waterproofing membrane at the component as described in Pt. 3.5 "Requirement to withstand horizontal forces" and fix in place.

The fully bonding of the connecting membrane (Wolfin M/M FR) can take place using contact adhesive (Teroson AD Adhesive Spray or Teroson AD 914) or using self-adhesive membrane (Wolfin GWSK membrane strip). The welding areas must be free of adhesives in order to achieve tight welding. In the case of bottom lamination, passage can be made with Wolfin M or IB.

Place the connecting membrane min. 50 mm wide onto the waterproofing membrane and weld tightly. The coving joint should be sufficiently covered. Self-adhesive membranes in the connection area must be rolled firmly onto the substrate. For this purpose, it is recommended to use a wide pressure roller, e.g. Witec pressure roller silicone 85 mm.

Possible adhesive substrates are indicated in the technical data sheets for the respective adhesive type. The substrates for Wolfin GWSK bonding can be found in Table 1 on page 10.

4.3 INTERMEDIATE FIXATION AS AN ADDITIONAL MEASURE FOR HEIGHTS GREATER THAN 0.50 M

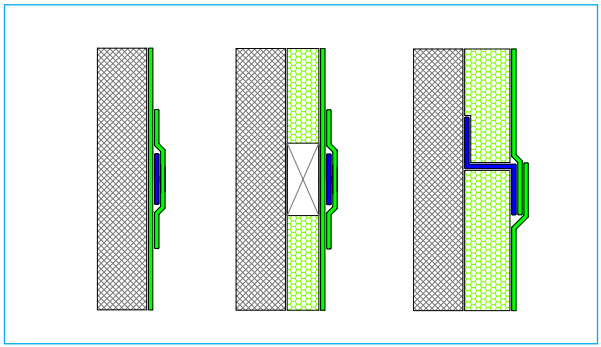
It is necessary to fit an additional intermediate fixation in the case of heights greater than 0.50 cm with loosely laid and self-adhesive membranes. The intermediate fixation must be added in such a way that the clearance width between the fixing lines does not exceed 0.50 m.

Alternatively, the connecting membrane can also be bonded over the entire surface up to a connection height of 1.0 m (no self-adhesive membranes). An additional intermediate fixation is required for heights > 1.0 m and a membrane bonded over its entire surface. The intermediate fixation must be added in such a way that the clearance width between the fixing lines does not exceed 1.0 m.

4.3.1 INTERMEDIATE FIXATION TO UPSTANDS

A strip of coated metal sheet (cut to a length of min. 70 mm, folded over on both sides by approx. 10 mm) or a Witec bar KF is to be installed with the necessary spacing on the vertical waterproofing. The fixing spacing here is ≤ 250 mm.

An additional auxiliary construction consisting of a timber section (width min. 50 mm) or similar may be required on the substrate for insulated components. The auxiliary construction must be flush with the insulation. A strip of waterproofing membrane (Wolfin IB / M) is to be welded over this intermediate fixation. Alternatively, intermediate fixation can also be achieved with a coated metal sheet Z-profile that bridges the insulation material thickness. (Fixing spacing on supporting component ≤ 250 mm, horizontal leg outside at least 50 mm.)

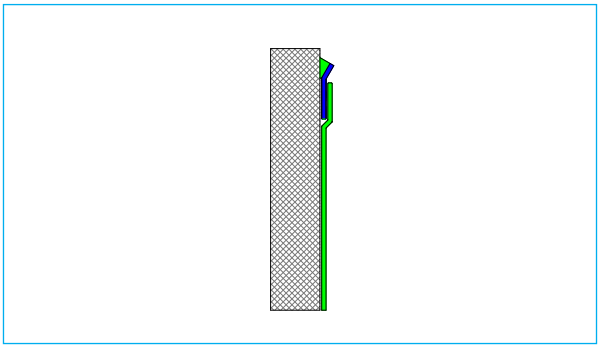


4.4 FLASHING ON UPSTANDS

Membranes on upstands must be permanently secured against slipping at the upper end. This can be achieved with coated metal profiles or clamping constructions. Protection against any water running behind is achieved using an elastic sealant (e.g. Teroson F173).

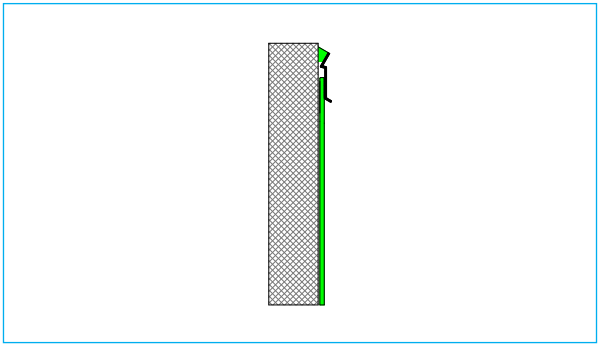
4.4.1 FLASHING WITH METAL COMPOSITE SHEET

The coated metal profiles are mounted at the necessary connection height and fixed in the substrate (fixing spacing ≤ 200 mm). The membrane is then welded tightly to the metal composite profile.



4.4.2 FLASHING WITH CLAMPING PROFILES

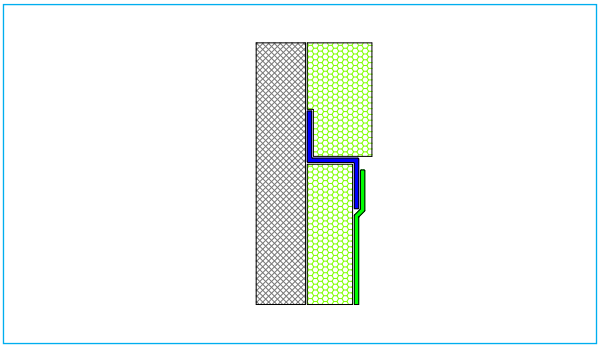
The membrane must be guided up to the necessary connection height. Teroson AD adhesive spray can be used to assist with installation. The clamping profiles are then fitted to the membrane and fixed in the substrate (fixing spacing ≤ 200 mm).



4.4.3 UPPER TRIM FOR THERMALLY INSULATED COMPONENTS

For thermally insulated connections (e.g. below WDV systems or similar), a Z-profile made from coated metal sheet is attached above the connection insulation (fixing spacing ≤ 200 mm). The membrane is welded to the coated metal profile.

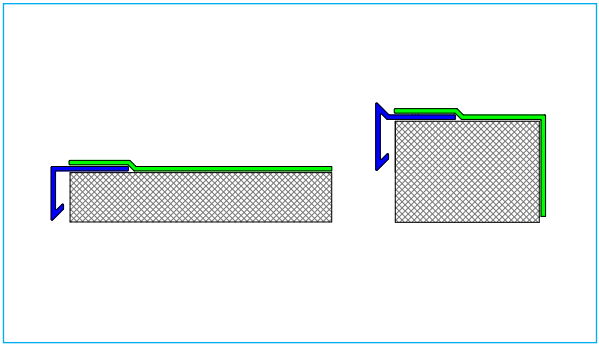
Alternatively, e.g. when using membranes that are laminated on the back, the membrane can be fixed to a metal Z-profile with a clamping profile. See also 4.4.2.



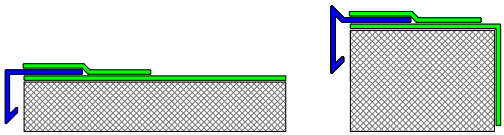
4.5 ROOF TRIM

Eaves or roof edge profiles made from coated metal sheet with a suitable folded edge are fitted correctly and in a windproof manner to the outer edge of the building. The horizontal leg is fitted offset (for fixing spacing, see Table 2) and not in the welding area.

The waterproofing membrane can be welded directly onto the coated metal sheet.



For membranes that are laminated on the bottom side (Wolfin GWSK/GWSK DA), it may be necessary to install the base membrane up to the outer edge of the component and fix it in place with the eaves/roof edge profile made from coated metal sheet (for fixing spacing, see Table 2). The passage from the coated metal profile to the waterproofing membrane is welded over with a separate membrane strip made from Wolfin M or Wolfin IB.

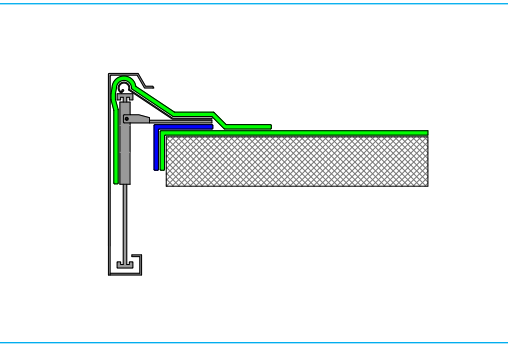


4.5.1 ROOF TRIMS WITH MULTI-PIECE METAL CLAMPING PROFILES

Lay the waterproofing membrane up to approx. 30 mm over the edge of the building and fix with a metal composite angle (e.g. 30/70 mm) fitted correctly and in a windproof manner at the external edge of the building (for fixing spacing, see Table 2).

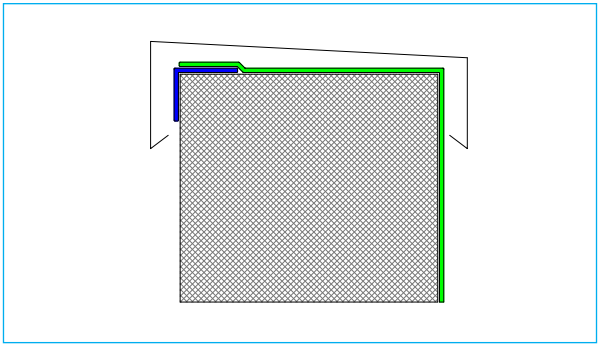
Fit multi-piece metal clamping profile according to manufacturer's instructions.

Clamp the strip of membrane material (Wolfin M / M FR) designed to hang in the profile in place using the corresponding mechanism and weld the free section tightly to the waterproofing membrane.

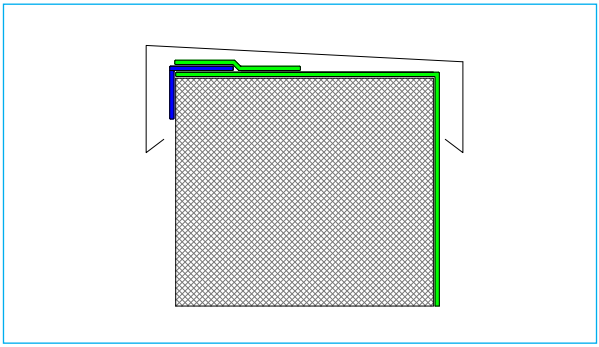


4.5.2 ROOF TRIMS WITH WALL CAPPING PROFILES

Fit coated metal angle (e.g. 30/70 mm) correctly and in a wind-proof manner at the outer edge of the building (fixing spacing ≤ 250 mm). Weld the membrane onto the coated metal profile. Fit wall capping profile according to manufacturer's instructions.



Alternatively, e.g. for membranes that are laminated on the bottom side, the membrane can be fitted approx. 30 mm over the edge of the building. A coated metal angle (e.g. 3/7 cm) is then fitted correctly onto the connecting membrane at the outer edge of the building (fixing spacing ≤ 250 mm). The passage between the coated metal profile and the membrane can also be welded over with a strip of membrane made from Wolfin M or Wolfin IB. Fit wall capping profile according to manufacturer's instructions.



4.6 CONNECTING TO DRAINING ELEMENTS

The standard method is to connect the waterproofing membrane to the draining elements offered in the system. The waterproofing membrane should be fixed in place in accordance with Pt. 3.5. When using the BMI stainless steel draining an ventilation system parts, an additional fixing of the waterproofing membrane according to Pt. 3.5 can be avoided if the stainless steel element is sufficiently fixed in the substrate. The factory-fitted membrane sleeve of the drainage element is then welded tightly onto the waterproofing membrane.

Material compatibility must be ensured in the case of drainage systems from other manufacturers (laminated membrane cuff, loose-fixed flange). The relevant processing guidelines issued by the manufacturer must be observed.

A separate homogeneous piece of membrane must be used to connect to drainage systems with a clamping flange or loose-fixed flange.

National requirements and standards have to be observed.

4.7 PIPES AND TUBES

The standard method for connecting penetrating pipes to the waterproofing membrane is to use the system parts available or the connection can be created by hand using Wolfin IB. The waterproofing membrane should be fixed in place in accordance with Pt. 3.5. When using the stainless steel system parts, an additional fixing of the waterproofing membrane according to Pt. 3.5 can be avoided if the stainless steel element is sufficiently fixed in the substrate. The factory-fitted membrane flange of the drainage element is then welded tightly onto the waterproofing membrane.

1. Place the cut Wolfin IB cuff (connection height + min. 10 mm x pipe circumference + 40 mm) taut around the pipe and attach to the seam overlap at various points. Guide the cuff in the lower area at least 10 mm horizontally. Then weld the seam homogeneously. Plane the seam edge (height difference) and smooth it with hot air and a silicone roller so that capillary-free welding of the cuff and flange is possible with solvent welding agent.

2. Cut the square/round flange out of Wolfin IB (dimensions min. Ø pipe + approx. 250 mm) and provide with a central round hole (Ø hole = pipe diameter – approx. 40 mm). Warm the edge of the membrane in the hole and slightly bend.

3. Pull the prepared flange over the pipe and the cuff so that a "collar" approx. 20 mm high rises vertically at the cuff. Weld the coving point of the cuff and flange using hot air and then allow to cool well.

4. Weld the cuff and flange with solvent welding agent. The "collar" is opened slightly with a test needle so that the solvent welding agent can run into the seam. Then press onto this area with a silicone roller and remove solvent welding agent residues with a rag.

5. Weld the flange homogeneously to the waterproofing membrane. Fixation of the waterproofing membrane to withstand horizontal forces is required (see Pt. 3.5). Single fixings can also be used for this purpose.

6. The upper flashing is created with a hose clip and seal (e.g. Teroson F173 sealant) dimensioned according to the circumference.

5. 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 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 for which 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 upstands. 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 the Technical Department of the responsible BMI unit if Type II expansion joints need to be created. They will submit a building-specific design proposal based on the expected movement and the type of installation used for the membranes.

Welding instructions

Wolfin synthetic roofing and waterproofing membranes can be bonded to each other in a homogeneous and thus permanently waterproof manner with warm gas (hot air) and solvent welding (Tetrahydrofuran).

Larger seam lengths should preferably be joined using hot air with a mobile welding machine (e.g. Leister Varimat). Seam joining using a solvent welding agent is also permitted. Please note to the national requirements.

Detail points should be attached by using a hot air hand welding gun.

6. SEAM OVERLAP/JOINT WIDTH

6.1 SEAM OVERLAP

The seam overlap depends on the type of installation and is described on page 7.

PLEASE NOTE

For solvent- and/or heat-sensitive substrates (e.g. polystyrene), we recommend increasing the seam overlap in the case of solvent or hot-air welding.

6.2 THE JOINT WIDTH FOR THE FOLLOWING IS:

Hot air welding	min. 20 mm
Solvent welding	min. 30 mm

7. STORAGE

The membranes must be stored dry before processing and must not be exposed to the weather for a prolonged period without seam closure.

Synthetics absorb moisture, causing the quality of the welded seam to deteriorate.

8. TEST WELDING

Different material thicknesses and changing climate conditions require different welding temperatures and welding speeds. Therefore, test welding must be carried out on the anticipated substrate before the start of the work and in the event of changes in the weather conditions. The quality of the seam should be checked after complete cooling of the test weld seam.

In the case of hot air welding, a shear test of the seam should be carried out after a corresponding cooling time. This serves to check the settings of the welding equipment during hot air welding.

A properly welded seam cannot be sheared off in the overlapping area of the membrane; it tears off the entire width of the test strip outside the joint. The tearing of membrane material in the seam area is also permissible and indicates a proper seam connection. See also Pt. 12.

A foamy structure in the seam area with hot air welding indicates a high moisture content in the membrane material or an insufficient airing time if the seam area has been pre-treated with solvent welding agent or cleaner.

In the case of solvent welding, an excessively high moisture content in the membrane material or in the solvent welding agent must be assumed in the event of white staining or the loosening of the membrane surface.

9. HOT AIR WELDING

9.1 REQUIREMENTS FOR WELDING

The welding area of the membranes to be welded must be dry, free of dirt, dust and adhesive residues. The substrate must be capable of bearing a load, even and without recesses (joints) or elevations (steps). An uneven substrate can lead to defects due to a partial lack of contact pressure.

For hot air welding in construction site conditions, it is necessary to observe the following:

- The welding temperature depends on the welding machine, the welding speed, the substrate and the weather.
- Overheating (e.g. brown discolouration at the edge of the membrane in grey membranes) of the seam should be avoided as this leads to a weakening/pre-damaging of the membrane material and to a deterioration in seam strength.
- The welding must take place with contact pressure. When using a hot air welding machine, it may be provided with additional weights. The compressive strength of the insulation material must correspond to the required contact pressure during welding as well as the respective manufacturer's instructions.
- Voltage fluctuations due to long power supply lines or additional electricity consumers lead to a variation in weld seam quality and must be excluded.
- The processor must have sufficient knowledge and skill for the welding and processing of synthetic membranes.

The membranes are installed without tension and overlapped according to the installation guidelines (see also Pt. 2.1). The membranes are connected by plasticising the overlapping surfaces by means of heating (hot air). The immediate, even pressing of the seam area using a pressure roller creates a homogeneous seam. Wrinkles in the seam area must be avoided as they can lead to capillaries.

9.2 MANUAL WELDING DEVICE

It is generally recommended to use infinitely adjustable manual welding devices. The guideline temperature setting is approx. 450 °C and depends on the weather and temperature influences as well as on the welding speed of the processor.

Combustion residues at the nozzle should be removed with a suitable wire brush. A pressure roller made from silicone (e.g. Witec pressure roller, silicone) is required to achieve adequate contact pressure in the seam area.

Welding is carried out in three steps:

1. Tacking of the seam
The seam is tacked to prevent the overlapped segments of the membrane from shifting.

2. Pre-welding
Pre-welding prevents unwanted temperature discharge. An unwelded seam width of 35 – 40 mm when using the 40 mm nozzle and 25 – 30 mm when using the 20 mm nozzle should be left.

3. Seal welding
The actual, final welding process must lead to an airtight and waterproof seam. A homogeneous seam is created by immediately and evenly pressing the plasticised seam area with a pressure roller applied in parallel to the nozzle opening, with a spacing of approx. 8 mm.

9.3 MACHINE WELDING

Welding machines with temperature measurement in the nozzle and automatic temperature control should be used. It should generally be ensured that there is sufficient contact pressure.

Test welding must always be carried out prior to the start of the welding work (see Pt. 8). The relevant instructions issued by the machine manufacturer must be observed.

Internal welding tests at room temperature (20 °C) have resulted in the following settings for temperature and feed rate as a guide:

DEVICE TYPE	TEMPERATURE	FEED RATE
Hot air welding machine	520 °C	2,2 m/min
Hot air welding machine with special nozzle geometry (e.g. Leister Varimat V2)	520 °C	3,2 m/min

The aforementioned values are to be understood as assistance for setting the optimum welding parameters and do not release the tradesperson from the necessary conducting of welding tests on the object. Changes in the outside temperature, humidity, substrate, wind or sun can change the aforementioned parameters.

The use of entry and exit plates (material thickness approx. 0.5 mm) is recommended.

Brown discolourations/burns at the edge of the seam as well as a welding bead that runs/flows out excessively indicate an excessive welding temperature.

10. SOLVENT WELDING

10.1 REQUIREMENTS FOR WELDING

The welding area of the membranes to be welded must be dry, free of dirt, dust and adhesive residues. The Witec solvent welding agent must be used for the solvent welding of the Wolfin membranes. The solvent welding agent containers must always be kept tightly closed before and after use, as penetrating moisture affects the solvent ability of the solvent welding agent and thus no permanently durable seam joints can be achieved. In order to prevent condensation in the containers, they should be stored in ventilated rooms at a moderate temperature and not outdoors. The containers must be protected from frost and direct sunlight. The solvent welding agent must not be mixed with other solvents.

- Occupational health and safety must be observed when handling solvent welding agents, see Pt. 10.3.
- The joint area must be dry and free of dirt, dust and adhesive residues.
- Solvent welding can be carried out up to a lower temperature of +8 °C. At low temperatures, we recommend preheating the seam or storing the membranes in rooms at a moderate temperature until processing takes place.
- If surface temperatures are too high (approx. > 50 °C) in the seam area, excessively fast evaporation of the solvent welding agent can cause the seam to not be properly and permanently welded. At high summer temperatures, we recommend that the seam welding be carried out when the sunlight is not at its strongest.
- To insert the Witec solvent welding agent into the seam area of the membrane, use the Witec speed welding brush or glued, vulcanised flat brushes.

10.2 WELDING TECHNIQUE

To achieve a homogeneous seam, the following basic aspects must be considered:

- Approximately 40 ml of solvent welding agent per metre of seam is required. An excessive dosage should be avoided.
- Excess solvent welding agent must be immediately removed with a suitable cloth.
- It should be ensured that the welded seam width runs straight and in parallel to the seam edge. Welding tips in the rear seam area should be avoided.
- Sufficient contact pressure must be ensured by means of a silicone roller (Witec pressure roller).

The Wolfin membranes are installed without tension and overlapped according to the installation guidelines (see also Pt. 2.1). The solvent welding agent is inserted into the membrane area to be welded with a speed welding brush using a slight rubbing motion, while simultaneously pressing the top membrane onto the lower membrane.

Retaining plates, for example, in the case of linear fixing (coving joint) in front of upstands should be kept free of solvent welding agents. Excess solvent welding agent is rolled out of the seam immediately after insertion with a 80 mm Witec silicone roller. The cooler the temperature, the longer the appropriate contact pressure must be applied to the seam. At very cool temperatures, the use of a film tube/sand bag filled with sand can be advantageous.

10.3 OCCUPATIONAL HEALTH AND SAFETY

Sufficient ventilation must be ensured when handling solvent welding agents in enclosed spaces. The regulations of the employer's liability insurance association (Berufsgenossenschaft) regarding the handling of tetrahydrofuran must be observed. Appropriate protective gloves and goggles should be worn.

11. T-JOINTS

In order to avoid capillary formation in the event of multiple overlaps (T-joint), the welding area should be chamfered (e.g. plane) towards the underlying membrane in the transition area and welded capillary-free using hot air.

PLEASE NOTE

The closing of T-joints by means of solvent welding agents is not permitted.

12. INSPECTION OF WELDED SEAMS

After the welding work is completed, all seams must be inspected at least visually and mechanically. The welded seam must be cooled down for this.

If defects are found, they must be reworked using hot air. If the defects cannot be re-welded homogeneously, the defect is to be welded over with a sealing disc / patch of a sufficient size.

Cold-welded seams must be aired for at least 3 to 4 hours before the seams can be inspected or a defect can be reworked.

12.1 VISUAL INSPECTION

During the visual inspection, the seam joint should be inspected by looking at it. In the event of defects, the uniformity of the seam pattern is interrupted (missing weld bead or lack of shine) or a defect is identifiable by a gap in the joint area at the seam edge. Partial moisture accumulation at the seam edge can also be an indication of a defect.

12.2 MECHANICAL INSPECTION

During a mechanical inspection, a suitable tool (Witec seam tester) should be run along the seam edge with uniform pressure. In the event of defects, the testing tool penetrates the seam.

PLEASE NOTE

Sharp-edged or pointed tools are unsuitable for seam inspection.

13. SEAM SEALING

Seam sealing can be produced with Wolfin liquid for the Wolfin membranes. Approx. 20 ml/m of this is used.

Seam sealing is always required for Wolfin M in the event of necessary proof of resistance to root penetration according to FLL test procedure/EN 13948 (green roofs).

Comments

The above information corresponds to our current state of knowledge gained through the development and production of Wolfin membranes, as well as the findings from the practical use of the products.

Relevant technical rules, published in standards and guidelines, in the respective countries are to be noted and observed.

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 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 membranes for the described applications.

With the publishing of these installation instructions, all previous versions become invalid.

If you have any questions, please contact the local Technical Support department.

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