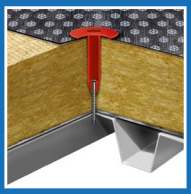
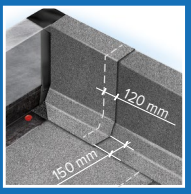
TECHNONICOL





MANUAL

for the waterproofing of flat roofs on corrugated steel sheet decking by using polymer-bitumen membranes

KNOWLEDGE. EXPERIENCE. CRAFTSMANSHIP.

Annotation

The manual is intended for employees of contracting companies performing roofing work, and may also be useful for technical supervision officers who monitor the quality of work performed. This document is based on more than 25 years of experience in the field of production and application of roll materials for roofing.

The manual step-by-step outlines the process of roofing arrangement, including junctions to roofing elements.

Considering these recommendations, you would reduce the probability of roof leaking and therefore increase the inter-repair lifetime of the entire roofing system.

We hope, that this document would be useful in your everyday work.

Contents

1.

Introduction

1. Introduction

1.1. General information

— Roof protects buildings from impacts of atmospheric precipitations.

— Only use of modern materials and high-quality installation work performance can provide reliability of a roof. It is commonly known, that roof leaking occurs mostly due to mistakes in project solutions and improper installation of roofing materials.

— The manual describes the installation of a roof by the torch-on application and by mechanical fastening with welding of overlaps.

— As an example, the manual describes the use of the bottom layer materials ULTRAFLEX A, ULTRAPLAST A, ULTRAPLAST B and the top layer material ULTRAFLEX A Grey Mineral, ULTRAPLAST A Grey Mineral, ULTRAPLAST B Grey Mineral. Approved TECHNONICOL products should be used in each region.

1.2. Description of roofing systems

This manual considers the following roofing systems:

1. Two-ply roofing on thermal insulation boards with mechanical fastening of a base layer and torch-on application of a top layer.

2. Single-ply roofing with mechanical fastening on thermal insulation.

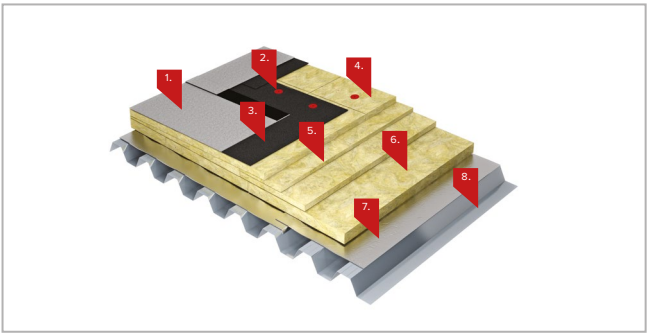
Technical solutions of TECHNONICOL roofing systems are given below. A more detailed description of systems, materials (and their analogues) and documentation can be found on our website.

Non-accessible roof systems with mechanical fixation:

NOTE: The possibility of torching-on polymer-bitumen materials on the thermal insulation should be approved by the tests results.

TN ROOF BRM STEEL FIX

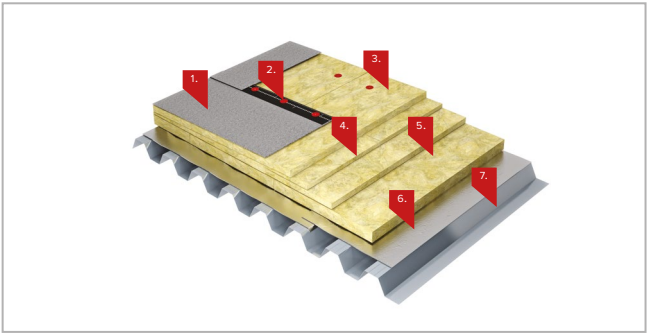
Non-accessible roof system on a corrugated steel sheet base with mechanical fastening of polymer-bitumen waterproofing membrane and thermal insulation of stone wool.



1. Polymer-bitumen membrane covered with slate granules (top layer)
2. Telescopic fastener
3. Polymer-bitumen membrane (bottom layer)
4. Stone wool
5. Wedge-shaped slabs of stone wool
6. Stone wool
7. Polymer-bitumen self-adhesive membrane (vapor barrier)
8. Corrugated steel sheet

TN ROOF BRM STEEL SOLO

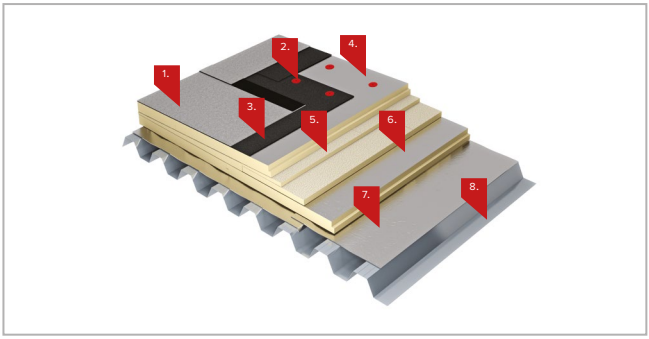
Non-accessible roof system on a corrugated steel sheet base with mechanical fastening of one-layer polymer-bitumen waterproofing membrane and thermal insulation of stone wool.



1. Polymer-bitumen membrane covered with slate granules
2. Telescopic fastener
3. Stone wool
4. Wedge-shaped slabs of stone wool
5. Stone wool
6. Polymer-bitumen self-adhesive membrane (vapor barrier)
7. Corrugated steel sheet

TN ROOF BRM STEEL SMART 01

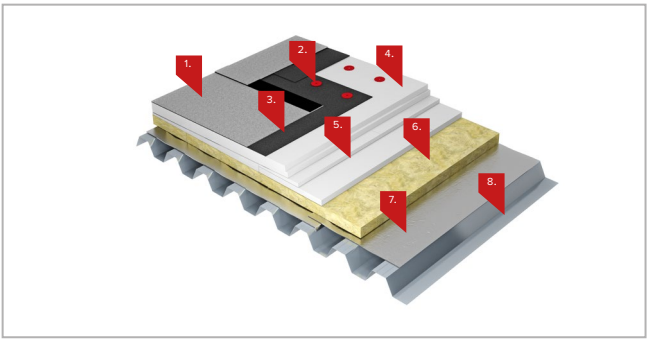
Non-accessible roof system on a corrugated steel sheet base with mechanical fastening of waterproofing polymer-bitumen membrane and thermal insulation of PIR boards.



1. Polymer-bitumen membrane covered with slate granules (top layer)
2. Telescopic fastener
3. Polymer-bitumen membrane (bottom layer)
4. PIR boards (Aluminium facing) / (Glass tissue with mineral binder)
5. Wedge-shaped boards of PIR / XPS
6. PIR boards (Aluminium facing) / (Glass tissue with mineral binder)
7. Polymer-bitumen self-adhesive membrane (vapor barrier)
8. Corrugated steel sheet

TN ROOF BRM STEEL COMBI EPS

Non-accessible roof system on a corrugated steel sheet base with mechanical fastening of polymer-bitumen waterproofing membrane and thermal insulation composed of stone wool and EPS boards.

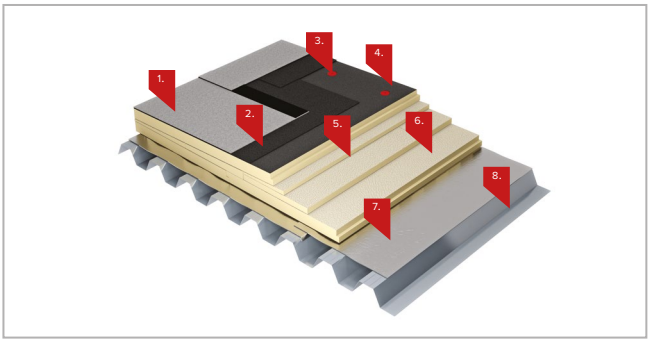


1. Polymer-bitumen membrane covered with slate granules (top layer)
2. Telescopic fastener
3. Polymer-bitumen membrane (bottom layer)
4. EPS thermal insulation
5. Wedge-shaped slabs of EPS
6. Stone wool
7. Polymer-bitumen self-adhesive membrane (vapor barrier)
8. Corrugated steel sheet

Non-accessible roof with gluing of the bottom layer of the membrane to the thermal insulation layer:

TN ROOF BRM STEEL SMART 02

Non-accessible roof system on a corrugated steel sheet base with the use of self-adhesive and torched-on waterproofing polymer-bitumen membrane and thermal insulation of PIR boards.

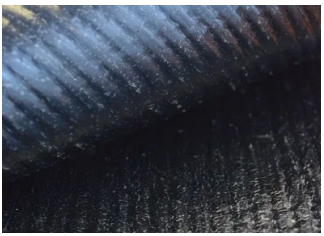


1. Polymer-bitumen membrane covered with slate granules (top layer)
2. Self-adhesive polymer-bitumen membrane (bottom layer)
3. Telescopic fastener
4. PIR boards (Glass tissue with bitumen binder)
5. Wedge-shaped boards of PIR / XPS
6. PIR boards (Aluminium facing) / (Glass tissue with mineral binder)
7. Polymer-bitumen self-adhesive membrane (vapor barrier)
8. Corrugated steel sheet

1.3. Roofing materials

ULTRAPLAST GREY MINERAL
This is APP-modified bitumen membrane. It is designed for the installation as the top layer in double-layer roofing system on buildings and structures. Can be used for new construction or repair.

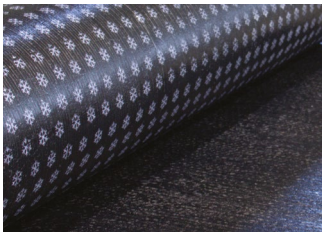
The material withstands temperature fluctuations and high mechanical loads providing a long-term, reliable and effective waterproofing. APP polymer provides additional flow resistance that makes it possible to use the material in a very hot climate.



ULTRAPLAST
This is APP-modified bitumen membrane with polyester reinforcement. It is designed to suit requirements of both newly-built and remedial roofing and underground waterproofing applications. The membrane is suitable for application in a hot climate.

This product can be applied to all suitable substrates as a bottom layer in double-layer roofing systems and also as a vapor barrier. Not recommended for use as single-ply waterproofing.

ULTRAFLEX GREY MINERAL
This is a polyester based, slate covered torch-on cap sheet, saturated and coated with high quality SBS-modified bitumen. Materials can be used as cap sheet in built up waterproofing systems on newly-built or refurbished flat roofs as well as part of overlay systems to existing asphalt waterproofing.



ULTRAFLEX

This is a polyester reinforced underlay, saturated and coated with highest quality SBS-modified bitumen. The membrane carrier is a tough **180 g/m^2** polyester reinforcement, giving the material excellent dimensional stability and very high mechanical strength.

This product can be applied to all suitable substrates as a bottom layer in double-layer roofing systems, as a vapor barrier or as top layer in built up ballasted waterproofing systems. Not recommended for use as single ply waterproofing.

VAPORSTOP CA

This is flexible reinforced SBSmodified bitumen membrane. It is used as a high-performance vapor barrier in roofing systems. The material is produced on a base of a glass net carrier coated with SBS-modified self-adhesive bitumen binder.

The membrane is protected on the bottom side with an easily removable siliconized film, while the top surface is covered with aluminium foil.

1.4. Special materials

TECHNONICOL ENVIRO WHITE

This is a roofing andwaterproofing SBS-modified bitumen membrane that allows obtaining the effect of “cool roof” thanks to the white slate with high solar reflection used as the top protective layer. As a result, the roof covering is not heated and the premises under the roof (attic or utility room) maintain comfortable temperature.

TECHNONICOL ENVIRO AIR is a roofing and waterproofing SBS-modified bitumen membrane with a special feature of air purification from harmful nitrogen oxides (NOx). Hydrophobized slate used as the top protective layer is covered with titanium dioxide (TiO_2) and special additives.

1.5. Roofing components

Bitumen prime coating
This is intended for the preparation (priming) of the deckings before laying the torched-on waterproofing materials.

Hot-applied roofing mastic
This is used for the installation of water intake funnels, installation of fillets from stone wool.

Funnel with clamping flange 110×450
It is for internal water drain. In roofs with no thermal insulation, it is recommended to use heated funnels.

Parapet drain funnels
This funnel and parapet spillover for water drainage are intended to remove water over the parapet of a flat roof.

Corner connecting element for parapet funnel
It serves to drain rainwater from parapet drain funnels. It is used together with a funnel of square section.

EPDM flashing Ø 0-125 mm
It flts idor junctions of a roofing to pipes.

Roofing aerator
It intended for steam removal in “breathable” roofs.

Edge rail (metal rod with an enlarged fillet)
It is used to fasten the edge of a roofing on vertical structures.

TECHNONICOL FIXER
It is used for sealing the edge of a roofing on vertical junctions in the area of an edge strip, for sealing roofing elements (pipe seals, funnels, roofing aerators etc.), and can also be used for repair of a protective layer of a roofing material.

Telescopic fastener
It is used for mechanical fastening of thermal insulation and roofing materials to a loadbearing roof decking made of reinforced concrete.

Plate-shaped holder
It is used for mechanical fastening of roofing materials to deckings made of reinforced concrete and sand-cement screeds.

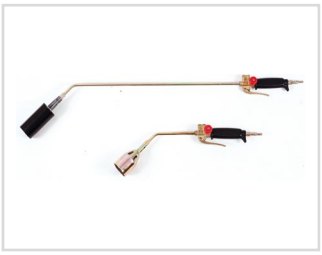
Pointed self-tapping screw EDS-B 4.8 with an anchor element
It is used for fastening roofing to decking made of reinforced concrete and sand-cement screeds.

Gray roofing slate
It is used as an upper protective layer with the use of sealing mastic for patching of waterproofing membrane damage and for restoring the appearance in places of local overheating of the torched-on material.

1.6. Applied equipment

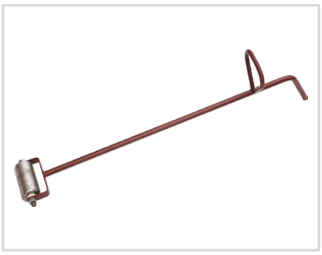
1.6.1. Set of gas equipment for roofing

Hook for unrolling
It is a tool used for unrolling polymer-bitumen roll materials during torch-on application.



Standard gas torch and shortened gas torch
They are used for torch-on application of roofing material.

Gas hose and pressure regulator with a manometer
They are used to connect a roofing propane torch to a gas regulator.



Metal feed roller
It is for total and hermetically sealed adhesion.

Seam torch with a roller
It is used for gluing polymer-bitumen material overlaps.

Electrical heater for gas cylinders
It is a tool for heating a gas cylinder. It maintains stable pressure and provides effective blowdown inside the cylinder.

1.6.2. Hot-air welding equipment for roofing

The set is intended for installing a single-ply roof on the horizontal surface.

Bitumen (BITUMAT) — is a powerful machine for hot air overlap welding of polymer bitumen roofing.

Cap on VARIMAT with a roller for hot air overlap welding of polymer bitumen roofing. It is used to upgrade the VARIMAT welding machine.

Brush for metal surfaces for removal of bitumen from nozzles of manual hot-air gun and automatic equipment (Bitumat, Varimat) after work.

Manual hot-air gun of Leister Electron ST type with a 80 mm slot nozzle for overlap welding of polymer-bitumen materials.

Manual hot-air gun of Leister Electron ST type with a 75 mm slot nozzle for overlap welding of polymer-bitumen materials.

Roller 80 mm wide for manual welding application.

2.

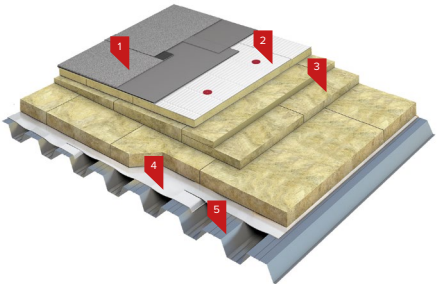
Preliminary works.

Installation of roof system

2. Preliminary works. Installation of roof system

2.1. General information

Roof is a multi-layer system consisting of waterproofing membrane (1), thermal insulation (2), slope-forming layer (3), vapor barrier (4) and load-bearing structure of the roof (5).



NOTE: Laying the roofing membranes is the final step in the installation of the roof system, be careful about installing the previous layers. Mistakes are hard to fix.

2.2. Installation of vapor barrier layer

2.2.1. What is a vapor barrier for?

Vapor barrier protects structural layers (thermal insulation, slope-forming layer) from saturation of moisture from interiors. When there is no vapor barrier or it is damaged, thermal insulation becomes saturated with moisture, which leads to decreasing of heat insulating ability and freezing of a roof structure.

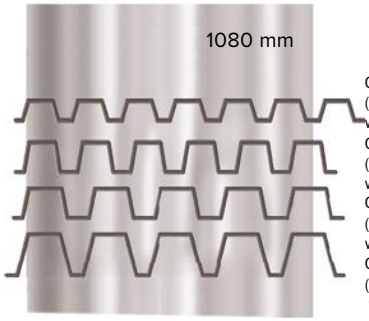
For mechanically fastened roofing systems material for vapor barrier must be selected with the utmost care. The vapor barrier in these systems turns out to be leaky due to the fact that the mechanical fasteners are fixed in the load-bearing decking of the roof (profiled sheet) directly through the vapor barrier. Due to the properties of the bitumen binder, the penetration points through the bitumen vapor barrier become sealed. Therefore, polymer-bitumen membrane VAPORSTOP CA 500 is recommended for use as a vapor barrier.

2.2.2. The device of vapor barrier on a profiled sheet

VAPORSTOP CA 500 is a foiled vapor barrier self-adhesive bitumen material. High tensile properties allow to withstand the weight of a person standing between the corrugations of the profiled sheet on the vapor barrier, while the material does not tear or stretch.

VAPORSTOP CA 500 is used in public and industrial buildings with normal temperature and humidity conditions (shopping centers, warehouse complexes, sports facilities, etc.).

VAPORSTOP CA 500 SELF 1.08 m wide is suitable for all types of profiled sheets:



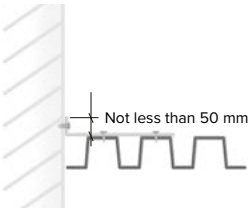
Corrugated steel sheet (height of the waves 75mm, width of the sheet 750mm)
Corrugated steel sheet (height of the waves 114mm, width of the sheet 600mm)
Corrugated steel sheet (height of the waves 114mm, width of the sheet 750mm)
Corrugated steel sheet (height of the waves 158mm, width of the sheet 750mm)

Clear the surface of the corrugated steel sheet from dirt, dust, foreign objects, ice, snow, puddles, oil.

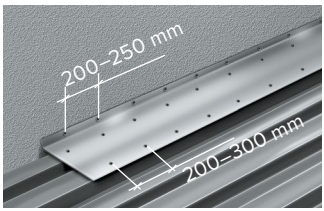
In the expansion joints, in the areas of junction of a corrugated sheet to walls, ventilation shafts, skylights, roof access hatches, fill the empty corrugations of profiled sheets with non-flammable stone wool materials.

Corrugations must be filled with insulation material not less than 250 mm from the edge of the profiled sheet. Openings and joints of the corrugated sheets without overlap must also be insulated (around the pipe penetrations, funnels, ridges and roof valleys).

NOTE: It is not allowed to fill the empty corrugations with bulk insulation.



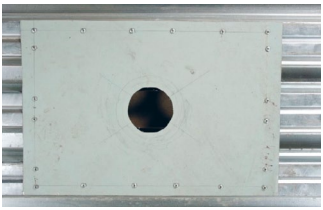
In places where the roof adjoins vertical structures (parapets, walls, ventilation shafts, roof access hatches, etc.), install and fix an L-shaped element made of galvanized steel with thickness not less than 0.8 mm.



The vertical part of the L-shaped element should be about 50 mm, and the horizontal part should overlap at least two crests of the corrugated steel sheet.

Fastening to the wall should be made with a span of 200–250 mm. Fastening to the corrugated steel sheet is made on the upper surface of the 2 nearest crests with a span of 200–300 mm, in a checkerboard pattern.

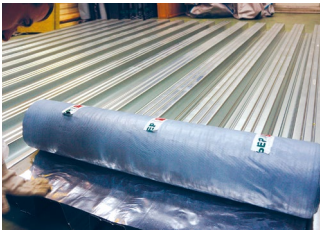
NOTE: The upper edge of an L-shaped element must be sealed with butyl-rubber sealant when installing a roof above rooms with high humidity and if the height of vertical part of the L-shaped element adjacent to vertical structures is more than 50 mm.



In places of penetrations of engineering communications, drainpipes, install a reinforcement sheet made of galvanized steel, at least 0.8 mm thick.

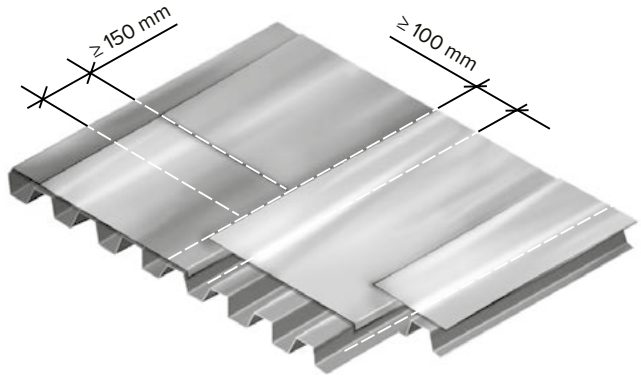
The size of the reinforcement sheet depends on the location of the cutting and must be fastened to at least 3-4 corrugations of the profiled flooring.

Laying of vapor barrier on a common plane



Place the material along the crests of the corrugated steel sheet.

NOTE: To improve adhesion to the decking, cover the crests with a primer for metal surfaces. Prior to the primer application clean and degrease the surface if required.



Lateral overlaps of adjacent sheets must be at least 100 mm and be located on the crests of the corrugated steel sheet.

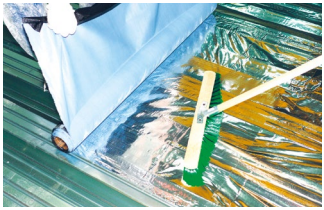
End overlaps must be at least 150mm. Adjacent sheets are laid with end seams spacing.

Before laying the material, unwind the roll to 2 m, form all the necessary overlaps and glue the beginning of the roll:

Using a roofing knife, cut the protective film at the bottom side of the material at a distance of 30–40 cm from the edge of the roll.

Carefully remove the protective film and glue the beginning of the roll.

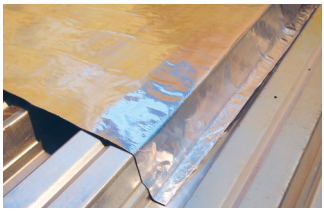
Press the place of gluing with a silicone roller.



Glue VAPORSTOP CA 500 to the decking:

One worker pulls the release film towards himself, the other smoothens the material with a brush.

Smoothing the material to the decking is carried out with a brush from the middle of the roll to the edges of the material.

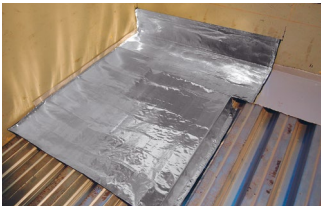


If the side of the vapor barrier overlaps the crest of the corrugated steel sheet less than by 50 mm, then glue the material to the corrugated steel sheet as shown.

The lateral overlap of the subsequent roll should be formed on the material glued to the crest of the corrugated steel sheet.

Attachment of vapor barrier to internal corner

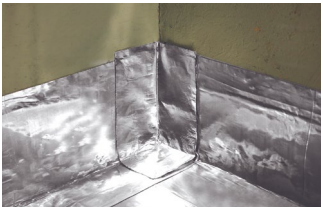
When unwinding the roll along a vertical structure (walls, parapets, ventilation shafts, etc.), lay VAPORSTOP CA 500 close to the vertical surface.



When bringing material to a vertical structure, glue the material directly onto the vertical surface. The material is placed 25 mm above the thermal insulation layer.

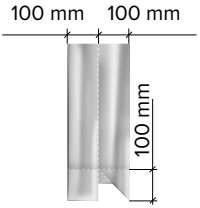
In places where it was not possible to place the material directly onto a vertical surface, glue an additional reinforcement layer.

The additional layer should overlap the edge of the vapor barrier material by 100 mm on the horizontal surface.



Prepare a patch as shown and glue it into the internal corner.

Strip width 200 mm.



Junction of vapor barrier to an external corner

When laying the material on the horizontal side, roll the material also on the vertical surface where possible. The material shall be placed on the vertical part 25 mm above the thermal insulation layer.

In places where it was not possible to place the material directly onto a vertical surface, glue an additional reinforcement layer.

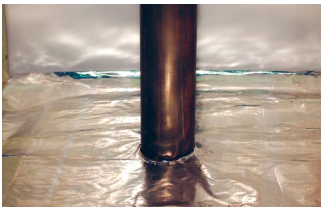
The additional layer should overlap the edge of the laid material by at least 100 mm on the horizontal surface. In the corner, fold the additional layer to the other side and form an overlap of at least 100 mm.

Cover the cut of the material in the corner with a patch:

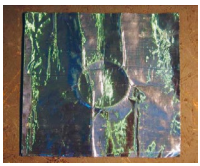
Junction of vapor barrier to pipe penetrations

This type of junction can only be applied when the pipe is rigidly connected to the load-bearing structural elements of the building (beams or roof purlines), and the corrugated steel sheet is laid on them.

This method is used only for cold pipes with a pumped liquid or gas temperature not higher than +45 °C. In other cases, it is necessary to mount a sleeve with a flange sliding along the pipe around the pipe and connect the vapor barrier to the sleeve in the manner described below.

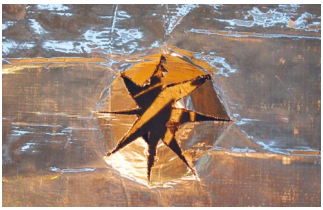


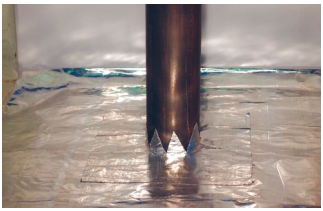
Place the vapor barrier on the decking by cutting off the vapor barrier around the pipe.



Prepare a reinforcement layer made of VAPORSTOP CA 500 in the shape of a square:

- The sides of the square should exceed the pipe diameter by 300 mm.
- Draw a circle in the middle of the reinforcement layer equal to the outer diameter of the pipe.
- Cut the material from the edge of the drawn circle to the center of the circle.





Place the reiforcement layer at the pipe penetration. Glue the resulting petals on the pipe.

Prepare a strip using VAPORSTOP CA 500:

- The length of the strip must be 100 mm longer than the circumference of the pipe.
- The width of the strip must be calculated on the basis that the material should be glued to the pipe 25 mm above the thermal insulation layer and overlap the horizontal surface of the decking by 50 mm.
- Cut into strips a part of the material that will be glued to the horizontal surface of the decking.

Glue the patch onto the pipe.

Junction to water intake funnels

When installing an internal drain, it is recommended to use a two-level funnel.

The funnel consists of a lower part with a flange (Fig. 1), which is installed on the vapor barrier layer and a put-on element (Fig. 2), inserted into the funnel (Photo 1). Tightness between the parts is provided by a rubber gland and a locking ring.

Fig. 1

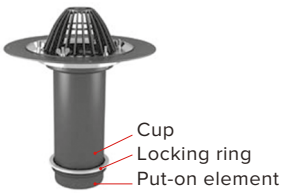
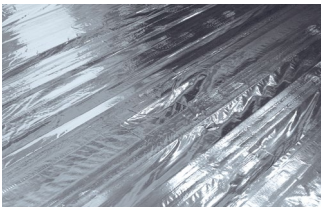


Fig.2

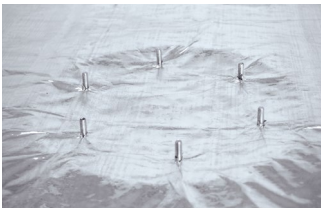
The photo shows a general view of a put-on element and a funnel installed on a vapor barrier layer, without a thermal insulation and waterproofing layer of the roof.

Remove the funnel flange before installing.

Install the funnel in accordance with the design and fasten the water intake funnel to the reinforcement sheet made of galvanized steel.



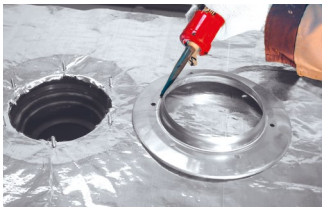
Glue the vapor barrier membrane over the entire area of the load-bearing decking, in accordance with section 2.2.2. of the section “Laying of vapor barrier on a common plane”.



Push the bolted connections of the funnel through the membrane.

Use a roofing knife to cut the vapor barrier along the inside diameter of the funnel.

Install the rubber gland first and then the locking ring into the funnel.



To increase the tightness of the flange connection with the vapor barrier material, apply a sealing bitumen-polymer mastic.

It is more convenient to apply the mastic in an S-shaped way directly from the cartridge.

Insert the flange and fasten with screws.

Peculiarities of works with VAPORSTOP CA 500 membrane at low temperatures.

The ambient temperature and the temperature of the material itself must be higher than the VAPORSTOP CA 500 flexibility -25 °C.

VAPORSTOP CA 500 must be kept in a warm room for at least 24 hours at a temperature of +15 °C. The material must be brought to the work site from the warm room immediately before laying on a corrugated steel sheet.

To improve the adhesion of the material to the cooled corrugated steel sheet, it is necessary to additionally warm up the decking from corrugated steel sheet with a burner flame or a hot air gun before rolling the roll out. Damage to the protective zinc layer on the corrugated steel sheet is not allowed.

2.3. Installation of thermal insulation

Thermal insulation is a layer of insulation system of an exterior structure, including roofs, which provides warmth preservation inside a building. The thermal insulation surface may serve as a roof decking, provided that the materials used are stone wool slabs with compressive strength of not less than 60 kPa at 10% deformation or LOGICPIR polyisocyanurate boards.

The following types of TECHNONICOL thermal insulation are used or the installation of a thermal insulation layer in the presented TN International roof systems (see section 1.2):

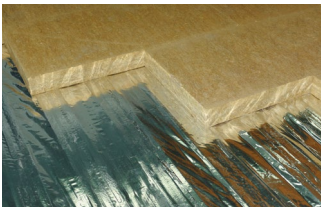
- stone wool – TECHNOROOF;
- extruded polystyrene – XPS TECHNONICOL CARBON PROF;
- polyisocyanurate — LOGICPIR

NOTE: In case of installing a monolithic or prefabricated screed on a board insulation based on stone wool, slabs with a compressive strength at 10% deformation of at least 0.040 MPa (40 kPa) must be used.

2.3.1. General information on installing a thermal insulation layer

NOTE: The installation of thermal insulation is considered in this section using an example of applying a stone wool-based thermal insulation slabs.

NOTE: Install thermal insulation slabs on the finished vapor barrier layer. The surface of the vapor barrier must be dry.



Lay the insulation slabs along the corrugated steel sheet so that the long side of the slab is perpendicular to the corrugations of the corrugated steel sheet.

When installing thermal insulation from two or more layers of insulation slabs, arrange the joints between the slabs as “offset ones”, ensuring a tight fit of the slabs to each other.

Fill the joints between insulation slabs over 5 mm with thermal insulation material*.

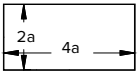
*When installing thermal insulation boards based on extruded polystyrene or polyisocyanurate (PIR), you can also use construction foam.

NOTE: Movement along the upper surface of TECHNOROOF stone wool leads to a deterioration in the strength characteristics of the slab.

In places of heavy human traffic, as well as at the location of carts with materials and equipment, provide temporary walkways made of sheet materials (OSB plywood, cement bonded particle boards).

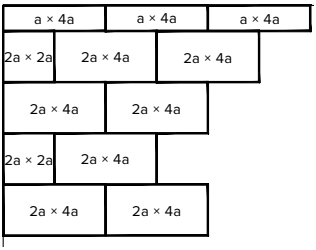
NOTE: A TECHNOROOF stone wool insulation slab wetted during installation must be removed and replaced with a dry one.

Insulation slab:



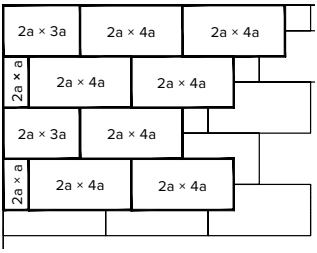
Installation of thermal insulation starts from the corner of the roof.

Insulation slabLaying of the first (bottom) layer:



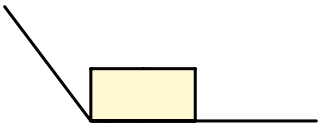
The slabs should be installed in the direction “towards yourself”. This will reduce damage to the slabs during installation.

Laying of the second (top) layer:

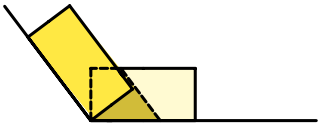


When laying, the thermal insulation slabs are additionally cut so that the joints of the slabs of the 1st and the 2nd layer do not coincide.

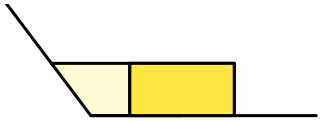
To simplify the installation of insulation slabs in oblique corners, it is recommended to use the following method:



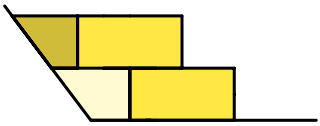
Place an insulation slab in the corner of the roof. The long side of the slab should be parallel to one of the corner sides.

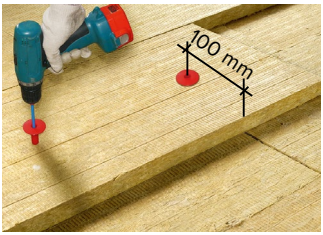


Lay the second slab on the first one so that the long side of the slab coincides with the second side of the corner. Cut the bottom slab along the line as shown in the picture below.



Arrange the first and second row of thermal insulation slabs from the obtained elements.





Fix the top insulation slab to the load-bearing decking with fasteners.

The fasteners must be installed at a distance of at least 100 mm from the edge of the board.

When installing the roof by mechanical fastening, fastening of slabs with dimensions of 1000×500 mm and 1200×600 mm is carried out at the rate of 2 fasteners per top slab, of boards with dimension of 2400×1200 mm — 6 fasteners per slab.

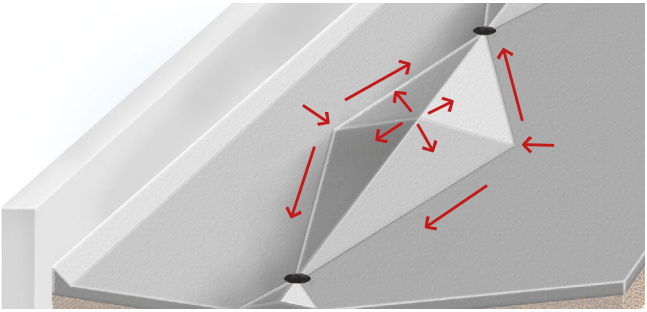
When installing the roof by continuous gluing to the surface of thermal insulation, fastening of slabs with dimensions of 1000×500 mm and 1200×600 mm is carried out at the rate of 5 fasteners per top slab, of boards with dimensions of 1200×1200 mm — 9 fasteners per slab.

See section 3 for general decking and fastening elements requirements.

NOTE: Free laying of insulation slabs is performed in case of using prefabricated screed from cement-bonded particle boards, laid on top of thermal insulation that can withstand wind load.

2.4. Formation of roof slope

Slopes are needed to drain water from the roof. For complete drainage of water from the surface of the roofing membrane through external and internal drains, it is recommended to form a slope of at least 2%.



Wedge-shaped insulation boards with a given slope (XPS TECHNONICOL CARBON PROF SLOPE, TECHNOROOF N TAPPERED, TECHNONICOL PIR SLOPE) can be used as a slope-forming layer in roof structures with a load-bearing decking from corrugated steel sheet. The slope-forming layer can also be formed by bearing structural elements according to the design.

Wedge-shaped boards are fastened in the same way as the thermal insulation layer.

TECHNOROOF N SLOPE slabs must not be laid directly on the vapor barrier and used as a decking for the roofing membrane. It is allowed to install a prefabricated screed on wedge-shaped insulation boards TECHNOROOF N SLOPE.

NOTE: Advantages of using wedge-shaped thermal insulation boards:

- reducing the load on the load-bearing roof structure;
- saving labor costs for forming slopes;
- reducing the time for work execution;
- no wet processes.

For more information on the work steps and requirements, see the Manual on the Installation of a Slope-Forming Layer on a Flat Roof Using Wedge-shaped Thermal Insulation.

2.5. Installation of a substrate layer for polymer-bitumen material

2.5.1. The use of thermal insulation slabs as a substrate layer for polymer-bitumen material

Thermal insulation surface may serve as a substrate for roofing material. The following types of TECHNONICOL thermal insulation are used for this purpose:

- Stone wool slabs TECHNOROOF with compressive strength of not less than 0.060 MPa (60 kPa) at 10% deformation. They are used when installing a roof with mechanical fastening.
- Boards XPS TECHNONICOL CARBON PROF. They are used when installing a roof with mechanical fastening. Torching-on is possible only when installing a reinforced sand-cement screed.
- Polyisocyanurate boards — LOGICPIR. They are used when installing a roof with mechanical fastening or with torchingon on thermal insulation. Torching-on on thermal insulation made of polyisocyanurate is possible in case of using boards with a mineral coated glass fiber mat cover (PIR GTM/GTM).

The decking is installed in accordance with section 2.3.1.

NOTE: The polystyrene concrete surface cannot be the decking for the waterproofing membrane.

2.5.2. The use of prefabricated screed as a substrate layer for polymer-bitumen material

Installation of a substrate layer made of prefabricated screed is carried out on a prepared layer made of thermal insulation boards. The decking is laid in two layers.

NOTE: The weight of the prefabricated screed must provide protection against tearing of the roof due to wind impact. Otherwise, the prefabricated screed must be mechanically fastened to the load-bearing decking. The number of fasteners is determined by the wind load calculation, taking into account the bending strength of the prefabricated screed sheets.

Before installing a substrate layer made of prefabricated screed, prime the prefabricated screed sheets on both sides with bitumen prime coating.1.

Lay the prefabricated screed sheets with the seams spacing so that the sheets of the top layer overlap the seams of the bottom layer by at least 500 mm.

Fasten the sheets together with rivets or self-tapping screws.

The fasteners should be evenly spaced over the entire surface of the sheet. The fastener pitch should be 250-300 mm.

NOTE: In the systems on prefabricated screeds, expansion joints are provided on the ridge with a pitch of no more than 20 m. Gaps with a width of at least 50 mm must also be made along all protruding structure and vertical surfaces of walls and parapets, except for the location of water intake funnels.

When the roof sloping is over 10%, the prefabricated screed must be mechanically fastened to the load-bearing decking.

2.5.3. Forming of a local subsiding in the area of funnel installation

NOTE: Local subsiding of the roof in the areas of internal water drainage funnels installation should be 20-30 mm at a distance of 500 mm from the center of the funnel. This can be achieved in several ways.

When installing a roofing membrane on a decking made of thermal insulation slabs, local subsiding can be achieved by decreasing of the thickness of the thermal insulation layer by 20-30 mm at a distance of 500 mm from the center of the funnel.

Thermal insulation slabs of stone wool in this place must be replaced with extruded polystyrene XPS TECHNONICOL CARBON PROF.

A cement bonded particle board 10 mm thick, primed on both sides, is laid over the extruded polystyrene. The sheet is fastened to the load-bearing decking.

Fasten the board to the load-bearing structure. Cement-particle board must be fastened at least by 4 telescopic fasteners.

NOTE: For a tight junction glue the XPS to the vapor barrier with a sealant. In case several layers of XPS are used for a patch, it is necessary to glue the boards to one another with a sealant.

2.5.4. Preparation of a roofing material decking on a vertical surface

On vertical structures roofing material must be glued to a smooth substrate. Due to this requirement apropriate vertical surface can be: monolithic and precast reinforced concrete, plastered brick structures, particle-cement sheets etc.

Vertical surfaces of reinforced concrete structures:

Even the surface of a concrete decking (walls, parapets) with a sand cement mortar of a grade not lower than C8/10.

Vertical surfaces of precast reinforced concrete structures:

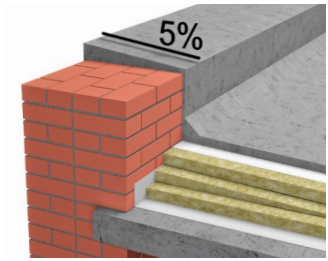
Fill the junctions of vertical reinforced concrete structures (walls, parapets) with polyurethane sealant.

Even the surface of a reinforced concrete decking (walls, parapets) with a sand cement mortar of a grade not lower than C8/10.

Vertical structures made of masonry units:

Vertical surfaces of structures made of masonry units (bricks, breeze blocks) should be plastered with a C8/10 sand cement mortar over the entire surface of placement of an additional waterproofing layer.

Vertical surfaces of structures protruding over the roof and made of masonry units (bricks, breeze blocks) can be covered with plain cement sheets or cement bonded particle boards over the entire surface of placement of an additional waterproofing layer.



A 5% slope towards the roofing must be created on the horizontal plane of the parapet.

Vertical substrates made of sand-cement mortar, precast screeds (both sides of the sheets should be treated) and concrete should be treated with cold primers to provide the necessary adhesion of roofing materials with the decking in accordance with section 2.6.2.

2.6. Substrate preparation before laying the roofing membrane

2.6.1. Cleaning of a substrate

- The basic requirements for the substrate made of thermal insulation are described in section 2.3.
- Before installing a waterproofing membrane, the substrate must be cleaned from construction debris and dirt.
- Check the slope of the substrate.
- Check the evenness of the substrate with a two-meter rod.

In case of a substrate made of piece elements (prefabricated screed, thermal insulation boards), the maximum clearance when checking the decking with a two-meter rail should not exceed 10 mm along and across the slope.

The deviation of the element plane from the specified slope (over the entire area) is no more than 0.2%.

2.6.2. Substrate surface priming

Vertical surface of a substrate made of sand-cement mortar, concrete, LOGICPIR insulation boards should be treated with cold primers to provide the necessary adhesion of roofing materials with the decking. It is recommended to use bitumen prime coating as a primer on dry surfaces. When installing a roof with mechanical fastening, priming of the substrate on a horizontal surface is not required.

NOTE: In accordance with the recommendations of TECHNONICOL, Bitumen prime coating is applied on a decking made of prefabricated screeds with a moisture content of not more than 12 % by weight.

Apply setup to prime the entire surface of placement of the material to the vertical surface (wall, parapet).

Apply primer to the surface. Use a paint roller for this.

On vertical surfaces for accurate primer applying use painter's tape, stick according to a setup.

Apply primer on the parapet on the facade side 50 mm wide to place the waterproofing material.

In hard-to-reach places, use a brush with stiff bristles.

NOTE: Wait until the primer is completely dry. Drying time depends on the brand of the primer and climate conditions during the works.

To identify whether the primer is dry, attach a cotton wool to it: there should be no bitumen traces on the cotton wool attached to a dry primer.

NOTE: It is not allowed to perform works on application of primer composition simultaneously with works on torch-on of waterproofing membrane.

3.

General decking and fastening elements requirements during mechanical fastening

3. General decking and fastening elements requirements during mechanical fastening

3.1. Requirements for the base

The roof is mechanically fastened into the bearing decking made of corrugated steel sheet. The minimum thickness of the profiled sheet must be 0.7 mm.

Before starting works, it is necessary to identify the resistance to pull-out of fasteners from the decking, using the Table.

Decking for installing fasteners	Resistance to pull-out of fasteners from the decking N, not less
Cold-rolled sheet steel 0,7 mm	900
Cold-rolled sheet steel 0,7–2,5 mm	950

3.2. How to choose fasteners for mechanical fastening

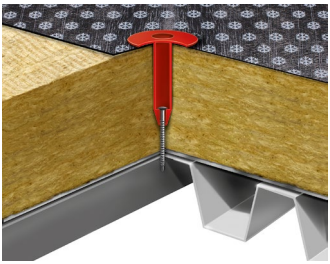
Elements of mechanical fastening for thermal insulation and roofing materials constitute an important part in the roof structure. Integrity and lifespan of a roof depend on chosen fasteners, necessary amount and fastening pitch calculations, quality of the installation works performed.

The waterproofing membrane is fastened to the load-bearing decking through the thermal insulation layer using plastic telescopic fasteners (1) and special self-tapping screws:

Roofing drill-tipped self-tapping screws with a diameter of 4.8 mm are used for fastening to the decking made of profiled sheet (2).

1

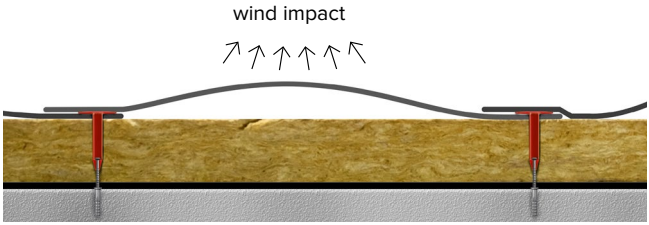
2



* Plastic telescopic elements are used in slopes up to 10%. In slopes more than 10%, steel self-tapping screws with steel plates are used instead of telescopic fastener. A screw used for such fastening should have thread on the upper part to prevent a plate from displacement down the screw during operation.

- The length of a telescopic element should be 15% (and at least 20 mm) less than the thickness of the thermal insulation layer. This value is explained by the insulation deformation due to mechanical load application.
- The length of a screw is selected so that it can be screwed in the decking from corrugated steel sheet for at least 15mm.

For easier selection of the length of a fastener depending on the thickness of the thermal insulation use Table below.



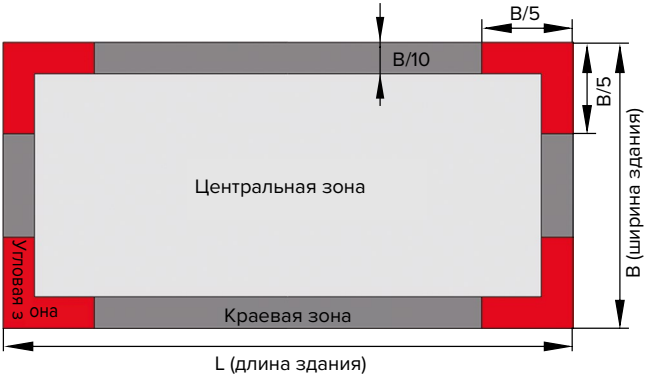
Thermal insulation thickness, mm	Length of fasteners, mm	
	Corrugated steel sheet decking	
	Telescopic fastener, mm	Drill-tipped self-tapping screw Ø 4,8 mm
40	20	60
50	20	70
60	20	80
70	50	60
80	60	60
90	60	70
100	80	60
110	80	70
120	100	60
130	100	70
140	120	60
150	120	70
160	130	70
170	140	70
180	150	70
190	150	80
200	170	70
210	180	70
220	180	80
230	200	70
240	200	80
250	200	100
260	220	80
270	220	100
280	220	100
290	170	160
300	180	160
310	200	160
320	200	160
330	220	160
340	220	160
350	200	200
360	200	200
370	220	200
380	220	200

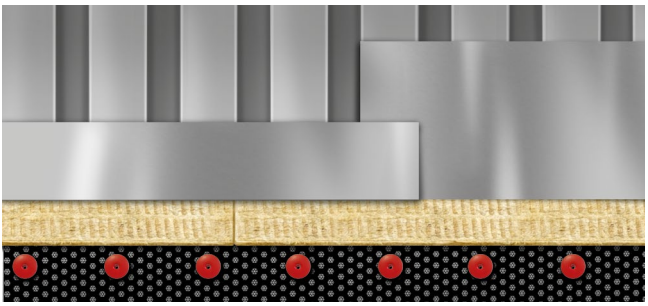
3.3. General requirements to calculations of the number and pitch of fasteners

Number of fasteners is determined according to the wind loading calculation.

NOTE: Calculation errors can lead to irreversible consequences.

According to the rate of wind load, the roof is conventionally divided into 3 zones: corner, edge and central ones.





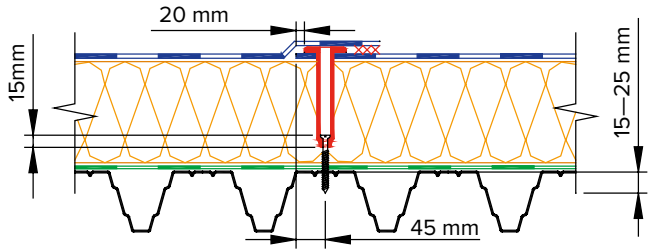
Wind loading is the biggest in the corner zones. Therefore, the number of fasteners in the corner zone should also be greater.

Recommendations for calculating the span of fasteners when fastening in corrugated steel sheet:

- To reduce material consumption, lay the roof perpendicular to the corrugations of the corrugated steel sheet;
- Fasten the material to the crest of the corrugated steel sheet;
- The pitch between fasteners should be limited by the distance between the crests of the corrugated steel sheet and be within 150–350mm.

3.3.1. Peculiarities of mechanical fastening of roofing material

a) Fasteners in a lateral overlap should be installed 45 mm from the edge of a roll. The size of the side overlap when laying the membrane designed for the mechanical fixing should be at least 100 mm, and when laying the waterproofing in one layer - at least 120 mm.

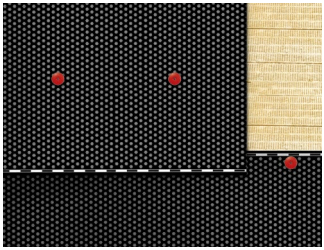


b) It is allowed to install a fastener in the transverse overlap, but only in cases of stretching of the roll (this fastener is not taken into account at wind load calculation) and on roofing slopes more than 10%.

NOTE: Fastener pitch should not exceed 350 mm.

c) In case the calculations reveal a pitch of fasteners installation less than 150 mm (when fastened to a rigid decking), it is allowed to install the fasteners following the methods described below.

Underlay membrane fastening in two-ply roofs:



Install the fasteners in the middle of the material. Such fastening scheme is not a defect. It is allowed to lay the material with a protective layer downwards, for further welding of the top layer.

Install additional strips 200 mm wide from underlay membrane.

Fasten the strip to the decking in accordance with the design pitch, providing the required amount of fasteners per square meter.

For subsequent roofing, torch the underlay membrane onto the fixed strips.

d) Extra fasteners are installed on perimeter of the entire roof along parapets, eaves, utilities (ventilation and lift shafts, roof ventilators, etc.). Extra fastening span should be not more than 250 mm.

NOTE: Mechanical fastening of the roof is prohibited to apply on vertical structures (walls, parapet, ventilation shafts, etc.). The waterproofing membrane should be completely glued to the decking.

3.4. Equipment for mechanical fastening

For mechanical fastening of roofing on corrugated steel sheets (sand-cement screed) screwdriver with a cross slot is needed.

NOTE: Tool misalignment must be not more than 2° to the decking surface.

Do not fasten the fasteners too tight, so that tightened areas do not occur around a seam.

4.
Works with equipment

4. Works with equipment

4.1. Works with equipment during the installation of the bottom layer by mechanical fastening

When installing a two-ply roof, the top layer must be completely glued to the bottom one. Welding of the overlapping areas of the bottom layer and gluing of the top layer to the bottom one is therefore carried out using standard torches.

In case of special requirements to the installation of the base layer to inflammable decks, it is recommended to use automatic welding equipment. You can read more about this equipment and technology in section 4.4.

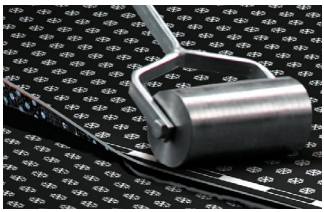
Before carrying out welding and gluing works for the overlapping areas, all the necessary overlaps should be prepared and the material, which is a lower one in the overlap (see section 5.2.2), should be mechanically fastened (see section 3.3).

To place a standard torch under the seam in the overlap conveniently, fold the side edge of the top material and put your leg on the side edge of the mechanically fastened material.

Aim the flame of a torch under the seam.

For high-quality torch-on application of the material, it is necessary to achieve even flowing-out of a polymer-bitumen binder from under the edge of the material.

Torch-on application is performed towards yourself.



Immediately after the application, when the material is not cooled yet, roll the glued overlapping area with a roller for total sealing of the overlap.

A sign of a good and right material warming is flowing-out of the polymer-bitumen binder from under the side edge of the material from 10 mm to 25 mm.

NOTE: Flowing-out by more than 25 mm indicates overheating of the material. Overheating during torch-on application impairs the operational properties of the roof.

Overlapping areas can be welded with a special gas torch and a roller.

It is not needed to fold the material with your leg, as it was recommended at overlaping areas torching-on with a standard gas torch. The necessary fold is formed by a gas torch nozzle.

Insert the nozzle of the overlapping area gas torch and glue the overlap.

For high-quality torch-on application of the material, it is necessary to achieve even flowing-out of a polymer-bitumen binder from under the edge of the material.

Torch-on application is performed towards yourself.

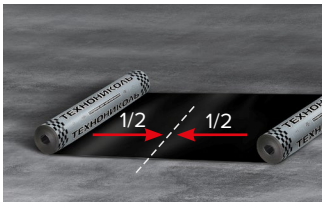
Immediately after application, when the material is not cooled yet, roll the glued overlapping area with a roller for total sealing of the overlap as mentioned previously.

4.2. Works with equipment during the installation of roofs on a vertical surface by means of torch-on application

During the installation of roofs by torch-on application, the material of the bottom and top layers is glued using standard gas torches.

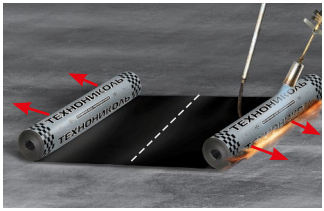
NOTE: Depending on the roof sloping (see section 5.2.), there are two methods of winding and unrolling of the roll during torch-on application.

Method No. 1 is used at low slopes of the roof.

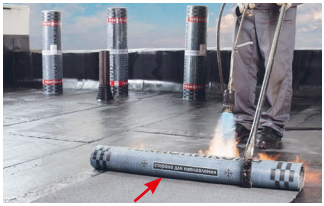


Roll up the aligned material till the middle.

The winding is better to be performed using a metal or a cardboard spool. Ensure that the edge of the roll is straight.



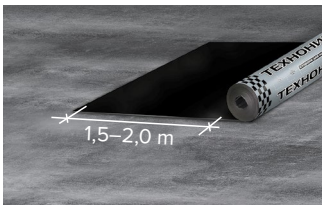
The material should be welded from the middle to both sides.



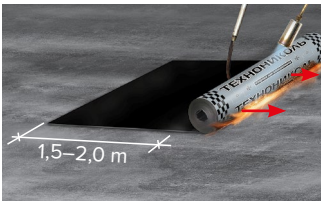
When installing the material, unroll the roll towards yourself.

For convenient unrolling use a hook.

Method No. 2 is used at significant roof sloping (more than 8%) to avoid probable displacement of the roll during torch-on application.



Roll the aligned material almost to the end: leave 1.5-2 m.



Weld the roll to the decking. When installing, roll the material towards yourself.

After the installation of the roll, weld the left part of the roll (1.5-2 m).

Basic rules of torch-on application of a bottom layer:

All the required overlaps should be prepared prior to start of the woks (see section 5.2.1).

Heat up the material with smooth movements of a gas torch.

When installing the roll, provide equal heating up of the material and the surface of the decking.

NOTE: When installing roofing membrane on thermal insulation boards, warming of the decking surface is not required. The material is warmed at a reduced gas pressure of up to 1-1.2 atm (up to 1.0-1.2 kg/cm^2). The gas torch flame is directed only to the roll surface. The flame length from the point of exit from the gas torch to the roll is no more than 300-400 mm.

When installing adjacent rolls, a gas torch should move in L-shaped trajectory to provide additional warming of the part of the overlapping material (the dimensions of overlaps are indicated below).

Deformation of the pattern indicates the correct warming of polymer-bitumen binder from the underside of the roll material.

For high-quality torch-on application of the material to the decking it is necessary to get a small bulge of a polymer-bitumen binder in the place where the material touches the surface.

NOTE: It is forbidden to walk on still hot material!!!

A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by 10-25 mm.

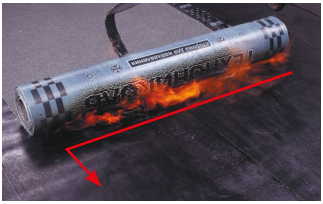
When using a material vented membranes for a bottom layer having strips of polymer-bitumen binder on the lower side of the membrane, the laying technology is similar to the technology described above.

Basic rules of torch-on application of a top layer:

All the required overlaps should be prepared prior to start of the works (see section 5.2.3).

Heat up the material with smooth movements of a gas torch.

When torching-on the first roll in the low area, provide equal heating up of the material and the surface of the decking.



When torching-on adjacent rolls, a gas torch should move in L-shaped trajectory to provide additional heating of the part of the overlapping material.

For high-quality torch-on application of the material to the decking it is necessary to get a small flowing-out of a polymer-bitumen binder in the place where the material touches the surface.

In case of torching on over the coarsegrained slate (end, lateral overlaps etc.), imbed the slate in the area of seam formation:

- heat up the material with a gas torch;
- imbed the slate into the bitumen with a spatula.

NOTE: Torch-on application of the material to the coarsegrained slate can lead to roof leaking.

A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by 10-25 mm.

NOTE: Flowing-out by more than 30 mm along the entire lengthwise overlap means overheating of the material. Overheating during torch-on application impairs the operational properties of the roof.

NOTE: It is forbidden to walk on still hot material!!! The slate will imbed into the bitumen binder layer, causing footprints or areas with exfoliated top layer of the material, which will lead to worse appearance, accelerated aging under the influence of sun radiation or mechanical damage to the roof.

4.3. Installation of the bottom layer on a horizontal surface using self-adhesive materials

When installing a roof over a sand-cement screed or thermal insulation PIR GTM/ GTM TECHNONICOL (glass tissue with mineral binder), the bottom layer can be made of self-adhesive materials, without the use of an open flame.

NOTE: Work on the installation of a roof using self-adhesive materials must be carried out at an ambient temperature of at least +5° C. It is not allowed to lay self-adhesive materials on a decking covered with dew or in fog.

For convenient laying of the material, glue the beginning of the roll to the decking surface:

- roll the beginning of the roll back 500 mm from the vertical structure;
- cut the removable film on the rolled part of the roll.

Remove the removable film and glue the material partly to the decking.

The materials are installed by two roofers. One worker pulls the release film towards himself/herself while unwinding the roll. The other worker smooths the material with a brush, pressing air out from under the material to ensure good adhesion to the decking.

To improve the quality of gluing, the installed material is pressed with a heavy roller. Longitudinal overlapping areas are additionally pressed with a heavy hand roller.

4.4. Works with equipment during the installation of single-ply roofs with mechanical fastening

Seams of a single-ply roof can be welded with automatic or manual hot-air equipment or with a seam or a standard gas torch.

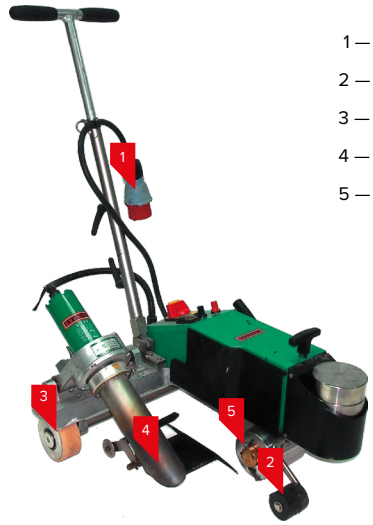
In case of special requirements to the installation of the base layer to inflammable decks, it is recommended to use automatic welding equipment.

Performing of a seam with automatic equipment

Automatic equipment is used for installation of single-ply roofs. The advantage of the automatic equipment is absence of human factor during welding.

Before starting the works, get acquainted with the recommendations of automatic welding equipment producer.

As an example, let us consider automatic equipment BITUMAT.



1 — Cable plug, 400 V power supply

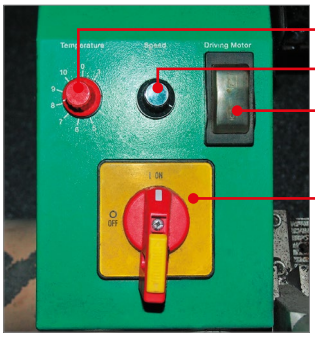
2 — Lifting device

3 — Metal guide roller

4 — 100 mm wide welding nozzle

5 — 100 mm wide roller

Device dashboard:



Temperature regulator

Speed regulator

On/Off motion tumbler

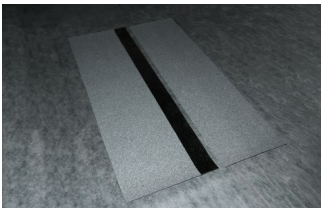
On/Off equipment tumbler

NOTE: BITUMAT requires 400V electric network.

Firstly, set parameters (air temperature (550–600 °C) and speed) of the welding equipment.

After turning off the equipment, wait till the air and nozzle heat up. Heating up duration depends on the ambient temperature; it takes from 7 to 10 minutes in average.

NOTE: At a working site always start the works with test welding to set the welding equipment correctly. Welding parameters, such as temperature and speed of the equipment, are not constant and depend on external weather conditions (environmental temperature, wind speed etc.).



Take two pieces of material for a test and weld a seam.

The main requirement to the seam is an even flowing-out of a bitumen binder by not more than 25 mm. A flowing-out by 10–25 mm is recommended.

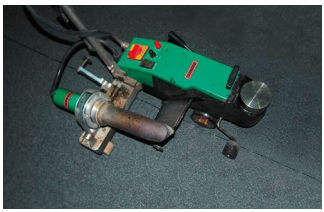
At the beginning flowing-out can be higher than during further steps, but should not exceed 25 mm. It is due to preparation of equipment for launching.

After total cooling of the seam, cut out a 50 mm wide strip from the test welding area and check the quality of bonding and the width of the seam (it should be not less than 90 mm wide).

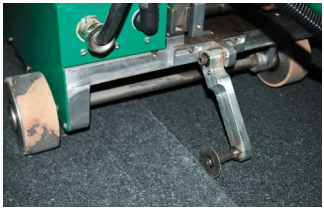
In case the seam is torn easily, it is necessary to reduce welding speed or increase welding temperature.

NOTE: When testing a high quality weld, a cohesive break occurs, i.e. it is not the seam, which is torn, but the material itself. It is rather difficult to perform cohesive failure of a qualitative seam of a bitumen-material.

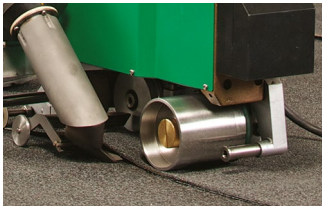
After setting the parameters, start welding of roofing membrane:



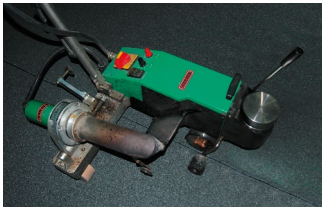
Place the equipment in the point, where welding is going to be performed.



Place the metal guide roller along the edge of the seam. It is necessary to position the welding machine along the seam during welding.



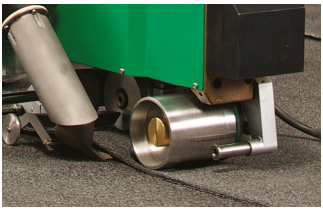
Roller should be placed 5 mm away from the edge of the material.



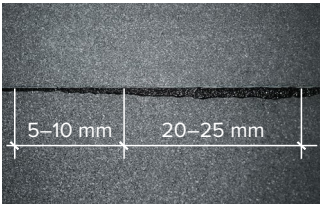
Lift the roller with the lifting device.

For convenient placement of the nozzle under the seam, fold the lateral edge of the above installed material and put your leg on the lateral edge of the mechanically fastened material.

Put the nozzle under the seam and remove the lifting device.



As soon as the smoke appears (1–2 sec), turn the motion on, and the equipment will start moving.



Flowing-out should be controlled with the speed regulator – in case of large flowing-out, increase motion speed, and vice versa.

In hard-to-reach areas, manually take out the equipment, lift the nozzle and turn off the motion of the equipment.

After that weld the seam with a manual hot-air gun (see below).

NOTE: To use automatic welding equipment designed for PVC-membranes, e.g. VARIMAT, it is necessary to use a special nozzle and a roller.

After works, set the lowest temperature, let the equipment cool down. Then the equipment can be switched off.

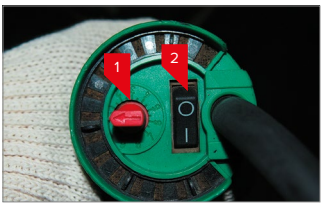
Manual seam performing:

Manual welding is carried out with a special hot-air gun. It is mainly used in hard-to-reach areas, where automatic welding equipment cannot be used.

NOTE: Before starting the works, get acquainted with the manuals and recommendations of welding equipment producer.

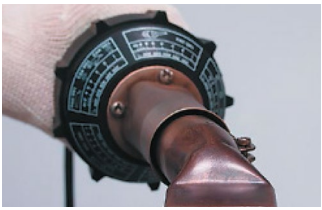
Manual hot-air gun of Leister Triac S type with a 80 mm slot nozzle.

Manual hot-air gun of Leister Electron ST type with a 75 mm slot nozzle.



1 — Temperature regulator

2 — On/Off equipment tumbler



Before starting the works, check up the equipment:

Nozzle should be fixed to the neck of the welding equipment.

Nozzle should be clean and be of an even width.

Burned deposits should be removed with a metal copper brush.

NOTE: Before seam welding it is recommended to perform a test seam to set the temperature of the equipment and the speed of welding.

With the regulator set the appropriate temperature of the air on exit from the nozzle. For welding choose the working temperature of about 550-600°C, depending on weather conditions and individual welding speed.

After turning on the gun, wait for about 7-10 min till the equipment heats up to the necessary temperature.

When the fan is prepared for work, one can start welding:

Insert the nozzle of the fan in the seam at an angle of about 45°. The edge of the nozzle should protrude from the overlap for 2–3 mm.

Wait for several seconds and start moving the fan along the seam.

While moving the fan, additionally roll the seam with a silicone roller 4-5 cm away from the nozzle.

When rolling with a silicone roller, control the flowing-out of a bitumen binder.

NOTE: Burned deposits, as they accumulate, must be removed with a metal copper brush.

4.5. Works with equipment during roof torch-on application on vertical surfaces

The roofing (two- and single-ply) on a vertical surface should be completely glued (torched on) to the decking. When installing a two-ply roof on vertical surfaces, an underlay membrane is used as a bottom additional layer, and granules covered cap sheet membrane as an upper additional layer (see section 6.2. and 6.3).

Torching-on is performed by unwinding the roll from bottom to top starting from the upper edge of the fillet.

For high-quality torch-on application of the material to the decking it is necessary to get a small bulge of a polymer-bitumen binder in the place where the material touches the surface.

The stick material should be additionally smoothened and pressed from the center to the edges of the roll, extruding bitumen binder and air.

After smoothening, pull off the unglued part of the material from the decking and continue torch-on application.

After the vertical gluing is finished torch on the material onto the angle fillet and onto the horizontal area.

Thoroughly press or roll the material in the areas of deck curving.

To provide an overlap with an additional top layer, heat up the material and imbed the slate.

5.

Installation of roofing polymer-bitumen membranes

5. Installation of roofing polymer-bitumen membranes

5.1. Installation of assembly components and anchoring elements

Before laying the main roof membrane, perform the following work:

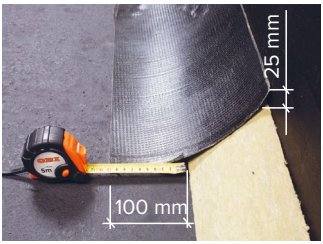
- glue additional reinforcement layers;
- install a water intake funnel;
- install expansion joints;
- install angle fillets;
- install an additional reinforcement layer onto an angle fillet made of ungritted material.

Reinforcement layers are necessary to increase reliability, tightness and durability of a roof in the areas of installation of water intake funnels, ridge, valley, junctions to vertical surfaces (parapets, walls) and other elements.

5.1.1. Installation of reinforcement layers in the junctions to vertical structures (walls, parapets)

Install angle fillets (from stone wool) on TECHNONICOL hot -applied roofing mastic in the junctions with parapets, walls and other vertical structures.

When installing a roof by mechanical fastening of the bottom layer, fillets (made of stone wool) are installed on the material preheated with a gas torch flame, placed at the parapet.



Prepare reinforcement strips from underlay membrane. Reinforcement layer should entirely cover the fillet and overlap horizontal surface by 100 mm and vertical surface by 25 mm from the fillet.

The end part of the roll can be placed on the angle fillet without a reinforcement layer, when the bottom layer of the waterproofing membrane is installed by torch-on application. This is possible only when the end part of the roll is installed up to the vertical structure: the end part of the roll should overlap the vertical surface 25 mm higher than the angle fillet.

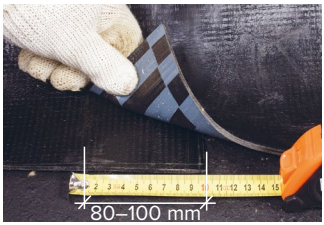
Torch the reinforcement layer strips onto the angle fillet.

Heat up with slow burner movements, ensure uniform heating of the material and the surface of the decking.

For high-quality torch-on application of the material to the decking it is necessary to get a small bulge of a polymer-bitumen binder in the place where the material touches the surface.

A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by 10-25 mm.

NOTE: Laying of reinforcement layers should be started from the lowest points of the roof to avoid the occurrence of counter seams.



Lateral overlaps of adjacent reinforcement layers should be 100 mm.

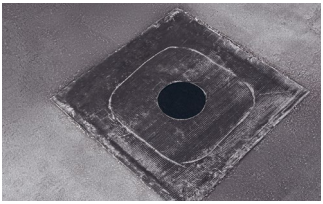
5.1.2. Installation of reinforcement layers in the water intake funnel area

Cut out an additional reinforcement layer from underlay membrane 500x500 mm. It is recommended to round the corners of the resulting additional layer.

Torch on the reinforcement layer in the area of local subsiding of the water intake funnel (in accordance with the design). Heat up with slow burner movements, ensure uniform heating of the material and the surface of the decking.

For high-quality torch-on application of the material to the decking it is necessary to get a small bulge of a polymer-bitumen binder in the place where the material touches the surface.

A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by 10-25 mm.



In the installed reinforcement layer, cut out a round hole for a water intake funnel pipe and outline the contours of the funnel fixing ring.

When installing a roof by mechanical fastening of the bottom layer on thermal insulation slabs:

Weld a reinforcement layer made of the underlay membrane to cement bonded particle board sheet (see section 2.5.4.).

Fasten the cement bonded particle board sheet to the load-bearing decking. The sheet should be fastened with at least 4 telescopic fasteners.

5.1.3. Installation of a water intake funnel

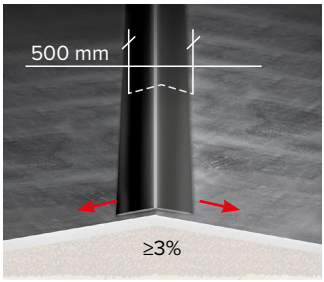
Burn down the film on the surface of the material in the area of water intake funnel installation.

Install the funnel and press the flange of the water intake funnel into heated up area or into a mastic layer.

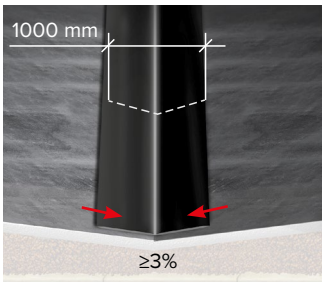
Fasten the funnel to the cement bounded particle board.

For a tight junction with a funnel, it is necessary to cover the funnel flange with a bitumen binder.

5.1.4. Installation of reinforcement layers on a ridge and in a valley



When the roof sloping is 3% or more, the ridge of the roof should be reinforced 250 mm from both sides and the valley 500 mm from the inflection line with one layer of a roll roofing material according to TN International recommendations.



5.2. Installation of roofing polymer-bitumen membranes

Direction of installation depends on the method the roofing membrane is to be installed.

When mechanically fastened:

Unrolling of polymer-bitumen roll materials should be carried out in one direction across the corrugations of the profiled flooring.

When torched on:

Make a decision on the direction of unrolling of the roll:

For slopes of more than 15%, the rolls should be rolled out along the slope, for slopes of less than 15%, both along and across the slope.

NOTE: Cross-sticking of rolls of the top and bottom layers of the main roofing membrane is not allowed!

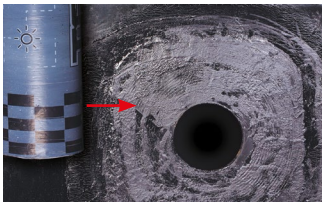
NOTE: Start installing roll materials from the low area (eave overhangs, valleys, places of water intake funnel installation, etc.).

It is a good practice to mark out the rolls on a prepared decking.

The marking will ensure aligned adhesion, help to avoid displacement of the rolls and decrease material consumption.

Place the rolls of polymer-bitumen materials in an upright position. At the working site, the amount of the materials should not exceed the needs of one working shift.

5.2.1. Torch-on application of the bottom layer



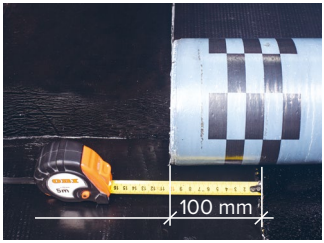
Unroll the entire roll of the membrane so that the side edge lies on the axis of the water funnel.

Align the roll according to the setup. To avoid displacement of the roll in the process of alignment and corrugations on the roll, it is necessary that one roofing worker stands on one edge of the roll and another aligns the roll.

NOTE: Depending on the roof sloping, select the method of winding and unwinding of the roll (see section 4.2).

A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by 10-25 mm.

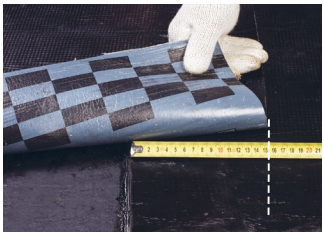
NOTE: Flowing-out by more than 30 mm along the entire lengthwise overlap means overheating of the material. Overheating during torch-on application impairs the operational properties of the roof.



The side overlap of adjacent rolls must be 100 mm.

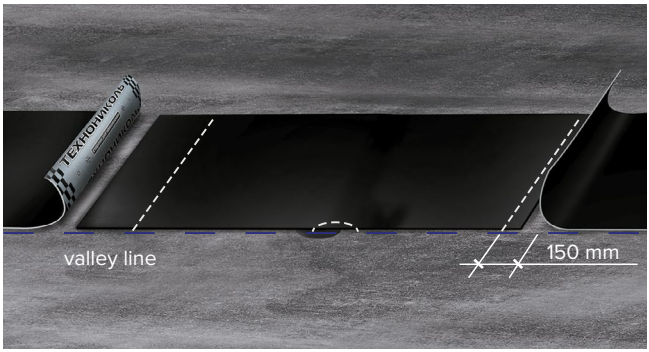
Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid counter seams. Water should flow from the overlapping area towards drainage divide line.

NOTE: The very first roll installed on the low area of a water intake funnel should be overlapped on both sides with adjacent sheets by 100 mm.

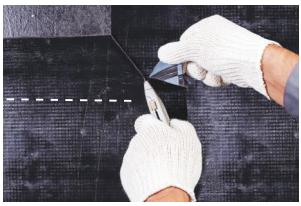


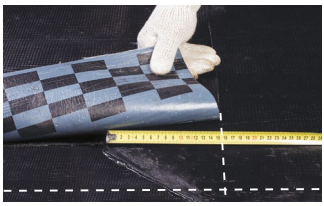
End overlap of adjacent rolls should be not less than 150 mm.

Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid the occurrence of counter seams. Water should flow from the overlapping areas towards the water intake funnel.

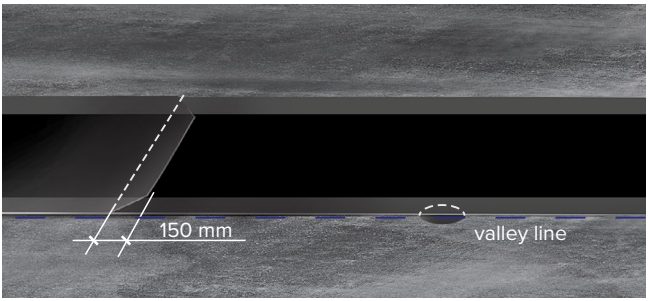


To increase the reliability and tightness of the end overlap it is recommended to cut the corner of the material sheet, which is a lower one in the overlap. Cut at an angle of 45°.

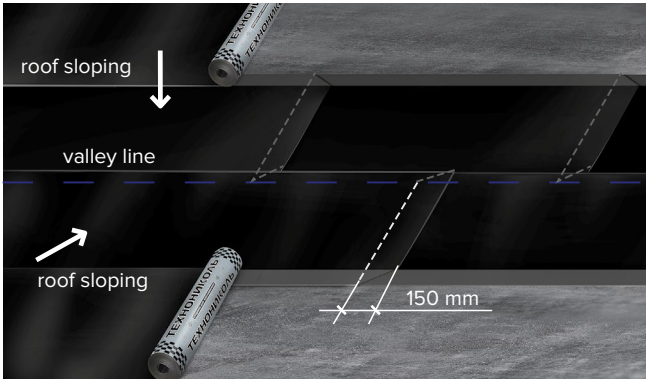


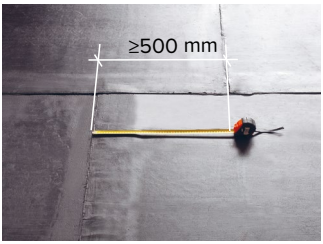


The very first roll on the low area is recommended to be cut on both sides.



Subsequent installation and edge cutting of the rolls:

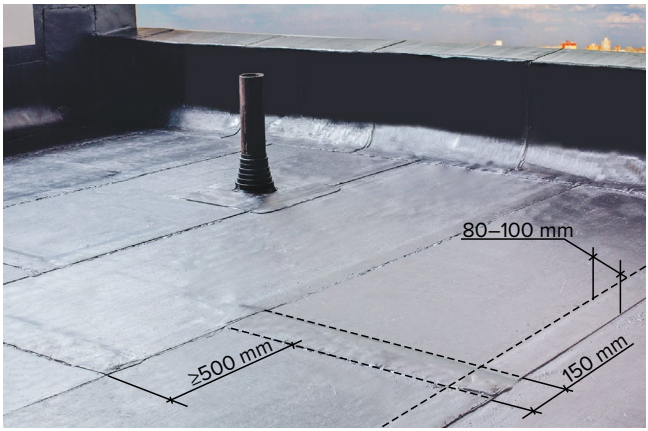




End overlaps of adjacent sheets of the roofing material should be shifted relative to one another by not less than 500 mm.

NOTE: For the installation of roofing elements and torching on of the bottom roof layer on vertical structures, refer to section 6 “Installation of Roofing Components”.

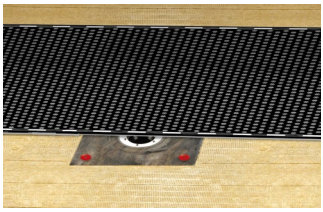
General view of a flat roof after torch-on application of the bottom layer.



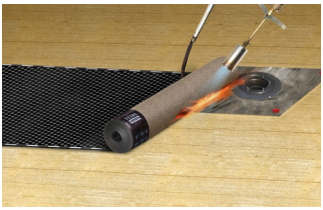
NOTE: It is forbidden to walk on still hot material!!!

5.2.2. Mechanical fastening of the bottom layer

NOTE: The bottom layer must be installed on the main (horizontal) roof plane.



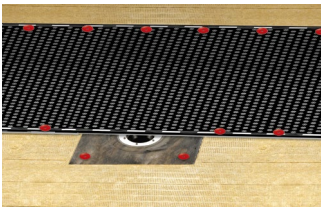
Place the first sheet of the roofing material underlay membrane so that the side edge lies on the axis of the water intake funnel.



Roll the roll back till the funnel reinforcement layer (funnel installation see in section 5.1.2 and 5.1.3).

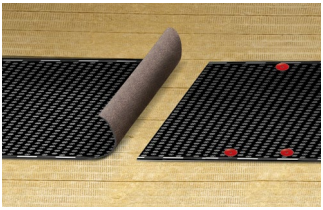
In the funnel area stick the material to the funnel reinforcement layer.

Temporarily fill the vertical funnel pipe with a non-flammable material so it will not be damaged during works with a torch.



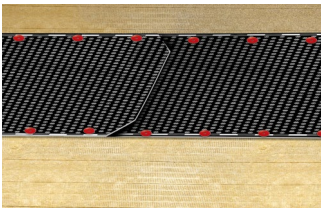
Fasten the roll to the decking in the lateral seam on both sides of the sheet in accordance with the calculated pitch (see section 3).

NOTE: Do not install mechanical fasteners in the place of funnel installation.



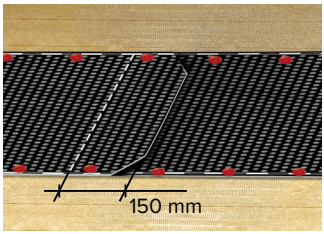
Unroll the next roll, try it on the plane, align, form an end overlap with the first roll installed.

End overlap of adjacent rolls should be not less than 150 mm.



Fasten the roll to the decking in the lateral seam on both sides of the sheet in accordance with the calculated pitch (see section 3.3).

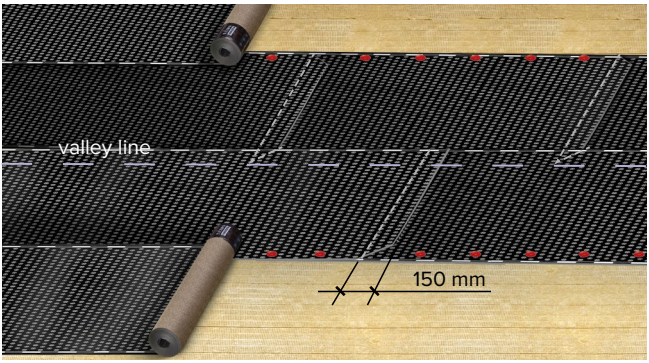
NOTE: Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid counter seams. Water should flow from the overlapping areas towards the water intake funnel.



To increase the reliability and tightness of the end overlap it is recommended to cut the corner of the material sheet, which is a lower one in the overlap. Cut at an angle of 45°.

Torch on the end overlap with the chosen equipment (see section 4.1).

NOTE: Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid counter seams. Water should flow from the overlapping area towards the counter seam.



Lateral overlap of the sheets should be not less than 100 mm.

Displacement of adjacent rolls should be not less than 500 mm.

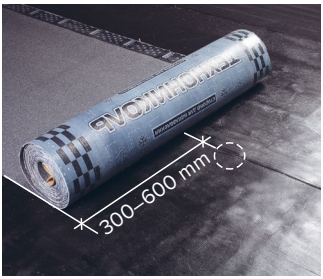
In the lateral overlapping areas, the next rolls should be fastened to the material, which is the lower one in the overlap.

Torch the lateral overlapping area with the chosen equipment (see section 4.1).

NOTE: See the installation of the bottom layer on a vertical surface in section 6.2 and 6.3.

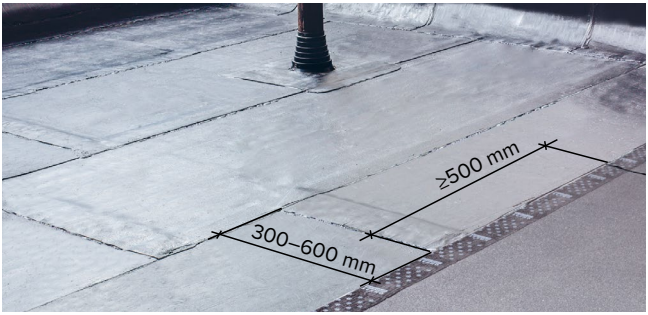
5.2.3. Torch-on application of the top layer

NOTE: Regardless of the method the bottom layer is laid on the main (horizontal) surface, the top layer must be completely glued.



Distance between lateral joints of roofing membrane sheets in adjacent layers should be 300-600 mm. For convenience, displace the top roll half the width, i.e. 500 mm.

End overlaps of adjacent material layers should not coincide. It is recommended to displace end overlaps of adjacent layers by not less than 500 mm.



Unroll the roll, taking into account the necessary displacement of the sheets of the bottom and the top layer sheets with respect to one another.

To avoid roll displacement during the process of alignment and corrugations on the roll, it is necessary that one roofing worker stands on one edge of the roll and another one aligns the roll, controlling overlaps.

Depending on the roof sloping, select the method of winding and unwinding of the membrane (see section 4.2).

A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by 10-25 mm.

NOTE: Flowing-out by more than 30 mm along the entire lengthwise overlap means overheating of the material. Overheating during torch-on application impairs the operational properties of the roof.

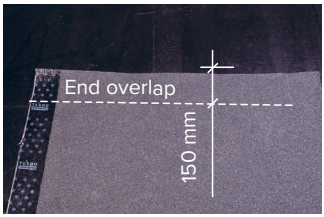
NOTE: It is forbidden to walk on still hot material!!! The slate will imbed into the bitumen binder layer, causing footprints or areas with exfoliated top layer of the material, which will lead to worse appearance, accelerated aging under the influence of sun radiation or mechanical damage of the roof.

The side overlap of adjacent rolls must be 100 mm.

Specially for end overlapping, there is a strip without coarse-grained slate on each cap sheet membrane material.

Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid counter seams. Water should flow from the overlapping area towards drainage divide line.

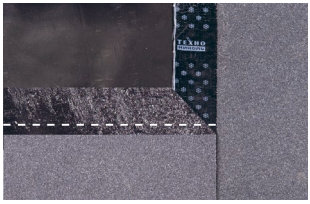
NOTE: The very first roll installed on a low area of a water intake funnel should be overlapped on both sides with adjacent sheets by 100 mm. Remove the grit in order to ensure end overlap on the other side of the roll.



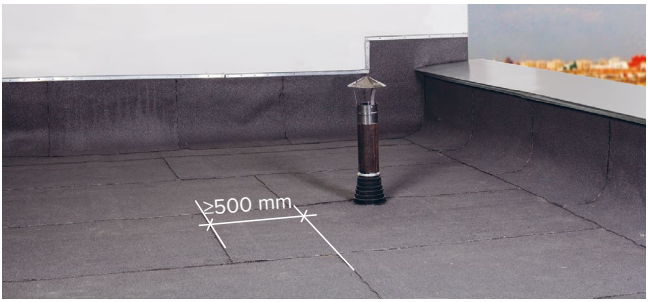
End overlap of adjacent rolls should be not less than 150 mm.

Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid the occurrence of counter seams. Water should flow from the overlapping area towards the water intake funnel.

To increase the reliability and tightness of the end overlap it is recommended to cut the corner of the material sheet, which is a lower one in the overlap, and then remove the coarse-grained slate. Cut at an angle of 45°.



End overlaps of adjacent sheets of cap sheet membrane should be displaced with respect to one another by not less than 500 mm:

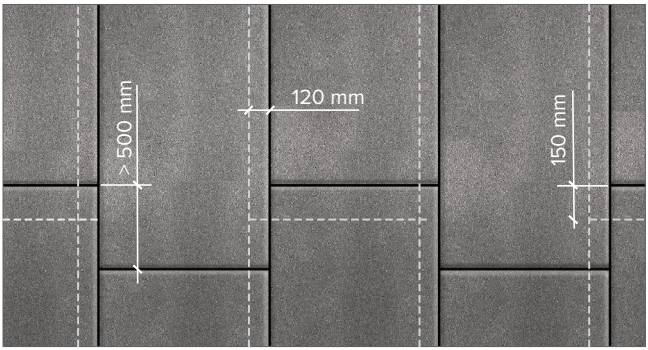


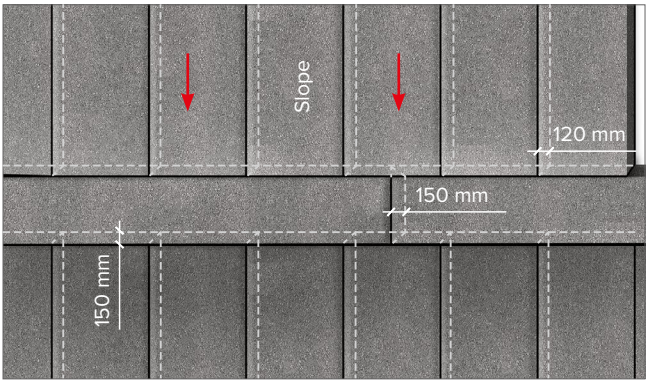
NOTE: For the installation of the roofing elements and torching on of the top layer of cap sheet membrane material on vertical structures, see section 6 “Installation of Roof Components”.

5.2.4. Installation of single ply roof

There are two methods of installation of a single-ply roof:

- solution with built-up strip without shift between end seams (roof slope less than 15 %);
- traditional solution with the shift of the end seams.

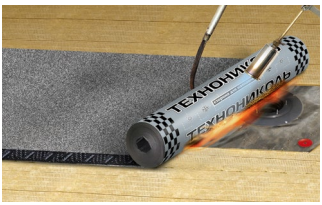




NOTE: When installing with automatic equipment, performing of the built-up strip is recommended. This will increase convenience and speed of work.

Let us consider installation of a built-up strip on a low area with a funnel.

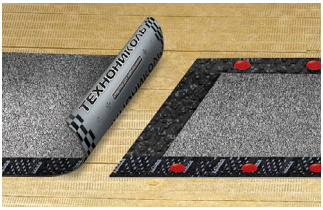
Unroll the first roll on the low area; the funnel should be in the middle of the roll.



Roll the roll back till the funnel reinforcement layer (funnel installation see in section 5.1.2 and 5.1.3).

- In the funnel area glue the material to the funnel reinforcement layer.
- Temporarily fill the funnel with a non-flammable material so it will not be damaged during torching.

Fasten the roll to the decking in the lateral seam on both sides in accordance with the calculated span (see section 3).

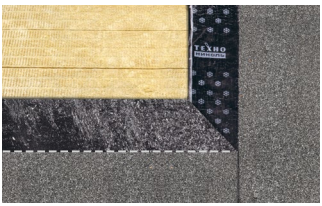


Unroll the next roll, talign it and form an end overlap with the first roll.

End overlap of adjacent rolls should be not less than 150 mm.

To increase the reliability and tightness of the end overlap it is recommended to cut the corner of the material sheet, which is a lower one in the overlap.

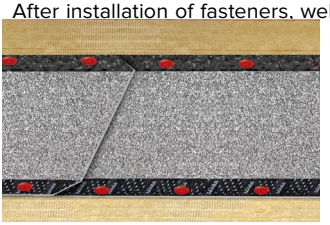
Cut at an angle of 45°.



Undercut of a built-up strip roll is performed from the both sides.

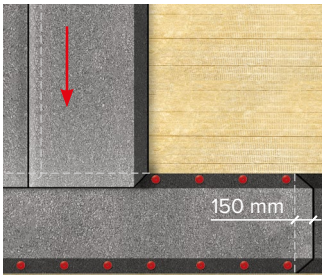
In the lateral seam on the both sides in accordance with the calculated span (see section 3).

After installation of fasteners, weld the end seam with the chosen equipment (see section 4.4) and continue the installation of a built-up strip.



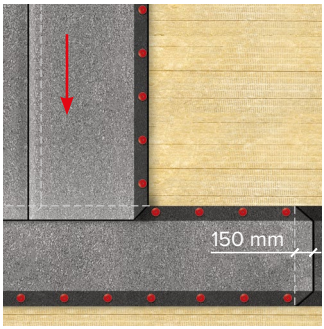
NOTE: Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top to avoid the occurrence of counter seams. Water should flow from the overlapping area towards the water intake funnel.

Placement of the rolls to the built-up strip



Unroll the roll perpendicular to the built-up strip, align and form an end overlap to the built-up strip.

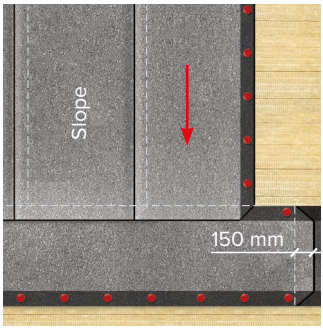
The end overlap of the roll, formed on the built-up strip, should be at least 150 mm.



Fasten the roll in the lateral seam along the entire length in accordance with the calculated span (see section 3).

Do not fasten in the end overlap.

Install the adjacent material. Lateral overlap of adjacent rolls should be not less than 120 mm.

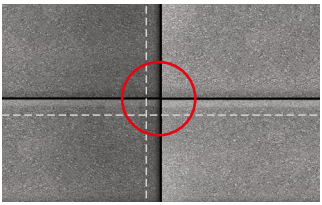


When forming overlaps, fastening in the lateral seam is performed on the material, which is a lower one in the overlap.

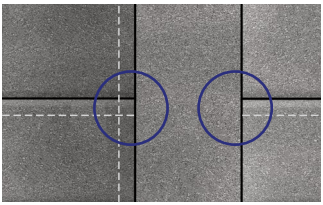
Weld the lateral seam with the chosen equipment (see section 4.4) and continue the installation of the next roll.

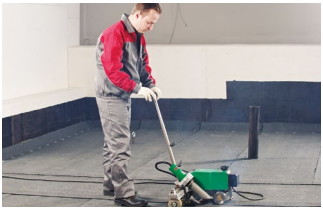
NOTE: Avoid X-shaped crossings of the seams, where 4 layers of a roll material occur. Form T-shaped and lineal seams. (see fig. on page 95).

Wrong



Correct

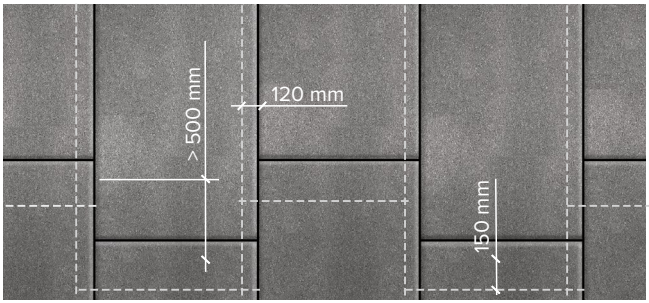




After the placement of all the rolls to the built-up strip, weld all the end seams with the chosen equipment (see section 4.4).

NOTE: Continue the roof installation, performing built-up strips and placing the rolls to the strip. Follow the rule of counter seams – water should flow from the seam towards a water intake funnel.

Traditional solution considers parallel installation of the rolls with end (at least 150 mm overlap) and lateral (at least 120 mm overlap) seams.



Rolls are fastened in accordance with the calculated span (see section 3).

The first roll is formed similar to the built-up strip on a low area.

Displacement of the end overlaps of the adjacent sheets should be not less than 500 mm.

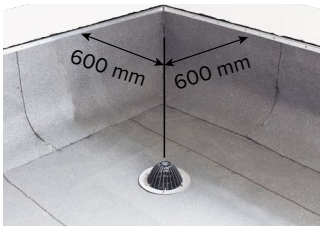
NOTE: Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top to avoid the occurrence of counter seams. Water should flow from the overlapping area towards the water intake funnel.

6.
Installation of roof components

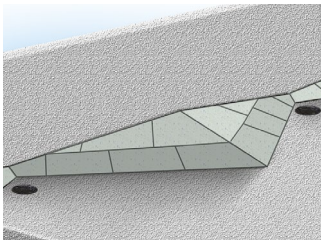
6. Installation of roof components

6.1. Junction to water intake funnel

NOTE: Local subsiding of the roof in the areas of internal water drainage funnels installation should be 20-30 mm within a radius of 500 mm (see section 2.5.4 Forming of a Local Subsiding in the Area of Funnel Installation).



Water intake funnels installed along parapets and other protruding parts of buildings should be placed not less than 600 mm away from them.



Form an additional counter slope from vertical structures (walls, parapets etc.) to a water intake funnel (see section 2.4. Formation of Roof Slope).

NOTE: It is forbidden to install rainwater pipes inside the walls.

6.1.1. Installation of a funnel with metal crimping flange

Water intake funnel can be installed in the roof structure as a two- or single-level funnel. Junctions of two- and single-level funnels to bitumen roofing are performed according to the same rules, with differences in preparation works before installation of the funnels on the roofing.

A two-level funnel consists of a bottom part with a flange (Fig. 1), which is installed on a vapor barrier layer (see section 2.2 Attachment of Vapor Barrier to Water Intake Funnel), and a put-on element (Fig. 2), which is inserted in the funnel (Fig. 1). Tightness between the parts is provided by a rubber gland and a locking ring.

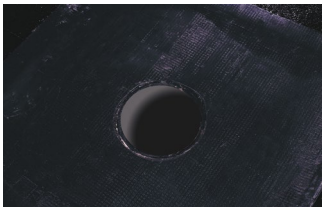
Fig. 1

Fig. 2

Remove the flange from the funnel.

Cut out an additional reinforcement layer from the underlay membrane 500x500 mm. It is recommended to round off the corners of the resulting additional layer.

Weld an additional reinforcement layer in the area of local subsiding of the water intake funnel (as per the design) in accordance with section 5.1.2.



In the installed additional reinforcement layer cut a round hole around the edge of the water intake funnel.

Heat up with the flame of a torch the part of the reinforcement layer, on which the funnel is going to be installed.

Press the head of the water intake funnel into the heated area. Make sure that the polymer-bitumen binder is flowing out from under the funnel flange evenly. The flowing-out ensures total tightness of the joint.

Fasten the water intake funnel to the decking with at least 4 fasteners.

Fastening will prevent the funnel from probable displacement during subsequent roofing installation.

Use EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve as fasteners.

For a tight joint with the funnel, it is necessary to coat the funnel flange with a bitumen binder. All methods of applying bitumen binder are described in section 5.1.3.

Install the bottom layer (see section 5.2.1 Torch-On Application of the Bottom Layer or section 5.2.2 Mechanical Fastening of the Bottom Layer). Lateral overlap of the sheets should lie on the axis of the funnel.

Temporarily fill the vertical funnel pipe with a non-flammable material so it is not damaged during works with a torch.

Cut the waterproofing membrane around the hole of the water intake funnel.

Torch on the top layer of the cap sheet membrane (see section 5.2.3 Torch-On Application of the Top Layer).

While the material is still warm, press bolt joints of the funnel through the material cap sheet membrane.

Cut the waterproofing membrane around the diameter of the water intake funnel.

To increase reliability of the flange joint with the roofing system, apply sealing mastic on the reverse side of the flange.

Insert the flange and fasten with screws.

Install a leaf catcher.

6.1.2. Installation of parapet drain funnel (overflow over the parapet).

Parapet drain funnel No.1 (see Photo No. 1) – funnel for external water drainage over balconies and parapets on low areas of a roof. Parapet drain funnel No.2 (see Photo No. 2) is a parapet spillover, which is installed in cases of emergency water drainage when the main funnel of internal water drainage is clogged.

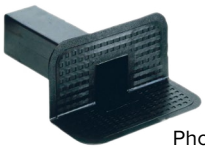
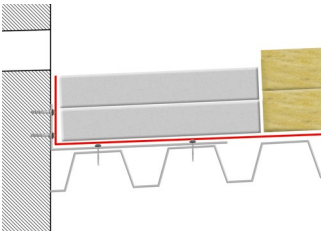


Photo N°1

Photo N°2

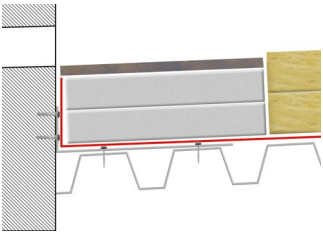
Junctions of parapet drain funnels to the roof are carried out according to identical technologies. In this manual, junction of a parapet drain funnel No.2 is described.

NOTE: When installing a roof over stone wool thermal insulation slabs:



In the place of funnel installation on an area of at least 500×500 mm, entirely replace TECHNOROOF stone wool thermal insulation with TECHNONICOL CARBON PROF extruded polystyrene (hereinafter referred to as XPS).

To subside the level of the roof in the funnel area, the XPS patch thickness should be 20 mm less than the thickness of the top thermal insulation slab.



Install a cement bonded particle board of the size of the patch and not less than 10 mm thick.

Treat the board with Bitumen prime coating.

Cut out a reinforcement layer from the underlay membrane and torch it onto the area of the local subsiding of the water intake funnel. The reinforcement layer should be 100 mm more than the parapet drain funnel flange on each side.

In the installed reinforcement layer cut a round hole for a water intake funnel pipe.

Heat up with the flame of a torch the part of the reinforcement layer, on which the funnel is going to be installed.

When using thin torch-on applied materials as the materials for a bottom layer, apply sealing mastic with a spatula.

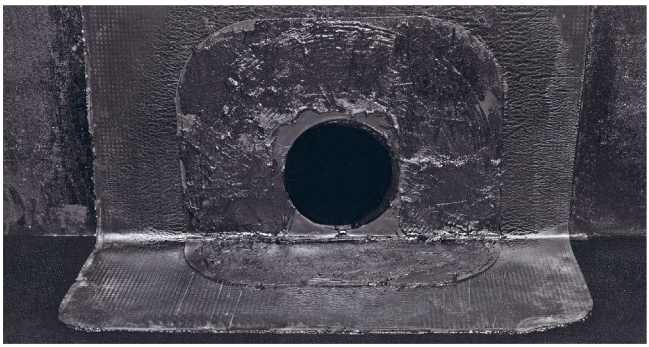
Install the funnel.

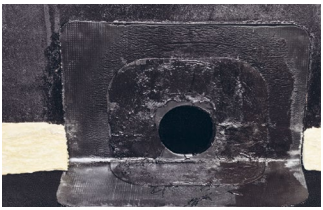
Press the head of the water intake funnel into the heated up polymer-bitumen binder or mastic.

Make sure that the binder is flowing out from under the funnel flange evenly. The flowing-out ensures total tightness of the joint.

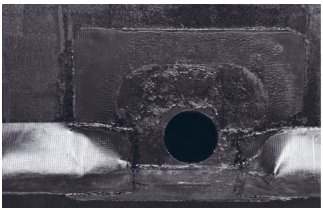
Fasten the water intake funnel to the decking, using at least 6 fasteners (4 on the vertical surface, 2 on the horizontal decking). Use EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve as fasteners.

For a tight joint with the funnel, it is necessary to coat the funnel flange with a bitumen binder. All methods of applying bitumen binder are described in section 5.1.3.





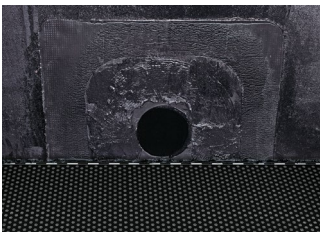
Install stone wool angle fillets to the parapet drain funnel using a hot-applied mastic. Make a smooth transition from the inclined surface of the fillet to the vertical surface of the additional layer.



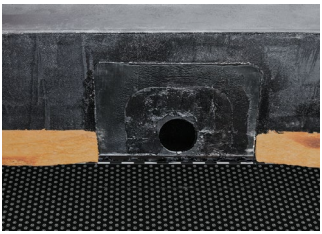
Torch the reinforcement layer strips of the underlay membrane onto the angle fillet (see section 5.1.1 Installation of Additional Reinforcement Layers in the Junctions to Vertical Structures).

Torch on the bottom layer of the underlay membrane (see section 5.2.1 Torch-On Application of the Bottom Layer). Move the material to the fillet and to the parapet drain funnel.

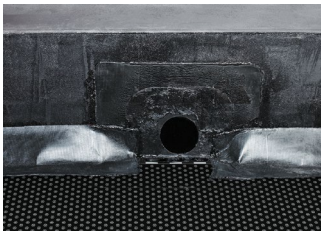
When installing a roof by mechanical fastening:



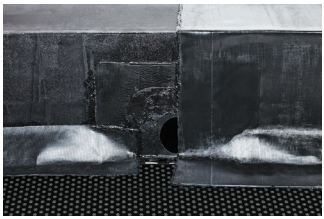
Complete the installation of the bottom layer of the underlay membrane on the main roof plane.



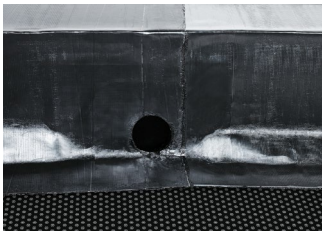
Install stone wool angle fillets to the parapet drain funnel using a hot-applied mastic. Make a smooth transition from the inclined surface of the fillet to the vertical surface of the additional layer.



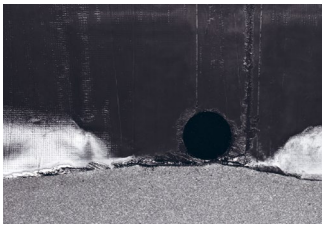
Torch the reinforcement layer strips of the underlay membrane onto the angle fillet.



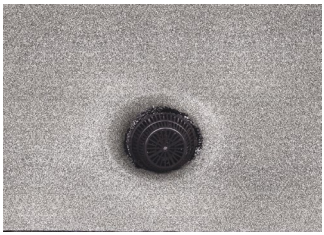
Torch the additional bottom layer of the underlay membrane onto the parapet so that the side edge lies on the axis of the water intake funnel (see section 6.2 Junction to Parapet).



Cut the waterproofing membrane around the hole of the water intake funnel.



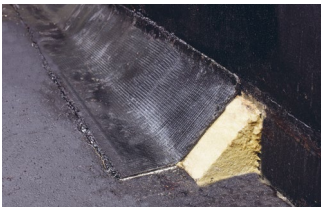
Torch on the top layer of the cap sheet membrane (see section 5.2.3 Torch-On Application of the Top Layer).



Torch an additional top layer of the cap sheet membrane onto the parapet (see section 6.2 Junction to Parapet). Cut the waterproofing membrane around the hole of the water intake funnel. Insert a leaf catcher in the created round hole.

6.2. Junction to the parapet up to 600 mm high

Placement of the underlay membrane to the parapet:

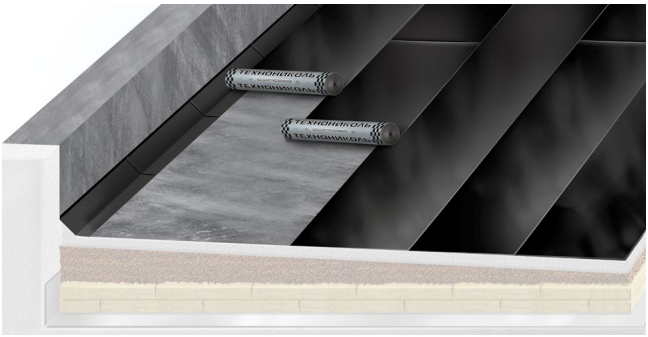


Install angle fillets in accordance with section 5.1.1.

Torch on the reinforcement layer strips of the underlay membrane in accordance with section 5.1.1.

Torch on the bottom layer of the underlay membrane (see section 5.2.1 Torch-On Application of the Bottom Layer). Place the material close to the angle fillet, but not make it overlap the angle fillet.

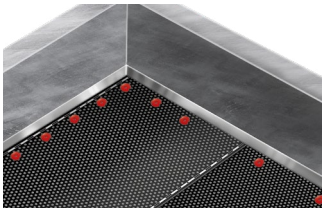
End overlaps of the materials of the bottom and reinforcement layers should better not coincide.



The end part of the roll can be placed on the angle fillet without reinforcement. This is possible only when the end part of the roll is moved to the vertical structure: the end part of the roll should overlap the vertical surface 25 mm higher than the angle fillet.

Placement of the underlay membrane to the parapet:

Complete the installation of the bottom layer of the underlay membrane on the main roof plane.

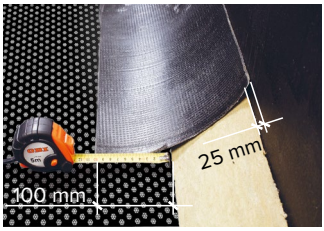


Move the underlay membrane close to the vertical structures.

Fasten the bottom layer along the entire perimeter with a prescribed pitch (see section 3.3).

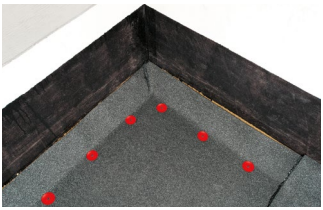
Install stone wool angle fillets at the junctions to the vertical structures on the material preheated with the flame of a torch.

Torch on the reinforcement layer strips of the underlay membrane in accordance with section 5.1.1.



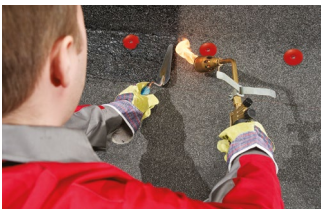
Laying a single-ply polymer-bitumen membrane to the parapet:

Install stone wool angle fillet at the junctions to the parapet.



Bring the roll to the vertical structure and place the material on the inclined surface of the fillet.

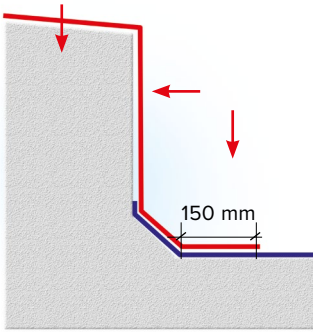
Mechanically fasten the membrane along the fillet with a span of not more than 250 mm.



For qualitative torch-on application over coarse-grained slate, remove the slate from the welding area.

To do this, heat up the surface of the material with the flame of a gas torch and imbed the slate in the bitumen binder with a spatula.

NOTE: On vertical structures (walls, parapet, ventilation shafts, etc.), mechanical fastening of the roof is prohibited. The waterproofing membrane should be completely glued to the substrate.

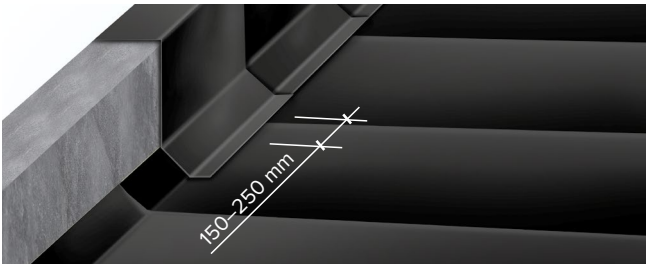


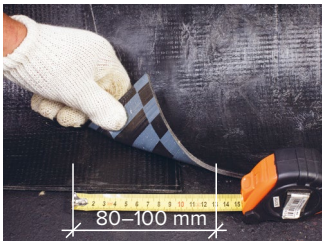
Prepare an additional bottom layer of the underlay membrane for placement on the plane of the parapet.

The additional bottom layer should overlap the vertical surface of the parapet at the height of not less than 250 mm and horizontal surface of the decking 150 mm from the angle fillet. Parapets up to 450 mm high can be entirely covered (this type of junction to the parapet is described in the manual).

Start the installation of the additional bottom layer of the underlay membrane on the parapet from the low parts of the roof, i.e. valleys, to avoid counter seams. Water should flow from the overlapping area towards the valley. The roll installed on the low area (valley) should be overlapped with adjacent sheets by 100 mm.

The distance between the overlapping area of the additional bottom layer installed on the parapet and the overlapping of the bottom layer on the main plane of the roof should be 150-250 mm.





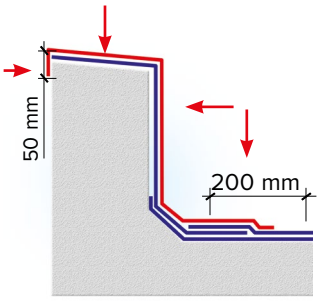
When installing subsequent rolls, maintain lateral overlaps of 100 mm.

Roll up the prepared part. The winding is better to be performed around a cardboard spool in case of manual roll feeding.

Torch an additional bottom layer of the underlay membrane onto the parapet (see section 4.3).

Torch on the top layer of the cap sheet membrane (see section 3.2.2 Torch-On Application of the Top Layer).

Place the material flush to the angle fillet, but do not make it overlap the angle fillet.



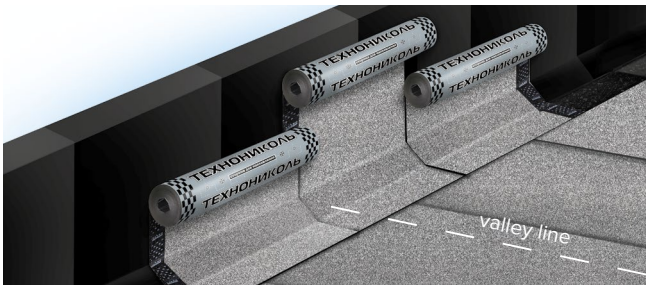
Prepare an additional top layer from the cap sheet membrane to be placed on the plane of the parapet:

The material should overlap the facade part of the parapet by 50 mm;

On the horizontal surface, the material should totally overlap the angle fillet and overlap the plane by 200 mm.

Torch an additional top layer of the cap sheet membrane onto the vertical surface (see section 4.2).

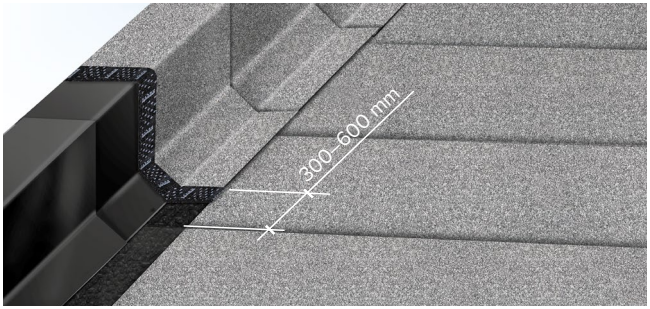
NOTE: Installation of an additional top layer of the cap sheet membrane on a vertical surface should start from low areas of the roof. Water should flow from the overlapping area towards the valley.



The roll installed on the low area (valley) should be overlapped by adjacent sheets by 100 mm.

Remove the coarse-grained grit from the material surface to form a lateral overlap.

The distance between the lateral junctions of the roofing sheets in adjacent layers on the parapet should be 300-600 mm.



To complete the torch-on application, torch on the bottom part of the roll and make it overlap the horizontal area and the facade part of the parapet by 50 mm.

NOTE: It is recommended to protect the upper part of the parapet with roofing galvanized steel or parapet slabs with seam sealing.

If the works are carried out correctly and all the recommendations are followed, the following layout should be obtained:

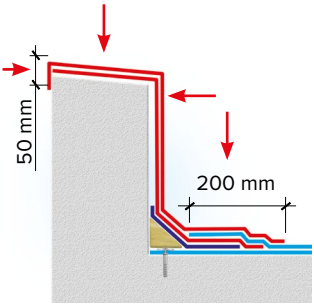


Fig. 1. Roof with mechanical fastening

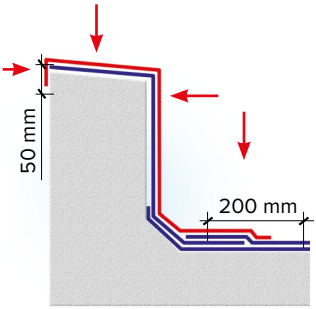
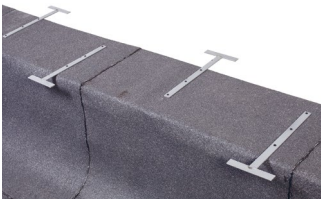


Fig. 2. Roof with torch-on applicationof the bottom layer

Let us consider an option of covering the parapet with roofing steel. To do this, a T-shaped roofing support and a parapet apron made of galvanized steel are needed.

T-shaped roofing support is intended for fastening galvanized steel drip caps and aprons to the parapets. The support should be not less than 4 mm thick and coated with corrosion-preventive compounds.

Galvanized steel parapet apron is intended for protection of the parapet from precipitation and mechanical damage.

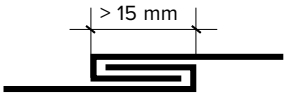


Install roofing supports on both sides of the parapet with a pitch of not more than 750 mm.

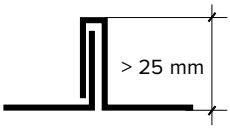
The row of roofing supports installed on one side of the parapet should be halfway displaced with respect to another row.

T-shaped supports should protrude beyond the parapet by 80-120 mm.

Install the galvanized steel apron on the roofing supports. The apron will protect the parapet from the effects of precipitation and mechanical damage.



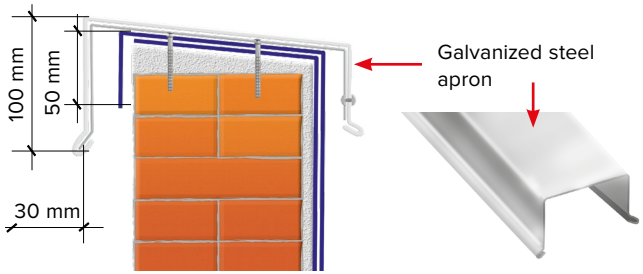
Flat seam



Standing seam

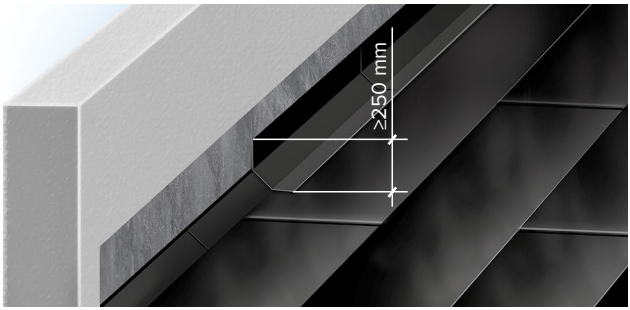
Galvanized steel parapet aprons should be connected to one another with a flat or standing seam.

For parapet protection different types of parapet aprons are used. The shape of the fastener (roofing support) depends on the shape of the galvanized steel apron itself (see below).



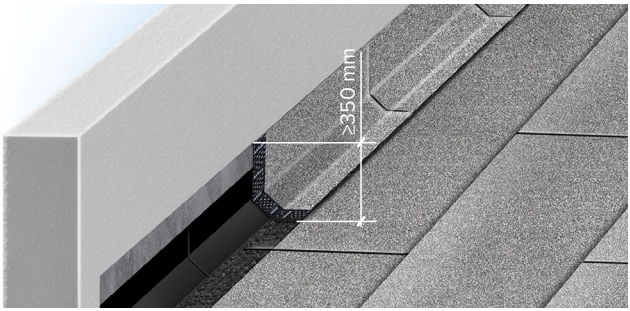
6.3. Junction to vertical surfaces (walls, high parapets, ventilation shafts, skylights etc.)

Junction to a vertical surface is carried out according to the technology, described in section 6.2. The only difference in this case is that the roofing material should overlap at a height of not less than 300 mm and additionally fastened with an edge rail.



The additional bottom layer should overlap the vertical surface by not less than 250 mm.

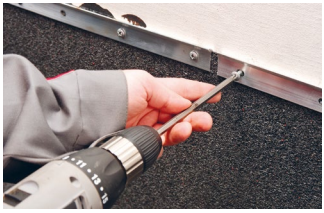
The additional top layer is recommended to overlap the vertical surface by at least 300 mm.



Depending on the type of the decking of the vertical surface, two options of fastening of the roofing material edge are possible.

Option No. 1

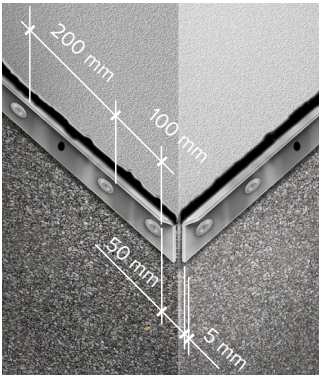
The wall is made of precast and reinforced concrete structures and masonry units, which are entirely plastered (see section 2.5.5).



Fasten the material torched onto the vertical surface with an edge rail using EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve.

Cut the edge rail in the areas of internal or external corners. It is forbidden to bend the edge rail at the corners.

The edge rail should be fastened not less than 50 mm away from the wall corner. In case with an external corner, this will prevent the wall from chipping.



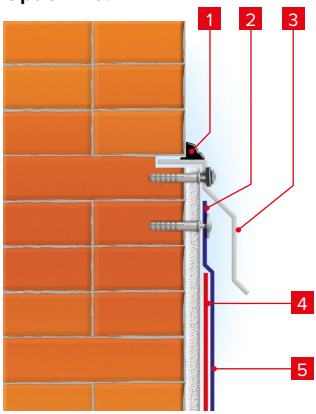
At the corners, the distance between the first and the second self-tapping screw (counting from the corner) should be 100 mm; all the subsequent self-tapping screws must be installed with a pitch of 200 mm.

Leave a 5-10 mm expansion gap between adjacent fasteners.

Fill the gap between the wall and the bent of the edge rail with sealing mastic.

When there are vertical changes of direction, place the edge rail vertically. Leave a 5-10 mm gap between adjacent fasteners. Apply sealing mastic on both sides of the vertical rail.

Option No. 2

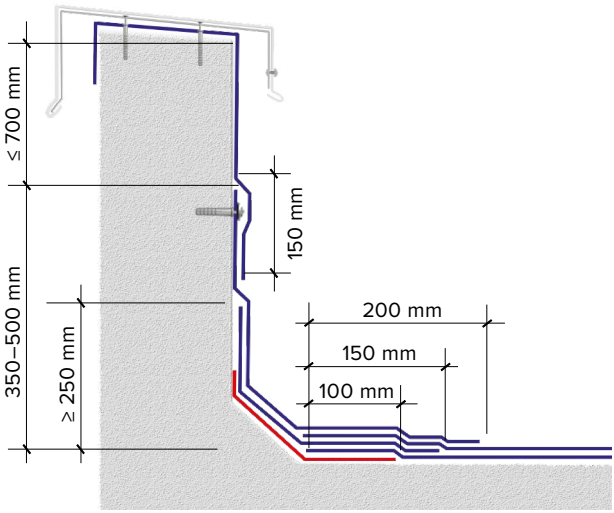


1. Sealing mastic
2. Mechanical fastening of the roof with a metal washer 50 mm in diameter and pointed self-tapping screws
3. Drip cap made of galvanized steel
4. Bottom layer of the roofing membrane
5. Top layer of the roofing membrane

The vertical surface is made of masonry units and is not plastered. Plaster the wall with C8/10 sand cement mortar over a metal mesh over the entire surface of placement of the additional waterproofing layer (the overlap should be not less than 350 mm).

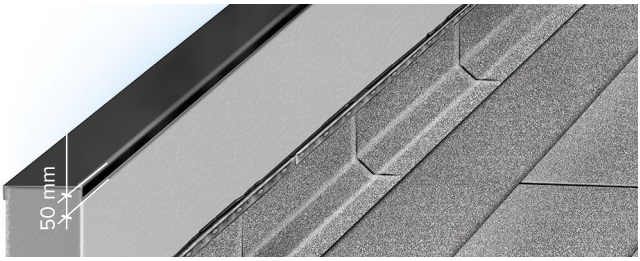
- Torch the material onto the vertical surface.
- Fasten the roofing with metal washers D=50 mm using EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve.
- Make a chase in the wall above the plastered area not less than 50 mm deep.
- Install a galvanized steel apron in the chase. The apron should overlap the edge of the roofing by at least 100 mm. The bottom edge of the apron should be not less than 150 mm above the roofing.
- Fasten the apron with roofing self-tapping rubber-sealed screws with a pitch of 200 mm.
- The length of one apron should not exceed 2,500 mm.
- An overlap in the apron junctions should be 30-50 mm. Do not install fasteners in the overlaps.
- Apply sealing mastic on the top.

When the material overlaps at a height of more than 700 mm, it is necessary to make an intermediate fastening of the roofing material:



NOTE: The upper part of the parapet on the roof should be protected with roofing steel or covered with parapet slabs with seam sealing.

Let us consider an option of covering the parapet with roofing steel:

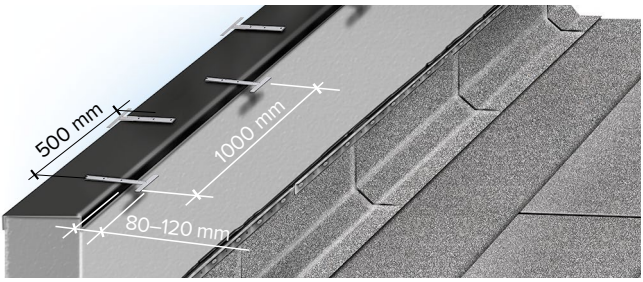


Torch cap sheet membrane material onto the horizontal part of the parapet and make the material overlap the vertical part (on the facade and roof side) by 50 mm.

Install T-shaped roofing supports on both sides of the parapet with a pitch of 1000 mm.

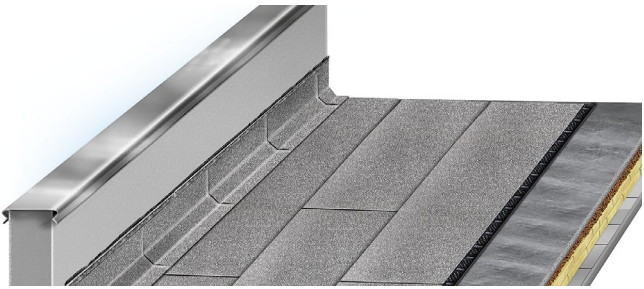
The row of roofing supports on one side of the parapet should be displaced 500 mm with respect to another row.

T-shaped supports should protrude 80-120 mm beyond the parapet.



Install the galvanized steel apron on the roofing supports.

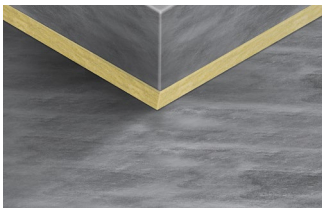
The apron will protect the parapet from the effects of precipitation and mechanical damage.



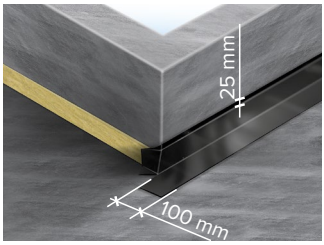
General view of the junction to a high parapet:

6.4. Junction to an external corner

Let's consider a junction to an external corner of the parapet with a height of no more than 450 mm.

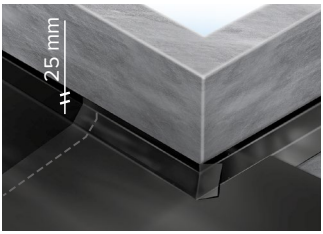


Install stone wool angle fillets in the areas of junction with the parapet on a TECHNONICOL hot-applied roofing mastic.



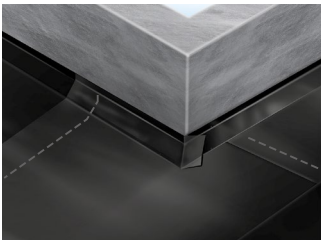
Install and torch the strips of underlay membrane material onto the angle fillet from the side of the parapet, where the material is going to be placed with its lateral part.

The reinforcement layer should entirely cover the fillet and overlap the horizontal surface 100 mm from the fillet and the vertical surface 25 mm from the fillet.



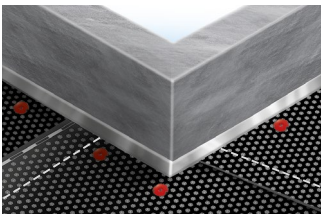
Torch on the bottom layer of the material, the end part of which approaches to the parapet.

The material should entirely cover the fillet and overlap the vertical surface 25 mm from the fillet.



Torch on the bottom layer of the underlay membrane over the entire roof surface (see section 5.2.1).

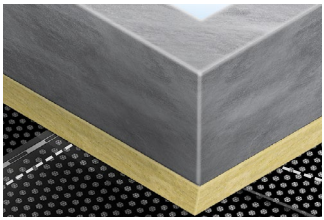
When installing a roof with mechanical fastening of the bottom layer:



Install the bottom layer of the underlay membrane over the entire surface of the main roof plane.

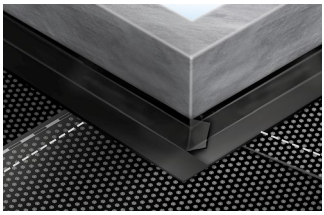
Place the underlay membrane flush to the vertical structures.

Fasten the bottom layer along the entire perimeter with a prescribed pitch (see section 3.3).



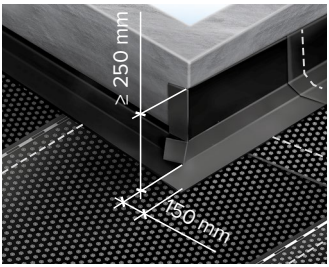
Install stone wool angle fillets on a pre-heated material in the junctions to the parapet.

Install and torch on reinforcement strips made of the underlay membrane.

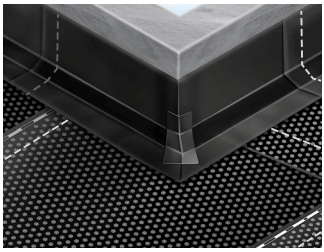


The reinforcement layer should entirely cover the fillet and overlap the horizontal surface 100 mm from the fillet and the vertical surface 25 mm from the fillet.

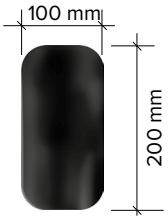
Torch an additional bottom layer on one side of the external corner.

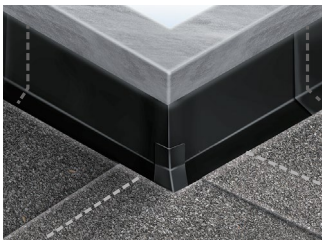


The material should overlap 100 mm of another side of the parapet, overlap the horizontal plane of the roof by 150 mm and the parapet by not less than 250 mm.

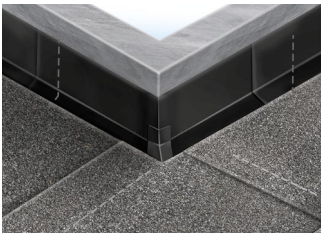


Torch an additional bottom layer on another side of the external corner.



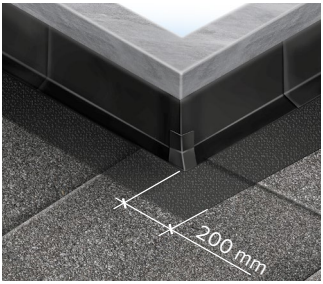


Torch a patch onto the corner junction to the fillet.



Torch on the top layer made of a cap sheet membrane (see section 5.2.3.).

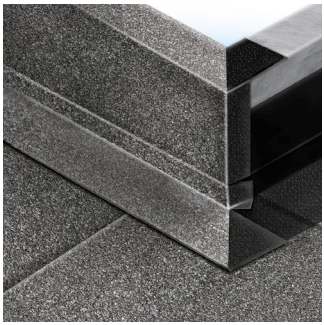
Place the material flush to the angle fillet, but do not make it overlap the inclined surface of the angle fillet.



In order to achieve a high-quality torching-on on a material with a coarse-grained grit, remove the coarse-grained grit from the welding area.

In order to remove the coarse-grained grit, you should:

- heat up the material with the flame of a torch;
- melt the grit into the bitumen with a spatula 200 mm from the edge of the angle fillet and cap sheet membrane material.



Torch on an additional top layer over the entire plane of the parapet on one side of the angle of the parapet.

The material should overlap the other side of the parapet by 100 mm, overlap the horizontal plane of the roof by 200 mm and the facade part of the parapet by 50 mm.

Remove the coarse-grained grit from the overlap area.

Torch on an additional top layer of a cap sheet membrane over the entire plane of the parapet starting from the other side of the parapet corner.

NOTE: Protect the parapet from the effects of precipitation and mechanical damage with a galvanized steel apron (see section 6.2).

Peculiarities of installation of an external corner to vertical surfaces (walls, high parapets, etc.).

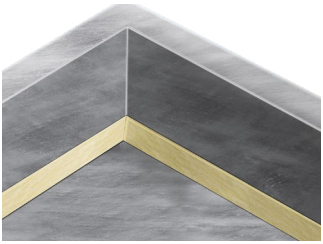
The principle of installation of an external corner to vertical construction is almost the same as the method described above.

The difference is that the top layer of the material is recommended to install at a height of not less than 350 mm (see section 6.3).

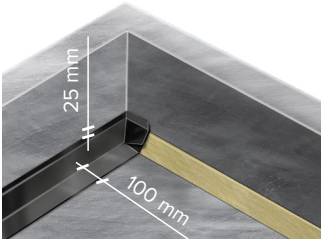
The material torched-on on the vertical surface must be fastened with an edge rail using EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve (see section 6.3).

Fill the gap between the wall and the bent of the edge rail with sealing mastic.

6.5. Junction to an internal corner



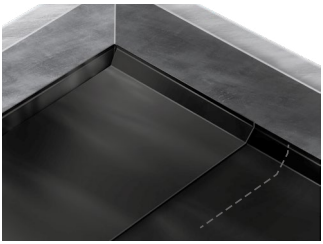
Install stone wool angle fillets in the areas of junction with the parapet on a TECHNONICOL hot-applied roofing mastic.



Install and torch strips of underlay membrane material onto the angle fillet on the side of the parapet, where the material is going to be placed with its lateral part.

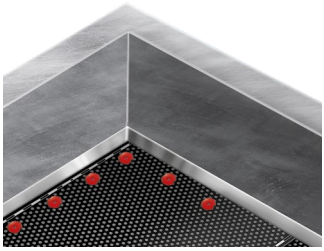
The reinforcement layer should entirely cover the fillet and overlap the horizontal surface 100 mm from the fillet and the vertical surface 25 mm from the fillet.

Torch on the bottom layer of the material, the end part of which is placed to the parapet:



The material should entirely cover the fillet and overlap the vertical surface 25 mm from the fillet.

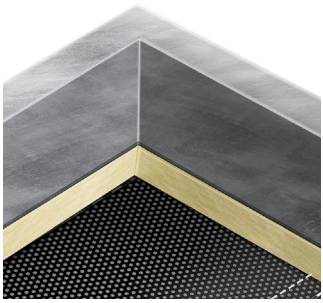
When installing a roof with mechanical fastening of the bottom layer:



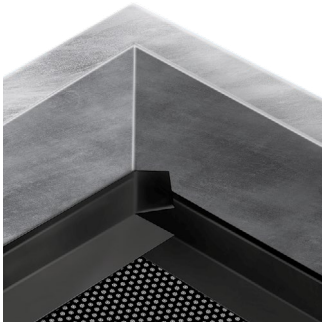
Install the bottom layer of the underlay membrane over the entire surface of the main roof plane.

Place the underlay membrane flush to the vertical structures.

Fasten the bottom layer along the entire perimeter with a prescribed pitch (see section 3.3).

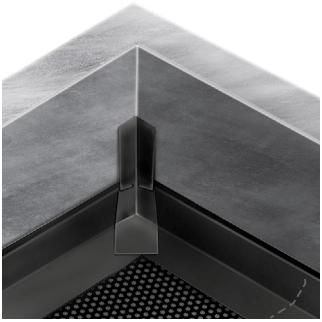


Install stone wool angle fillets on a pre-heated material in the junctions to the parapet.

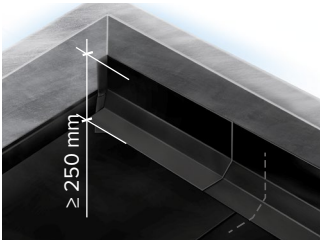


Install and torch-on reinforcement strips made of the underlay membrane.

The reinforcemen layer should entirely cover the fillet and overlap the horizontal surface 100 mm from the fillet and the vertical surface 25 mm from the fillet.

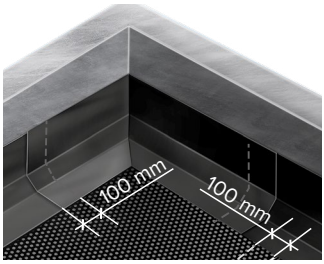


Torch on a patch to the corner to seal the seam. Make the patch overlap up to the height of the additional bottom layer (not less than 250 mm).

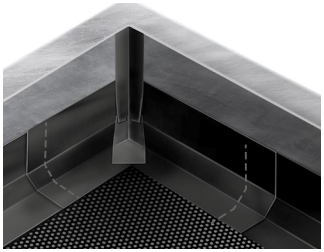


Torch on an additional bottom layer on one side of the corner at a height of not less than 250 mm.

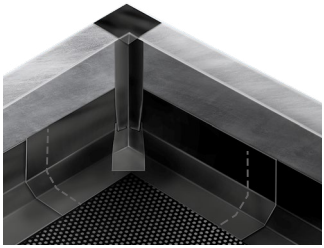
The material should overlap the horizontal surface of the roof by 150 mm.



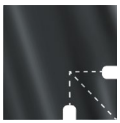
Torch on an additional bottom layer to the other side of the corner.

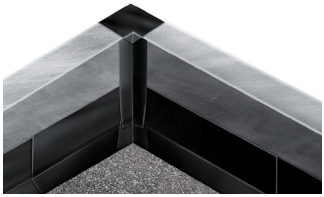


Torch a patch onto the corner over the entire height of the parapet to seal the seam.



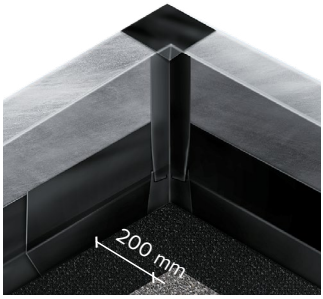
Torch a patch onto the horizontal plane of the parapet to seal the seam.





Torch on the top layer of the cap sheet membrane (see section 5.2.3.).

Place the material flush to the angle fillet, but do not make it overlap the inclined surface of the angle fillet.

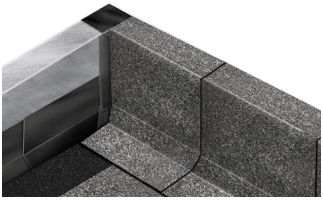


In order to achieve a high-quality torch-on to the material with a coarse-grained grit, remove the grit from the welding area.

In order to remove the grit, you should:

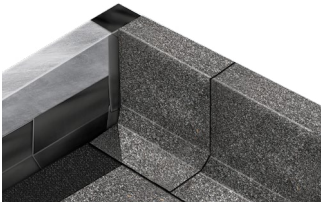
- heat up the material with the flame of a torch;

- melt the grit into the bitumen with a spatula at the distance of 200 mm away from the edge of the angle fillet and cap sheet membrane material.

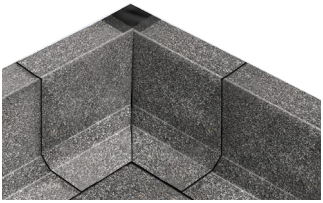


Torch on an additional top layer over the entire plane of the parapet on one side of the parapet corner.

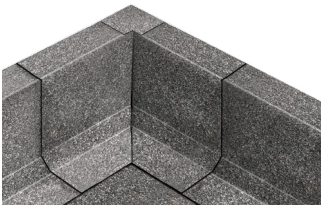
Make the material overlap the facade part of the parapet by 50 mm.



In order to achieve a high-quality torch-on to the material with a coarse-grained grit, remove the grit from the welding area.



Torch on an additional waterproofing top layer over the entire plane of the parapet on the other side of the parapet corner.

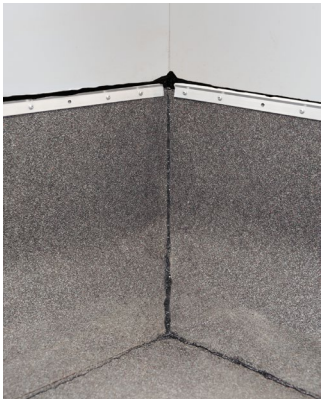


Torch a patch of a material with a coarse-grained grit onto the remaining horizontal plane of the parapet.

Remove the coarse-grained grit from the additional top layer in the area of an overlap with the patch.

NOTE: Protect the parapet from the effects of precipitation and mechanical damage with a galvanized steel apron.

Peculiarities of the installation of an internal corner to vertical surfaces (walls, high parapets, etc.)



The principle of the installation of an internal corner to vertical walls, high parapets and other vertical structures is almost the same as the method described above.

The only difference is that the top layer of the material is recommended to install at a height of not less than 350 mm (see section 6.3).

The material torched onto the vertical surface must be fastened with an edge rail using EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve (see section 6.3).

Fill the gap between the wall and the bent of the edge rail with sealing mastic.

6.6. Junction to a roof eave

NOTE: To install a roof eave, a T-shaped roofing support and a galvanized steel apron are required.

A T-shaped roofing support is intended for fastening galvanized steel drip caps and aprons to the parapets. The support should be not less than 4 mm thick and coated with corrosion-preventive compounds.

A galvanized steel overhang protects the wall from dripping rain or melt water.

Torch the first layer of the underlay membrane onto the roof eave.

Make the material overlap the facade part of the building by 50 mm.

After torching the material onto the roof eave, continue installing the first layer over the entire surface of the roof (see section 5.2.1 Torch-On Application of the Bottom Layer).

Install and fasten T-shaped supports with a pitch of not more than 700 mm.

T-shaped supports should protrude 80-120 mm beyond the roof eave.

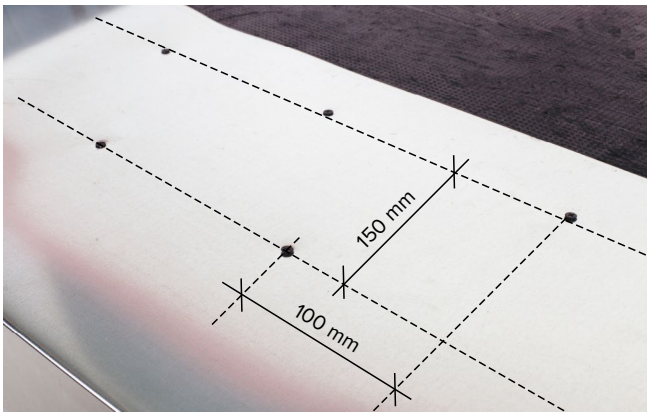
Install the roof eave:

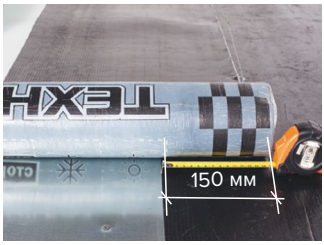
- roof eave must be installed on the roofing support tightly;
- the minimum width of the roof eave flange should be 350 mm.

NOTE: Welted metal sheets of a roof eave should be installed with overlaps.

Fasten the roof eave using EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve with a pitch of 200 mm in two rows. The distance between the rows should be 150 mm.

The rows of the self-tapping screws should be displaced with respect to one another by 100 mm.





Torch on a reinforcement layer made of the underlay membrane. The reinforcement layer should overlap the roof eave by 150 mm.

Torch on the top waterproofing layer made of a cap sheet membrane (see section 5.2.3 Torch-On Application of the Top Layer).

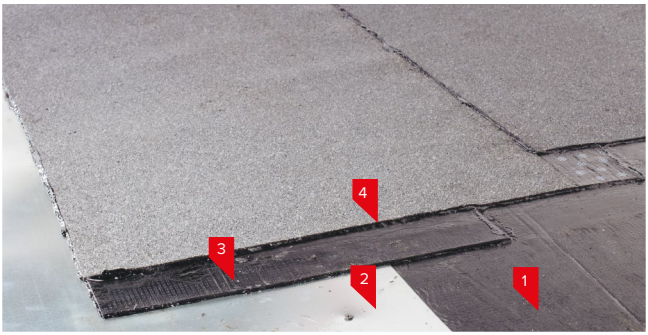
If the works are carried out correctly and all the recommendations are followed, the following layout should be obtained:

1. Underlay polymer-bitumen membrane

2. Roof eave

3. Reinforcement layer

4. Cap-sheet membrane



There are various types of galvanized steel roof eaves, which differ in shape. The shape of the fasteners (roofing support) depends on the shape of the galvanized steel apron itself.

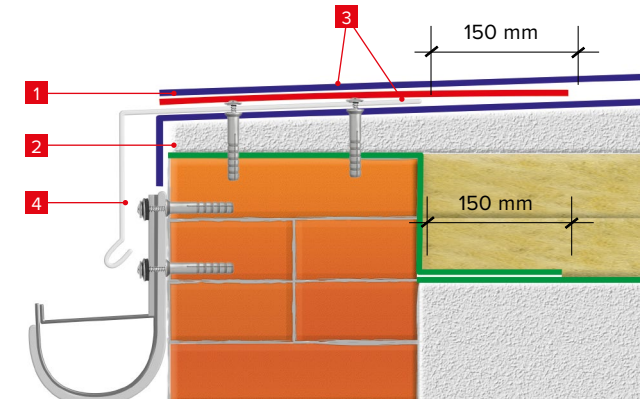
1. Reinforcement layer (underlay membrane)

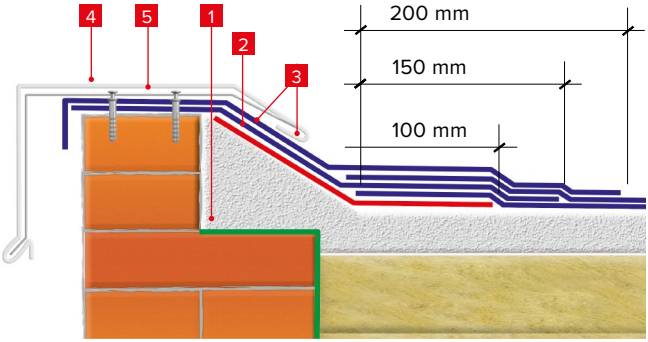
2. Vapor barrier

3. Roll roofing material

4. Galvanized steel apron

5. Roofing support





Before installing a roof eave, it is necessary to carry out preparation works in case of installing a roof over stone wool thermal insulation slabs:

- In case the wall is made of masonry units or reinforced concrete panels, it is necessary to lay masonry units until the necessary level of the roof sloping is reached. The height of the protruding part of the wall should not be less than the height of the main thermal insulation layer.
- Prepare a rigid frame for roof eave installation (Figure 1) or replace stone wool slabs with extruded polystyrene or PIR GTM/GTM TECHNONICOL boards (Figure 2).

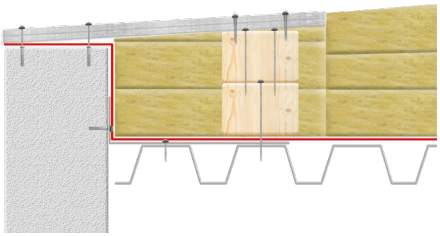


Figure 1.

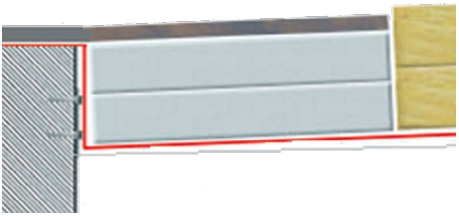
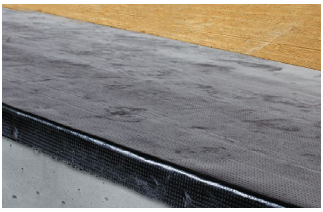


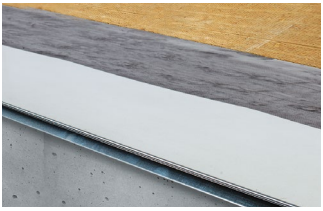
Figure 2.

If a rigid frame is to be installed, start installing it after the installation of the vapor barrier layer (see section 2.2);

- fasten a timber beam. Select the height of the beam, taking into account the thickness of the thermal insulation layer and roof sloping;
- install the thermal insulation;
- install sheets from cement bonded particle boards on perimeter of the roof eave in two layers with seam spacing. The sheets should be not less than 10 mm thick. One sheet should be not less than 500 mm wide. Fasten the sheets to the timber beams, to the external wall and between one another.



Torch on a reinforcement layer of the underlay membrane to the sheets.



Install the roof eave (as recommended above).

Install a bottom layer of the underlay membrane.

The underlay membrane must be torched-on to the reinforcement layer and to the roof eave.

Torch on the top waterproofing layer made of a cap sheet membrane (see section 5.2.3 Torch-On Application of the Top Layer).

6.7. Installation of a pipe through the waterproofing membrane

Installation of a pipe through the waterproofing membrane can be carried out using:

- EPDM flashing (Figure 1);
- Metal sleeve (Figure 2);
- Roofing material (section 6.7.4).

Figure 1

Figure 2

Installation of a metal sleeve:

- the flange of the metal sleeve should overlap the horizontal surface by 150 mm from the sleeve walls;
- the sleeve should be at least 350 mm high;
- the diameter of the sleeve pipe should be 10 mm more than the insulated pipe.

6.7.1. Installation of a pipe through the waterproofing membrane using a EPDM flashing

In case of using an EPDM flashing, there are 2 options to install a pipe through the waterproofing membrane:

Option 1:

Put the EPDM flashing onto the pipe and select the necessary diameter.

Cut the EPDM flashing according to the chosen diameter of the pipe.

Burn the film on the surface of the material. When using thin torch-on applied materials as the materials for the bottom layer, before installing the flashing flange it is necessary to burn the film on the material and pour a layer of TECHNONICOL hot-applied mastic or apply TECHNONICOL FIXER mastic with a spatula.

Press the flange into the heated-up material. Make sure, that the flowing-out of the polymer-bitumen binder from under the sleeve flange is even. The flowing-out will ensure total leak tightness of the joint.

In order to achieve a leak tight joint, it is necessary to cover the flashing flange with a bitumen binder. All the methods of applying bitumen binder are described in section 5.1.3. using the example of coating the funnel flange.

Torch on the top layer made of a cap sheet membrane (see section 5.2.3 Torch-On Application of the Top Layer).

To tighten the joint between the pipe and the EPDM flashing, apply sealing mastic.

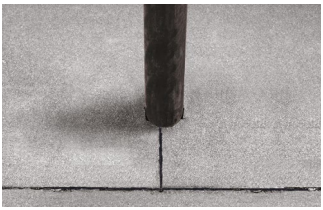
Install a hose clamp on the flashing and tighten.

Galvanized steel hose clamp will provide a tight joint between the flashing and the pipe.

In order to ensure additional tightness between the flashing and the roofing membrane, coat the flashing along the perimeter of the junction between the sealant and the material with sealing mastic.

To complete the junction to the pipe, install a galvanized steel jack onto the pipe. The diameter of the pipe jack should be at least 60 mm more than the diameter of the pipe.

Option 2:



Lay the membrane over the entire surface of the roofing.

Melt in the grit in the place of flashing flange installation.

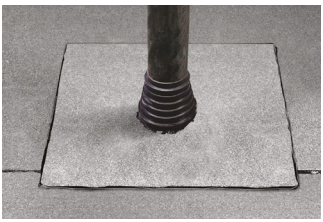
Put the EPDM flashing onto the pipe and select the necessary diameter.

Cut the flashing according to the chosen diameter of the pipe.

Heat up the material surface and press the flange into the heated-up material.

Make sure, that the flowing-out of the polymer-bitumen binder from under the flashing flange is even. The flowing-out ensures total tightness of the joint.

For a tight joint, it is necessary to coat the flange of the flashing with a bitumen binder (see section 5.1.3).



Prepare and torch on a reinforcement layer. The reinforcement layer should overlap the flange of the flashing by 150 mm.

To tighten the joint between the pipe and the flashing, apply sealing mastic.

Install a hose clamp on the flashing and tighten.

6.7.2. Installation of a pipe through the waterproofing membrane using a metal sleeve

Fasten the metal sleeve to the decking with 4 fasteners.

Cover the flange of the sleeve with a bitumen binder (see section 5.1.3).

Torch on an additional reinforcement layer in the shape of a square.

The sides of the square should overlap the flange of the metal sleeve by 150 mm on each side.

Cut a round hole in the center of the square with a diameter equal to the diameter of the sleeve pipe.

Torch on the top layer of the cap sheet membrane (see section 5.2.3 Torch-On Application of the Top Layer).

Install a galvanized steel storm collar onto the pipe and start using a hose clamp.

Apply sealing mastic between the pipe and the storm collar and tighten the hose clamp. The storm collar should overlap the sleeve by 75 mm heightwise.

To complete the junction to the pipe, install a galvanized steel pipe jack onto the pipe. The diameter of the pipe jack should be at least 60 mm more than the diameter of the pipe.

6.7.3. Installation of a small diameter pipe through the roofing membrane, junction to anchors and other small elements

Prepare a metal sleeve:

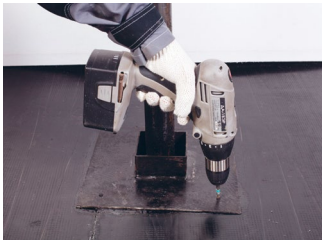
- the flange of the metal sleeve should overlap the horizontal surface 150 mm from the sleeve walls;
- the sleeve should be at least 100 mm high;
- the distance between the edge of the pipe and the sleeve wall should be not less than 25 mm.

This type of a metal sleeve can be also used when installing a junction to anchors and other small elements.

Torch on a layer of the roofing material (see section 5.2.1 Torch-On Application of the Bottom Layer).

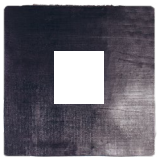
Heat up the material for the installation of the sleeve flange with the flame of a gas torch.

Install the sleeve and press the flange into the heated-up material. Make sure, that the flowing-out of the polymer-bitumen binder from under the sleeve flange is even. The flowing-out ensures total leak resistance of the joint.



Fasten the metal sleeve to the decking with at least 4 fasteners. Use EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve as fasteners.

For a tight joint, it is necessary to coat the flange of the sleeve with a bitumen binder. All methods of applying bitumen binder are described in section 5.1.3. using the example of coating the funnel flange.



Prepare a reinforcement layer from the bottom layer material in the shape of a square:

- the sides of the square should overlap the flange of the metal sleeve by 100 mm on each side;
- cut a round hole according to the dimensions of the sleeve in the center of the square.

Install and torch on an additional reinforcement layer. Pay attention to the flowing-out of bitumen from under the edge of the material.

Torch on the top layer of the roofing material (see section 5.2.3 Torch-On Application of the Top Layer).

The gap between the pipe and sleeve walls should be filled with two-component polyurethane sealant.

Instead of a polyurethane sealant, TECHNONICOL hot-applied roofing mastic can be used: fill the sleeve with the hot-applied mastic and apply shale slate atop.

When installing the roofing over stone wool thermal insulation slabs:

In the place of pipe installation, replace stone wool thermal insulation TECHNOROOF with extruded polystyrene TECHNONICOL CARBON PROF (hereinafter referred to as XPS).

The XPS part should be 200 mm more than the sleeve flange on each side.

Before installation of the XPS part, cut a round hole 10 mm more than the funnel pipe diameter.

Install a cement bonded particle board according to the size of the patch and not less than 10 mm thick.

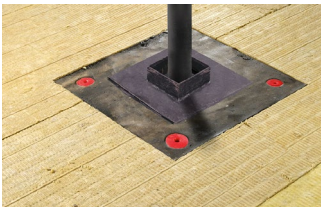
Before installation of the sheet, cut a round hole 10 mm more than the funnel pipe diameter.

Treat the sheet with primer bitumen prime coating.

Fasten the sheet to the load-bearing decking using 4 fasteners.

Torch on a reinforcement layer of the underlay membrane to the sheet.

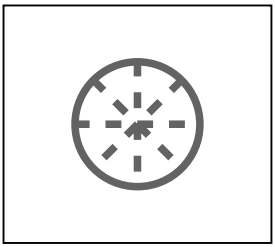
Heat up the reinforcement layer for the installation of the sleeve flange with the flame of a gas torch.



Install the sleeve and press the flange into the heated-up material. Make sure, that the flowing-out of the polymer-bitumen binder from under the sleeve flange is even. The flowing-out ensures total leak resistance of the joint.

Install the material over the entire surface of the roof.

6.7.4. Installation of a pipe through the roofing membrane using roofing material



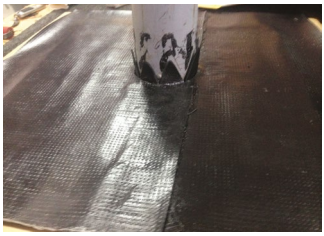
Prepare an additional reinforcement layer from underlay membrane in the shape of a square:

The side of the square should be more than the pipe diameter by 300 mm.

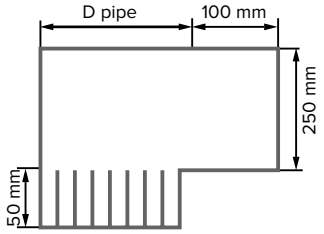
Cut a round hole in the center of the square with a diameter equal to the diameter of the pipe, so that the formed petals overlap the vertical surface of the pipe.

Torch an additional reinforcement layer onto the horizontal surface. Pay attention to the flowing-out of bitumen from under the edge of the material.

Weld the petals to the vertical surface of the pipe.



Lay the bottom layer onto the horizontal surface (see section 5.2.1. Torch-On Application of the Bottom Layer or section 5.2.2. Mechanical Fastening of the Bottom Layer).

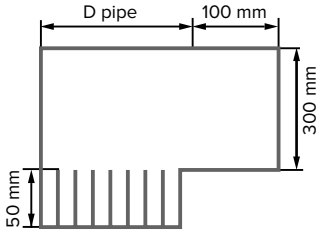


Prepare the bottom layer using the underlay membrane to be installed onto the vertical surface of the pipe.

The strip must be 100 mm longer than the circumference of the pipe.

The material should overlap the vertical surface by at least 250 mm.

Torch on the bottom flashing so that the petals of the bottom flashing are offset with respect to the petals that overlap the vertical surface of the pipe.



Prepare the top flashing using cap sheet membrane to be installed onto the vertical surface.

The material should overlap the vertical surface by at least 300 mm.

Torch on the top flashing so that its petals are offset with respect to the petals of the bottom flashing.

Lay the top layer onto the horizontal surface (see section 5.2.3. Torch-On Application of the Top Layer).

Install a hose clamp and tighten.

To tighten the joint between the pipe and the material, apply polymer-bitumen sealing mastic.

6.8. Junction to a roofing aerator

Roofing aerator (roof cowl) is a device intended for removing water vapors and moisture from the roof space.

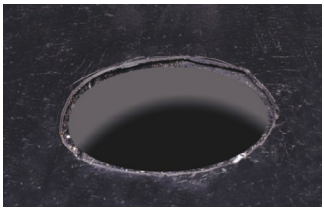
The roofing aerator is used for the installation of “breathable” roofs as well as for repairs of local bulges on the old roof and, if needed, on roofs with a slope-forming layer made of expanded clay gravel.

Roofing aerators are installed on the roof at the rate of 1 pc (1 roofing aerator Ø110 mm) per 100 m^2 of the roof. For optimal removal of vapor from under the roofing membrane the distance between the roofing aerators should not exceed 12 m. In the valley, roofing aerators are installed every 10-12 m, in the ridges – 6-8 m.

There are two options to install junction to the roofing aerator.

Option 1:

Place the bottom layer made of underlay membrane on the roof (see section 5.2.1. Torch-On Application of the Bottom Layer).



Cut a round hole in the place of installation of the roofing aerator down to the slope-forming layer made of loose-fill thermal insulation. The diameter of the hole should be equal to the inner diameter of the roofing aerator pipe.

NOTE: When repairing leaking roofs, in the places of roofing aerator installation a hole is cut down to the vapor barrier layer.

Heat up the area of the underlay membrane, on which the roofing aerator is going to be installed, with the flame of a torch.

Install the roofing aerator and press the flange into the heated-up material. Make sure that the flowing-out of the polymer-bitumen binder from under the flange of the roofing aerator is even. The flowing-out ensures total leak resistance of the joint.

Fasten the roofing aerator to the decking with at least 4 fasteners. Use EDS-S 4.8 mm pointed self-tapping screws with a polyamide sleeve as fasteners.

For a tight joint, it is necessary to coat the flange of the roofing aerator with a bitumen binder. All methods of applying bitumen binder are described in section 5.1.3. using the example of coating the funnel flange.

Torch on the cap sheet membrane (see section 5.2.3 Torch-On Application of the Top Layer).

Fill the roofing aerator with expanded clay gravel so that the level of the gravel is 1/3 roofing aerator's height higher than the level of the roof.

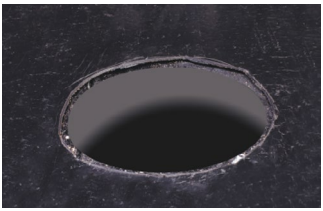
To complete the roofing aerator, install the cowl.

For extra sealing of of the junction between the roofing aerator and the roofing membrane, apply sealing mastic along the perimeter of the junction between the roofing aerator and the cap sheet membrane.

Option 2:

Start the installation of roofing aerators after installing the roof along the entire roof plane.

Cut a round hole in the place of installation of the roofing aerator.



NOTE: In case of installing the roof over PIR thermal insulation boards, cut a hole down to the vapor barrier.

Melt the grit into the place of installation of the roofing aerator flange.

Install the roofing aerator, press the flange into the heated-up material, fasten the roofing aerator to the load-bearing decking (see Option 1).

Coat the flange with bitumen binder.

Prepare and torch on a reinforcement layer. The reinforcement layer should overlap the roofing aerator flange by 150 mm.

6.9. Lightning protection

Lightning protection is a set of measures taken for people, building and equipment protection from negative impacts of lightning. In this manual examples of roofing lightning protection devices are depicted.

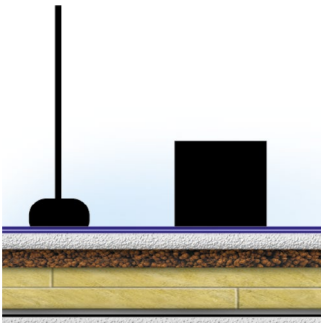
To install lightning protection, use the following:

Lightning rope is intended for the installation of a lightning protection grid.

Concrete base is used for the installation of interception rods on flat roofs.

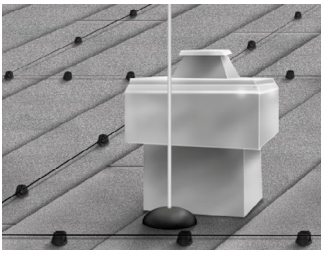
Lightning rods and masts are used for the installation of separately standing interception rods.

Lightning diverter holder is intended for fastening of the lightning diverter wire.



To protect the equipment on the roofing (ventilation, conditioning, antennas, etc.) separately standing lightning rods are used.

Lightning rods are installed on a concrete base near the protected object. Concrete base is installed on the roofing freely.



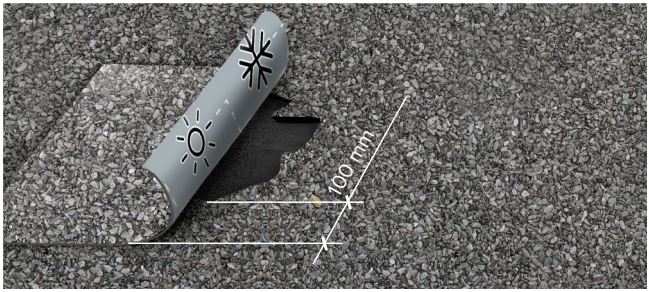
Lightning protection grid is installed in accordance with the design. The grid is fastened to plastic holders. To create a ballast holding the lightning protection grid, plastic holders are to be filled with sand or sand cement mortar. The installation pitch should not exceed 1 m.

All elements of lightning protection should be interconnected with the lightning protection grid. Lightning protection grid is to be connected to current conductors. Current conductors go over the facade of the building to the ground wire.

6.10. Roofing repair

Repair of the roofing in case of a mechanical damage:

- Clear the damaged area from debris and dust.
- Cut out a patch, which overlaps the damaged area of the roofing by 100 mm.
- Heat up the place of the patch installation with the flame of a torch and melt the grit with a spatula into the top layer of polymer-bitumen binder.
- Torch the patch onto the damaged area.



Grit recovery in cases of protection bitumen binder layer damage:

Apply sealing mastic on the damaged area.

Apply shale grit on the mastic.

Spread the grit with a brush evenly over the entire area.

7.
Control of material quality

7. Control of material quality

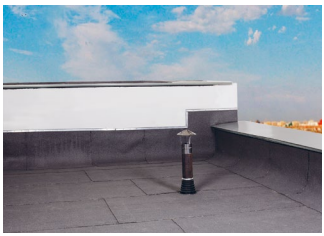
7.1. Material storage

Roll materials should be stored vertically on pallets in one row height-wise, protected from humidity and direct sunlight (under sheds) and sorted by brand.

Short-term outdoor storage of pallets with roll materials is allowed provided that the original package is not damaged.

While stored, bitumen materials must not directly contact with steam and other heat sources (heaters) with the constant surface temperature of more than 45°C. The distance from heat sources (heaters) should be more than 1 m.

7.2. Assessment of the appearance of the completed roof



When accepting a roof made of bitumen materials, the first thing is to visually inspect the condition of the roof surface to make sure there are no cuts, burn-throughs, exposure of the decking, as well as bubbles, waves, dead zones.

The seam must be even, flowing-out of the bitumen binder from under the seam must be from 10 mm to 25 mm. There shall be no remains of protective film at the edge of the roll in the seam area.

The quality of the connection of materials to each other can be controlled using a slot screwdriver with rounded edges. The check is carried out after the material has completely cooled down in places where there is no bitumen binder flowing out from the seam area.

If you doubt the quality of the torch-on application, you need to make a cut in the questionable area. The width of the cut must be 50 mm, the length – 200 mm (the cut must completely overlap the seam). Carry out a visual inspection of the cut sample. There should be no separation between the layers. After cutting the sample, you must immediately make a patch (see section 4.12).

Inspect visually the quality of the protective layer. The protective layer should be evenly distributed over the entire roof surface.

In the areas of junction to vertical surfaces, check that the waterproofing membrane is glued over the entire area and does not sag.

8.
Work safety

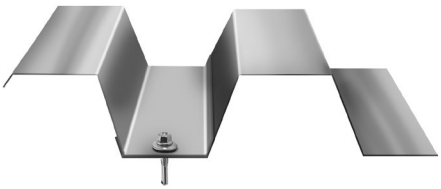
8. Work safety

8.1. General information

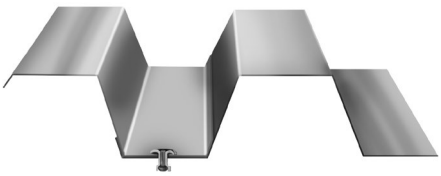
NOTE: Be careful! Before starting work, make sure that the corrugated deck sheets are laid along the entire plane of the roof, without gaps and cracks.

Corrugated steel sheets must be fixed to each other with fasteners:

- self-drilling screws:



- aluminium rivets:



Men at least 21 years of age are allowed to work on roofing installation and repair. They must have:

- passed preliminary and periodic medical examinations in accordance with the requirements of the Ministry of Health and Social Development;
- received training;
- received a basic health and safety induction, fire and electrical safety trainings, and have obtained permits to work;
- been instructed on labor protection and workplace safety.

Work on laying all layers of decking must be carried out only with the use of personal protective equipment.

8.2. Personal and collective protective equipment

Appearance	Description
	Safety belt is required to protect workers from falling from a height.
	Safety helmet is essential to protect the head.
	Gloves are essential to protect your hands.
	Safety shoes are essential to protect your feet.
	Asbestos fire blanket serves to extinguish small fires.
	Carbon dioxide extinguisher serves to extinguish small fires.
	First aid kit serves to provide first aid.
	A set of safety signs to inform about safety requirements.

8.3. Safety regulations for works with gas torches

NOTE: When working with gas cylinders (working gas – propane) it is necessary to be guided by the Temporary Instruction on Safe Exploitation of Pack Racks, Storage and Transportation of Gas Cylinders with Propane-Butane During Waterproofing Works.

Polymer-bitumen materials are laid using open flame, thus safety regulations during works with gas torches must be followed:

- It is absolutely forbidden to hand over filled gas cylinders onto a roof with the cap down;
- During works with the gas specially intended regulators must be used: reducing, regulating and automatically maintaining working gas pressure ones;
- Domestic regulators are forbidden;
- When igniting a hand gas torch (working gas – propane), a valve should be cracked open for **1/4-1/2** of a turn and after a shortterm hose venting gas mixture should be ignited, whereupon flame may be regulated;
- Gas torch ignition should be carried out with a match or a special flint lighter. Do not light the torch from odd burning things;
- With an ignited gas torch do not move away from the working site, do not climb up the stairs and scaffolds, do not make abrupt movements;
- To turn off a gas torch, block the gas-supply valve and then lower the blocking lever. The gas in the hose must be entirely burned;
- During breaks flame should be put out and valves should be tightly blocked;
- During breaks (meal breaks, etc.) valves on cylinders and regulators must be closed;
- In case of a gas torch being overheated, works should be suspended and the gas torch should be turned off and cooled down to the temperature of the environmental air in a container with clean water;
- Gas-flaming works should be carried out at the distance of not less than **10 m** from a group of cylinders (more than **2**), intended for gas-flaming works; not less than **5 m** from single cylinders containing flammable gas; not less than **3 m** from flammable gas pipelines;
- If gas leaking from a cylinder is detected, the works must be immediately stopped. Cylinders or any other equipment may not be repaired in the area where gas-flaming works are carried out;

- In case of a regulator or a block valve being frozen, they should be warmed up only with clean warm water;
- Gas cylinders must be located not less than **1 m** away from heaters and **5 m** from heating furnaces and other strong heat sources. Do not take off a cap with a hit of a hammer, chisel or any other tool, which can produce a spark. A cap must be taken off with a special wrench;
- Hoses should be protected from damaging; during laying avoid flattening, twisting, kinking. Do not use oil hoses, prevent sparks and heavy objects falling on hoses, avoid exposure to high temperatures. Do not use gas hoses for liquid fuel supply;
- In case of a fire at a working site, it should be extinguished with extinguishers and dry sand, covering the fires with an asbestos cloth;
- At the end of the roofing works with a gas torch, a roofer must turn the fuel-supply valve off, close the valve on the cylinder. The gas in the hose must be entirely burned. Then the hoses and the regulators must be taken off from the cylinders, rewound and put in a special storage place;
- The roofing installation works should not be performed at the same time with other construction and installation works caaried out on the roof that involve using open fire (welding works, etc.).

8.4. First aid for burns with hot bitumen

In case of burns 	■ Cool the burn area with water (preferably with cold water) to avoid deep damage of tissues. ■ Cooling with water must be carried out immediately till the bitumen gets hardened and cooled on the skin. To avoid hypothermia, the cooling is not recommended to last longer than **5 minutes**. ■ It is prohibited to remove the bitumen from the burnt area. Qualified medical assistance must be provided as soon as possible.
In case of severe burns	■ The bitumen from the burn blisters must be removed together with the skin at the same time with Ithe initial irrigation and removal of dead tissues. ■ The bitumen should not be removed from the skin that did not peel off. This skin must be treated with petrolatum or animal fat-based substances, similar to petrolatum, lanolin, antibiotic ointments. ■ Subsequent treatment with ointments and bandaging should be carried out until the bitumen dissolves completely and can be removed (usually after **24-72 hours**). ■ After removal of the bitumen, the burn is treated conventionally. ■ It is prohibited to use solvents for bitumen removal, because they can aggravate tissue damage.

9.
Additional information

9. Additional information

9.1. Training for contractors

This manual contains the basic rules for the installation of two-ply torched-on roofs from polymer-bitumen materials.

If you want to receive practical skills, learn the secrets that are not included in this publication, contact your local technical specialists.

Training benefits:

- Increase in productivity and quality of work performed.
- Acquisition of skills to work with new modern materials.
- Minimum claims by the customer and supervisory authorities when accepting work.
- Performance of works in accordance with the modern construction standards in the field of quality.

9.2. Technical support

TECHNONICOL technical support can be contacted by email:

tech.support@technonicol.in

9.3. Contact information

www.technonicol.in

e-mail: **info@technonicol.in**

This manual is a general guideline for designers and contractors. The manual is based on TECHNONICOL experience and must not conflict with local law.