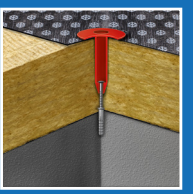
TECHNONICOL








Manual

for the waterproofing of flat roofs on concrete decking by using polymer-bitumen membranes

KNOWLEDGE. EXPERIENCE. CRAFTSMANSHIP.

TECHNONICOL

We are proud of what we produce and create. We enjoy seeing how new high-quality materials are produced from plain raw components with our up-to-date equipment, our work and efforts. We are continuously improving ourselves and strive to do the same for the environment. We prefer to address the comprehensive energy efficiency of buildings and structures. Our innovative solutions enable us to create high technology and energy-efficient buildings, improve the quality of buildings under construction, cut down operation and construction costs. We are glad to know that our materials are used in the construction of houses, plants, bridges, social infrastructure facilities and other objects, which improve the level and quality of life of people.

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 arrangement of a roof by the torch-on application and by mechanical fastening with welding of overlaps;
- In case new materials are being fastened over old roofing without complete removal of an old roofing, the current waterproofing membrane must be completely removed from vertical surfaces and fillets;
- 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:

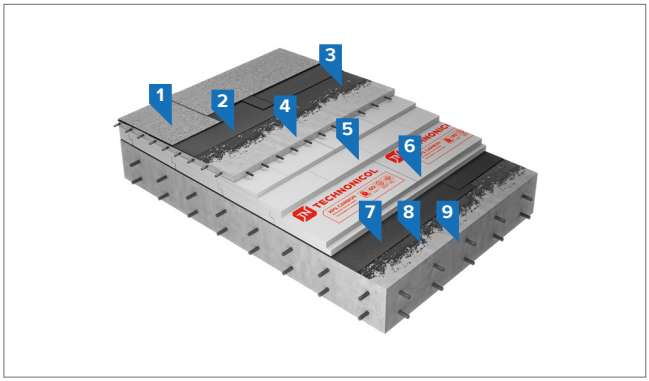
- Two-layer roofing on thermal insulation boards with mechanical fastening of a base layer and torch-on application of a top layer;
- Single-layer roofing with mechanical fastening on thermal insulation;
- Two-layer roofing on a concrete deck on both – inverted accessible and ballasted roofs.

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

Traditional non-accessible roof systems arranged by torch-on application on a sand-cement screed

TN ROOF BRM CONCRETE STANDARD

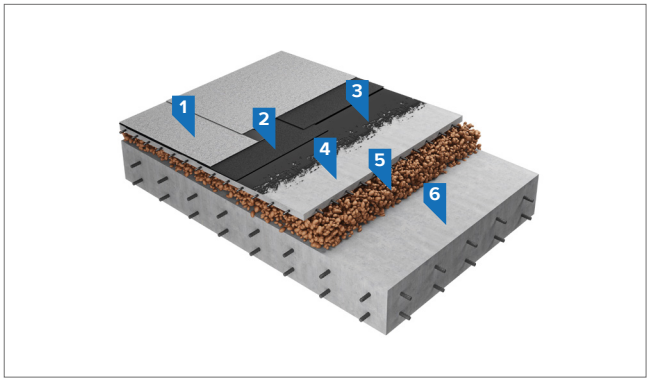
Non-accessible roof system on a concrete base with polymer-bitumen waterproofing and thermal insulation of XPS boards. The slope of the non-accessible roof should be at least **2%**.



1. Polymer-bitumen membrane covered with slate granules (top layer);
2. Polymer-bitumen membrane (bottom layer);
3. Bitumen prime coating;
4. Reinforced sand-cement screed;
5. XPS wedge-shaped boards;
6. TECHNONICOL CARBON PROF 300 / TECHNONICOL CARBON SOLID 500 XPS boards;
7. Polymer-bitumen membrane (vapor barrier);
8. Bitumen prime coating;
9. Concrete decking.

TN ROOF BRM CONCRETE LIGHT

Non-accessible roof system without thermal insulation on a concrete base. This solution is recommended for residential buildings and structures with a non-insulated attic or other structures where the basebuild does not provide for thermal insulation of the roof construction. The slope of the non-accessible cold roof should be at least **2%**.

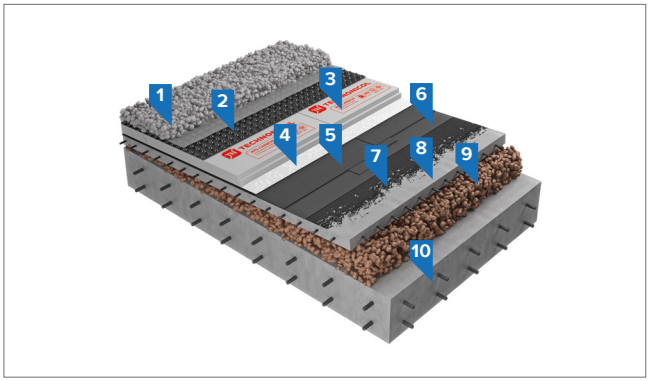


1. Polymer-bitumen membrane covered with slate granules (top layer);
2. Polymer-bitumen membrane (bottom layer);
3. Bitumen prime coating;
4. Reinforced sand-cement screed;
5. Sloping layer – expanded clay;
6. Concrete decking.

Inverted roof systems arranged by torch-on application

TN ROOF BRM CONCRETE BALLAST

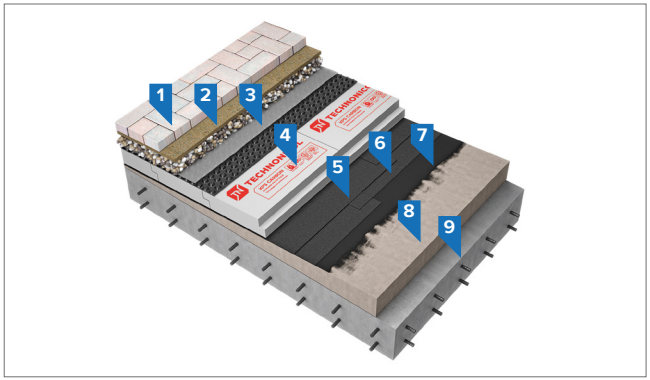
Non-accessible ballasted roof system on a concrete base with polymer-bitumen waterproofing membrane and thermal insulation of XPS boards. This is a traditional solution for installing a ballasted roof on a concrete base. The use of this system provides greater protection of the roof from mechanical damage and extends the service life of the entire roofing construction. The slope of an unused inversion roof can be **2-3%**.



1. Gravel (**16-32 mm** fraction);
2. Drainage membrane with geotextile;
3. TECHNONICOL CARBON PROF 300 / TECHNONICOL CARBON SOLID 500 XPS boards;
4. Geotextile (glass fibre mat **≥300 g/m²**);
5. Polymer-bitumen membrane (bottom layer);
6. Polymer-bitumen membrane (bottom layer);
7. Bitumen prime coating;
8. Reinforced sand-cement screed;
9. Slope-forming layer – expanded clay;
10. Concrete decking.

TN ROOF BRM CONCRETE PAVEMENT

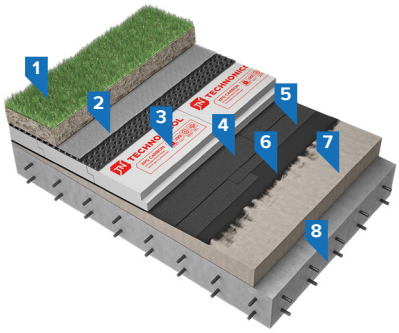
Inverted accessible roof system resistant to foot traffic, a waterproofing layer of polymer-bitumen materials and insulation of XPS boards. This solution ensures the effective use of the roof as an additional space, provides areas for rest and walks, or a sports ground. At the same time, the roof will be reliably protected not only from loads, but also from any atmospheric actions. The slope of the exploited roof can be **2-3%**.



1. Paving slabs;
2. Sand-cement mix for paving;
3. Drainage membrane with geotextile;
4. TECHNONICOL CARBON PROF 300 / TECHNONICOL CARBON SOLID 500 XPS boards;
5. Polymer-bitumen membrane (bottom layer);
6. Polymer-bitumen membrane (bottom layer);
7. Bitumen prime coating;
8. Reinforced sand-cement screed;
9. Concrete decking.

TN ROOF BRM CONCRETE GREEN

Inverted accessible roof system with green areas, a waterproofing layer of polymer-bitumen materials and insulation of XPS boards. The green roof is not only an environmentally friendly, beautiful construction, but also an effective solution for the roof, which is resistant to any weather conditions. This system allows to create a full-fledged relaxation and entertainment zone on the roof, as well as a garden or even a greenhouse.

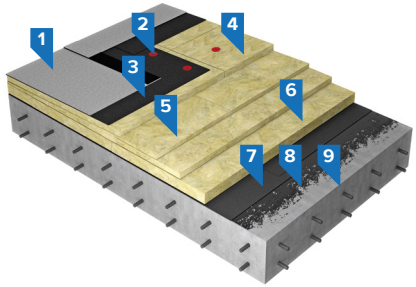


1. Soil with plants;
2. Drainage membrane with geotextile;
3. TECHNONICOL CARBON PROF 300 / TECHNONICOL CARBON SOLID 500 XPS boards;
4. Polymer-bitumen membrane (bottom layer);
5. Polymer-bitumen membrane (bottom layer);
6. Bitumen prime coating;
7. Reinforced sand-cement screed;
8. Concrete decking.

Non-accessible roof systems with mechanical roof fixation

TN ROOF BRM CONCRETE FIX

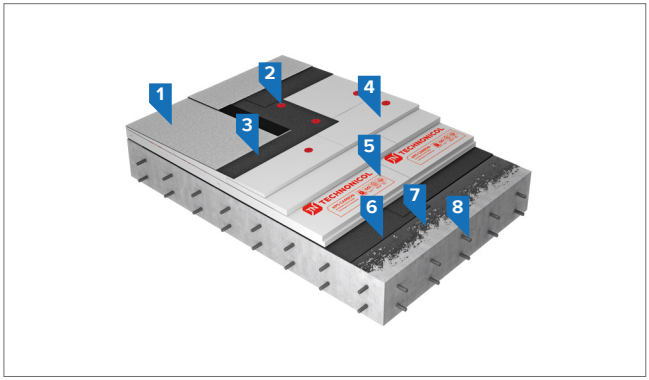
Non-accessible roof system on a concrete base with mechanical fastening of polymer-bitumen waterproofing membrane and thermal insulation of stone wool. This is a time-proved solution for installing a roof on a concrete base and a system which is very easy to install. The traditional technology of waterproofing installation and high quality materials offered with this system will ensure the reliability and durability of the building.



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 stone wool slabs;
6. Stone wool;
7. Polymer-bitumen membrane (vapor barrier);
8. Bitumen prime coating;
9. Concrete decking.

TN ROOF BRM CONCRETE SMART XPS

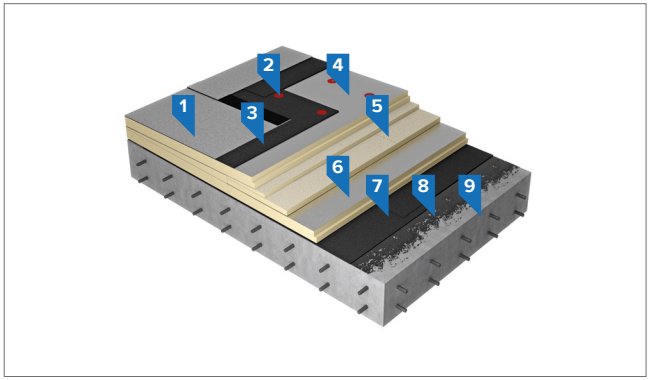
Non-accessible roof system on a concrete base with mechanical fastening of polymer-bitumen waterproofing membrane and thermal insulation of XPS boards. This is a practical solution for pre-fabricated buildings and structures on a concrete base. The system is used when the speed of construction and reliability of the entire roofing structure are important. The high-strength and density thermal insulation allows to construct an almost perfectly flat base for roofing material.



1. Polymer-bitumen membrane covered with slate granules (top layer);
2. Telescopic fastener;
3. Polymer-bitumen membrane (bottom layer);
4. XPS wedge-shaped boards;
5. TECHNONICOL CARBON PROF 300 / TECHNONICOL CARBON SOLID 500 XPS boards;
6. Polymer-bitumen membrane (vapor barrier);
7. Bitumen prime coating;
8. Concrete decking.

TN ROOF BRM CONCRETE SMART PIR

Non-accessible roof system on a concrete base with mechanical fastening of polymer-bitumen waterproofing membrane and thermal insulation of PIR boards. This is a fresh look at the traditional solution for installing a roof on a concrete base. The system is used when the speed of construction and reliability of the entire roofing structure are important. The application of low thermal conductivity materials can significantly reduce the weight and thickness of the roofing system.

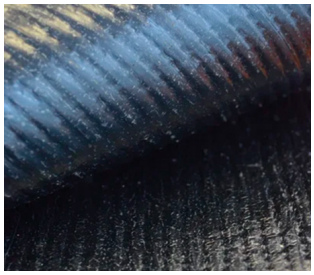


1. Polymer-bitumen membrane covered with slate granules (top layer);
2. Telescopic fastener;
3. Polymer-bitumen membrane (bottom layer);
4. PIR boards faced with aluminum foil;
5. Wedge-shaped PIR thermal insulation boards;
6. PIR boards faced with aluminum foil;
7. Polymer-bitumen membrane (vapor barrier);
8. Bitumen prime coating;
9. Concrete decking.

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.

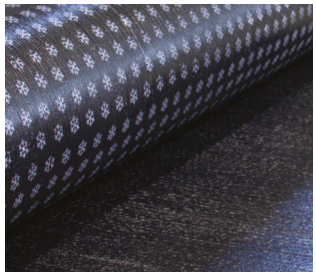
The material withstands temperature fluctuations and high mechanical loads providing a long-term, reliable and effective waterproofing. APP polymer provides additional flow resistance that makes it possible to use the material in a very hot climate.



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/m²** 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 SBS-modified 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 and waterproofing 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.

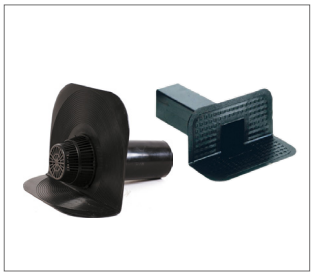
TECHNONICOL ENVIRO AIR
This is a roofing and waterproofing SBS-modified bitumen membrane with a special feature of air purification from harmful nitrogen oxides (NO_x). Hydrophobized slate used as the top protective layer is covered with titanium dioxide (TiO_2) and special additives.

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.

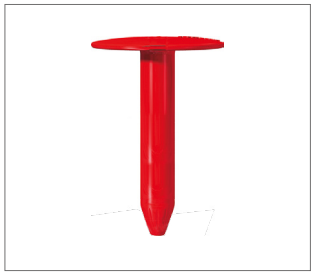
Corner connecting element for parapet funnel
It serves to drain rainwater from parapet drain funnels. It is used together with a funnel of square section.

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 load-bearing roof decking made of reinforced concrete.

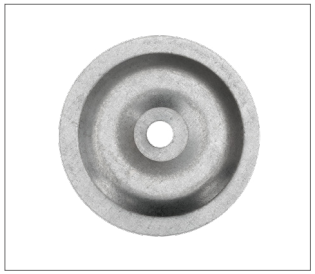


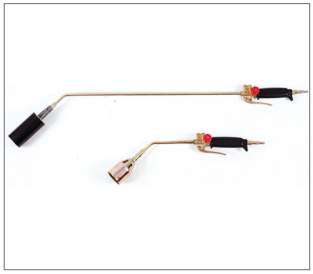
Plate-shaped holder
It is used for mechanical fastening of roofing materials to deckings made of reinforced concrete and sand-cement screeds.

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.

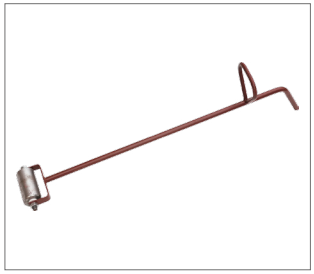
1.6. Applied equipment

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



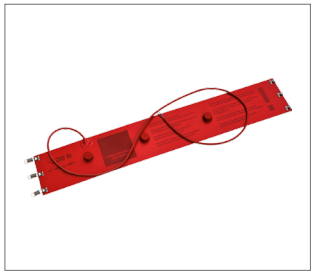
Standard gas torch and shortened gas torch
They are used for torch-on application of roofing material.

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.

2.

Preliminary works. Installation of roof system

2. Preliminary works. Installation of roof system

2.1. General information

NOTE: Roofing works during atmospheric ice, fog, ceasing visibility within working area, thunderstorm, wind with the speed of more than 15 m/s are prohibited.

Roof is a multi-layer system consisting of waterproofing membrane, slope-forming layer, thermal insulation, vapor barrier and load-bearing structure of the roof, see section 1.2.

NOTE: Installation of roofing is a final step in roofing works, install previous layers attentively. Mistakes are difficult to correct.

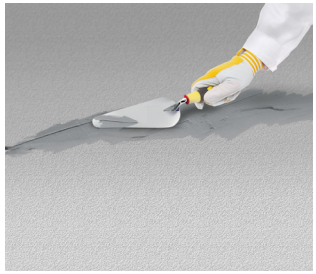
2.2. Installation of vapor barrier layer

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.

Polymer-bitumen materials on polyester or glass fiber base are recommended as vapor barrier on reinforced concrete decking. These materials obtain vapor barrier properties and are resistant to possible mechanical damage during fastening.

Preparation of decking for vapor barrier installation



Seal up roughnesses and junctions of load-bearing reinforced concrete slabs with a sand-cement mortar of a grade not lower than C8/10. Align the surface of an irregular reinforced concrete decking with a sand-cement mortar of a grade not lower than C8/10 at least **30 mm** thick.

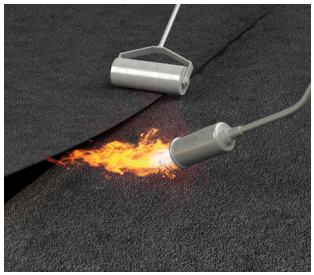
Clear the surface of the decking from dirt, dust, foreign objects, ice, snow, puddles.

The bitumen vapor barrier can be completely glued to the decking or laid without gluing, but with mandatory welding of overlaps.

Free laying with welding of overlaps

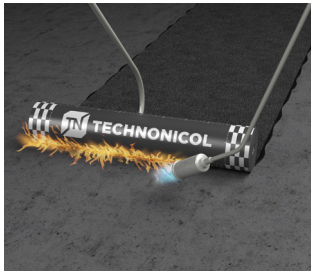
Free laying of vapor barrier material with welding of overlaps is allowed with a decking slope of **<10%**.

NOTE: In case of subsequent gluing of the thermal insulation layer to the vapor barrier, free laying with welding of overlaps is not allowed.



On vertical surfaces, the vapor barrier must be placed and torched on above the thermal insulation layer. The most reliable method of installation is full gluing to the decking.

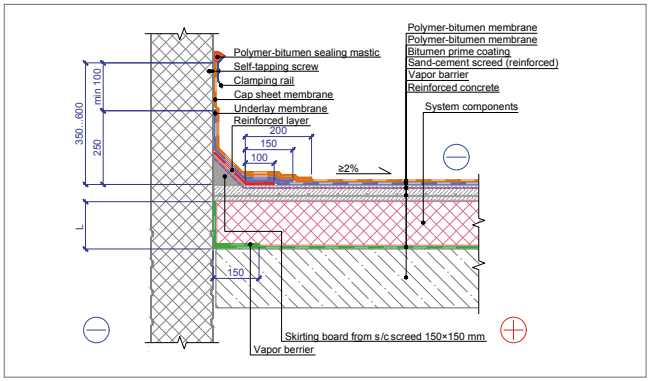
Continuous torching on to the decking



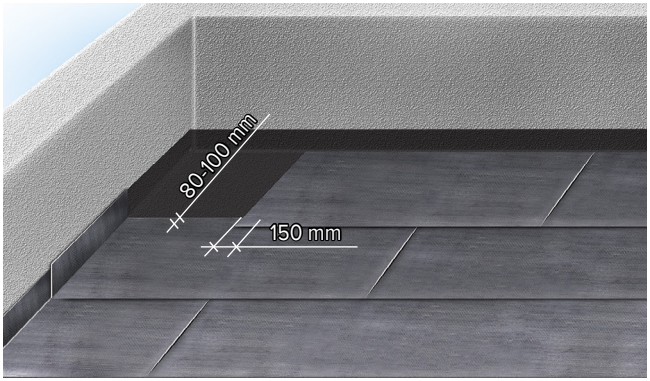
All surfaces to which the material will be torched on (vertical surfaces up to the height of the material and the decking for vapor barrier with full gluing) must be treated with cold primers.

NOTE: It is recommended to use bitumen prime coating as a primer on dry surfaces.

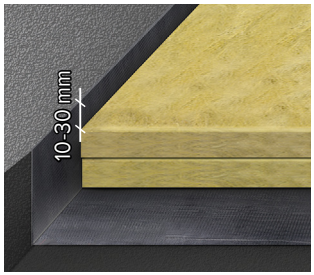
In multi-level roofs, as well as in the places where the thermal insulation layer adjoins the non-insulated walls of premises, the internal air temperature of which is **+12°C**, it is recommended to install a vapor barrier at least **30 mm** above the upper edge of the fillet to prevent possible condensation in the thermal insulation of the premises. Picture below shows an option of making a vapor barrier layer to insulated vertical structures.



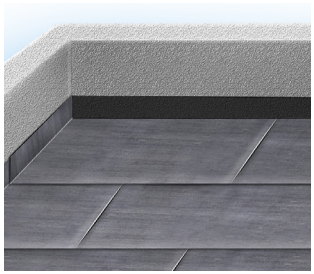
Basic rules for laying a vapor barrier made of polymer-bitumen roll materials



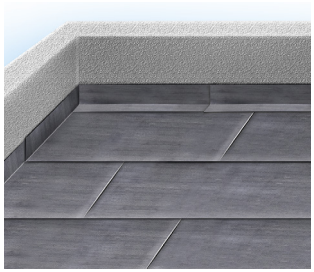
Control the material overlapping: **100 mm** for edge overlapping and **150 mm** for end overlapping. Adjacent sheets are laid with end overlapping spacing.



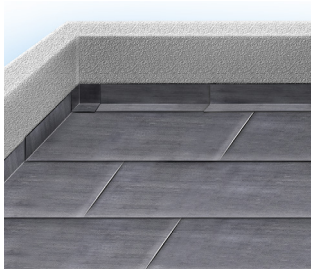
When the vapor barrier is laid with its edge side to the vertical structure, place the material and torch it onto the vertical surface above the thermal insulation layer.



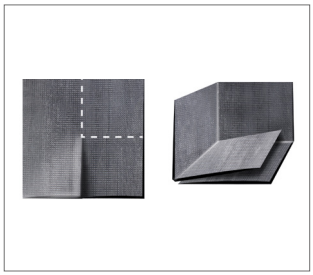
When the vapor barrier is laid with its lateral side to the vertical structure, place the material close to the vertical surface.



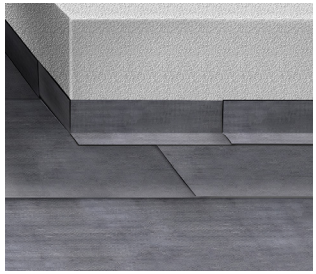
Glue an additional layer onto the vertical surface from the side of the roll, which is laid close to the vertical structure.



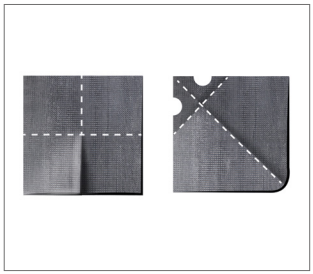
The additional layer must be laid on a vertical surface above the thermal insulation layer and overlap the horizontal surface of the decking by **150 mm**.



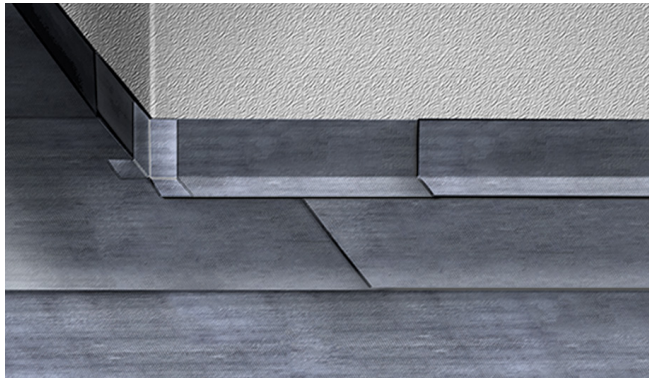
Cut a patch and torch it in the inner corner.



Torch the vapor barrier material on the vertical surface (walls, parapet, ventilation shafts, etc.).



Cut patches and torch them in the outside corner.



Attachment of vapor barrier to water intake funnel

Install the funnel according to the design and fix the funnel to the load-bearing decking.

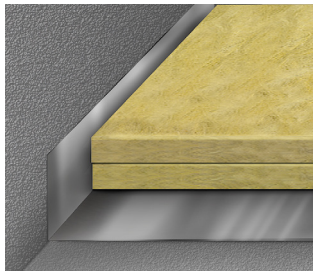
Torch-on the vapor barrier over the entire load-bearing decking.

Push the bolted connections of the funnel through the vapor barrier.

Cut the vapor barrier according to the internal 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 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.



Lay insulation on the vapor barrier layer in accordance, see section 2.3.

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 for the installation of a thermal insulation layer in the presented roof systems, see section 1.2.):

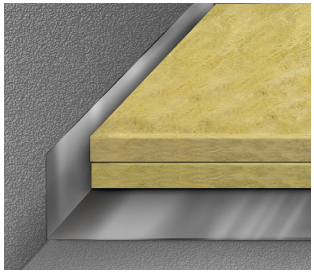
- Stone wool – TECHNOROOF;
- Extruded polystyrene – XPS TECHNONICOL CARBON PROF;
- Polyisocyanurate – LOGICPIR.

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 slab.

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



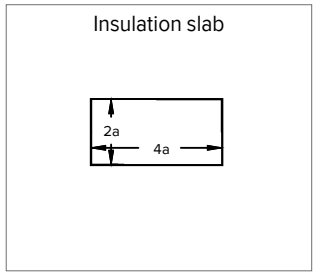
When installing thermal insulation from two or more layers of insulation slabs, arrange the joints between the slabs as “off-set ones”, ensuring a tight fit of the slabs to each other.

Fill the joints between the 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.

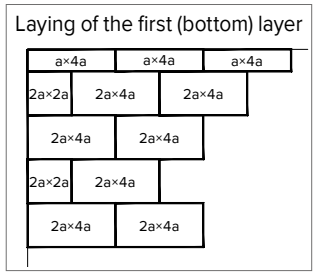
NOTE: Movement along the upper surface of TECHNOROOF stone wool boards leads to a deterioration in the strength characteristics of the slab.

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).

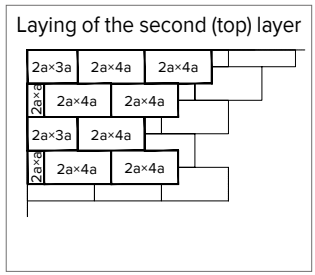
NOTE: TECHNOROOF stone wool insulation slab wetted during installation must be removed and replaced with a dry one.



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

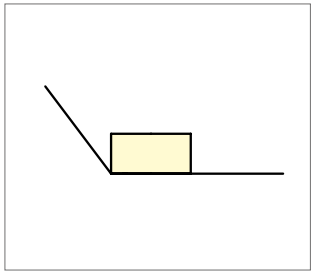


The slabs should be installed in the direction “towards yourself”. This will reduce damage to the slabs during installation.

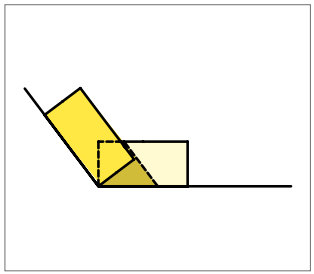


When laying, the thermal insulation slabs are additionally cut so that the joints of the slabs of the first and second layer do not coincide.

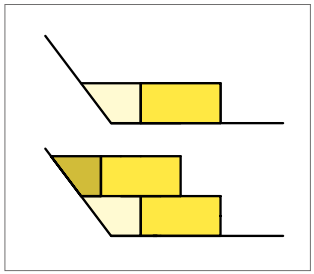
To simplify the installation of insulation slabs in oblique corners, it is recommended to use the following method of slab-cutting.



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 board along the line as shown in the picture.



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

NOTE: Thermal insulation slabs applied on buildings with a height of more than 75 m must be fully glued to the vapor barrier in accordance with our recommendations due to the increased impact of wind load.

2.3.2. Ballast method of fastening a thermal insulation layer

Free laying of thermal insulation is applied in the case of hold-down weight of overlying layers that can withstand wind load:

- Sand-cement screed or prefabricated screed, installed over thermal insulation material;
- Installation of protective layers of the accessible roof, installation of gravel ballast, etc.

Insulation boards are installed in accordance, see section 2.3.1.

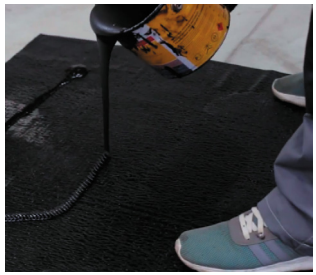
When installing a sand-cement screed base over the thermal insulation material, a separating layer must be provided. Asphalted paper should be used as a separating layer. This will reduce the damage to the boards and the wetting of the insulation material during the subsequent installation of structural layers.

A sand-cement screed can also be arranged over the slope-forming layer of fill material or insulation boards, see section 2.4. and 2.5.1.

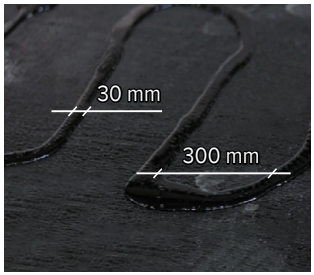
When installing inverted roofs, thermal insulation boards with low water absorption of XPS TECHNONICOL CARBON PROF grades are used. Over the thermal insulation material, gravel filling or arrangement of protective layers of the accessible roof is performed along the separating and drainage layer.

2.3.3. Gluing method of fastening thermal insulation boards

The gluing method of fastening thermal insulation boards is used in systems where roofing membrane is torched directly onto thermal insulation material.



For gluing thermal insulation slabs, hot applied rubber-bitumen mastic is used. The bitumen is heated in special heaters with a mixing device and temperature control. The temperature of the heated mastic should be **150-180°C**.



The hot-applied mastic is spot-applied, or in an S-shaped way. And it must ensure the gluing of the thermal insulation slab at least **30%** of the area of the slab.

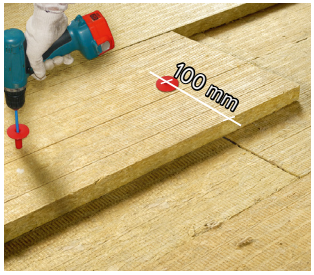
Thermal insulation slabs are installed immediately after applying the adhesive layer.

Insulation slabs are laid in accordance, see section 2.3.1., starting from the corner of the roof. In the case of a multilayer insulation system, the slabs are glued together in a similar way.

NOTE: It is necessary to use thermal insulation boards with a glass fiber mat cover, for example, PIR GTM/GTM TECHNONICOL or PIR GTM/GTB TECHNONICOL.

2.3.4. Mechanical fastening of thermal insulation boards

Mechanical fastening of thermal insulation slabs is used in the systems where a roofing membrane is laid over a thermal insulation material. Thermal insulation slabs are laid in accordance, see section 2.3.1.



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 slab.

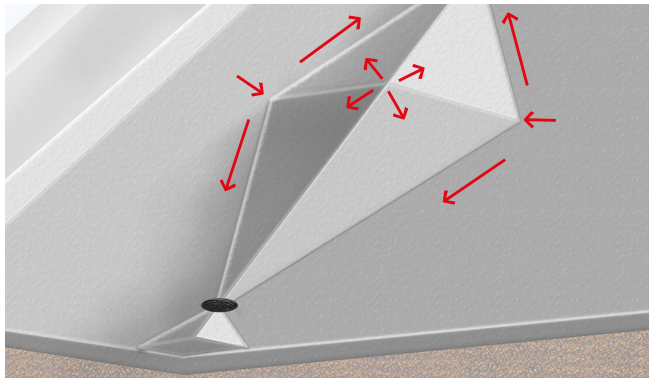
When installing the roof by mechanical fastening, fastening of slabs with dimensions of **1000×500 mm** and **1200×600 mm** is carried out at the rate of **2 fasteners** per top slab, of slabs with dimension of **2400×1200 mm** – **6 fasteners** per slab.

When installing the roof by continuous gluing to the surface of the 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 slabs with dimension of **1200×1200 mm** – **9 fasteners** per slab.

See section 3.1. for general decking and fastening elements requirements.

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%**. As a slope-forming layer, filled-up thermal insulation (expanded clay gravel, perlite, etc.), lightweight concrete mixtures (foam concrete, expanded clay concrete, perlite concrete), sand-cement screed or wedge-shaped thermal insulation boards can be used.



NOTE: The slope-forming layer can be formed by load-bearing roof slabs when designing a roof.

2.4.1. Slope formation on a roof using filled-up thermal insulation

Before starting work, it is recommended to install a separating layer (for example, from asphalted paper, glassine) over the insulation boards.

The works are performed in dry weather. It is not allowed to perform works during rainfalls (rain, snow, etc.). Grade strips are provided for on the decking along leveled elevations with a pitch of **2-3 m**.

Fill and align the material with the screed guides. The filled-up material must be dry.

On the slope-forming layer, lay a reinforcing wire mesh with a cell size of **150×150 mm**. Reinforcing mesh allows further work on the filled-up material without breaking the slopes.

NOTE: Main disadvantages of slopes formed using filled-up thermal insulation: violation of design slopes due to displacement of filled-up material during installation, additional loads on the load-bearing roof structure.

2.4.2. Arrangement of slope-forming layer using TECHNONICOL wedge-shaped thermal insulation boards

The fastest and most convenient way to form a slope is to use wedge-shaped thermal insulation boards with a given slope. TECHNONICOL slope-forming boards should not be considered as an alternative to thermal insulation boards.

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

Advantages of using wedge-shaped thermal insulation boards:

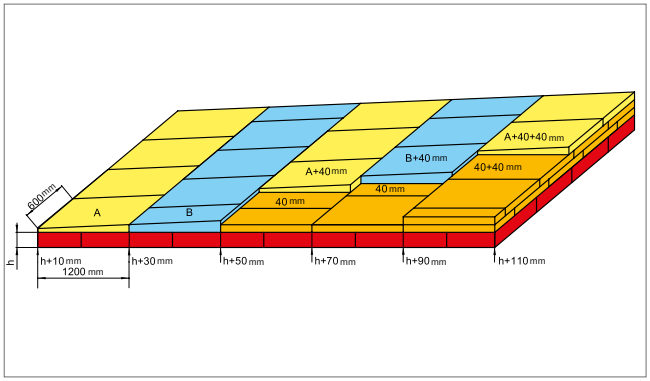
- Reducing the load on the load-bearing roof structure;
- Saving labor costs for forming slopes;
- Reducing the time for work execution and no wet processes.

Wedge-shaped boards for forming the main slope on the roof

XPS TECHNONICOL CARBON PROF (ECO) SLOPE **2.1%** or TECHNONICOL CARBON PROF (ECO) SLOPE **1.7%**: the boards from the A and B sets make the main slope of **2.1%** (**1.7%**) on the roof from the valley to the ridge. The boards are laid on the top layer of the main thermal insulation.

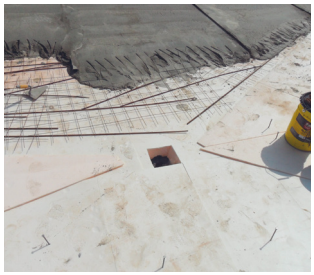
The slope is being installed from the lowest point of the roof, i.e. from the funnel, valley or overhang.

As an additional board, use **40 mm** thick boards when forming a slope.



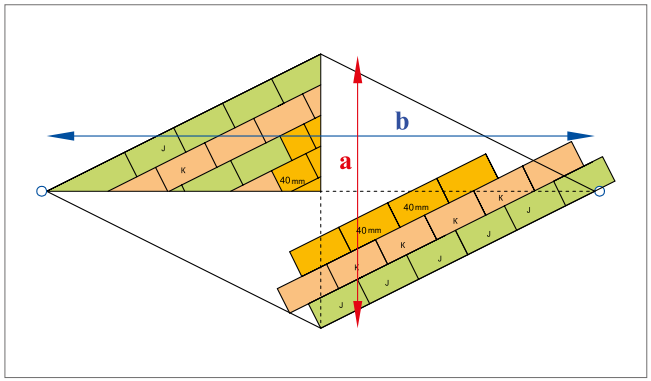
Wedge-shaped boards for valley sloping and counter slope

XPS TECHNONICOL CARBON SLOPE **3.4%** and TECHNONICOL CARBON SLOPE **4.2%**: boards from the J and K sets create a **3.4%** or **4.2%** slope between funnels in valley, counter slope from parapet, skylights, ventilation shafts and other elements.



XPS TECHNONICOL CARBON PROF SLOPE **8.3%**: the boards are designed for counter slopes between funnels in valleys, counter slopes on the roof with the main slope of more than **3%**.

The first row is made of J boards, the second – K boards. Further, if required, install a **40 mm** thick XPS additional board and repeat the layout of the boards: first, row of J boards, then – row of K boards. The ratio of the long (b) diagonal of the rhombus to the short (a) one should be **b/a≤3**. Recommended ratio: **b/a=3**.



Wedge-shaped boards TECHNOROOF N SLOPE (**1.7%** and **4.2%**) or PIR TECHNONICOL (**1.7%**; **2.1%** and **3.4%**) can be used to create the main slope on the roof, to form a slope in the valley and counter slopes. 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. Installation of a sand-cement screed on a horizontal surface

Installation of a sand-cement screed is carried out on a prepared sloping layer of filled-up materials or thermal insulation boards.

Before installing a screed over the wedge-shaped thermal insulation boards, it is recommended to create a separating layer (e.g. ruberoid or asphalt roofing paper).

Place a reinforcing net **150×150mm**. Install the nets with an overlap of at least one mesh. In overlaps, tie the nets with a tying wire with a pitch of **300 mm** (**3 meshes**).

Set the guide battens on the level-checked marks at a pitch of **1.5-3 m**. To keep the slope and a screed thickness, set the guide rods at spots, checked with a level. For convenience use rods with a profile height of the required screed thickness.

Sand-cement screeds at least **50 mm** thick are insalled on filled-up thermal insulation (expanded clay gravel, perlite and others) and on thermal insulation boards (stone wool, extruded polystyrene, polyisocyanurate).

Fill the strips formed by rods with sand-cement mortar. Even the mortar with a screed board, moving along the guide rods. After curing of the screed, demount the rods and fill the holes left from the rods with the sand-cement mortar.

For work convenience you may fill with the sand-cement mortar the strips through one. Then even the mortar with a screed board, moving along the guide rods. After curing of the screed, demount the remaining rods and fill the gaps with the sand-cement mortar. Even the mortar with a screed board.

NOTE: Form expansion joints in new sand-cement screeds.

It is useful to form expansion joints in the drainage divide line, while the width of every joint should be calculated separately.

$$\Delta L = L0 * \alpha * \Delta t,$$
$$\Delta t = t2 - t1$$

ΔL – minimal width of an expansion joint, mm;
L0 – distance between joints, mm;
α – decking thermal expansion coefficient (sand-cement screeds, bitumen concrete), **1°C** (thermal expansion coefficient of a sand-cement screed – **0.00001*(°C)$^{-1}$**);
t2 – "working" temperature, i.e. decking installation temperature;
t1 – maximum temperature, to which the decking may be exposed, °C.

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

Installation of a substrate layer from prefabricated screed is carried out on a prepared layer of thermal insulation boards. The substrate 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.

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 structures and vertical surfaces of walls and parapets, except for the location of water intake funnels.

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

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

Thermal insulation surface may serve as a substrate for roofing membrane. 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 torching-on on thermal insulation. Torching-on on thermal insulation made of polyisocyanurate is possible in case of using boards with a glass fiber mat cover (PIR GTM/GTM).

The decking is installed in accordance with section 2.3.1.

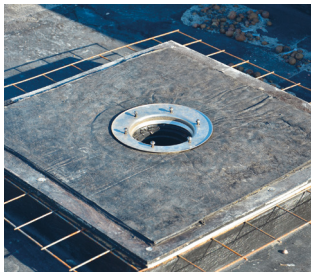
NOTE: The polystyrene concrete cannot serve as a substrate for the waterproofing membrane.

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

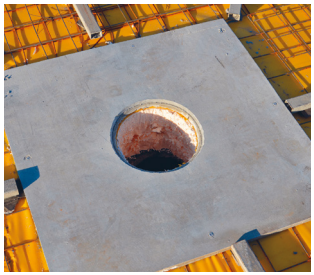
NOTE: Local subsiding of the roof in the areas of internal water drainage funnels installation should be 20-30 mm at a distance of 500 mm from the center of the funnel. This can be achieved in several ways.

Method No.1

Install a timber box on a vapor barrier layer. Height of the wall should be equal to the thermal insulation thickness.



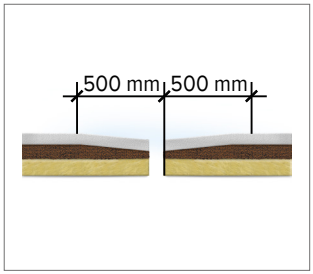
Install thermal insulation in the box and cover with two cement bonded particle boards. Install a reinforced mesh between the boards.



After installation of the thermal insulation layer, see section 2.3., install a sloping layer, see section 2.4., so that the lowest point of a slope coincides with the level of the sheet.

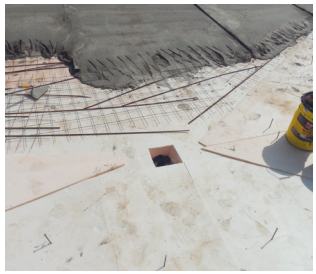
Then flow sand-cement screed, see section 2.5.1, up to the level of cement bonded particle board.

Method No.2



Local subsiding can be achieved by decreasing of the thickness of a slope-forming layer of filled-up material. Then flow sand-cement screed.

Method No.3



When forming a sloping towards a funnel, subsiding is formed with wedge-shaped thermal insulation boards, see section 2.4.2. Then flow sand-cement screed.

Method No.4

This method is typical for the case of using a stone wool thermal insulation layer.

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

Mineral wool thermal insulation slabs in this place must be replaced with extruded polystyrene XPS TECHNONICOL CARBON PROF.

A chrysotile-cement pressed flat sheet **10 mm** thick, primed on both sides, is laid over the extruded polystyrene. The sheet is fastened to the load-bearing decking.

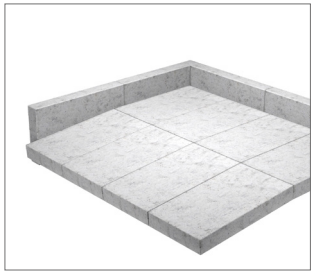
NOTE: For a tight junction stick the XPS to the vapor barrier with sealant. In case several layers of XPS are used for a patch, it is necessary to stick the boards to one another with a sealant.

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

Vertical surfaces of reinforced concrete structures

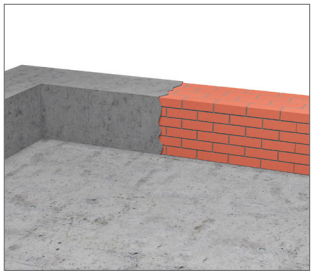
Even the surface of a concrete decking (walls, parapets) with a sand-cement mortar of a grade not lower than C8/10.

Vertical surfaces of precast reinforced concrete structures



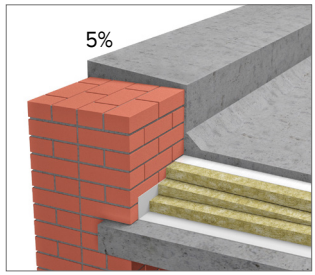
Fill the junctions of vertical reinforced concrete structures (walls, parapets) with polyurethane sealant. Even the surface of a reinforced concrete decking (walls, parapets) with a sand-cement mortar of a grade not lower than C8/10.

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.

2.6. Substrate preparation before laying the roofing membrane

2.6.1. Preparation of the surface

- Fill all the probable cavities, cracks, roughnesses with C8/10 sand-cement mortar;
- Remove grease from the decking;
- Check the slope of the substrate. The formed slopes should be not less than **2%**. The slope can be measured with a level and a rod or with a level and a measuring tape;

- Check the evenness of the substrate with a two-meter rod. Carry out the measurements at least **5 times** per every **70-100 m²** of a roof. Maximum gap must not exceed 5 mm along the slope and **10 mm** across the slope. In case of cement milk, corrosion or oil spots, remove them by abrasive treatment, then rinse and dry the surface. When the defect lies deeper, it should be removed and replaced with a new concrete or filled with a sand-cement mortar;
- Clear the surface of the substrate from dirt, dust, foreign objects, ice, snow, puddles;
- Check the moisture content of the substrate. The moisture content of sand-cement screeds should not exceed **5%** by weight, and the moisture content of asphalt concrete screeds – **2.5%**. If a roofing membrane is installed with mechanical fastening to a sand-cement screed, the moisture content of the screed should not exceed **8%**. Concrete moisture values are most often determined by factory tools, i.e. moisture meters.

In the case of a substrate layer made of piece elements (prefabricated screed, thermal insulation boards), the maximum clearance when checking the evenness 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) should not be 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: Bitumen prime coating is applied to the surface with not more than 5% moisture content by weight.

Mark out the vertical surface on which the material will be laid.

Apply primer to the surface. Use a paint roller for this. On vertical surfaces for accurate primer use painter's tape, gluing it along the markings.

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. Decking requirements

Mechanical fastening of the roof is possible for the following types of decking:

- Reinforced sand-cement screed at least **50 mm** thick and of at least **5 kPa** compression strength;
- Monolithic and prefabricated reinforced concrete slabs at least **120 mm** thick.

NOTE: Mechanical fastening to hollow and ribbed slabs is not recommended. This can lead to weakening of the load-bearing capacity of the slab, thus when selecting a solution for a roof with mechanical fastening, a roofing decking from sand-cement screed should be performed or TN ROOF BRM CONCRETE BALLAST or TN ROOF BRM CONCRETE STANDARD should be used.

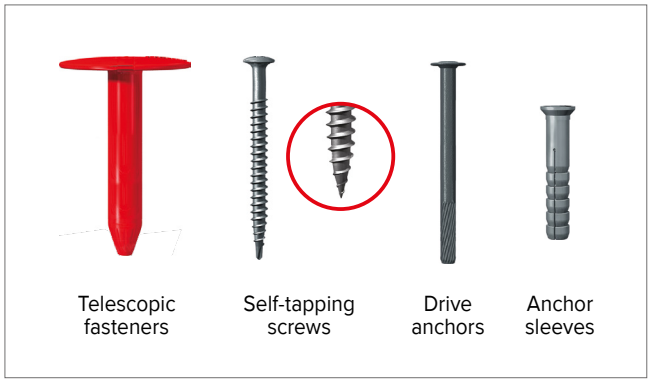
3.2. How to choose fasteners for mechanical fastening

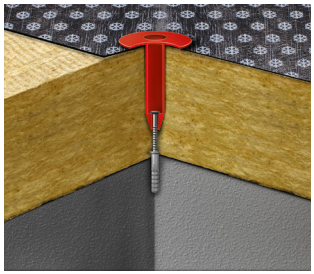
Elements of mechanical fastening for thermal insulation and roofing materials constitute an important part in the roof structure. Integrity and lifespan of a roof depend on chosen fasteners, necessary amount and fastening pitch calculations, quality of the installation works performed.

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

- For fastening to a decking made of concrete of class C12/15-C20/25 or a sand-cement screed at least **50 mm** thick made of a mortar of a grade not lower than C8/10, roofing pointed self-tapping screws **4.8 mm** in diameter and **45 mm** or **60 mm** long are used;
- For fastening to the decking from concrete of C20/25 class, drop-in anchors with polyamide anchor sleeves **45 mm** or **60 mm** long are used.

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 concrete or sand-cement decking for at least **45 mm**.

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

When installing a roof on a rigid decking, fastening is carried out with plate-shaped holders **50 mm** in diameter and special self-tapping screws:

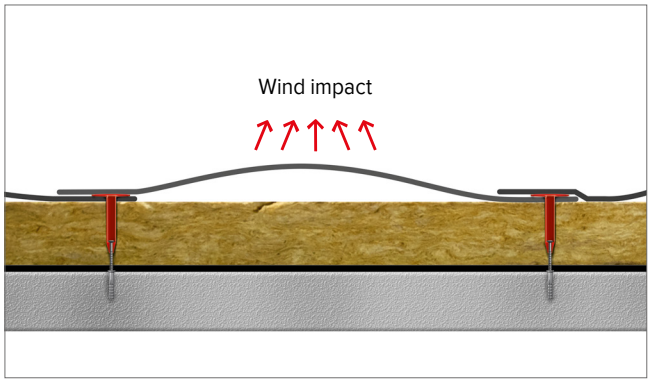
- For fastening to a decking made of concrete of class C12/15-C20/25 or a sand-cement screed at least **50 mm** thick made of a mortar of a grade not lower than C8/10, roofing pointed self-tapping screws **4.8 mm** in diameter are used together with a polyamide anchor sleeve **45 mm** or **60 mm** long;
- For fastening to a concrete decking of class C20/25, drive anchors are used.

The list of selection of the length of a fastener depending on the thickness of the thermal insulation

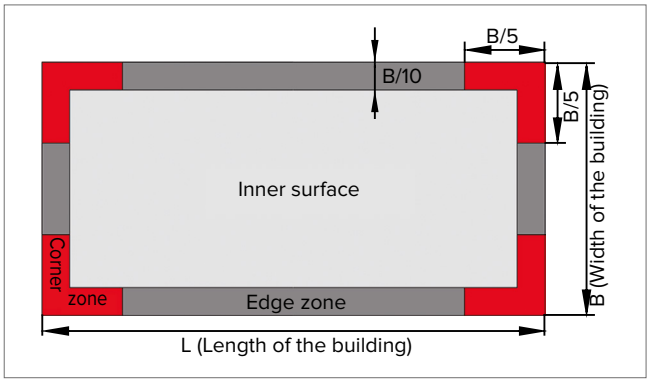
THERMAL INSULATION THICKNESS, mm	LENGTH OF FASTENERS, mm		
	CONCRETE DECKING		
	TELESCOPIC FASTENER, mm	POINTED SELF-TAPPING SCREW 4.8 mm	ANCHOR ELEMENT 8×45 mm
40	20	80	45
50	20	90	45
60	20	100	45
70	50	80	45
80	50	80	45
90	60	90	45
100	80	80	45
110	80	90	45
120	100	80	45
130	100	90	45
140	120	80	45
150	130	80	45
160	140	80	45
170	150	80	45
180	150	90	45
190	150	100	45
200	180	80	45
210	180	90	45
220	180	110	45
230	200	100	45
240	200	100	45
250	150	160	45
260	170	160	45
270	170	160	45
280	180	160	45
290	200	160	45
300	200	160	45
310	170	200	45
320	180	200	45
330	200	200	45
340	200	200	45
350	220	200	45
360	220	200	45
370	-	-	-
380	-	-	-

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

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



NOTE: Calculation errors can lead to irreversible consequences.



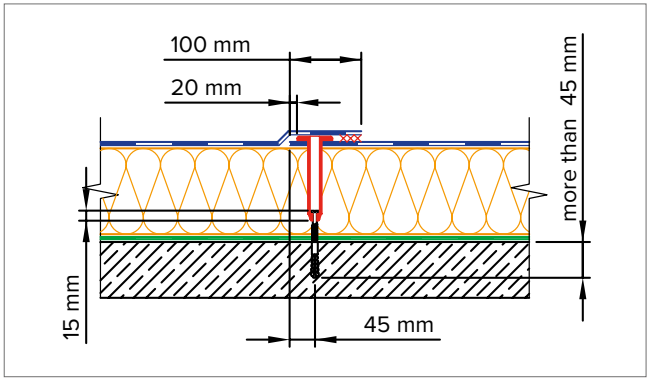
According to the rate of wind load, the roof is conventionally divided into **3 zones**: corner, edge and central ones. Wind loading is the biggest in the corner zones. Therefore, the number of fasteners in the corner zone should also be greater.

Recommendations on rigid decking (sand-cement screed, monolithic slabs) fastener pitch calculations:

- The direction of the roofing depends on the angle of the slope, see section 5.2.2.;
- Fastener pitch should be within **150-350 mm**, with a larger calculated pitch, it is taken equal to **350 mm**.

3.3.1. Peculiarities of mechanical fastening of roofing material

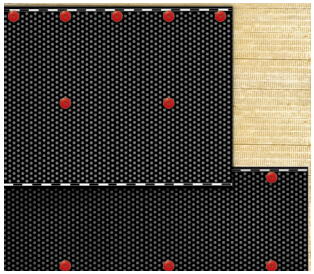
Fasteners in a lateral overlap should be installed **45 mm** from the edge of a roll. When installing cap sheet membrane material, the lateral overlap should be not less than **100 mm**.



It is allowed to install a fastener in the end overlap, but only in cases of stretching of the roll (this fastener is not considered in wind loading design) and on roofing slopes more than **10%**.

NOTE: Fastener pitch should not exceed 350 mm.

In case the calculations show a pitch of fasteners installation less than **150 mm** (when fastened to a rigid decking), it is allowed to install the fasteners in the ways described below.



Fastening of the membrane of the bottom layer 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.

Extra fasteners are installed on perimeter of the entire roof along parapets, eaves, utilities (ventilation and lift shafts, roof ventilators etc.). Extra fastening pitch 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) a perforator, concrete drill, screwdriver with a cross slot is needed.

Screwdriver

Perforator

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

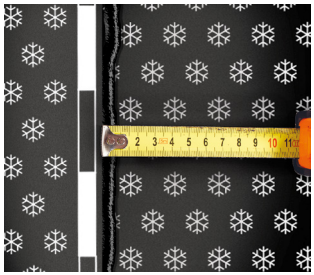
4.1. Works with equipment during the installation of the bottom layer by mechanical fastening

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. 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.

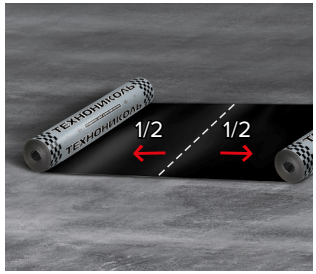
Immediately after application, when the material is not cooled yet, roll the glued overlapping area with a roller for total sealing of the overlap as mentioned previously.

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

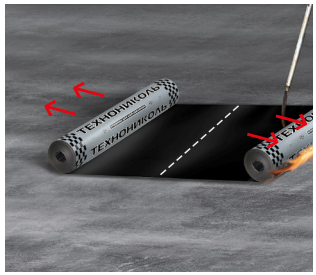
During the installation of roofs by torch-on application, the material of the bottom and top layers is glued using standard gas torches.

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)



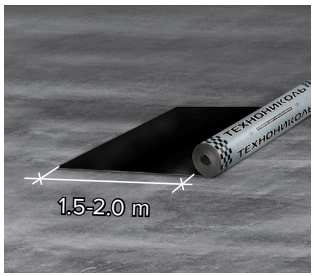
Roll up the aligned material till the middle. The winding is better to be performed using a metal or a cardboard spool. Ensure that the edge of the roll is straight.



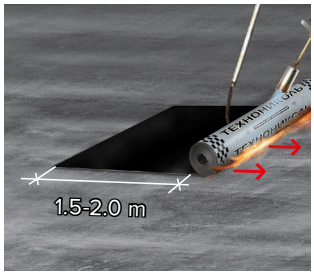
The material should be welded from the middle to both sides.

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)

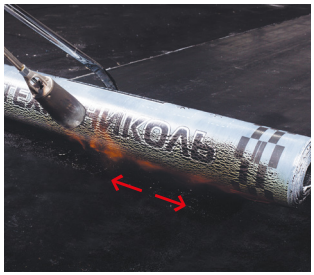


Roll the aligned material almost to the end: leave **1.5-2 m**.



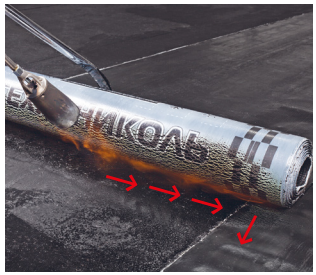
Weld the roll to the decking. When installing, roll the material towards yourself. After the installation of the roll, weld the left part of the roll (**1.5-2 m**).

All the required overlaps should be prepared prior to start of the wotks, see section 5.2.1.



Warm the material with smooth movements of a gas torch. When installing the roll, provide equal warming of the material and the surface of the decking.

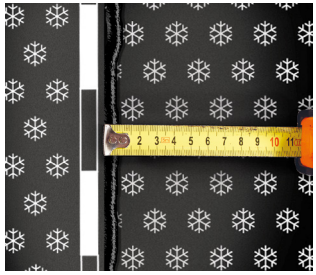
NOTE: When installing roofing membrane on thermal insulation boards, warming of the decking surface is not required. The material is warmed at a reduced gas pressure of up to 1-1.2 atm (up to 1.0-1.2 kg/cm^2). The gas torch flame is directed only to the roll surface. The flame length from the point of 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.



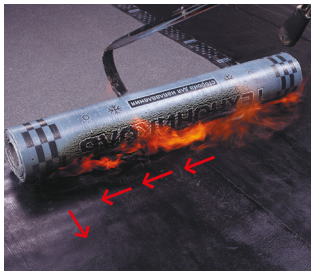
A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by **10-25 mm**.

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

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.

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 coarse-grained slate (end, lateral overlaps etc.), remove the grit from in the area of seam formation: heat up the material with a gas torch; imbed the grit into the bitumen with a spatula.

NOTE: Torch-on application of the material to the coarse-grained 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 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.

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 glued material should be additionally smoothened and pressed from the center to the edges of the roll, pressing out 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 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 melt the grit in.

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 the angle fillet made of ungritted material.

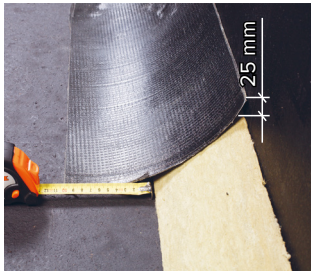
Reinforcement layers are necessary to increase reliability, tightness and durability of a roof in the areas of installation of water intake funnels, ridge, valley, junctions to vertical surfaces (parapets, walls) and other elements.

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.

NOTE: Angle fillet can also be made of C8/10 sand-cement mortar with 100×100 mm sides. In this case, inclined surface of a fillet should be treated with a primer.



Prepare reinforcement strips from 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.

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.

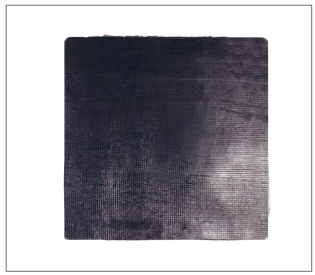
For high-quality torch-on application of the material to the decking it is necessary to get a small bulge of a polymer-bitumen binder in the place where the material touches the surface.

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 of the underlay membrane 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

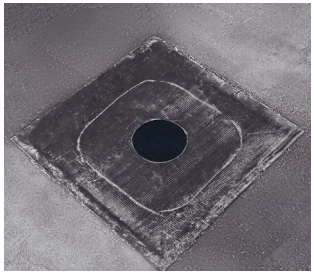


Cut out an additional reinforcement layer from the underlay membrane 500×500 mm. It is recommended to round off the corners of the resulting additional layer.

Torch on the reinforcement layer in the area of local subsiding of the water intake funnel (in accordance with the design).

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 the 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**.

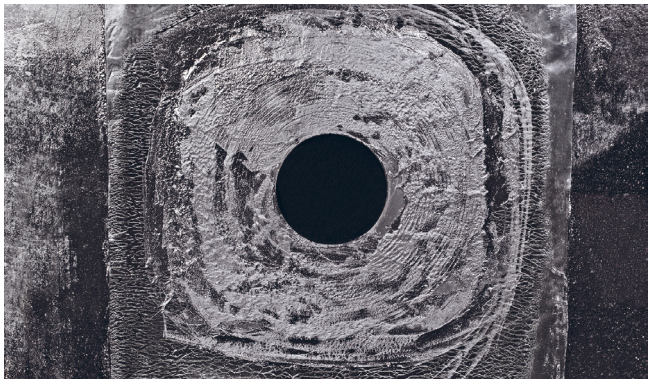
5.1.3. Installation of a water intake funnel

Burn down the film on the surface of the material in the area of water intake funnel installation. When using thin torch-on applied materials as the materials for the bottom layer, before installation of the funnel flange it is necessary to burn the film on the material and pour a layer of TECHNONICOL hot-applied mastic or apply MASTIC TECHNONICOL FIXER with a spatula.

Install the funnel and press the fixing ring of the water intake funnel into the heated up area or into a mastic layer. Ensure that the polymer-bitumen binder is flowing out from under the funnel fixing ring evenly. The flowing-out ensures total tightness of the joint.

For a tight joint with the funnel, it is necessary to coat the funnel flange with a bitumen binder. There are several ways of applying the bitumen binder:

- Hot applying with TECHNONICOL hot roofing mastic;
- Hot applying with cuttings of polymer-bitumen material;
- Cold applying with a sealing mastic.



The first hot method of applying – applying with TECHNONICOL hot roofing mastic. Pour the hot mastic over the entire funnel flange. The subsequent laying of the roofing material is carried out in accordance, see section 5.2.1. or 5.2.2.

The second hot method of applying – applying with cuttings of TECHNOELAST material. Take the cuttings of TECHNOELAST material. Heat up the reverse side of the material and put the heated polymer-bitumen binder on the water intake funnel flange with a spatula.

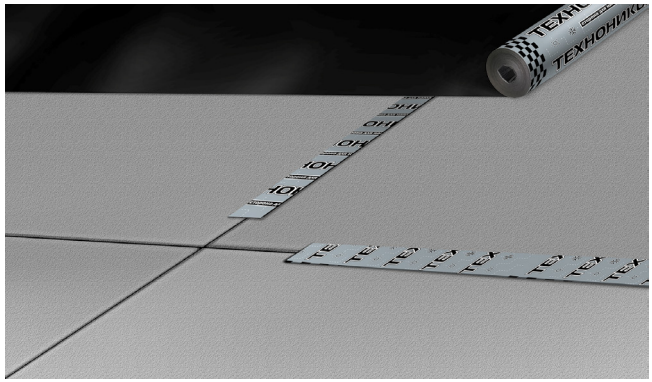
Spread the binder evenly over the entire surface of the flange of the funnel. The subsequent laying of the roofing material is carried out in accordance, see section 5.2.1. or 5.2.2.

The third cold method of applying – applying with MASTIC TECHNONICOL FIXER. Cover the funnel flange with the sealing mastic directly before installation of a roofing layer.

Burn down the film on the reverse side of the area of the bitumen membrane, which will be installed on the funnel flange. Install the burned-film area of the material on the mastic coated flange without torch-on application. Torch on the remaining part of the roll in accordance, see section 5.2.1. or 5.2.2.

5.1.4. Installation of expansion joints

Expansion joints are required to prevent damage to sand-cement screed and monolithic insulation material (cracking) caused by thermal deformations that can lead to damage to the roofing membrane.

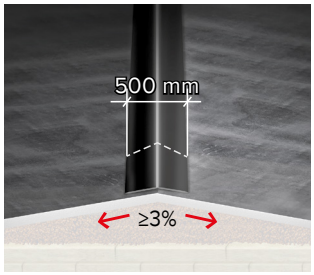


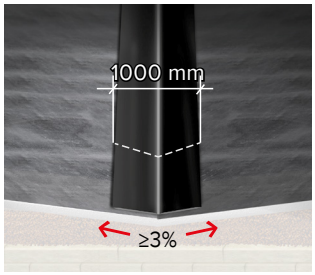
Overlap the expansion joints, see section 2.5.1., with **100-150 mm** wide strips of roll material with the gritted side down.

NOTE: **To avoid displacement in the process of laying of the roofing material, spot-torch on the strip on one side of the joint. When installing a decking made of a prefabricated screed, gaps with a width of at least 50 mm must be made along all protruding structures and vertical surfaces of walls and parapets, except for the location of water intake funnels. Also, joints are foreseen in ridge areas with a pitch of no more than 20 m.**

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

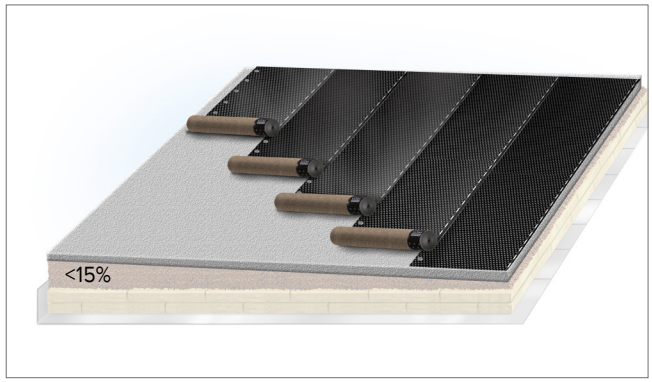
When the roof sloping is **3%** or more, the ridge of the roof should be reinforced **250 mm** from both sides and the valley **500 mm** from the inflection line with one layer of a roll roofing material according to our recommendations.



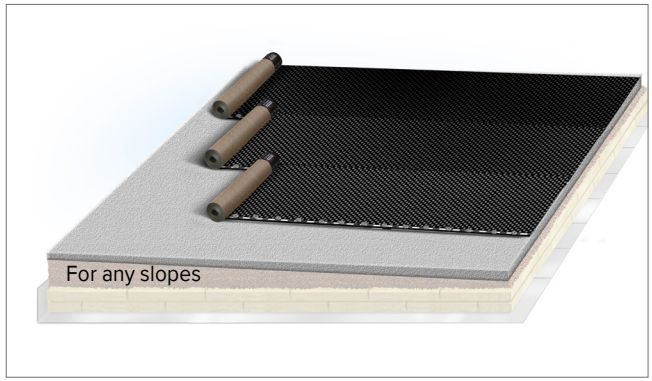


5.2. Installation of waterproofing layer

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.

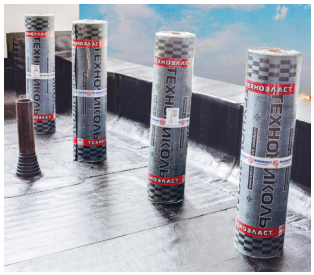


NOTE: **Cross-sticking of rolls of the top and bottom layers of the main roofing membrane is not allowed!**



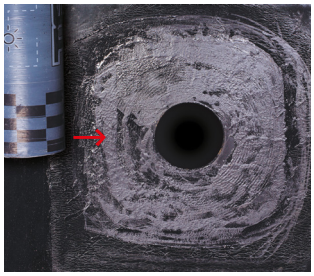
NOTE: **Start installing roll materials from the low area (eave overhangs, valleys, places of water intake funnel installation, etc.).**

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.

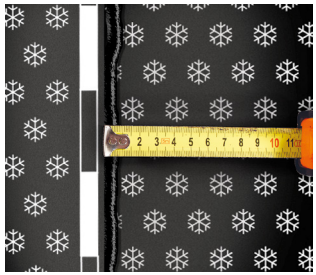
5.2.1. Torch-on application of the bottom layer



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

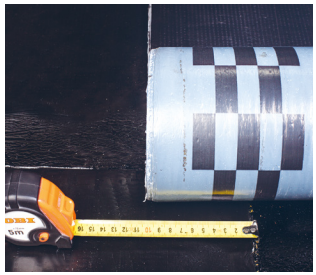
Align the roll according to the setup. To avoid displacement of the roll in the process of alignment and corrugations on the roll, it is necessary that one roofing worker stands on one edge of the roll and another aligns the roll.

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



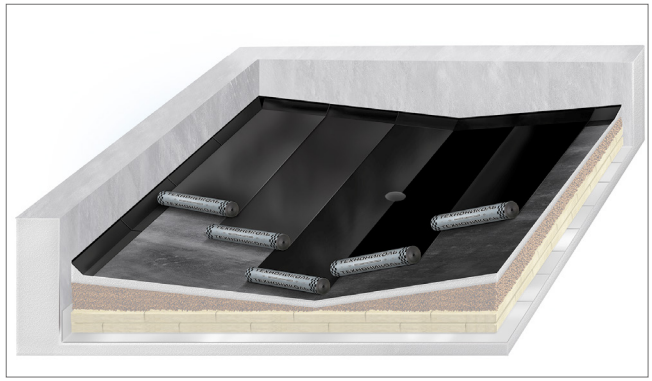
A sign of a good and right material heating is flowing-out of the polymer-bitumen binder from under the side edge of the material by **10-25 mm**.

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.

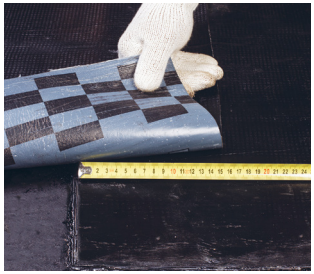


The side overlap of adjacent rolls must be **100 mm**.

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.

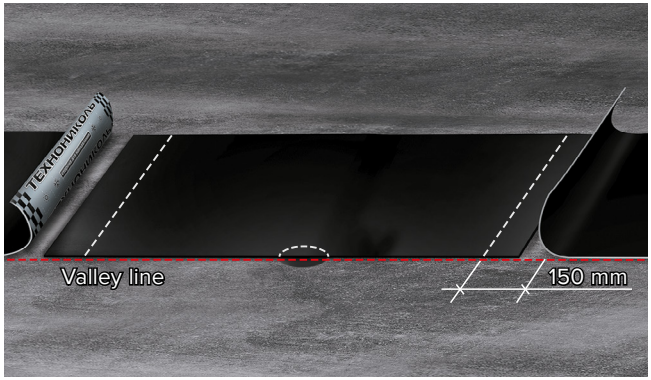


NOTE: The very first roll installed on the low area of a water intake funnel should be overlapped on both sides with adjacent sheets by 100 mm.

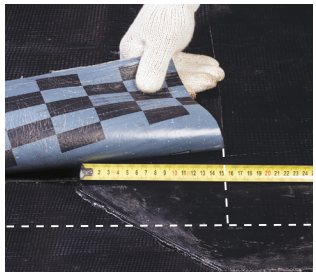


End overlap of adjacent rolls should be not less than **150 mm**.

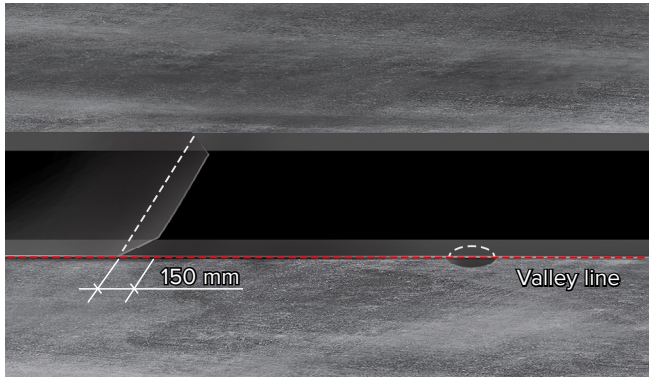
Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid the occurrence of counter seams. Water should flow from the overlapping areas towards the water intake funnel.



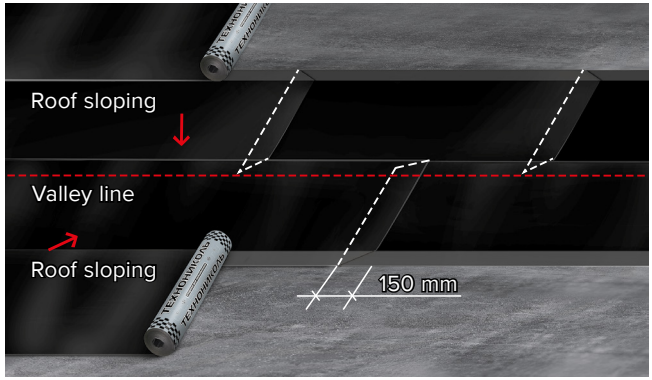
To increase the reliability and tightness of the end overlap it is recommended to cut the corner of the material sheet, which is a lower one in the overlap. Cut at an angle of **45°**.

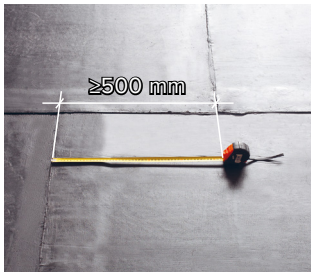


The very first roll on the low area is recommended to be cut on both sides.



Then install and cut the edges of the rolls.

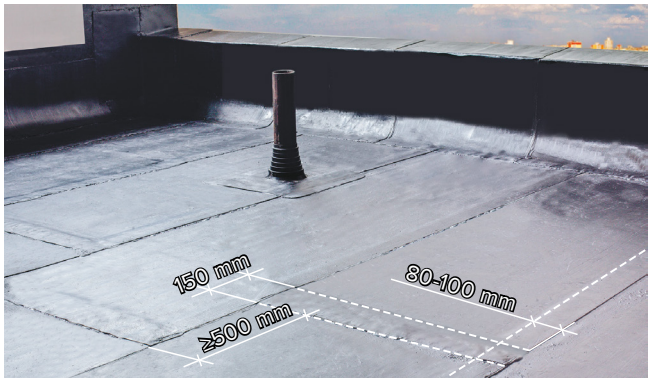




End overlaps of adjacent sheets of the roofing material should be shifted relative to one another by not less than **500 mm**.

NOTE: For the installation of roofing elements and torching on of the bottom roof layer on vertical structures, see section 6.1.

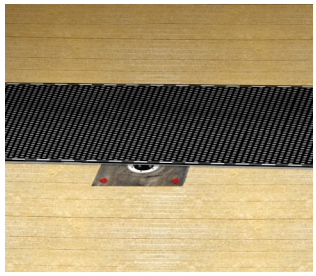
General view of a flat roof after torch-on application of the bottom layer of the underlay membrane.



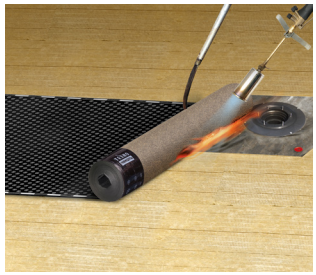
It is forbidden to walk on still hot material!!!

5.2.2. Mechanical fastening of the bottom layer

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

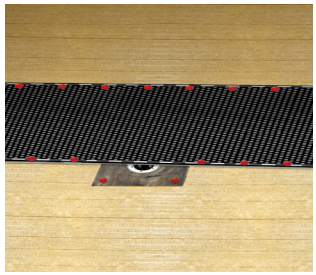


Place the first sheet of the roofing material underlay membrane so that the side edge lies on the axis of the water intake funnel.



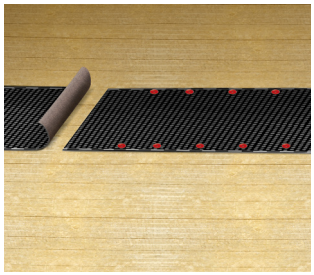
Roll the roll back till the funnel reinforcement layer, see section 5.1.2. and 5.1.3. In the funnel area stick the material to the funnel reinforcement layer. Temporarily fill the vertical funnel pipe with a non-flammable material so it will not be damaged during works with a torch.

NOTE: Depending on the roof sloping, select the method of winding and unwinding of the membrane, see section 5.2.

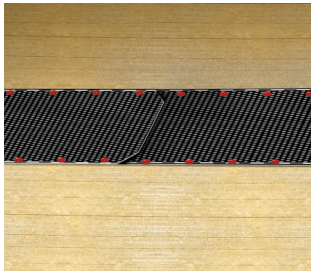


Fasten the roll to the decking in the lateral seam on both sides of the sheet in accordance with the calculated pitch, see section 3.1.

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

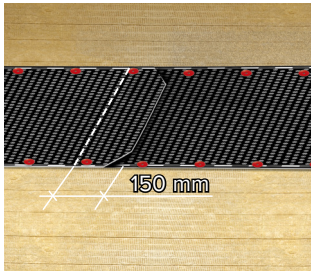


Unroll the next roll, try it on the plane, align, form an end overlap with the first roll installed. End overlap of adjacent rolls should be not less than **150 mm**.



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.

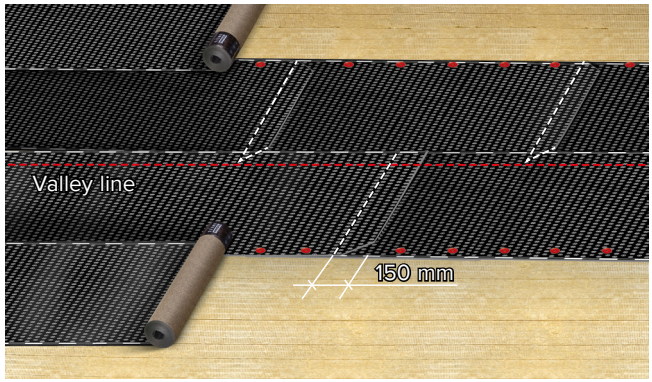
NOTE: Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid counter seams. Water should flow from the overlapping areas towards the water intake funnel.



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 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.

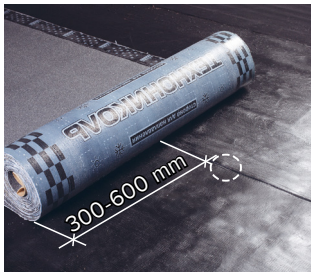


Lateral overlap of the sheets should be not less than **100 mm**. Displacement of adjacent rolls should be not less than **500 mm**. In the lateral overlapping areas, the next rolls should be fastened to the material, which is the lower one in the overlap. Torch the lateral overlapping area with the chosen equipment, see section 4.1.

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

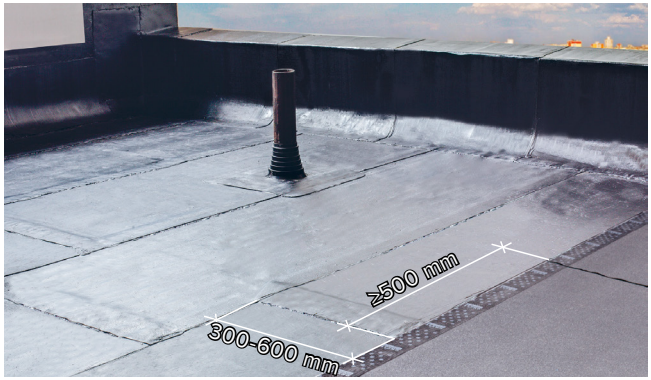
5.2.3. Torch-on application of the top layer

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



The 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 unrolling 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**.

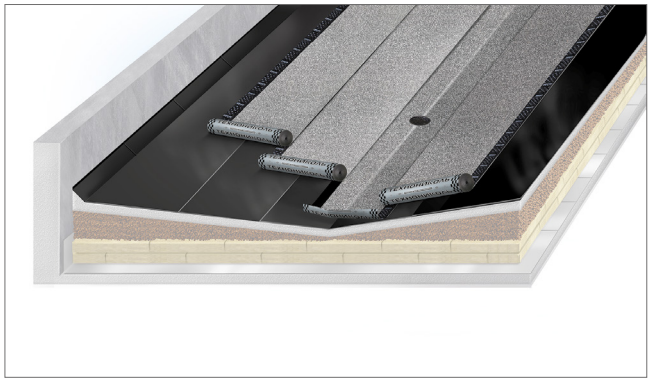
NOTE: Flowing-out by more than 30 mm along the entire lengthwise overlap means overheating of the material. Overheating during torch-on application impairs the operational properties of the roof.

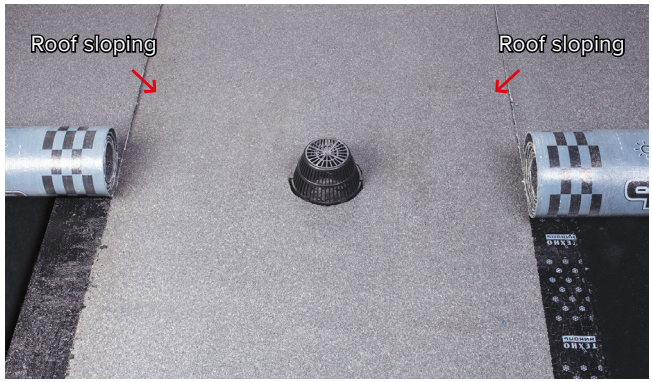
NOTE: It is forbidden to walk on still hot material!!! The grit will be melted into the bitumen binder layer, causing footprints or areas with exfoliated top layer of the material, which will lead to worse appearance, accelerated aging under the influence of sun radiation or mechanical damage to the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

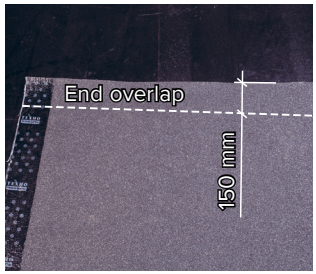
The side overlap of adjacent rolls must be **100 mm**. Specially for end overlapping, there is a strip without coarse-grained grit on each cap sheet membrane material.

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.

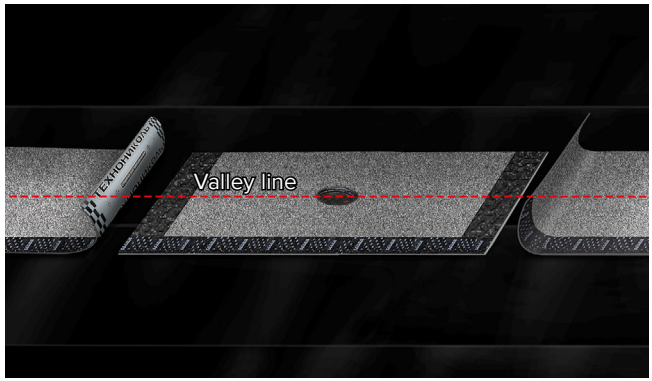




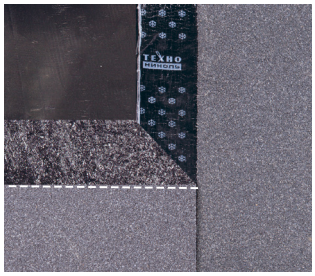


End overlap of adjacent rolls should be not less than **150 mm**.

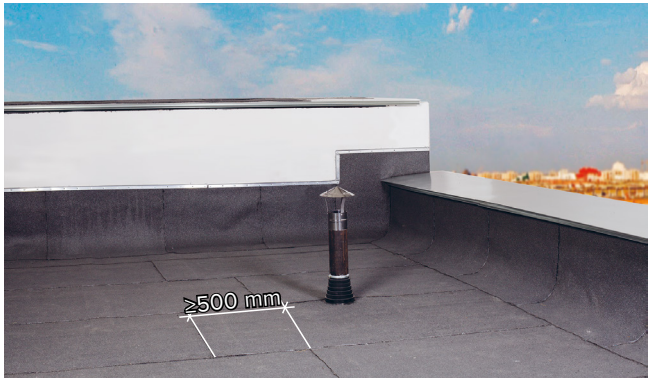
Keep the order of material installation in lateral overlaps from the lowest points of the roof to the top one to avoid the occurrence of counter seams. Water should flow from the overlapping area towards the water intake funnel.



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 grit. Cut at an angle of **45°**.



End overlaps of adjacent sheets of the roofing material 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 6.1.**

6.

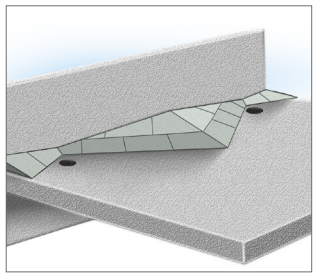
Installation of roof components

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.

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 the water intake funnel, see section 2.4.

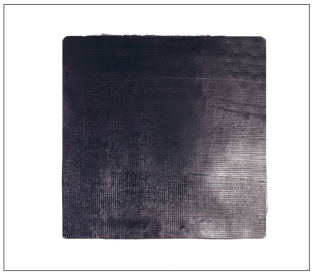
NOTE: It is forbidden to install rainwater pipes inside the walls.

6.1.1. Installation of a funnel with metal crimping flange

There are two possible types of water intake funnels – single-level and two-level funnels. Junctions of two-level and single-level funnels to bitumen roofing are performed according to the same rules, with differences in preparation works.

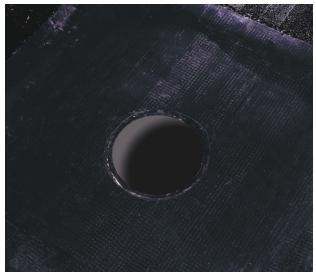
A two-level funnel consists of a bottom part with a flange, which is installed on a vapor barrier layer, see section 2.2., and a put-on element, which is inserted in the funnel. Tightness between the parts is provided by a rubber gland and a locking ring.

Remove the flange from the funnel.



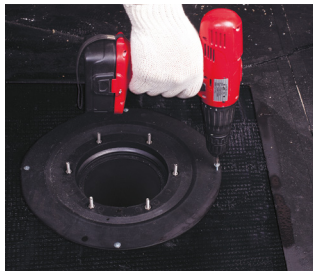
Cut out an additional reinforcement layer from the underlay membrane **500×500 mm**. It is recommended to round off the corners of the resulting additional layer.

Weld an additional reinforcement layer in the area of local subsiding of the water intake funnel as per the design, see 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, see section 5.1.3.

Install the bottom layer, see section 5.2.1. or 5.2.2. 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.

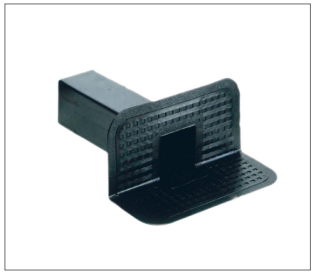
While the material is still warm, press bolt joints of the funnel through the material cap sheet membrane.

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)



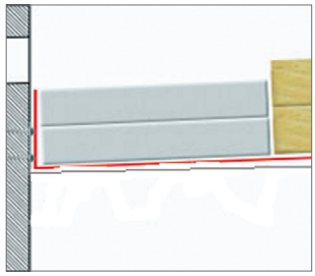
Parapet drain funnel used for external water drainage over balconies and parapets on low areas of a roof.

Parapet drain funnel is a parapet spillover, which is installed in cases of emergency water drainage when the main funnel of internal water drainage is clogged.

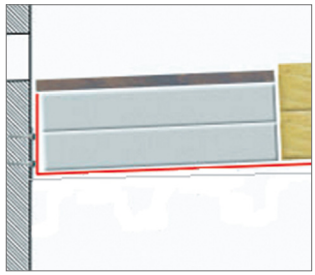
Junctions of parapet drain funnels to the roof are carried out according to identical technologies. In this manual, junction of a parapet drain funnel is described.

The local low area of the roof in the place of installation of the parapet drain funnel should be **20-30 mm** in an area of at least **500×500 mm**. Depending on the roof decking, this can be achieved by reducing the thickness of the slope-forming layer of filled-up thermal insulation, when constructing the decking made of sand-cement screed, or by reducing the thickness of the thermal insulation layer.

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 (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.

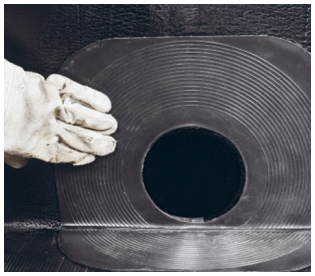


Install a cement bonded particle board of the size of the patch and not less than **10 mm** thick. Treat the board with TECHNONICOL BITUMEN PRIME COATING.

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.

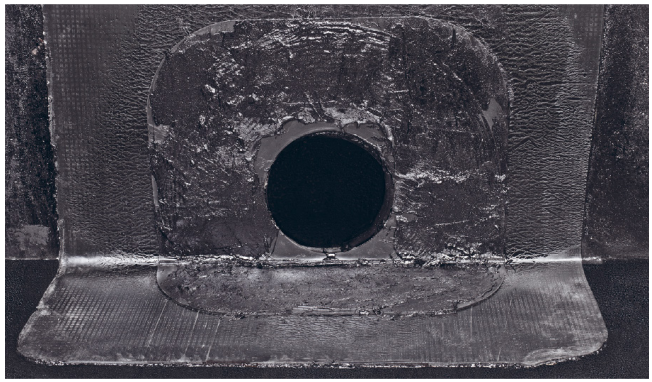


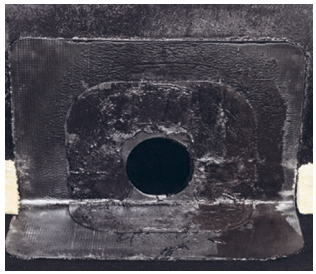
Install the funnel. Press the head of the water intake funnel into the heated up polymer-bitumen binder or mastic.

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

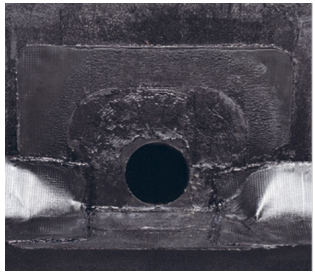
Fasten the water intake funnel to the decking, using at least **6 fasteners** (**4** on the vertical surface, **2** on the horizontal decking). Use EDS-S **4.8 mm** pointed self-tapping screws with a polyamide sleeve as fasteners.

For a tight joint with the funnel, it is necessary to coat the funnel flange with a bitumen binder, see section 5.1.3.

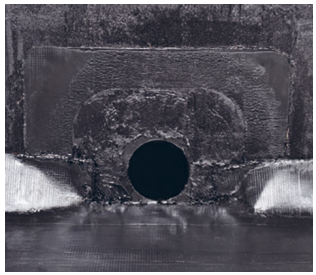




Install stone wool angle fillets to the parapet drain funnel using a hot-applied mastic. Make a smooth transition from the inclined surface of the fillet to the vertical surface of the additional layer.

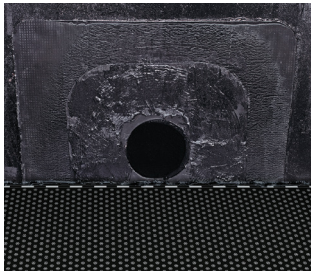


Torch the reinforcement layer strips of the underlay membrane onto the angle fillet, see section 5.1.1.

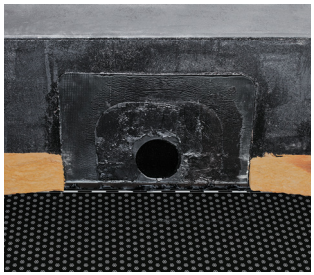


Torch on the bottom layer of the underlay membrane, see section 5.2.1. Move the material to the fillet and to the parapet drain funnel.

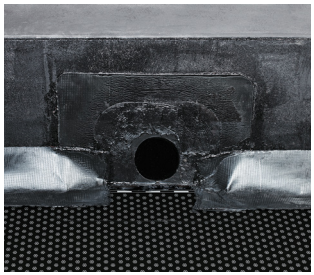
6.1.3. Installation of roof by mechanical fastening



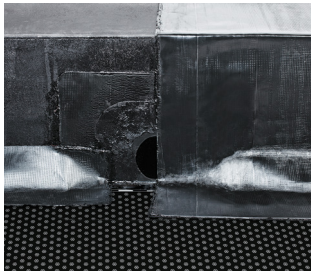
Complete the installation of the bottom layer of the underlay membrane on the main roof plane.



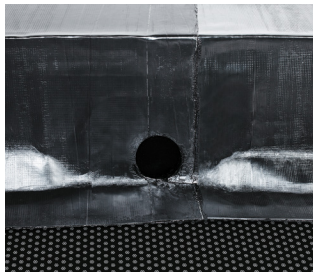
Install stone wool angle fillets to the parapet drain funnel using a hot-applied mastic. Make a smooth transition from the inclined surface of the fillet to the vertical surface of the additional layer.



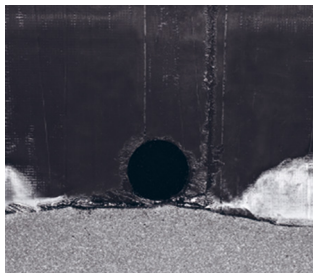
Torch the reinforcement layer strips of the underlay membrane onto the angle fillet.



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.



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



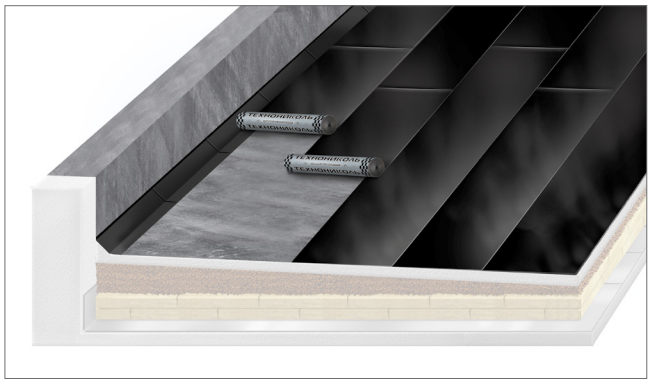
Torch on the top layer of the cap sheet membrane, see section 5.2.3.

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

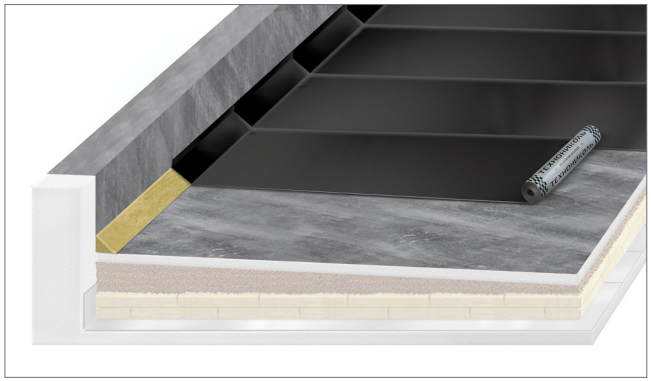
6.2. Junction to the parapet up to 600 mm high

Install angle fillets, see section 5.1.1. Torch on the reinforcement layer strips of the underlay membrane, see section 5.1.1.

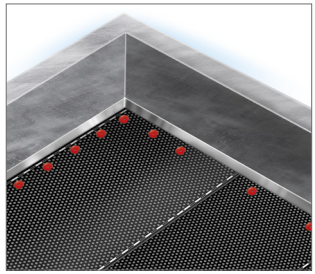
Torch on the bottom layer of the underlay membrane, see section 5.2.1. Place the material close to the angle fillet, but not make it overlap the angle fillet. End overlaps of the materials of the bottom and reinforcement layers should better not coincide.



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.

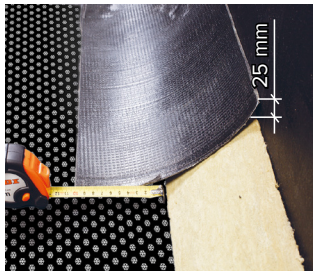


Complete the installation of the bottom layer of the underlay membrane on the main roof plane.



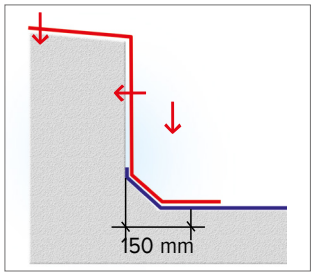
Move the underlay membrane close to the vertical structures. Fasten the bottom layer along the entire perimeter with a prescribed pitch, see section 3.3.

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

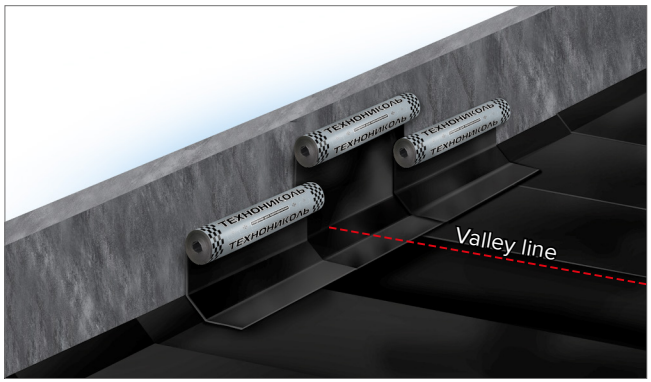


Torch on the reinforcement layer strips of the underlay membrane, see section 5.1.1.

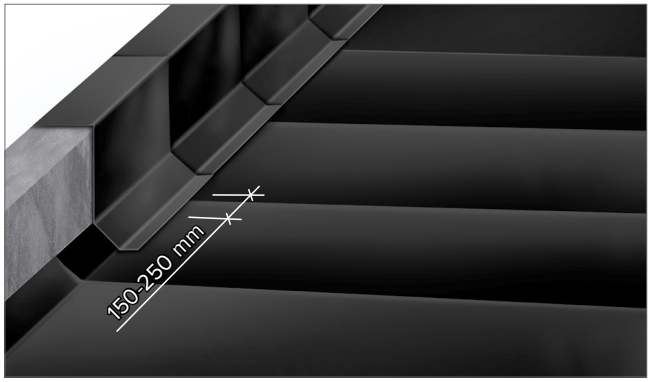
NOTE: On vertical structures (walls, parapet, ventilation shafts, etc.), mechanical fastening of the roof is prohibited. The roofing membrane should be completely glued to the decking.



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 the horizontal surface of the decking **150 mm** from the angle fillet. Parapets up to **450 mm** high can be entirely covered (it is this type of junction to the parapet that is described in the manual).



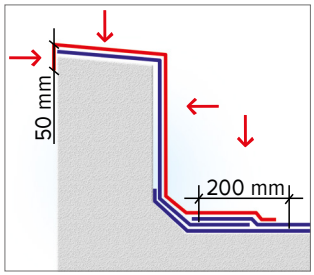
Start the installation of the additional bottom layer of the underlay membrane on the parapet from the low parts of the roof, i.e. valleys, to avoid counter seams. Water should flow from the overlapping area towards the valley. The roll installed on the low area (valley) should be overlapped with adjacent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

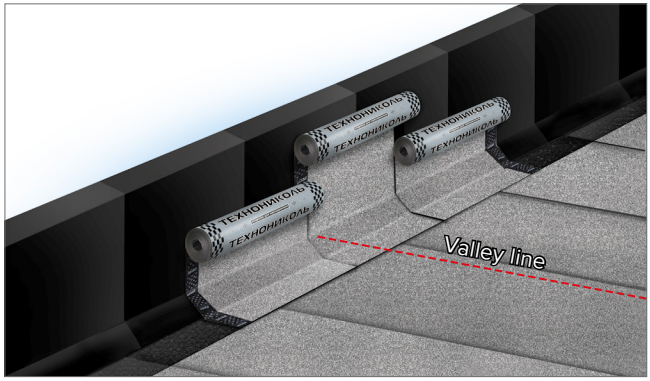
Torch on the top layer of the cap sheet membrane, see section 3.2.2. Place the material flush to the angle fillet, but do not make it overlap the angle fillet.



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.

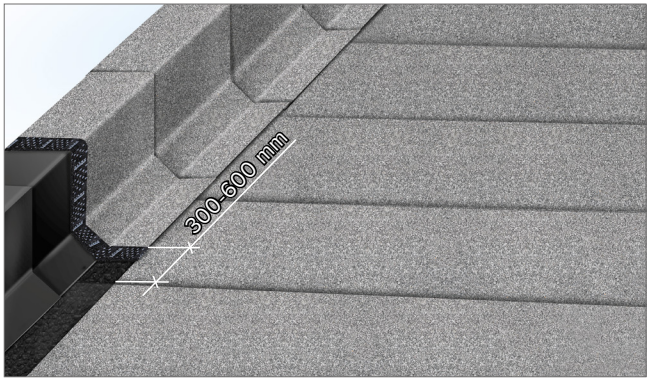
NOTE: **Installation of an additional top layer of the cap sheet membrane on a vertical surface should start from low areas of the roof. Water should flow from the overlapping area towards the valley.**



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.

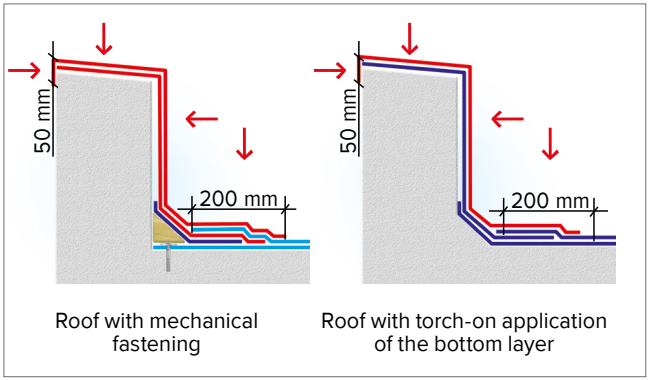
The distance between the lateral junctions of the roofing sheets in adjacent layers on the parapet should be **300-600 mm**.



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.**

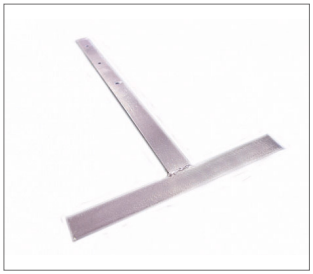
If the works are carried out correctly and all the recommendations are followed, the layout should look like the pictures below.



Roof with mechanical fastening

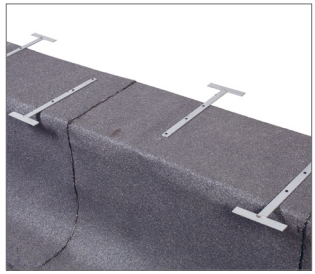
Roof with torch-on application of the bottom layer

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.

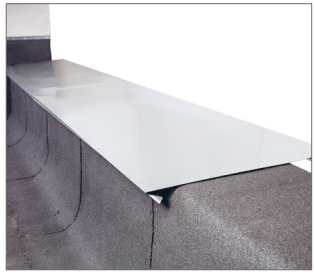


A T-shaped roofing support is intended for fastening galvanized steel drip caps and aprons to the parapets. The support should be not less than **4 mm** thick and coated with corrosion-preventive compounds.

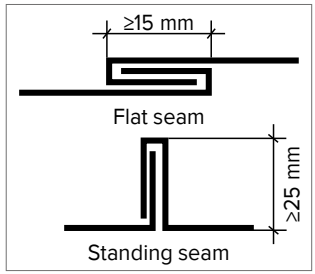
Galvanized steel parapet apron is intended for protection of the parapet from precipitation and mechanical damage.



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**.

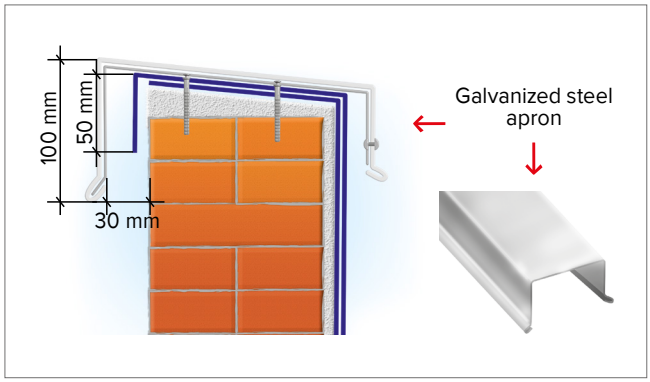


Install the galvanized steel apron on the roofing supports. The apron will protect the parapet from the effects of precipitation and mechanical damage.



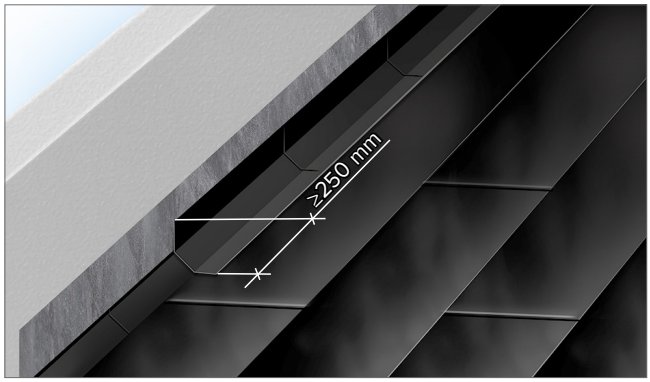
Galvanized steel parapet aprons should be connected to one another with a flat or standing seam.

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 picture below.



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

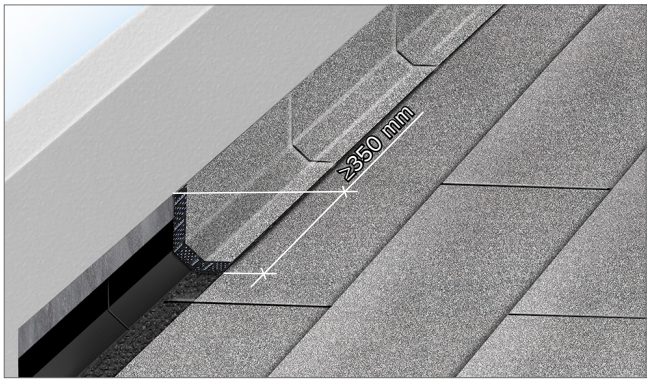
Junction to a vertical surface is carried out according to the technology, see section 6.2. The only difference in this case is that the roofing material should overlap at a height of not less than **300 mm** and additionally fastened with an edge rail.



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**.

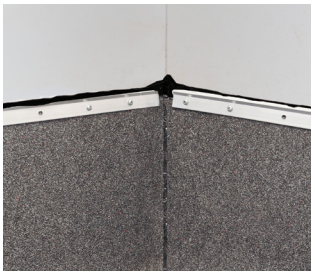
Depending on the type of the decking of the vertical surface, two options of fastening of the roofing material edge are possible.



Option No.1

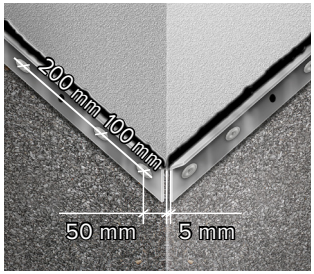
The wall is made of precast and reinforced concrete structures and masonry units, which are entirely plastered, see section 2.5.5.

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.

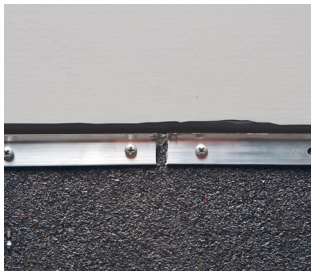


Cut the edge rail in the areas of internal or external corners. It is forbidden to bend the edge rail at the corners.

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.

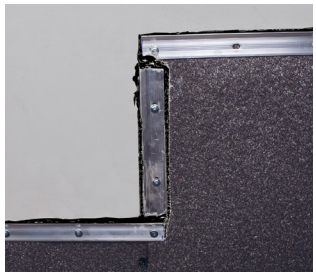


At the corners, the distance between the first and the second self-tapping screw (counting from the corner) should be **100 mm**; all the subsequent self-tapping screws must be installed with a pitch of **200 mm**.



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

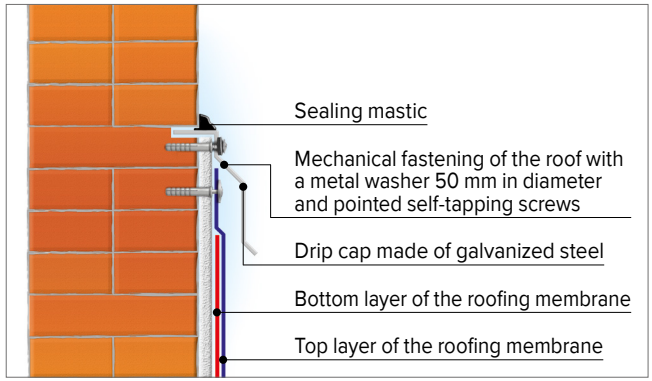
Fill the gap between the wall and the bent of the edge rail with sealing mastic.



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.

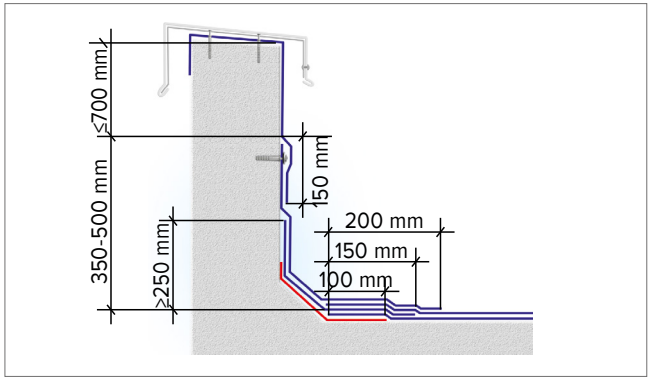
Option No.2

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 with a diameter of **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 **250 cm**;
- 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.

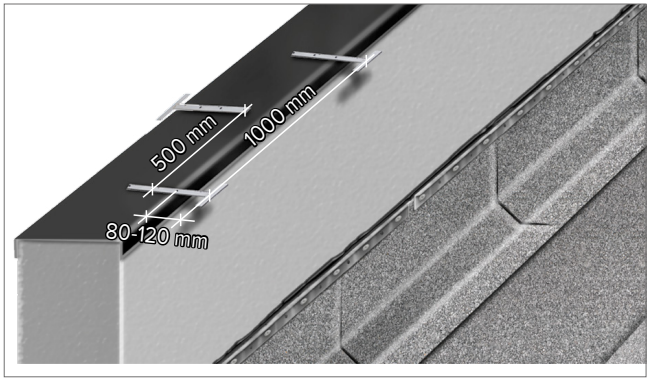
Let us consider an option of covering the parapet with roofing steel.

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**.

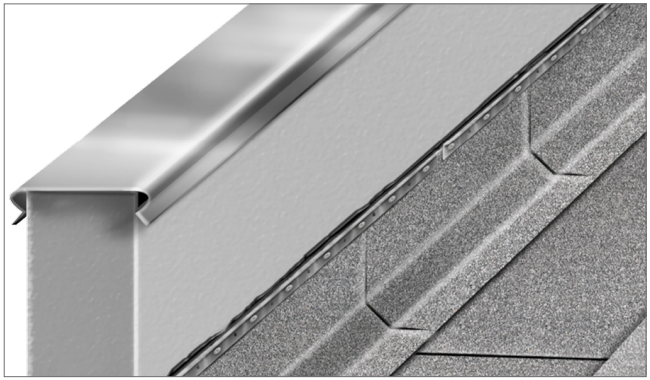
The row of roofing supports on one side of the parapet should be displaced **500 mm** with respect to another row.

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

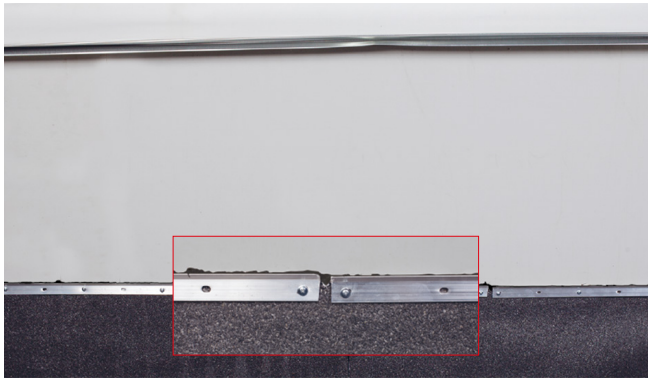


Install the galvanized steel apron on the roofing supports.

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

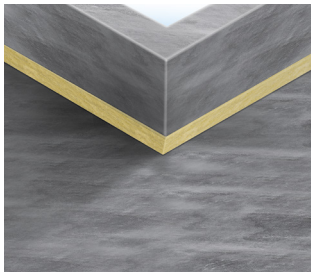


General view of the junction to a high parapet.

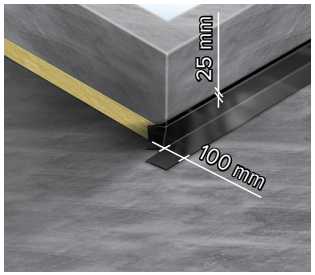


6.4. Junction to an external corner

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

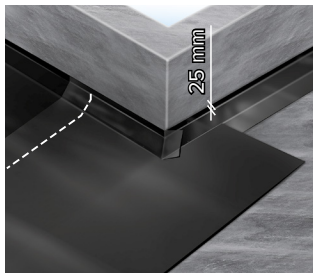


Install stone wool angle fillets in the areas of junction with the parapet on a TECHNONICOL hot-applied roofing mastic.

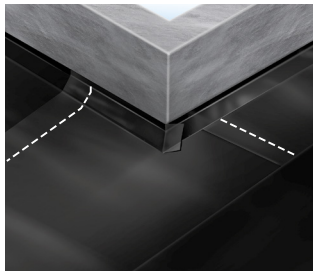


Install and torch the strips of underlay membrane material onto the angle fillet from the side of the parapet, where the material is going to be placed with its lateral part.

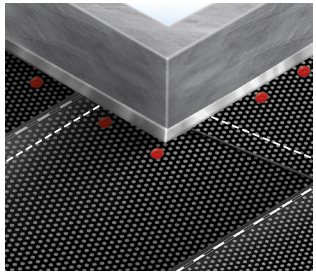
The reinforcement layer should entirely cover the fillet and overlap the horizontal surface **100 mm** from the fillet and the vertical surface **25 mm** from the fillet.



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.

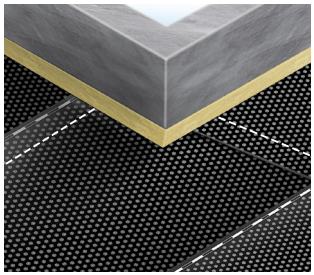


Torch on the bottom layer of the underlay membrane over the entire roof surface, see section 5.2.1.

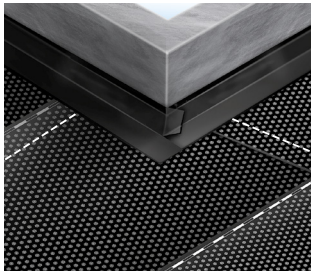


When installing a roof with mechanical fastening of the bottom layer, install the bottom layer of the underlay membrane over the entire surface of the main roof plane. Place the underlay membrane flush to the vertical structures.

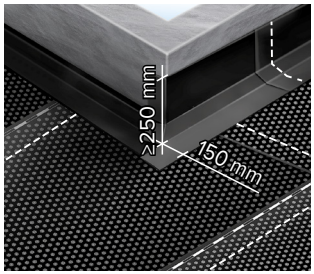
Fasten the bottom layer along the entire perimeter with a prescribed pitch, see section 3.3.



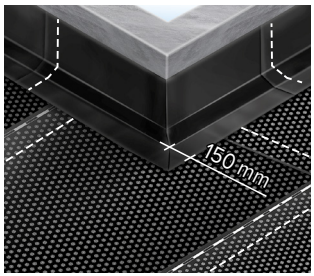
Install stone wool angle fillets on a pre-heated material in the junctions to the parapet. Install and torch on reinforcement strips made of the underlay membrane.



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.

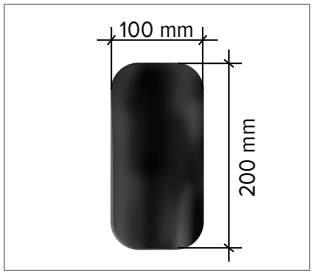


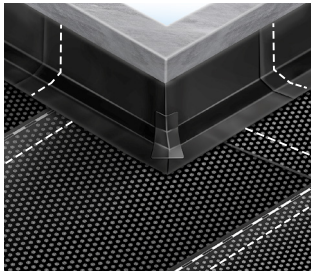
The material should overlap **100 mm** of another side of the parapet, overlap the horizontal plane of the roof by **150 mm** and the parapet by not less than **250 mm**.

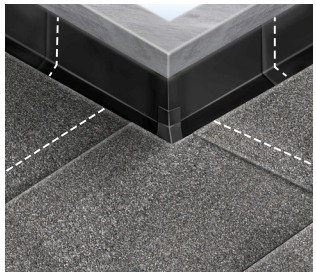


Torch an additional bottom layer on another side of the external corner.

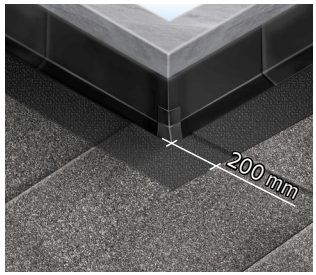
Torch a patch onto the corner junction to the fillet.







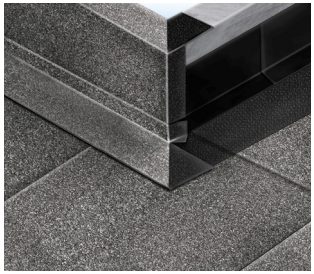
Torch on the top layer made of a cap sheet membrane, see section 5.2.3. Place the material flush to the angle fillet, but do not make it overlap the inclined surface of the angle fillet.



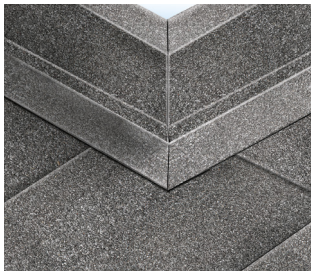
In order to achieve a high-quality torching on a material with a coarse-grained grit, remove the coarse-grained grit from the welding area.

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.

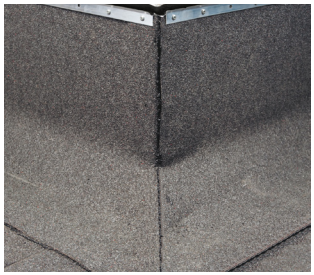


Torch on an additional top layer over the entire plane of the parapet on one side of the angle of the parapet. The material should overlap the other side of the parapet by **100 mm**, overlap the horizontal plane of the roof by **200 mm** and the facade part of the parapet by **50 mm**.



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.

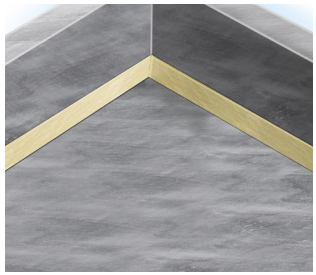


The principle of installation of an external corner to vertical construction is almost the same as the method described above. The difference is that the top layer of the material is recommended to overlap at a height of not less than **350 mm**, see section 6.3.

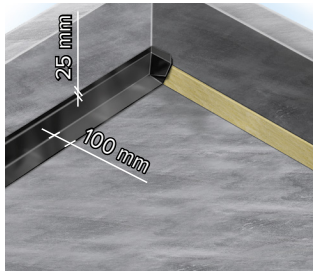
The material torched-on on the vertical surface must be fastened with an edge rail using EDS-S **4.8 mm** pointed self-tapping screws with a polyamide sleeve, see section 6.3.

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

6.5. Junction to an internal corner

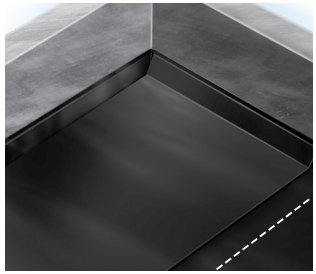


Install stone wool angle fillets in the areas of junction with the parapet on a TECHNONICOL hot-applied roofing mastic.

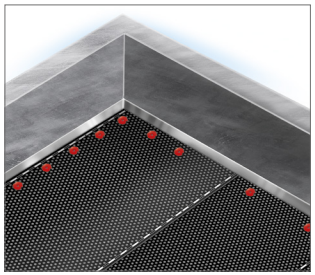


Install and torch strips of underlay membrane material onto the angle fillet on the side of the parapet, where the material is going to be placed with its lateral part.

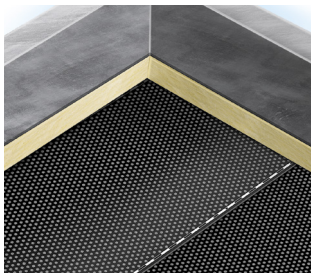
The reinforcement layer should entirely cover the fillet and overlap the horizontal surface **100 mm** from the fillet and the vertical surface **25 mm** from the fillet.



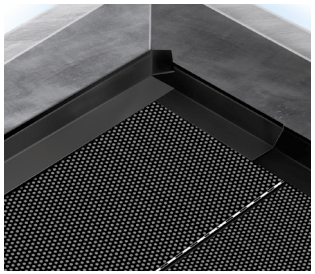
Torch on the bottom layer of the material, the end part of which is placed to the parapet. The material should entirely cover the fillet and overlap the vertical surface **25 mm** from the fillet.



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.

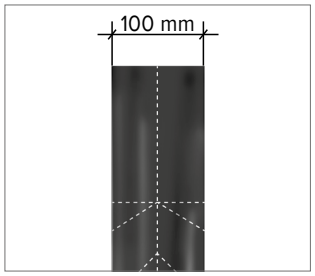


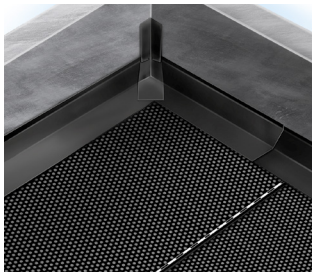
Install stone wool angle fillets on a pre-heated material in the junctions to the parapet. Install and torch-on reinforcement strips made of the underlay membrane.

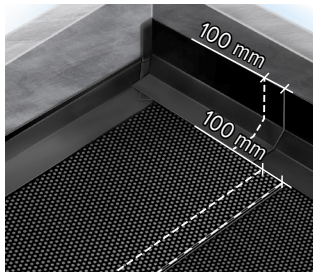


The reinforcement layer should entirely cover the fillet and overlap the horizontal surface **100 mm** from the fillet and the vertical surface **25 mm** from the fillet.

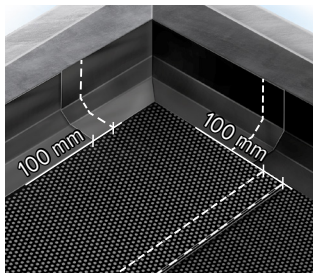
Torch on a patch to the corner to seal the seam. Make the patch overlap up to the height of the additional bottom layer (not less than **250 mm**).





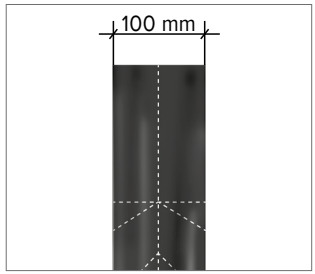


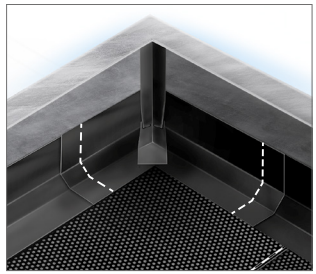
Torch on an additional bottom layer on one side of the external corner at a height of not less than **250 mm**. The material should overlap the horizontal surface of the roof by **150 mm**.



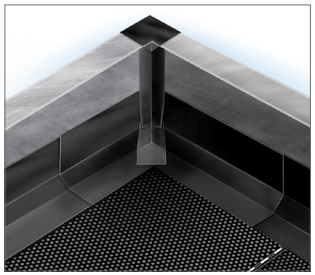
Torch on an additional bottom layer to the other side of the external corner.

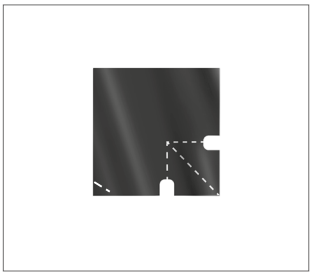
Torch a patch onto the corner over the entire height of the parapet to seal the seam.

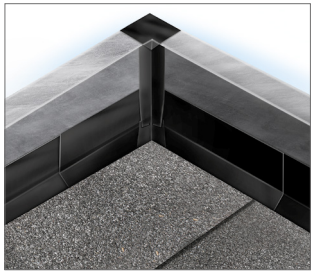




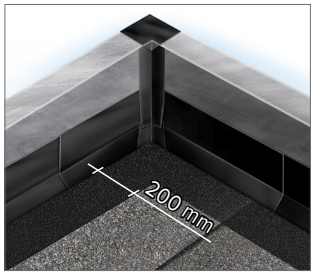
Torch a patch onto the horizontal plane of the parapet to seal the seam.







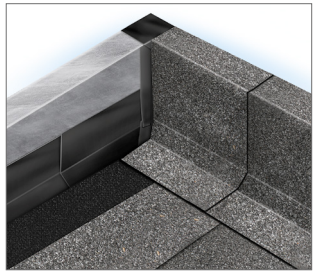
Torch on the top layer of the cap sheet membrane, see section 5.2.3. Place the material flush to the angle fillet, but do not make it overlap the inclined surface of the angle fillet.



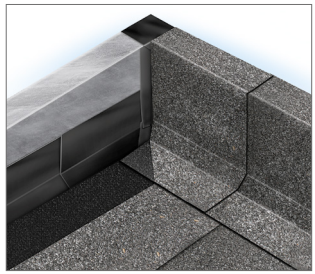
In order to achieve a high-quality torch-on to the material with a coarse-grained grit, remove the grit from the welding area.

In order to remove the grit, you should heat up the material with the flame of a torch.

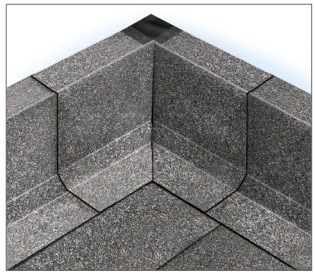
Melt the grit into the bitumen with a spatula at the distance of **200 mm** away from the edge of the angle fillet and cap sheet membrane material.



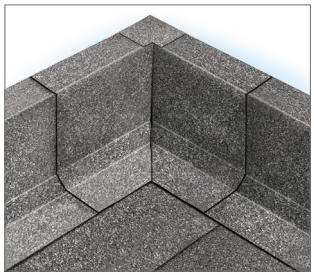
Torch on an additional top layer over the entire plane of the parapet on one side of the parapet corner. Make the material overlap the facade part of the parapet by **50 mm**.



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

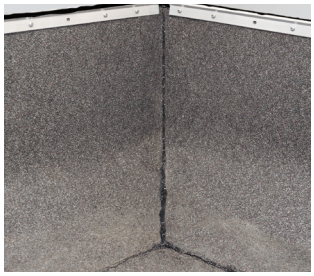


Torch on an additional waterproofing top layer over the entire plane of the parapet on the other side of the parapet corner.



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.



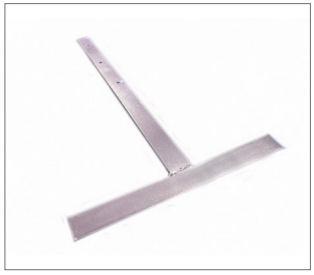
The principle of the installation of an internal corner to vertical walls, high parapets and other vertical structures is almost the same as the method described above. The only difference is that the top layer of the material is recommended to overlap at a height of not less than **350 mm**, see section 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.

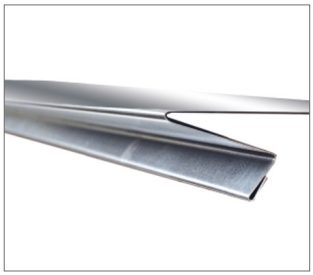
Fill the gap between the wall and the bent of the edge rail with sealing mastic.

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.

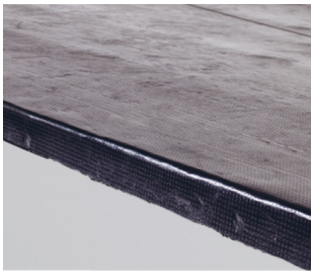


A T-shaped roofing support is intended for fastening galvanized steel drip caps and aprons to the parapets. The support should be not less than **4 mm** thick and coated with corrosion-preventive compounds.



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.

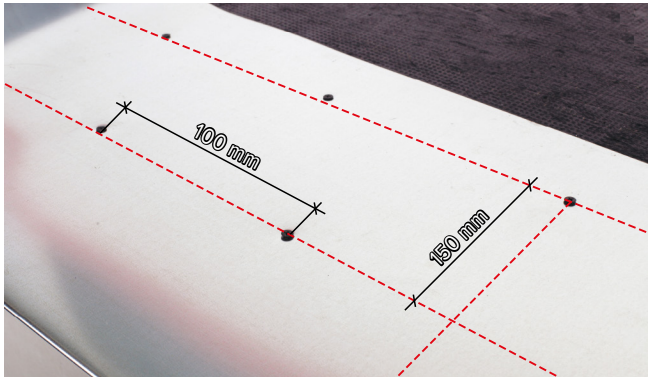
Install and fasten T-shaped supports with a pitch of not more than **700 mm**. T-shaped supports should protrude **80-120 mm** beyond the roof eave.

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**.



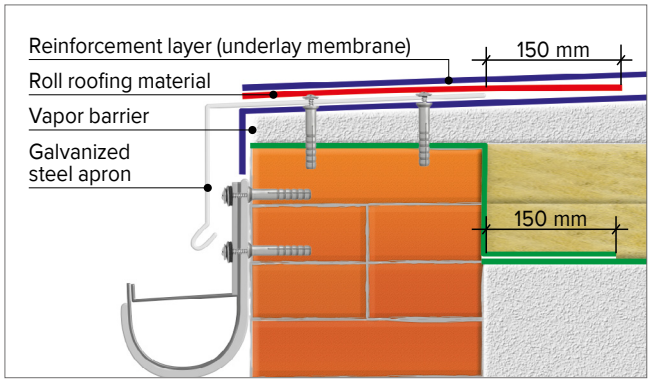
Torch on a reinforcement layer made of the underlay membrane. The reinforcement layer should overlap the roof eave by **150 mm**.

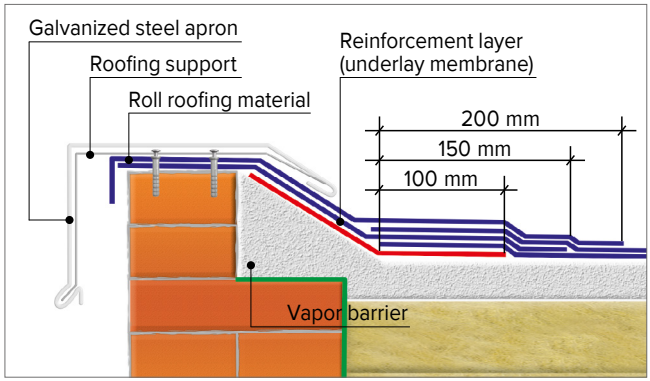
Torch on the top waterproofing layer made of a cap sheet membrane, see section 5.2.3.

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

1. Cap-sheet membrane;
2. Reinforcement layer;
3. Roof eave;
4. Underlay polymer-bitumen 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.

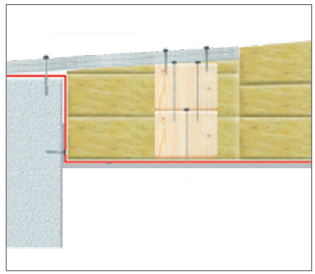


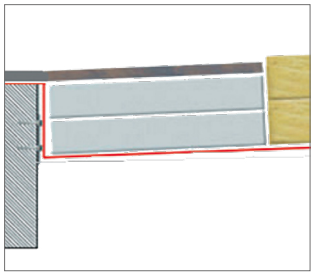


Before installing a roof eave, it is necessary to carry out preparation works in case of installing a roof over stone wool thermal insulation slabs:

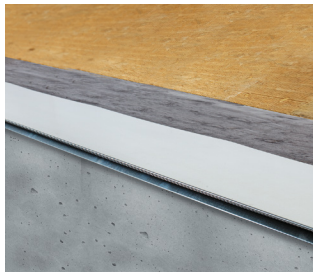
- In case the wall is made of masonry units or reinforced concrete panels, it is necessary to lay masonry units until the necessary level of the roof sloping is reached. The height of the protruding part of the wall should not be less than the height of the main thermal insulation layer;
- Prepare a rigid frame for roof eave installation, see picture below, or replace stone wool slabs with extruded polystyrene or PIR GTM/GTM TECHNONICOL boards, see picture below;
- 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 strip. Select the height of the strip, 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. One sheet should be not less than **10 mm** thick. The sheets should be not less than **500 mm** wide. Fasten the sheets to the timber strips, to the external wall and between one another.





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



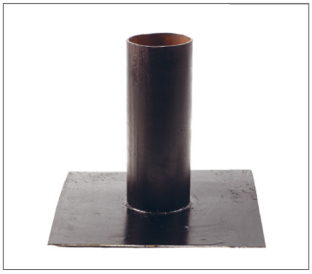
Install the roof eave (as recommended above). Install a bottom layer of the underlay membrane.

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.

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, see picture below;
- Metal sleeve, see picture below;
- Roofing material, see section 6.7.4.



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.

Method No.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 funnel flange it is necessary to burn the film on the material and pour a layer of TECHNONICOL hot-applied mastic or apply MASTIC TECHNONICOL FIXER 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, see section 5.1.3.

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

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

Install a hose clamp on the seal 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.

Method No.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.

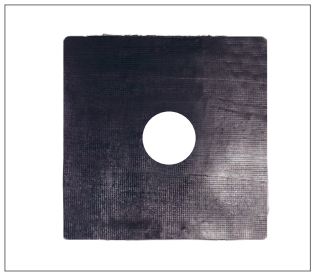
Prepare and torch on a reinforcement layer. The reinforcement layer should overlap the flange of the flashing by **150 mm**.

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

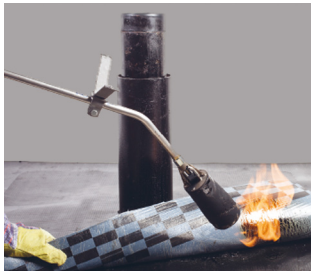
Install a hose clamp on the flashing and tighten.

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.



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



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.

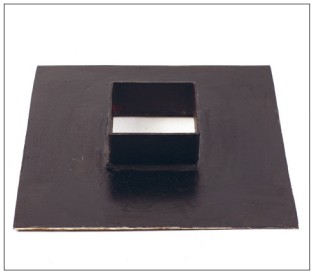
Torch on the top layer of the cap sheet membrane, see section 5.2.3.

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

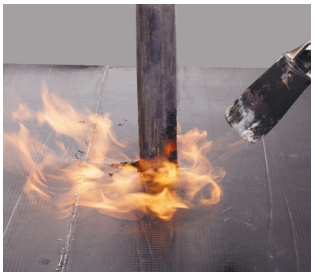
Prepare a metal sleeve:

- 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**.



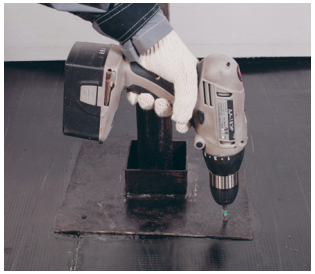
This type of a metal sleeve can be also used when installing a junction to anchors and other small elements.

Torch on a layer of the roofing material, see section 5.2.1.



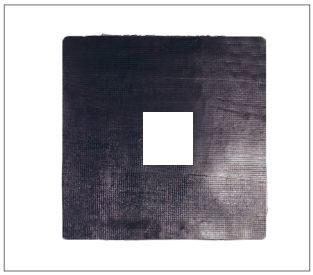
Heat up the material for the installation of the sleeve flange with the flame of a gas torch.

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.



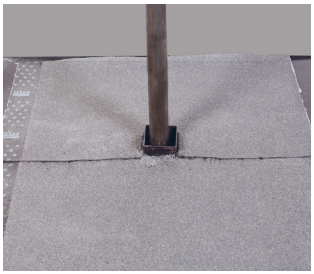
Fasten the metal sleeve to the decking with at least **4 fasteners**. Use EDS-S **4.8 mm** pointed self-tapping screws with a polyamide sleeve as fasteners.

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



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 hole according to the dimensions of the sleeve in the center of the square.

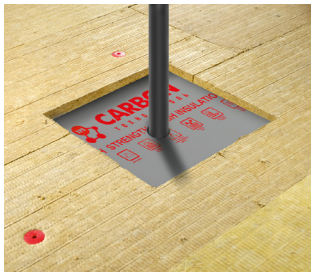
Install and torch on an additional reinforcement layer. Pay attention to the flowing-out of bitumen from under the edge of the material.



Torch on the top layer of the roofing material, see section 5.2.3.

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).



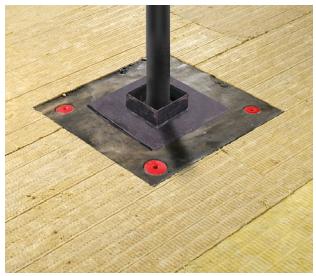
The XPS part should be **200 mm** more than the sleeve flange on each side. Before installation of the XPS part, cut a round hole **10 mm** more than the funnel pipe diameter.

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 TECHNONICOL BITUMEN PRIME COATING. Fasten the sheet to the load-bearing decking using **4 fasteners**.

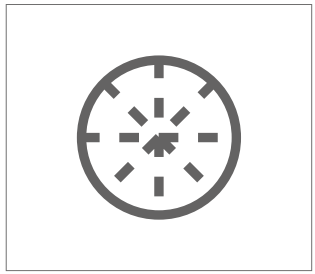
Torch on a reinforcement layer of the underlay membrane to the sheet.

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.

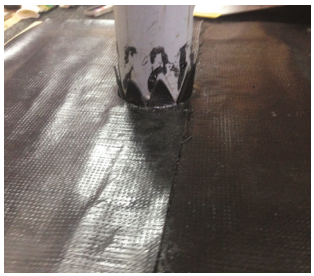
6.7.4. Installation of a pipe through the roofing membrane using roofing material



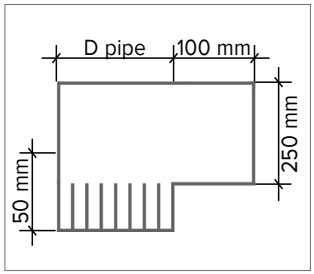
Prepare an additional reinforcement layer from underlay membrane in the shape of a square. The side of the square should be more than the pipe diameter by **300 mm**.

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.

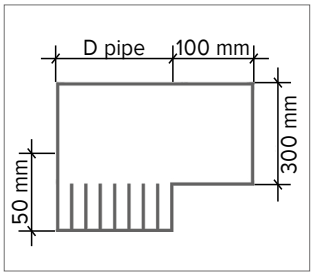


Lay the bottom layer onto the horizontal surface, see section 5.2.1. or 5.2.2.



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 the 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. 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

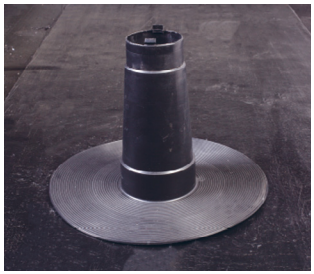
Roofing aerator (roof cowl) is a device intended for removing water vapors and moisture from the roof space.

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.

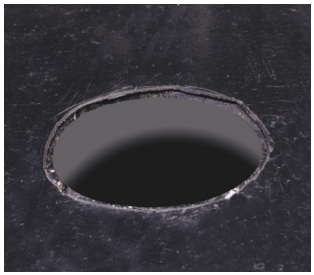
Roofing aerators are installed on the roof at the rate of **1 piece** (roofing aerator with diameter of **110 mm**) per **100 m²** of the roof. For optimal removal of vapor from under the roofing the distance between the roofing aerators should not exceed **12 m**. In the valley, roofing aerators are installed every **10-12 m**, in the ridges – **6-8 m**.

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

Method No.1



Place the bottom layer made of underlay membrane on the roof, see section 5.2.1.



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.

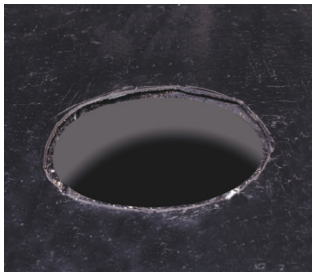
For a tight joint it is necessary to coat the flange of the roofing aerator with a bitumen binder, see section 5.1.3.

Torch on the cap sheet membrane, see section 5.2.3. 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.

Method No.2

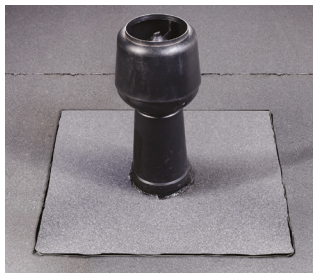
Start the installation of roofing aerators after installing the roof along the entire roof plane. Cut a round hole in the place of installation of the roofing aerator.



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 Method No.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.

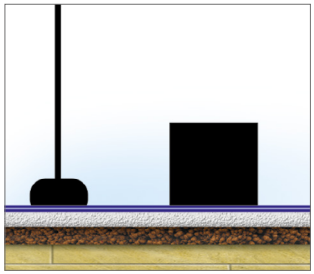
To install lightning protection, use the following items.

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

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

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

Lightning diverter holder
It 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**.

NOTE: 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

For 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.

For 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 heightwise, 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 4.1.2.

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

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.

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

8.2. Personal and collective protective equipment

Safety belt
It is required to protect workers from falling from a height.

Safety helmet
It is essential to protect the head.

Gloves
These are essential to protect your hands.

Safety shoes
These are essential to protect your feet.

Asbestos fire blanket
It serves to extinguish small fires.

Carbon dioxide extinguisher
It serves to extinguish small fires.

First aid kit
It serves to provide first aid.

A set of safety signs
It helps 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 short-term 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 the 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 aminal 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 or contact us via email info@technonicol.in.

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.

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

FOR NOTES

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