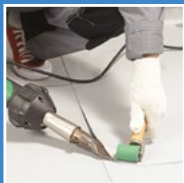




TECHNOLICOL



Manual

for installation of single-
ply polymer roofing and
waterproofing membranes

KNOWLEDGE. EXPERIENCE. CRAFTSMANSHIP.



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.

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1.

Introduction

1. Introduction

1.1. General information

This manual represents a brief guide to proper use on site. It contains basic principles and recommendations for the installation of TECHNONICOL single-ply polymeric weatherproofing membranes.

TECHNONICOL polymeric membranes, made under LOGICROOF brand, are state-of-the-art roofing and waterproofing materials. These membranes are made of high-quality plasticized PVC (PVC-P). This multi-component material contains the latest generation of plasticizers and other additives that make the roofing long-lasting, resistant to ultraviolet radiation, and highly safe from fires while maintaining plasticity even under sub-zero temperatures, in addition to the other benefits it offers.

LOGICROOF polymeric roofing is manufactured using the most advanced extrusion methods. The production takes place completely within a production plant located in the Russian Federation – the first Russian plant of its kind. This technology makes it possible to produce material with a homogeneous structure without internal defects, thus achieving high quality and long service life.

Certificates and test reports issued by both Russian and European independent organizations confirm the high quality of LOGICROOF polymeric membranes.



1.2. Materials applied

PRODUCT NAME	COMPOSITION	AREA OF APPLICATION
LOGICROOF V-RP	PVC membrane with polyester fabric reinforcement with UV protection. Installation in temperatures at or above -20 °C.	For mechanically attached systems. For the insulation of the main area.
LOGICROOF V-RP FB	PVC membrane with polyester fabric reinforcement and laminated geotextile fleece on the bottom. Resistant to UV radiation.	For fully adhered roofing systems.
LOGICROOF V-SR	PVC membrane without reinforcement; resistant to UV radiation.	For detailing such as waterproofing around penetrations and the reinforcement of inner and outer corners.
LOGICROOF V-GR	This PVC membrane has a high resistance against punctures; it contains fungicidal additives, and is resistant to UV radiation. Installation at or above -15 °C.	For inverted roof systems.

PRODUCT NAME	COMPOSITION	AREA OF APPLICATION
LOGICROOF V-GR FB	PVC membrane with fiberglass reinforcement and laminated geotextile fleece on the bottom. Resistant to UV radiation.	For fully adhered inverted roofing systems.
LOGICROOF V-RP ARCTIC	PVC membrane with increased flexibility. It is reinforced with polyester fabric and offers UV protection. LOGICROOF V-RP ARCTIC membrane can be installed at temperatures at or above -25 °C.	For mechanically attached systems in northern regions. For the insulation of the main roof area.
LOGICROOF NG	Special fire retardant material to be used with PVC membranes.	For making fire bands around skylights and smoke vents.

1.3. Transport and storage

LOGICROOF polymeric waterproofing membranes are delivered in an opaque foil that reliably protects the roll from dirt and ultraviolet radiation. Each roll is labelled with the date of manufacture and a batch number.



NOTE: Keep the rolls in a horizontal position in the factory packaging on pallets, stacked in up to two layers of pallets, at least 1 m away from a heat source. Protect the rolls from direct sunlight and moisture. It is not recommended to store pallets with waterproofing membrane on inclined surfaces (with an incline of more than 3 %).



In winter, store the PVC membrane at least **12 hours** prior to installation in a room with a temperature at least **+10 °C**. It can be stored, for instance, in a heated area on the roof.

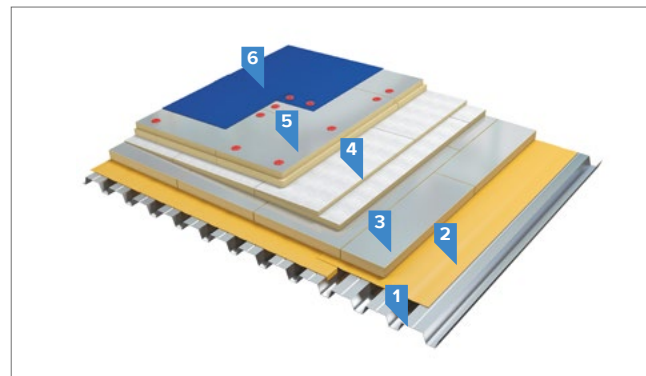
The simplest way to ensure protection against low temperatures can involve the creation of a closed space from unused thermal insulation packages. A radiator can be used as a heating source.

1.4. Description of roofing systems with PVC membranes

Roofing system with thermal insulation of PIR boards

Non-accessible roof areas on a corrugated steel sheet with roofing made from TECHNOMICOL polymeric waterproofing membrane with thermal insulation based on TECHNOMICOL PIR thermal insulation boards.

The system is designed for the roofs of public buildings (business and entertainment centres, sports complexes, swimming pools, etc.) and industrial buildings (warehouse and logistics centres, etc.) with an increased load (related to maintenance work, e.g. snow removal, or to the maintenance and inspection of the roof-mounted equipment).

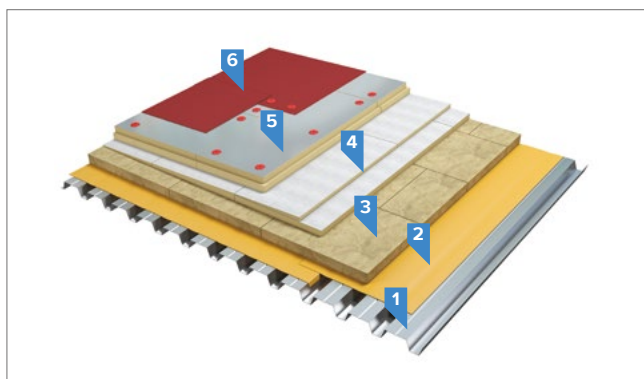


1. The substrate consists of corrugated steel sheet of a type according to the project (for the substrate installation requirements, see section 3.1);
2. TECHNOMICOL vapor barrier;
3. TECHNOMICOL PIR thermal insulation board;
4. TECHNOMICOL PIR SLOPE tapered insulation board;
5. TECHNOMICOL PIR thermal insulation board;
6. TECHNOMICOL reinforced polymeric waterproofing membrane mechanically attached with suitable fasteners.

Roofing system with combined thermal insulation of PIR and stone wool

Non-accessible roof areas on a corrugated steel sheet with roofing made from TECHNOMICOL polymeric waterproofing membrane with combined thermal insulation.

The system is designed for the roofs of public buildings (business and entertainment centres, sports complexes, swimming pools, etc.) and industrial buildings (warehouse and logistics centres, etc.) with increased demands for fire protection and heavy loads, related to roof maintenance work (e.g. snow removal), or to maintenance and inspection of the roof-mounted equipment.

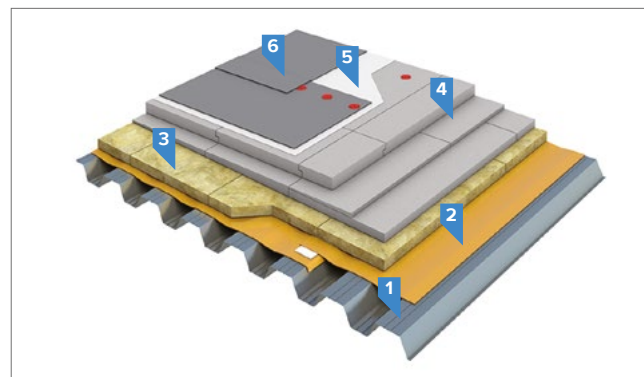


1. Substrate – corrugated steel sheet of a type according to the project (for the substrate preparation requirements, see section 3.1.);
2. TECHNOMICOL vapor barrier;
3. TECHNOROOF N30/V60 mineral thermal insulation board;
4. TECHNOMICOL PIR SLOPE tapered insulation board;
5. TECHNOMICOL PIR thermal insulation board;
6. TECHNOMICOL reinforced polymeric waterproofing membrane mechanically attached with suitable fasteners.

Roofing system with combined thermal insulation of XPS and stone wool

Non-accessible roof areas on a corrugated steel sheet with roofing made from TECHNOMICOL polymeric waterproofing membrane with combined thermal insulation.

The system is designed for the roofs of public and industrial buildings with an increased load (related to roof maintenance work – for instance, snow removal – or the maintenance and inspection of the roof-mounted equipment).

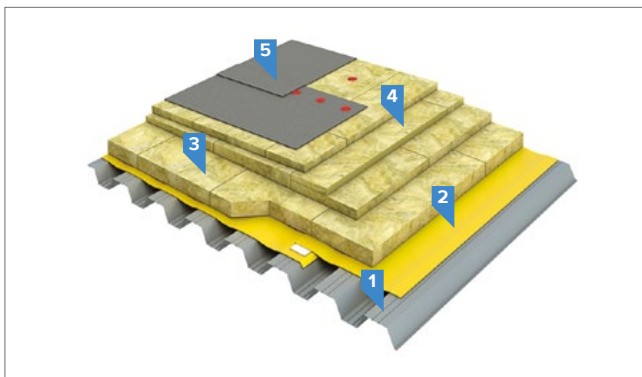


1. Substrate – corrugated steel sheet of a type according to the project (for the substrate preparation requirements, see section 3.1.);
2. TECHNOMICOL vapor barrier;
3. Bottom thermal insulation layer – thermal insulation made from TECHNOROOF N30 mineral wool – fire-resistant layer with a thickness of at least 60 mm (if necessary, an insulation material of variable thickness (tapered insulation) can be used to create a slope);
4. TECHNOMICOL CARBON PROF 300 XPS thermal insulation board;
5. Separation layer – fiber glass (weight of **100 g/m²**);
6. TECHNOMICOL reinforced polymeric waterproofing membrane mechanically attached with suitable fasteners.

Roofing system with thermal insulation of stone wool

Non-accessible flat roof areas on a corrugated steel sheet with roofing made from TECHNOMICOL polymeric waterproofing membrane with TECHNOMICOL mineral wool.

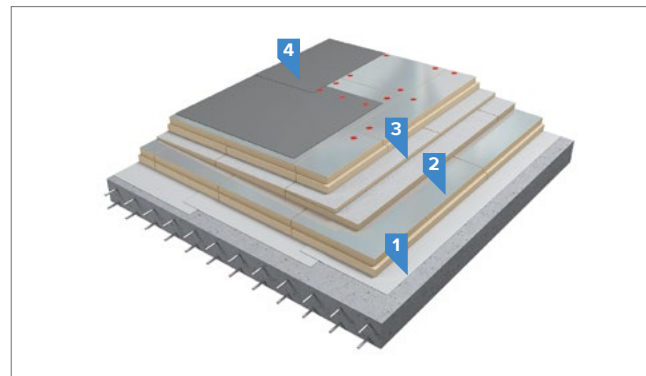
The system is designed for buildings with a large roof area and a minimal amount of technical equipment on the roof.



1. Substrate – corrugated steel sheet of a type according to the project (for the substrate preparation requirements, see section 3.1.);
2. TECHNOMICOL vapor barrier;
3. Bottom thermal insulation layer – thermal insulation based on mineral wool, e.g. TECHNOROOOF N30 (if necessary, an insulation material of variable thickness (tapered insulation) can be used to create a slope);
4. Top thermal insulation layer – TECHNOROOOF V60 mineral wool thermal insulation;
5. TECHNOMICOL reinforced polymeric waterproofing membrane mechanically attached with suitable fasteners.

Roof renovation system

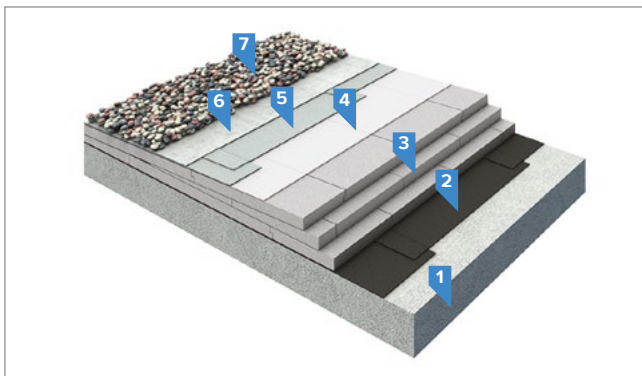
This roof system can be used both for new buildings as well as for refurbishment work and repairs to roofs on industrial or residential buildings and public buildings, where roof inspections are planned (related to maintenance work, e.g. snow removal, or to the maintenance and inspection of roof-mounted equipment).



1. Existing roof;
2. TECHNOMICOL PIR thermal insulation board;
3. TECHNOMICOL PIR SLOPE tapered insulation board;
4. TECHNOMICOL reinforced polymeric waterproofing membrane mechanically attached with suitable fasteners.

Ballasted roofing system

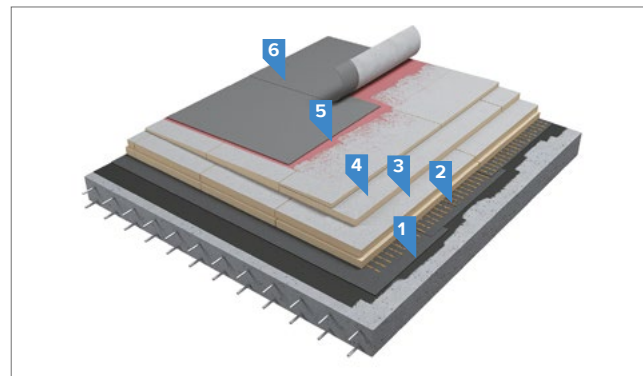
In this system, roofing layers are loaded with ballast or paving. The roofing is mechanically fixed only around the perimeter and large penetrations such as rooflights. This system is designed for load-bearing roofs of residential and public buildings of a classic design.



1. Substrate – reinforced concrete, non-reinforced or lightweight concrete;
2. Vapor barrier – bitumen layer impervious to vapor, e.g. VAPORSTOP CA 500 or ULTRAFLEX SA;
3. TECHNONICOL CARBON PROF 300 XPS thermal insulation board (if necessary, an insulation material of variable thickness (tapered insulation) can be used to create a slope);
4. Separation layer – fiber glass (at least **120 g/m²**) or geotextiles (at least **300 g/m²**);
5. LOGICROOF V-GR polymeric waterproofing membrane, glass fiber reinforced;
6. Separation layer – geotextiles (at least **300 g/m²**);
7. Loading layer (washed ballast, **20-40 mm**).

Fully adhered roofing system

The system of bonded roofing is designed for the refurbishment and repair of old roofs and also for buildings where the roofing cannot be mechanically anchored. The system is also suitable for roofs with heavy exposure to wind.



1. Old substrate;
2. LOGICROOF Spray – low-expansion PUR foam;
3. TECHNONICOL PIR thermal insulation boards with fiber glass;
4. TECHNONICOL PIR SLOPE tapered insulation board;
5. LOGICROOF spray contact adhesive;
6. LOGICROOF V-RP FB polymeric waterproofing membrane.

2.

Preparatory work

2. Preparatory work

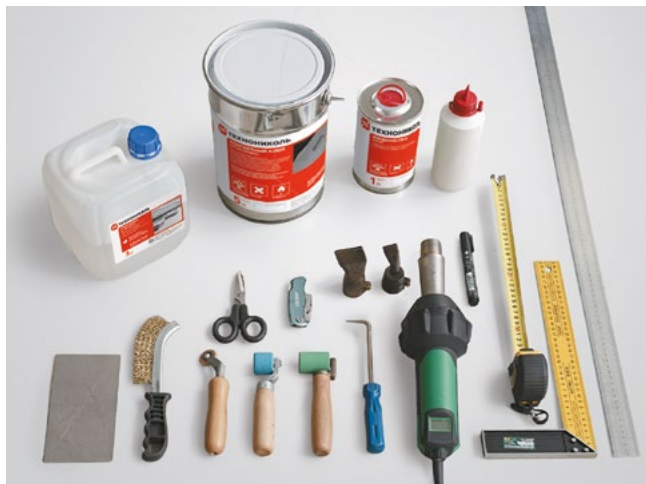
2.1. Work safety rules

The roof installation of polymeric waterproofing membrane must be carried out in accordance with the following rules:

- Before starting work with electrical equipment powered from **220 V** or **380 V**, check the voltage. If stable voltages cannot be achieved, we recommend using regulators or single and three-phase generators;
- If stable voltages cannot be achieved, it is recommended to cease welding until the voltage is stable again to avoid poor weld quality;
- Connect the welding equipment to an electrical outlet combined with a protective grounding device. The use of an extension cable with grounding is also permitted. When using such equipment, use an automatic switch with differential protection;
- Hot air gun nozzles (both for manual and automatic equipment) must be free of deposits, and air must pass freely through all nozzle holes. Do not work with deformed nozzles;
- Do not switch off the equipment while it is in heating mode, as it may cause the heating element to overheat and fail. Before switching off, set the temperature controller to the “0” position and wait until the air at the outlet of the nozzle cools down (with models Triac S, Triac PID, Herz Laron) or switch the device to cooling mode by holding the temperature control button followed by automatic shutdown (with Triac AT models, the corresponding indication appears on the display);
- When working with welding equipment, use gloves or other PPE for protection against potential burns;
- Do not use electrical equipment if the power cord is damaged or coiled. Before starting work, always extend the entire length of the power cable;
- After finishing work with the electrical equipment, disconnect all extension cables from the voltage sources and store them in a closed room or cover them with a waterproof material. After finishing work, store the electrical equipment in a closed room;
- In case of insufficient lighting, measures must be taken to ensure adequate lighting in the required places as well as other safety measures related to the safety of the work of the personnel;
- Do not install roofing membranes without calculating the wind load and considering wind zones and the number of fasteners for each individual area (fastener plan);
- The implementation of the roof without considering the wind loads can lead to the destruction of the roofing! For the requirements of dividing the roof into wind zones, see section 5.3.

2.2. Equipment and tools

Use the following equipment and tools to ensure the fast and high-quality installation of the roofing membrane:



- Hand held welding apparatus (hot air gun);
- Narrow nozzle with a width of **40 mm**;
- Narrow nozzle with a width of **20 mm**;
- Silicon and Teflon rollers (**40** and **28 mm**);
- Narrow brass roller (**8 mm**);
- Soft metal brush for cleaning the nozzles of the welding equipment;
- Seam tester for the quality control of welds;
- Knife with interchangeable blades for membrane cutting;
- Sheet metal shears;
- Electric screwdriver;
- Roofing knife;
- Tape measure;
- Gloves (cotton or leather);
- Cotton cloths;
- TECHNOMICOL cleaner for PVC membranes;
- TECHNOMICOL PVC liquid coating.



Silicone roller – main pressure roller for manual welds;

Teflon roller – harder than a silicone roller (can be used to ensure the better clamping of uncoated membranes);

Narrow brass roller – for welding joints at the points of transition between horizontal and vertical welds as well as welding joints inaccessible to a wide roller.



TECHNONICOL cleaning agent – special agent for PVC membrane cleaning. This is used to remove dirt and grease from the surface of the membrane around welds and to activate the old surface when performing repairs before applying liquid PVC.

Pressure-activated TECHNOMICOL glue – serves to bond the PVC membrane to masonry, concrete, wood, and metal surfaces. It cannot be used for the installation of fully-adhered roofing systems.

TECHNONICOL PVC liquid coating – serves for the additional sealing of welds; eliminates the capillary suction of moisture into the reinforcement layer.



Prefabricated pipe flashings for sealing around penetrations.



PVC fittings for the reinforcement of internal and external corners – serve to ensure the fast and high-quality reinforcement of edges and corners on the roof.



TECHNICOL polyurethane sealant. Termination bars made from aluminium and magnesium alloy – used to fasten the edges of the waterproofing membrane to the upstand.



Fastening bars – made from aluminium and magnesium alloy are used to fix waterproofing membrane when changing angles between horizontal and vertical welds and when finishing at the top of the upstand. This can be used to replace the termination and fixing bars. It is highly durable in bending and torsion, as well as resistant to corrosion.



Double-sided adhesive tape – serves to seal the overlapping seams of the vapor barrier layer. Butyl-rubber tape – serves to connect the vapor barrier layer at temperatures below freezing.

2.3. Hot air equipment for welding waterproofing membrane

For welding polymeric roofing, use special hand held, semi-automatic, and automatic hot air welding equipment.

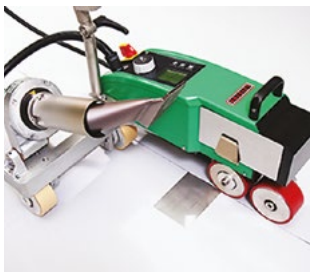


The recommended models of manual welding equipment include the following: Leister Triac S or PID, Triac AT, HerzRion, HerzEron, Weldy by Leister supplied with a set of nozzles and pressure rollers.

A narrow nozzle with a width of **40 mm** serves for normal welding on horizontal and vertical surfaces. A narrow nozzle with a width of **20 mm** serves for welding in difficult-to-access places during the creation of joints.



The recommended model for semi-automatic welding is Leister Triac Drive. The semi-automatic equipment is used to weld overlaps on horizontal, vertical, and inclined surfaces, as well as on surfaces with a slope exceeding **30°**.



For welding typical overlaps, the following automatic welding devices are recommended:

Leister Varimat (**230 V – 4600 W; 380 V – 5700 W**),
VARIANT T1 (**230 V**) or Herz
Laron (**230 V – 4600 W; 438 V – 5700 W**) with a weld
width of **40 mm**.

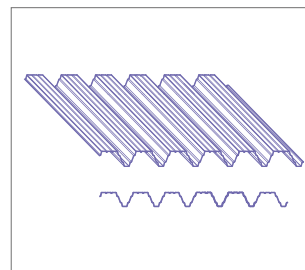
3.

Installation of roof components

3. Installation of roof components

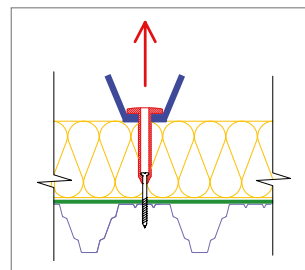
3.1. Preparation and laying of the load-bearing roofing substrate

The durability and resistance of the entire roof depends on the quality of the load-bearing roofing layer. Pay special attention to its laying and ensure that it meets the requirements of the design documentation.



The thickness of the corrugated steel sheet should be at least **0.7 mm**. When installing the corrugated steel sheet, its wide wave should be placed up.

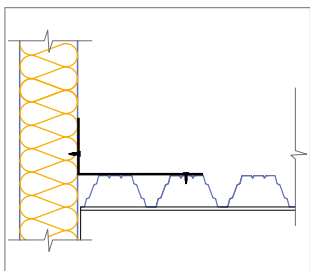
NOTE: Check the compliance of the corrugated steel sheet anchoring to the load-bearing structure along the entire roof area with the project. Longitudinal connections of the corrugated steel sheet must be riveted or joined with self-tapping screws.



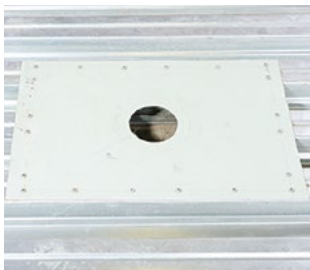
The load-bearing substrate used for the roofing layers must be sufficiently resistant to stress. A simple procedure for checking the load-bearing capacity of the roofing substrate (decking) is as follows: mechanically fasten the membrane (V-RP, **50 mm** wide) and expose it to the vertically-acting load by pulling. If the load-bearing capacity of the roof is sufficient, the membrane will crack before the fastener gets yanked from the roofing substrate.



Around the perimeter of the corrugated steel, in areas where the steel sheet is adjacent to the vertical structures, it is recommended to consider the necessity of mounting L-shaped reinforcing profiles from galvanized steel with a minimum thickness of **0.7 mm**.



The dimensions of the L-shaped profile should be determined on site based on the type of the corrugated steel sheet used. The main requirements are as follows: the horizontal section of the L-shaped profile must extend over the horizontal section of the other corrugated steel sheet (see figure).



Penetrations/holes in the corrugated steel for penetrations and roof outlets should be reinforced with plates of galvanized steel sheets with a thickness of at least **0.7 mm**.



If necessary, fill the corrugated steel sheet waves with a non-flammable material in the length of **250 mm**.

It is not recommended to fill the corrugated steel sheet waves with loose thermal insulation material.



Prior to installation of the vapor barrier, it is necessary to fill all joints between prefabricated reinforced concrete structures and remove construction waste, water, snow or ice from the trapezoidal profile surface and troughs.



To remove snow from the pits of the corrugated steel sheet, a special shovel corresponding to the corrugated steel sheet profile can be used.

3.2. General recommendations for carrying out roofing work

To prevent the roofing from damage by walking, protect it by covering it, e.g. with empty pallets.

Unsecured holes in the roof must be covered with an operational load-bearing material or fenced in order to prevent people from falling.



Place loaded pallets evenly over the entire roof area so as not to deform the trapezoidal profile.



When moving equipment on the roof, it is also necessary to lay a footway from prefabricated LOGICROOF WalkWay Puzzle parts or plywood over the separation layer – geotextile with an weight of at least **300 g/m²**.

3.3. Installation of the vapor barrier layer

The first phase of installing the roofing membranes includes the installation of the vapor barrier layer. It fulfils an important function of protecting the thermal insulation against the penetration of condensation.

A special polyethylene construction film is mostly used in combination with roof decking of the corrugated steel. However, vapor protection can be achieved by the use of bitumen or plastic membranes.

When installing the layer, pay attention to its integrity and follow the installation procedure.



When installing a vapor barrier along the corrugated steel sheet, the overlaps should be connected to the top wave.

To ensure the bonding of the vapor barrier overlaps at temperatures above **+5 °C**, use double-sided adhesive tape.



The longitudinal and transverse overlaps of the vapor barrier must be at least **100 mm**.

In the event of damage, it is necessary to seal the damaged part with double-sided adhesive tape.



To seal the seams of the vapor barrier at temperatures below **+5 °C**, use a butyl-rubber tape.



When installing the vapor barrier perpendicularly to the waves of the corrugated steel sheet, temporarily place a piece of plywood or OSB board under the surface being sealed to ensure the quality of the joint.



Where the roofing is close to an upstand, roof skylight, shafts, and other structures, the vapor barrier layer must be brought to at least the height of the thermal insulation layer.



For the correct functioning of the vapor barrier, glue the vapor barrier layer to the vertical structure when laying thermal insulation and additional sealing layers.

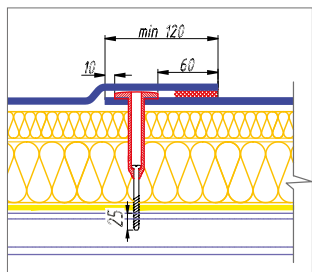
3.4. Mechanical fasteners

Mechanical fasteners are an important component of the roofing. The mechanical resistance and stability of the roofing depend on the correct choice of fasteners. Always use only suitable fasteners to ensure the reliable fixing of the roof components.

NOTE: When using compressible thermal insulation as a substrate for the membrane, use telescopic tube washers and fasteners to secure the insulation and membrane.



Only use approved fasteners to secure the membrane and thermal insulation boards to the corrugated steel sheet.



The length of the screw should be determined so that its tip protrudes at least **25 mm** under the steel sheet.

Longitudinal overlaps must be at least **120 mm** as long as the diameter of the telescopic anchor plate is no more than **50 mm**.

NOTE: The length of the telescopic element must be at least 20 mm shorter than the thickness of the thermal insulation layer.



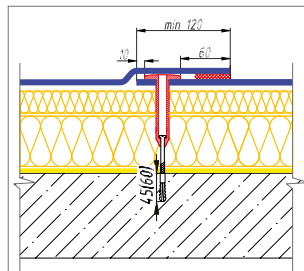
A self-drilling screw, **Ø 4.8 mm**, for anchoring into the corrugated steel sheet with a thickness of more than **0.9 mm**.



A regular self-tapping screw, **Ø 4.8 mm**, is used for anchoring into the corrugated steel sheet with a thickness of less than **0.9 mm**.



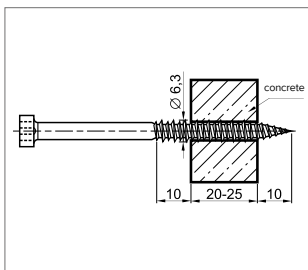
Use an approved fastener to fix the membrane to a concrete substrate.



Fix a self-tapping screw with a polyamide plug into a pre-drilled hole.



For fixing to heavy concrete we recommend using a suitable self-tapping screw. The screw has a special Torx head that ensures high drivability when fixing.



NOTE: When laying the membrane directly on the substrate without an insulating layer, secure it using a flat metal pressure plate with a corresponding self-tapping screw.



Use a circular or oval-shaped washer with dimensions of **40×80 mm, Ø 50 mm**.



Use a self-tapping screw, **Ø 5.5 mm**, without a smooth section, to fasten the membrane and pressure elements (laths) to the OSB boards, cement-bonded or asbestos-cement slabs.

3.5. Installation of thermal insulation

Generally, two layers of insulating boards with displaced overlaps are used to ensure the thermal insulation of the roofing system.

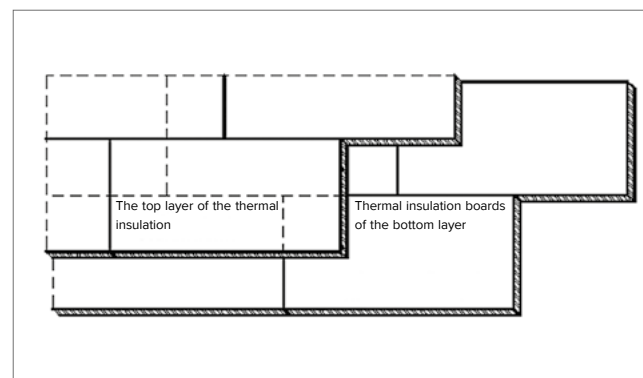


Insulation boards are to be laid on the vapor barrier layer. The surface of the vapor barrier must be dry.

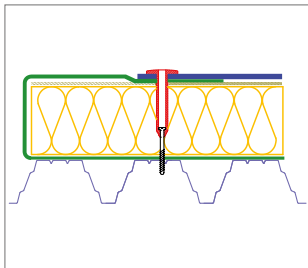


If a corrugated steel is used as the load-bearing substrate of the roofing, the longer side of the insulation board must be oriented perpendicularly to the waves.

The layout diagram of thermal insulation material in two layers.



NOTE: The roof fasteners must not be overtightened!



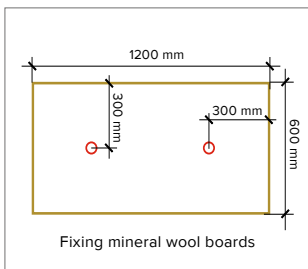
To protect the installed material from the rain, wrap the thermal insulation at the end of each working day with a vapor barrier layer and place its ends under the roofing, then secure the layers mechanically. During shorter work breaks, you can similarly overlay this layer and load it.

At the beginning of the next working day, release the vapor barrier layer from the anchors and continue working; leave the damaged part of the vapor barrier layer for overlapping.



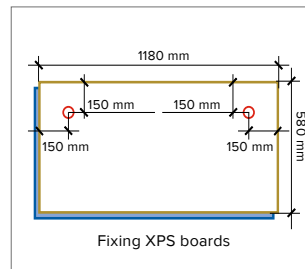
The thermal insulation material should be fixed independently from the membrane.

NOTE: When installing the thermal insulation material in several layers, it is not necessary to individually fix each layer! The insulation material can be fixed in a one-off manner.

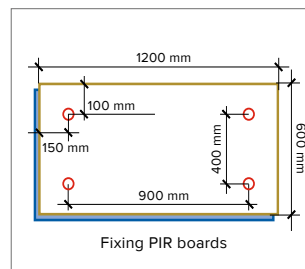


Use a minimum of **2** fasteners to fix a stone wool board of **1200×600 mm**.

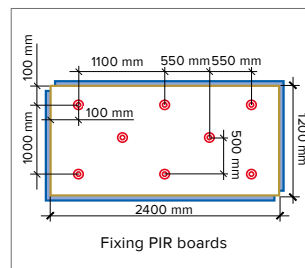
The fastening element must not be placed in the joint between the boards because such fixing is not reliable.



Use a minimum of **2** fasteners placed on the side, where L-shaped edge of the fixed XPS board will press the previous XPS board.



Use a minimum of **4** fasteners to fix PIR insulation board with dimensions **1200×600 mm**.



Use a minimum of **8** fasteners to fix PIR insulation board with dimensions **2400×1200 mm**.

3.6. Installation of the separation layer

When installing the PVC membrane on a combustible porous substrate (such as XPS, EPS, etc.), it is necessary to create a separation layer of fiberglass with a minimum weight of **100 g/m²**. In case of installation on a non-combustible porous substrate (e.g. foam glass), one can make the separation layer from geotextile with a weight of at least **150 g/m²**.



The material of the separation layer must be laid with overlaps of at least **100 mm**.

NOTE: When installing the membrane on bitumen materials, it is necessary to create the separation layer of geotextiles with a minimum weight of 300 g/m².

4. Welding

4. Welding

4.1. Hand welding

Hand welding should be carried out with a special hot air gun. The use of a conventional hot air gun is forbidden as it generates unstable air temperatures at the outlet of the nozzle.

NOTE: Before welding, refer to the welding equipment manufacturer's instructions.



Before starting welding, check the following parts of the equipment:

- The nozzle opening must be clean and unobstructed, i.e. free of deposits;
- The air intake openings must be clean and unobstructed for the passage of air. If necessary, clean the intake holes with a soft brush.

The operating air temperatures can be set on the temperature controller in the range of **50 to 600 °C**.

For welding the PVC membrane set the temperature between **450 °C** and **550 °C** according to the weather and the speed of welding. After switching the gun on, wait **7-10 minutes** before the air and nozzles heat up (longer in cold weather).



To remove dirt from the surface of the membrane in the welding area or to activate the old membrane during repair, clean the surface using a **TECHNONICOL** cleaner and a cotton cloth.

NOTE: Before starting welding, remove the remaining cleaner from the surface of the membrane with a cotton cloth.

4.1.1. Spot welding the membrane

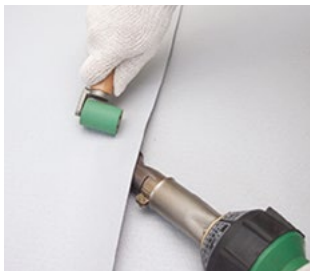


Lay the membrane with a 60 mm overlap and make stitches to hold the membrane at several places. To do so, put the heated nozzle to the overlap at a distance of more than **40 mm**, while simultaneously pressing the membrane with your finger at the nozzle outlet.

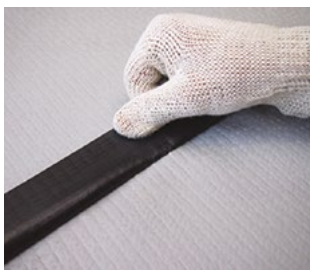


Proper stitching must be easily torn off without leaving obvious traces on the membrane.

4.1.2. Back welding or preliminary welding

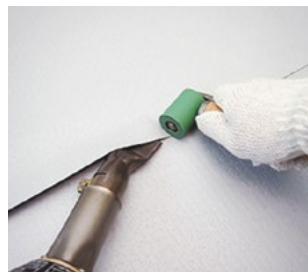


Back welding or preliminary welding eliminates air leakage from the welding zone; this is done by quickly inserting the nozzle and moving it along the seam with one stroke, while simultaneously pressing the roller towards the edge of the nozzle.

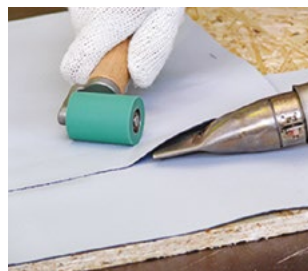


A properly done back or preliminary weld must keep the hot air in the welding zone.

4.1.3. Main welding

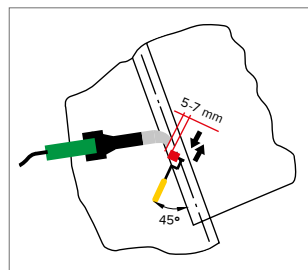


To perform the final weld, insert the hot air gun to the remaining overlap at an angle of approximately **45°**. At the same time, the tip of the nozzle must protrude **1-2 mm** from the overlap.



To avoid melting the bottom layer, lift the end of the nozzle by **1-2 mm**.

Run the silicone roller along the edge of the nozzle at a distance of **5-7 mm**.



Move the gun along the overlap and simultaneously move the silicone roller over the joint; the roller must “jump” over the edge of the membrane. When moving the roller toward the weld (to the outer edge of the membrane), press it harder.

NOTE: Apply this three-step manual welding to all welds and roof connections.



Apply TECHNOCOL PVC liquid coating to all “tear” welds, i.e. when the membrane is torn and not cut and the reinforcing grid remains exposed (the top membrane is shown in green in the example). Liquid PVC is not meant for repairing poor quality welds and may only be used after successful welding.



The nozzle must be properly attached to the welding gun.

NOTE: The nozzle attachment may be replaced only after complete cooling.



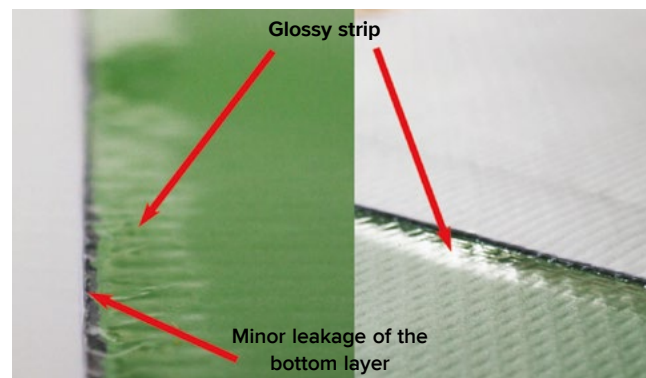
If dirt has accumulated on the nozzle, remove it with a copper brush.

4.2. Criteria for making high-quality welds

Main indicators of a high-quality weld are the cohesive burst of the weld (see section 4.3.) and the width of the main weld of at least **30 mm**.

Visual indicators:

- A glossy strip along the outer edge of the weld, about **5 mm** wide;
- Minor leakage of the material from the bottom layer along the weld;
- No creases on the surface of the overlap;
- No overheating of the material (i.e. changes in the membrane colour, occurrence of deposits, scales, carbon traces).



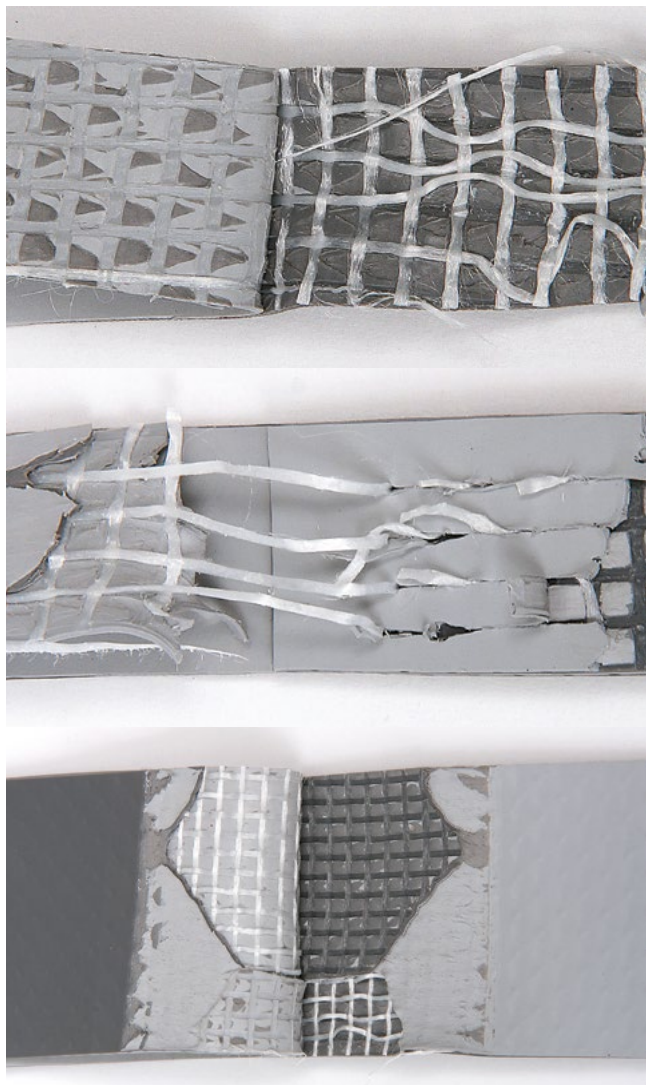
Major possible errors in hand-held welding:

- Absence of an “air pocket” in the welds overlap;
- Incorrect welding parameters (air temperature, gun speed, and roller pressure) which may ignite the material or cause insufficient melting;
- Incorrect membrane surface preparation in the welding overlap (i.e. impurities, dirt, etc.);
- Hot air gun lifted too high (in this case, only **2-3 mm** of the membrane edges are welded);
- Early stopping of the roller away from the edge, i.e. the roller does not reach the outer edge of the overlap (this may lead to the edge being not welded);
- The roller movement is not guided along the edge of the nozzle (at an angle) or along the overlap.

4.3. Cohesive burst of the weld

The cohesive burst of the weld is a burst when the reinforcement grid of one of the welded parts is exposed or one of the layers over the entire width of the weld has peeled off.

Examples of good quality cohesive bursts of welds:



4.4. Quality control of welds

High-quality welds are the key to durability for roofs using polymeric waterproofing membrane. Check the quality only after the welded joints have completely cooled.

NOTE: At the end of each shift, we recommend to carry out a check of the welds using a seam tester and control cut-outs (control cut-outs are made at least 3 times during a work shift).



Check the quality of a weld by moving the tester along the outer edge using mild pressure. The tip of the tester must not penetrate the weld.



The weld strength may be determined by a tensile test of a **50 mm** wide cut-out sample; this test can be performed on a Leister Examo portable tensile device or on a stationary device.



To carry out quality control without the above-mentioned devices, a strip of the welded membrane with a width of **20-30 mm** can be used for manual peel test. Tear the strip of the welded membrane with your hands.



When tearing a high-quality weld, the reinforcement of the material should become exposed. Measure the width of welded joint; it must not be less than **30 mm**. Install the patch of the membrane on the place of sampling. The size of the patch should be at least **5 cm** bigger than the hole in all directions.

4.5. Automatic welding

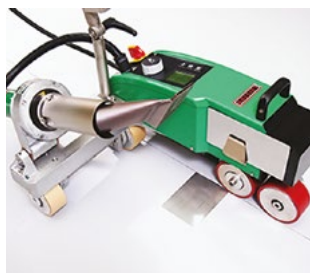
To achieve a high-quality weld on the main roof area, use special automatic hot air welding equipment.

NOTE: Before welding, refer to the manufacturer's instructions for automatic welding.

NOTE: The rollers of the automatic welding equipment must be complete and undamaged.

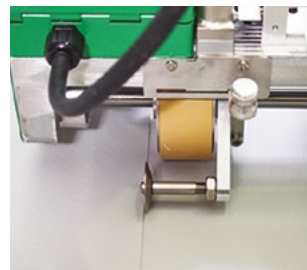


Before the start of welding, set the required parameters: air temperature and speed of the welding machine (see section 4.6. for details on selecting these parameters).



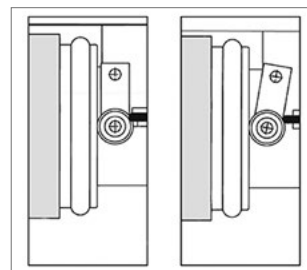
To achieve a smooth edge for easier additional manual welding, insert a metal plate with machined edges with a thickness of **0.3-0.5 mm**, made of galvanized or stainless steel, at the beginning of the weld.

Place the welding equipment so that its wheel is halfway along the beginning of the metal plate.



The metal guiding roller must be positioned along the edge of the overlap in the lowered position.

It is necessary to comply with the above requirement to maintain the correct position of the device during welding.

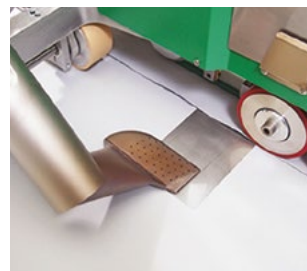


If it is necessary to weld across the slope of the roof, set the screw to compensate for the angle of incline.

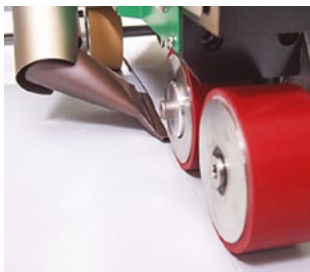


Before the start of welding, pull the edge of the top membrane to make it easier to insert the welding nozzle into the overlap.

NOTE: Do not touch the hot parts of the device.



Insert the nozzle into the overlap area. The movement of the device starts automatically.



Make sure that the nozzle tip extends beyond the outer edge of the weld by **2-3 mm**.



Install the second metal plate at the end of the weld. Once the pressure wheel hits the plate, remove the nozzle from the overlap area; the machine stops automatically. Remove all dirt/deposits from the nozzle with a soft metal brush.

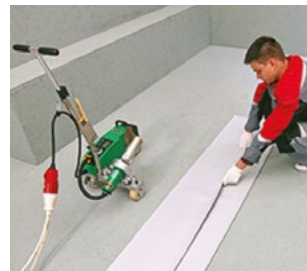


Continue to weld the membrane with the automatic welding equipment.

The nozzle must be cleaned every time it is removed from the weld, while the device is still at its operating temperature.

4.6. Choosing the parameters for the automatic welding equipment

Welding parameters, such as air temperature and speed, are not fixed; they depend on a number of factors: ambient temperature, wind strength, etc. Incorrectly setting the welding parameters makes it impossible to obtain durable, high-quality welds. Suitable parameters can be determined by performing a test weld.



To determine or refine welding parameters, a test weld is required at the beginning of each working day or in the case of a significant change in the weather.

To do this, use two clean membrane strips of a sufficient length and width.



Weld the membrane strips and change the speed of the welding machine in length sections of at least **50 cm**. For easier work, you can mark the membrane strips in advance with a marker.



When the weld cools down completely (cooling can take up to **20 minutes** at high ambient temperatures), cut a test strip of the welded membrane from the centre of each section with a width of **20-30 mm** and tear the weld.



The main indicators of quality welding are given in section 4.2.

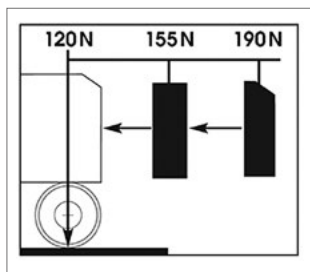


In this example, the membrane becomes detached (i.e. the seam separates without the use of force); cohesive tearing is not observed. To achieve a high weld quality, either reduce the welding speed or increase the welding temperature.



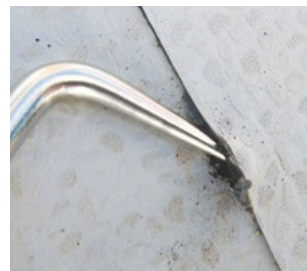
In this example, indicators of excess welding are as follows: visible traces of ignition; change in the membrane colour; melting of the surface of the bottom layer of the membrane.

To achieve quality welding, increase the speed or reduce the welding temperature.



In addition to speed and temperature, another parameter can be adjusted – weld pressure; this parameter depends on the weights installed on the welding equipment.

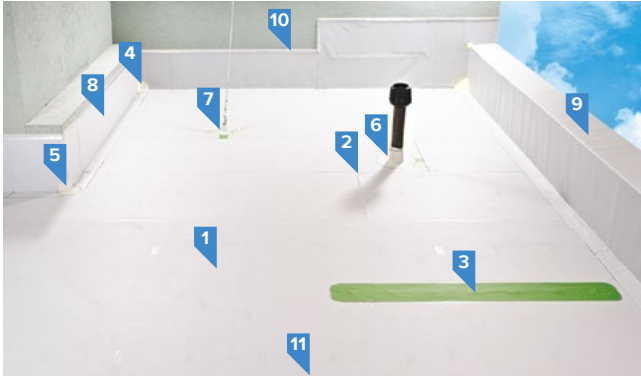
General recommendation: install two weights if welding takes place on the mineral wool thermal insulation. When welding on a rigid surface (i.e. XPS, PIR, concrete, etc.), it is permissible to use a single weight or to weld without weights.



Sometimes, sediments from the contaminated nozzle penetrate into the welded area. There are 2 ways to eliminate this problem:

- Clean the weld from impurities, perform additional welding of the defective area with a manual hot air gun and treat the weld with liquid PVC;
- Or weld a membrane patch over the defective area after pre-cleaning the operational surfaces with a PVC cleaner. To improve the durability, we recommend treating the welds with TECHNOMICOL PVC liquid coating.

4.7. Various details



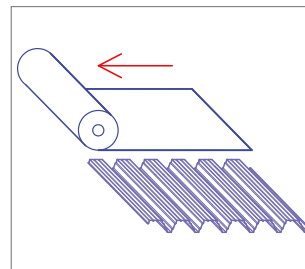
1. Installation of the roofing membrane in the main area – **page 59**;
2. Making T-joints – **page 66**;
3. Centre fixing – **page 69**;
4. Execution of internal corner – **page 77**;
5. Execution of external corner – **page 88**;
6. Detailing around penetrations – **page 97**;
7. Detailing around penetrations of a small diameter – **page 105**;
8. Detailing an upstand using the “hidden pocket” – **page 115**;
9. Detailing a low upstand – **page 118**;
10. Detailing a high upstand with edge bar connection – **page 119**;
11. Detailing to the fascia – **page 122**.

5.

Installation of the roofing membrane in the main area

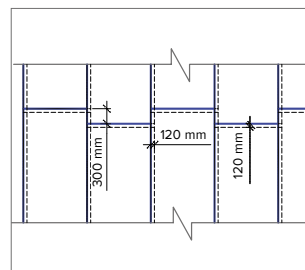
5. Installation of the roofing membrane in the main area

5.1. Basic principles of roofing membrane installation



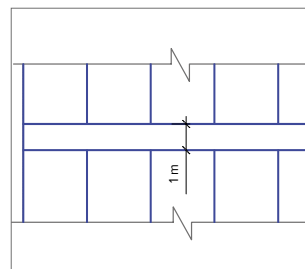
It is always necessary to place the membrane perpendicularly to the waves of the corrugated steel sheet.

When installing the rolls, start from the valley or from the anti-slope along the upstand.

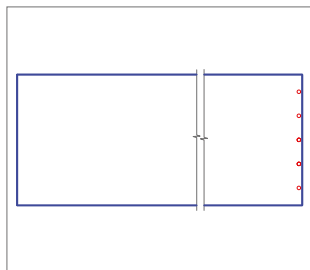


All longitudinal and transverse overlaps of the membrane must be at least **120 mm**.

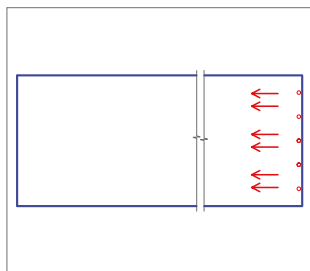
Shift the ends of each strip so that its distance from the adjacent strip is at least **300 mm** (minimum one wave of corrugated steel sheet).



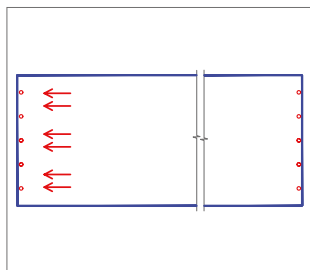
If the rolls of membrane cannot be laid in this way, place a separate strip across the main surface. The width of this strip must be at least **1 m**.



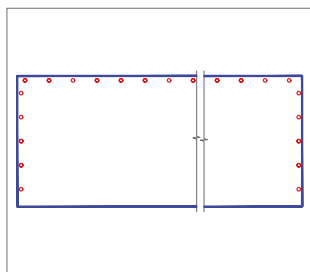
Start the membrane installation with unwinding the roll on the substrate. First, secure one end of the membrane.



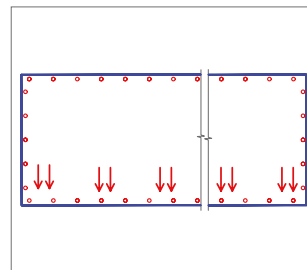
Stretch the membrane along its entire length to avoid creases.



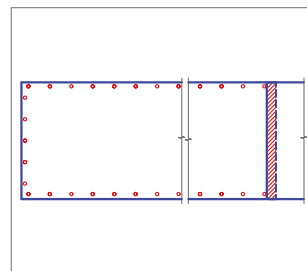
To prevent the membrane from winding back, step on it and secure the other end of the membrane.



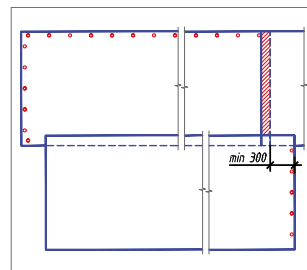
Then install the fasteners on the longitudinal side of the membrane.



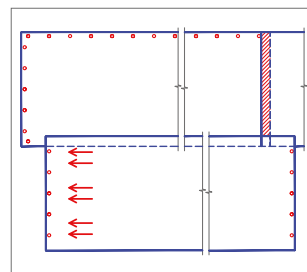
Stretch the membrane across the area and fasten it on the second longitudinal side.



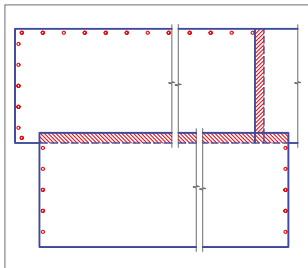
Weld the next roll to the sheet end of the first roll; the width of the overlap must be at least **120 mm**. Then stretch the second roll and fasten its opposite side. Do the same for longitudinal sides of the second roll following the principles mentioned above. Finish the whole first row similarly.



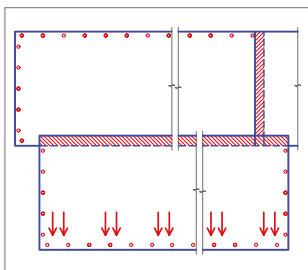
In order to form the next row, unwind another roll of the membrane and shift it by no less than **300 mm** (minimum one wave of corrugated steel sheet). The longitudinal overlap width must be at least **120 mm**. Secure one end of the membrane.



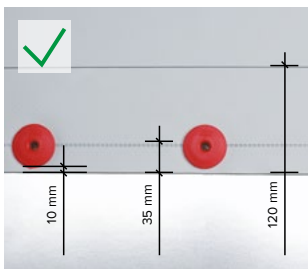
Stretch the membrane along the whole length, step on it and fasten the other end of the roll.



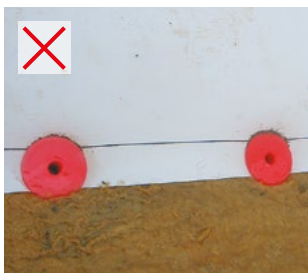
Weld the longitudinal overlap with the automatic welding equipment.



Wait for the weld to cool down. Then stretch the membrane away from the welded edge and fix the opposite edge with fasteners. Continue the membrane installation for the remaining roof area by repeating the same procedure.



Make sure that the fasteners are positioned on the fixing line marked on the longitudinal edge of each LOGICROOF roll.



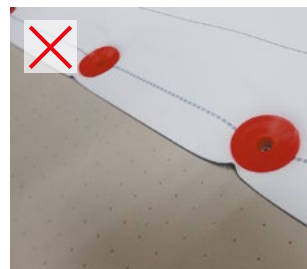
Improper positioning of fasteners.



The positioning of fasteners near the very edge of the membrane may cause it to rupture due to wind load.



Beware of over-fixing as this will ruck the membrane.



Over-fixed fasteners.

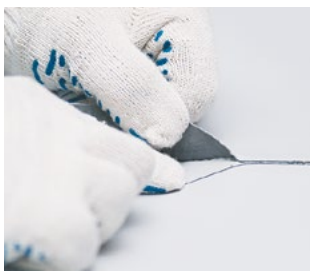
NOTE: All fasteners should be fully covered with the following rolls of the membrane or patches. The uncovered fasteners on the top surface of the roofing will compromise the waterproofing.



Use the automatic welding equipment when possible.



After automatic welding, remove the metal plates from the beginning and the end of the seam and weld the remaining part of the overlap manually.



After an interruption of hand-held or automatic welding, pull the seam slightly before starting new welding, as it might remain not properly welded for up to **5 mm**.



In places where the horizontal surface is connected to the vertical roof elements, it is preferable to start welding using a narrow brass roller.



Make sure that the vertical part of the overlap between the adjacent strips is welded properly.



The reliable installation of the waterproofing membrane can only be ensured as long as one avoids creating folds and waves during laying.



If necessary, use roofing pliers to ensure a tighter membrane tension between the fastening points.

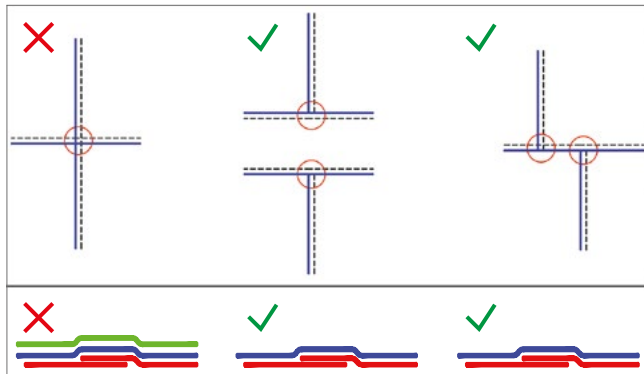
NOTE: The tension of the membrane depends on the temperature. The membrane should not be tensioned too much if the ambient temperature exceeds +30 °C, as this could lead to excessive membrane tension at subzero temperatures.



If you install the membrane at subzero temperatures, small undulations may form on its surface. These may be caused by the properties of the material (due to the differences in the shrinkage of the PVC and its reinforcing grid) and usually disappear after the membrane is stretched in the summer.

5.2. Making T-joints

Avoid joints in the shape of X, containing 4 membrane layers. Make joints in the shape of T and linear welds.



In the case of an X-joint, a membrane patch needs to be welded over.

NOTE: When installing the polymeric waterproofing membrane, it is necessary to round all of its outer corners.



Weld the rounded corner of the middle membrane to the lower membrane in the place of longitudinal overlap.

Then weld the transverse overlap between the middle and the top membrane with the use of automatic equipment leaving the corner unwelded.



Use scissors to round the corner of the top membrane. To make work easier, mark the beginning of the weld overlap.



Taper the edge of the middle membrane into the length of welded overlap (at least **30 mm**) with a blade or special tool. Tapering can be done using a hot air gun.



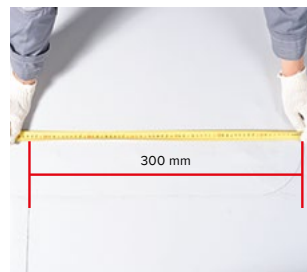
Then finally weld the corner between the middle and the top membrane.

Continue the installation of the top membrane as usual.



Check the weld quality with a tester.

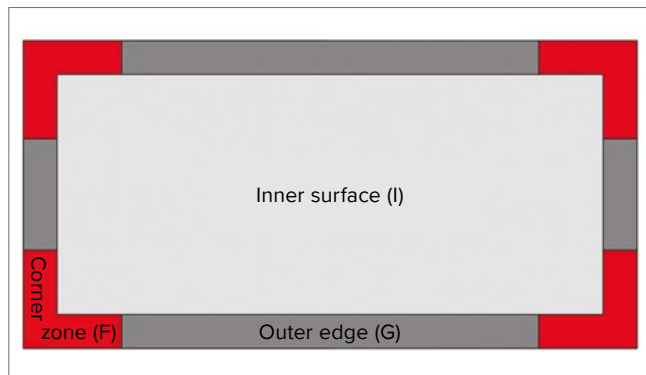
We recommend treating the manually welded areas with **TECHNICOL PVC** liquid coating.



Shift the ends of each roll for at least **300 mm** (minimum one wave of corrugated steel sheet) in order to avoid the weakening of the steel sheet due to the fastening of the membrane on one wave.

5.3. Areas loaded by wind

Wind load is a significant factor affecting the durability of the roof. The wind load calculation in accordance with EN1991:1.4 and the relevant National Annexe must be carried out prior to commencement of the roofing project.

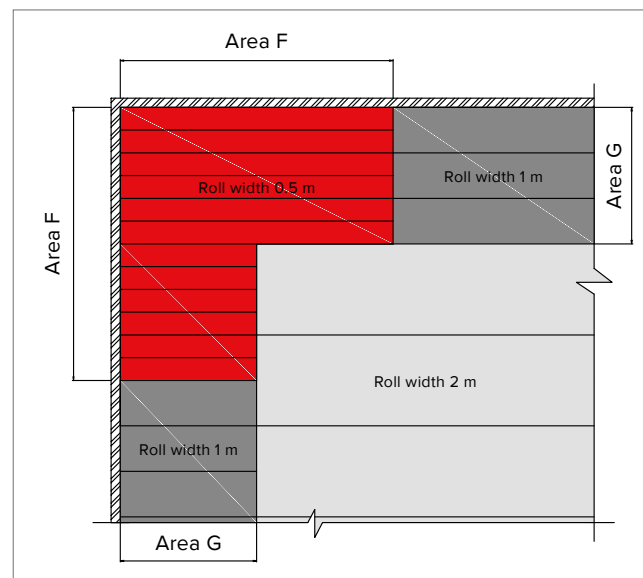


- Generally, each flat roof is divided into **3 zones** according to wind load: corner zone (F), outer edge (G) and the inner surface (I);
- Zones with the height difference of more than **3 m** are considered as the outer edge zones (G);
- The most significant effect of wind load is evident in the corner (F) and outer edge (G) zones, so an increased amount of fasteners must be used there;
- The dimensions of the wind zones and the amount of required fasteners must be stated by the fastener plan;
- The minimum distance between fasteners in a row is **180 mm**;
- The pitch of the fasteners is also limited by the wave pitch of the corrugated steel sheet. Accordingly, it may limit the number of fasteners applicable to one conventional meter of the membrane.

NOTE: The PVC membrane should be fixed to every wave of the corrugated steel sheet on the whole area of the roofing.

If a **2 m** wide membrane is used, **1 m²** can be fastened with **2.77** anchors at a maximum. If the fastener plan requires a larger amount of anchors (usually in the corner and outer edge zones), it is necessary to use membrane with a width of **1 m** or **0.5 m** (see the scheme below), or the two-meter membrane should be additionally secured with another row of fasteners over which the cover strips with a width of **20 cm** are welded (see section 5.4.).

An example of membrane layout in the corner and outer edge zones using the rolls of a reduced width:



5.4. Centre fixing

An increase in the number of fasteners in the corner and outer edge zones can be achieved by inserting rows of fasteners to the centre of the standard membrane with a width of **2.1 m**.



Fix the fasteners through the centre of the membrane. Weld the reinforcing element from a round piece of the membrane under the last anchor (example highlighted in green).



Cut a **200 mm** wide strip from the main roofing membrane (example highlighted in green).

Stitch the strip to ensure its position, so that an even alignment is achieved and it is prevented from moving.



Weld the membrane to the substrate using the automatic welding equipment. Weld the strip end manually. Test the welding quality with a tester.

We recommended treating the manually welded areas with **TECHNONICOL** PVC liquid coating.



5.5. Detailing valleys

To eliminate the slackening of the membrane in a valley and around the sloped roof areas near the roof outlets, it is necessary to create a hidden pocket or use a pre-mounted membrane strip to which the main layer of the membrane is further welded.



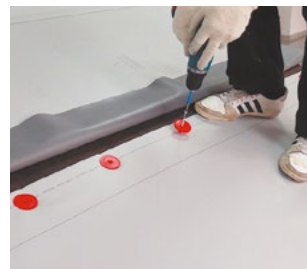
Firmly fix the membrane strip with a width of **10 cm** to the substrate of the valley area with a standard telescopic fastener.



Manually weld the underside of the main roofing membrane to the pre-fixed strip.

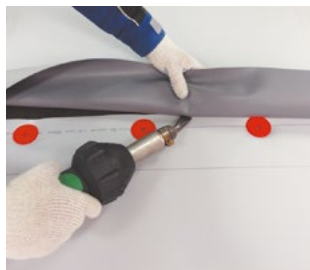
5.6. Installation of roofing on steep roofs

When working on steep roofs, great attention must be paid to work safety, especially regarding the use of safety ropes.

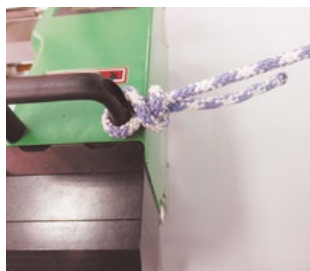


Fix the membrane with a pitch of the anchor elements according to the wind load calculation. The side and end overlaps of the strips must be at least **125 mm** (i.e. **5 mm** more than the standard overlap, which is due to the material shrinkage allowance based on the point fastening along the seam).

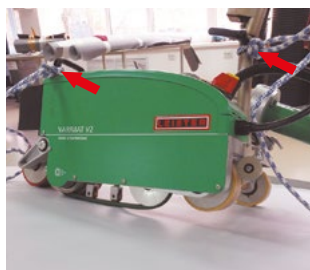
NOTE: Failure to observe the 5 mm reserve can cause small wrinkles around the weld.



To eliminate writhing and wrinkling during subsequent welding using the automatic equipment, stitch the membrane along the entire length of the weld.



Fasten the welding equipment with ropes by using self-tightening hitches.



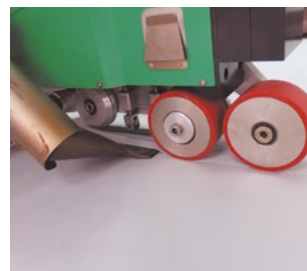
Fasten the welding equipment with ropes at the handles, otherwise, the equipment will not be stable due to the displaced centre of gravity, which may result in insufficient pressing or slipping of the moving device or to its overturning.



For comfortable operation and high-quality welding, weld the membrane at the lowest speed, selecting the appropriate temperature.



Hold the welding equipment, tighten the rope and start welding.



Make sure that the pressure roller of the automatic welding machine does not deviate from the overlap and that the nozzle tip protrudes **2-3 mm** from the joint.



When installing the membrane, always observe work safety.



Finished weld.

6.

Execution of corners

6. Execution of corners

6.1. Execution of internal corner



6.1.1. Installation of the waterproofing membrane in a corner

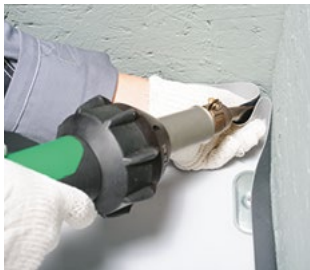
NOTE: Roofing layers must be protected from water penetration during roofing works.



Turn up the long side and end of the membrane strip on the vertical structure to a height of **50-80 mm**.



Fold the membrane as shown.



Weld the inside of the folded part.



Weld the folded part to one of the sides of the turned-up membrane.



6.1.2. Installation of the waterproofing membrane in the corners of intermediate upstands

For comfortable work, while making the corner, glue the membrane strip to the upstand.



Fold the bottom overlaps created for the corner. It is advisable to place a piece of the membrane below this part so that the adhesive does not soil the main roofing membrane.



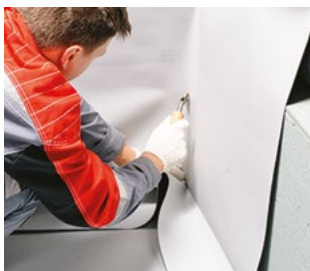
Pour a small amount of TECHNINICOL contact adhesive into a tray.



Using a roller, apply a thick layer of the contact adhesive to one upstand.



Then apply the adhesive to the appropriate part of the membrane. Be careful not to apply the adhesive in the area where welding is going to be done.



First, press the membrane in the corner using a narrow brass roller.



Then press the membrane against the surface of the upstand with a silicone roller.



Cut the membrane as shown.



Apply the adhesive to the other face of the upstand and the membrane.



Using the same procedure, attach the waterproofing membrane to the upstand.

NOTE: TECHNOMICOL contact adhesive cannot be used for the installation of fully-adhered roofing systems. For these purposes, a membrane with a fleece back should be used with special glue.



6.1.3. Execution of corners using the “envelope method”



Fold the material in the internal corner into a “loop.” The beginning of the fold must lie exactly at the top of the corner between the upstands.



For more comfortable work, press the membrane along the edges of the corner with a brass roller and stitch it to the roofing using a hot air gun.



Bend the membrane loop to one side and press the bend with the roller.



Fold the loop to the other side and do the same from the opposite side.



Shift the membrane so that the bend line is in the middle of the loop.



Place the membrane loop horizontally and run the roller over the place again.



To prevent damage to the lower layers of the material, put the loop on a metal plate with machined edges with a thickness of **0.3-0.5 mm**, made of galvanized or stainless steel, and make a stitching.



Weld the seam as shown on the photo.



Weld the contact points of the "envelope" that was created, to the main roofing membrane using the narrow brass roller.



Weld the joint at the place of transition of the envelope to the main roofing membrane using the brass roller.



Then weld the overlap to the main roofing membrane using the usual procedure with the silicone roller.



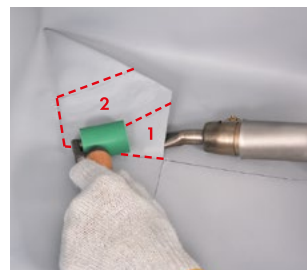
Using the narrow brass roller, weld the place where the membrane overlap is crossed into the envelope.



Carefully weld the joint edges and the beginning of the weld between the overlap and the main roofing membrane.



Then weld the membrane overlap to the main roofing membrane using the usual procedure with the silicone roller.



Gradually weld the segments 1 and 2 of the envelope.



Stitch the free part of the envelope with a hot air gun.

NOTE: When corners are correctly made using the "envelope method," it is not necessary to make a reinforcement element.



6.1.4. Installation of prefabricated corner elements

To ensure a fast, high-quality corner reinforcement, use a prefabricated corner element. It is made of non-reinforced PVC of a greater thickness and is easily weldable to the surface of the PVC membrane. The finished element must be consistently welded to the membrane without the creation of cavities and non-welded areas.



Fix the centre of the finished element.



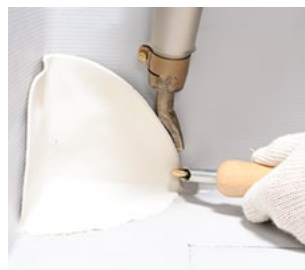
Weld the element in the zones of joints of planes using a brass roller.



Then weld the horizontal part of the prefabricated element.



Weld the edge of the horizontal part using a narrow brass roller.



Similarly, weld the element in all its planes. Check the quality of the welded joints with a tester. Treat the horizontal part of the welded joint with TECHNOMICOL PVC liquid coating.



6.2. Execution of external corner



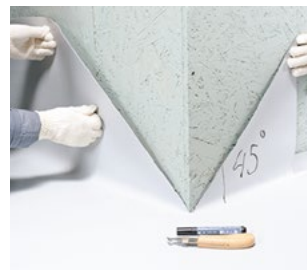
6.2.1. Installation of the waterproofing membrane around the external corner



Pierce the membrane with the roofing knife at the point of contact between the membrane and the base of the corner.



Mark the line at an angle of 45° from the bottom corner towards the top edge of the membrane and cut the membrane along the line.



Place the membrane as shown and anchor it around the perimeter.



Cut off excess membrane sections. The extension of the membrane on the plinth should be at least **50 mm**.



To ensure water tightness, weld the corner fitting from a non-reinforced V-SR membrane (example highlighted in yellow). At first, weld it to the vertical surfaces.



Then weld the element to the horizontal surface.



6.2.2. Execution of the external corner using prefabricated corner elements

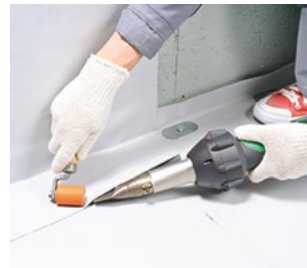
To ensure a fast, high-quality corner reinforcement, use a prefabricated corner element. It is made of non-reinforced PVC of a greater thickness and is easily weldable to the surface of the PVC membrane. The finished element must be consistently welded to the membrane without the creation of cavities and non-welded areas.



At first, glue the prepared piece of the main roofing membrane to the external corner.



Cut through the bend of the membrane in the corner using the roofing knife.



Round all corners with a pair of scissors. Weld the edges to the horizontal membrane.



Attach the reinforcing element and mark its outline with a marker. Taper the edge of the membrane to the depth of the required weld (at least **30 mm**).



Stitch the corner element to the main roofing membrane.



Start welding the element along the corners from the centre of the patch and proceed to the edges. Use a narrow nozzle hot air gun with a width of **20 mm** and a brass pressure roller.



Weld the inner part of the horizontal surface of the element from the centre towards the edges, ending approximately **30 cm** from the edge.



Finally, weld the outer edge of the element. Proceed likewise with the vertical sections of the element. Check the weld quality with a tester. Treat the welds with **TECHNONICOL** PVC liquid coating.

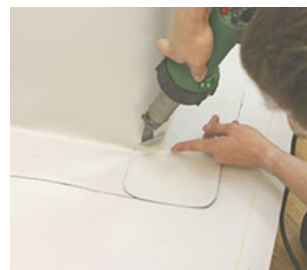


6.2.3. Execution of external corner using a non-reinforced V-SR membrane



Cut out a part of V-SR membrane; its size must overlap the vertical and horizontal overlap of the membrane by at least **30 mm**.

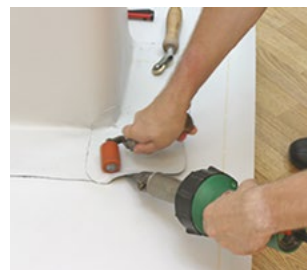
Use a hot air gun to heat one of the corners and shape it by pulling it to achieve the shape as shown in the picture.



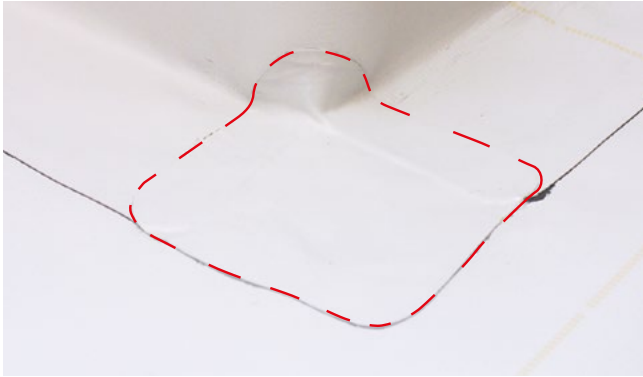
Place the corner fitting. It must tightly adjoin to all sides of the isolated corner.

Weld the element along the top edge of the corner using your fingers and a hot air gun with a narrow nozzle.

At one time, weld only the part that you can press with your finger. Then fold another sector of the top corner to weld the non-welded part. Repeat this operation until the whole top corner is completely welded.



Carefully weld the place of the membrane crossing using a narrow brass roller. Then weld the remaining surface with a wide silicone roller. Check the weld quality with a tester. Treat the welds with **TECHNONICOL** PVC liquid coating.



7.

Detailing around penetrations

7. Detailing around penetrations

7.1. Installation of the waterproofing membrane around penetrations



NOTE: For a reliable and durable joint, we recommend using round or square metallic pass-throughs of penetrations on the roof.



Mark the place of penetration on the back side of the membrane.



Firmly press the membrane over the protruding object and cut through it vertically.



Cut the membrane around the penetration base as shown in the picture.

Anchor the end of the membrane to the substrate and round the corners of the membrane with a pair of scissors.



Weld a patch (example highlighted in green) over the cut-through area.

Check the quality of the welds with a tester.



Fasten the membrane to the substrate around the penetration.

7.2. Detailing around penetrations using prefabricated elements

For fast and reliable detailing around penetrations, use the corresponding prefabricated PVC element.



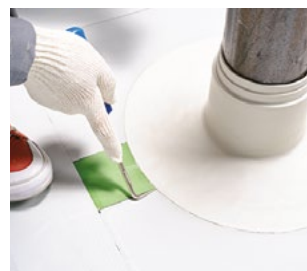
Cut the top of the prefabricated element to the required diameter of the protruding structure. If required, fill the gap between the prefabricated element and the protruding structure with a geotextile (to eliminate sagging).



Pull the prefabricated element over the penetration and stitch it to the roofing membrane in several places. Taper the edge of the reinforcing strip installed over the cut-through area (the green one on the picture) to the width of the desired weld (at least **30 mm**).



Weld the flange of the prefabricated element around the edges using the manual hot air gun and the silicon roller.



Check the quality of the welded joint with a tester.

Treat the welds with **TECHNICOL** PVC liquid coating.



Fill the gap between the prefabricated element and the protruding structure with TECHNOMICOL polyurethane sealant.



Tighten the joint with stainless steel banding.

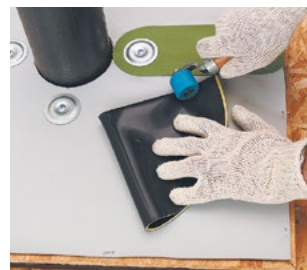
NOTE: Never use plastic tightening rings to tighten the PVC membrane.



7.3. Detailing around penetrations using a non-reinforced membrane

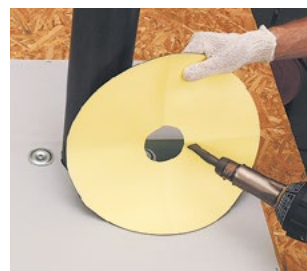


Cut out a round patch from a non-reinforced V-SR membrane (example highlighted in yellow). Its diameter must ensure an overlap of at least **40 mm** over the installed fasteners.



Fold the patch in half and press the place of the fold with a roller. Then fold it into quarters and press the place of the fold again.

Cut the top of the patch so that the inner opening is **50 mm** smaller than the diameter of the penetration.



Heat the patch on both sides around the hole with a hot air gun to soften the membrane.

To ease the installation of the penetration patch, you can stretch the inner opening with your fingers.



Not waiting for the patch cooling, stretch it quickly and vigorously onto the pipe. Then press the patch with a brass roller.



Weld an inner collar part of the patch around the penetration with a hot air gun while pressing it with a brass roller. Taper the edge of the reinforcing strip installed over the cut-through area (the green one on the picture) to the width of the desired weld (at least **30 mm**).

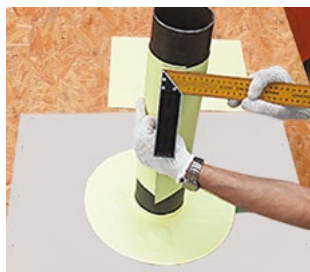


Manually weld the central part of the resulting flange to the main membrane with the hot air gun.



Finally, weld the patch around the outer edge.

Check the weld quality with a tester.



Cut out a piece of the non-reinforced V-SR membrane with a width of **30-40 cm** (example highlighted in yellow). The length of the strip must be **4 cm** bigger than the perimeter of the penetration to ensure an overlap for the weld.



Wrap the element around the pipe, pull it with your fingers and stitch it in several places of overlaps with a hot air gun. Use a narrow nozzle with a width of **20 mm**.



Remove the element from the pipe and round the bottom corner of the element in the overlap zone with a pair of scissors.



Manually weld the overlap with the hot air gun and smooth it out with a teflon or silicone roller.

To make work easier, an auxiliary horizontal tube can be used (especially in a case of a larger number of circular penetrations of the same diameter).



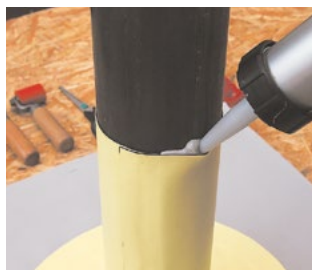
Then heat the lower section of the element with the hot air gun to make the membrane softer.



Stretch the heated part with your hands as shown in the picture. Then, in order to form a flange around the structure, start heating and stretching the adjacent section of the bottom part of the element. The horizontal size of the flange must be at least **20 mm**.



Pull the element over the pipe. Weld the seam to the patch base.



Fill the gap between the element and the pipe with TECHNOMICOL polyurethane sealant.



Tighten the joint with stainless steel banding.



Check the weld quality with a tester. Treat the welds with TECHNOMICOL PVC liquid coating.

7.4. Detailing around penetrations of a small diameter



Cut out a hole in the membrane in order to apply it around the small diameter of the penetration.



Weld the patch made of the main roofing membrane over the cut-through area (example highlighted in green).



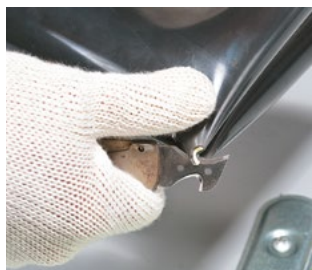
Fix the membrane to the substrate around the small diameter penetration.



Cut a round patch from the non-reinforced V-SR membrane (example highlighted in yellow). The minimum patch diameter must be equal to the diameter of the penetration plus **150 mm**.



Fold the patch four times as shown in the picture.



Cut out the centre of the circle.



Heat the patch around the hole with a hot air gun to soften the membrane.



Quickly insert the patch onto the protruding element before the membrane cools down.



Stitch the patch at several places.

Taper the edge of the reinforcing strip installed over the cut-through area (the green one on the picture) to the width of the desired weld (at least **30 mm**).



Weld the patch to the main roofing membrane; pay special attention to areas where the patch comes into contact with the reinforcing strip.

Check the joints with a tester.



Then cut out another round element from the non-reinforced V-SR membrane.



Fold the element four times.



Use the roofing knife to create a hole in order to determine the centre of the circle.



Make a cut from the centre to the border of the circle.



Fold one segment as shown in the picture and press it with a roller.



Use the roofing knife to make a cut **20 mm** from the folding line.



Round the corners of the cut with a pair of scissors.



Join the radii of the circle to form a conical shape with an overlap with the welding width of **20 mm**.

Attach the produced element to any external corner, pull both its sections together with your fingers, and stitch them together in few points using a hot air gun.



Then weld the joint.



Turn the element inside out and weld the seam from the inside. Check the weld quality with a tester.



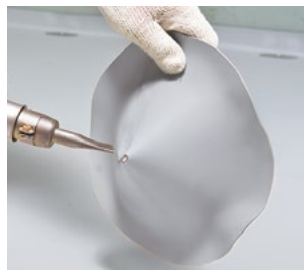
Then heat the small area around the outer part of the cone by moving the nozzle until the membrane softens.



Stretch the heated surface as shown in the picture in order to create a rim. Gradually heat and pull the cone along the whole circumference of the base.



Using a roofing knife, make a cut in the top of the cone.



Heat the element around the hole with a hot air gun.



Quickly pull the cone onto the protruding element of a small diameter before the membrane cools down.



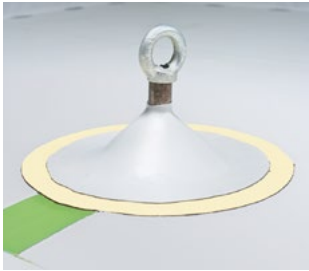
Stitch the rim of the cone to the previously installed patch at several places.



Perform the back (preliminary) welding using a brass roller. During this step, push the brass roller outwards to ensure the tension needed for the membrane.



Then weld the outer edges of the element to the roofing.



Check the weld quality with a tester. Tighten the cone at the top with stainless steel banding and fill it with PU sealant.

Treat the welds with TECHNOMICOL PVC liquid coating.



8.

Working around an upstand and fascia

8. Working around an upstand and fascia

8.1. Detailing an upstand using a “hidden pocket”

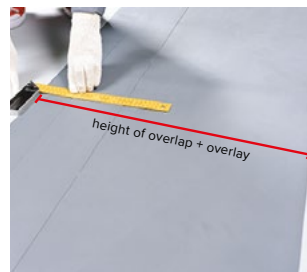
From the point of view of lifespan and the quickest installation time, the most reliable option is to install the membrane on the upstand using the so-called “hidden pocket” method.

Cut out a strip of the main roofing membrane.

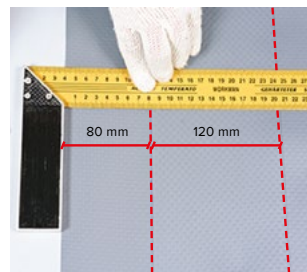
To speed up the work, the side strip may be torn off; to do so, cut the membrane with the roofing knife, then tear off the strip. Thanks to its special mesh, the discontinuity reveals itself along the reinforcing fibres.

It is necessary to place the torn-off edge of the membrane so that it is, after installation, protected from moisture – place this edge on the vertical surface of the upstand or under the overlap.

NOTE: Do not tear off the membrane when it is cold during the winter season. Prior to tearing, the membrane should be kept at a temperature of at least +10 °C for at least 12 hours.



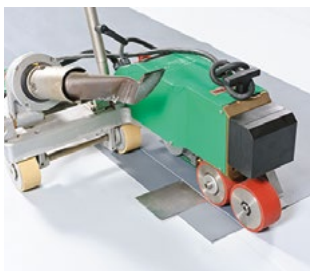
The width of the strip must correspond to the height of the overlap on the upstand (or the length of the membrane to wrap the upstand) plus the size of the overlap on the horizontal surface (at least **150 mm**). Also, prepare a narrow strip of the membrane with a width of **120 mm** to create a “pocket.”



Mark a line on the reverse side of the membrane for the upstand at a distance of **80 mm** from the bottom edge of the membrane and align the separate strip of the material for the pocket (**120 mm** wide) along this line.



Stitch the pocket strip in several places along the opposite edge.



Using automatic welding equipment, weld the pocket strip to the bottom edge of the main element.



Release the stitches.



Insert the fixing bar into the hidden pocket and pull out the pocket strip with roofing pliers while pressing the bar with the regular pliers. Fix the bar to the bottom zone of the upstand with a **200 mm** span. When fastening, place a metal plate under the material to avoid damaging the membrane.



If a required fixing bar is smaller than the standard length, cut it from both sides with sheet metal shears.



Then break it at the site of the cut.

NOTE: Do not cut the bar with the angle grinder on installed waterproofing, thermal insulation or the vapor barrier.



Lift the free edge of the waterproofing strip to the upstand.



If the height of the strip is greater than **450 mm** or it is necessary to create an upstand with another layer of insulation, use another hidden pocket with a fixing bar to enable fastening.



Place the additional bar in the pocket. When securing the edge fastener, pull the corner of the membrane diagonally so that no folds are formed on the membrane.

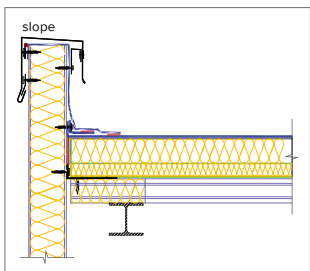
8.2. Detailing a low upstand



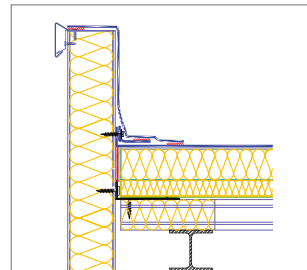
In the case of a low upstand (usually a height of **350 mm**), place the membrane over the upstand; pull the outer side of the membrane with one hand and smooth it with the other hand in the upward direction so that it does not form folds.



Anchor the membrane mechanically to the outer side of the upstand.

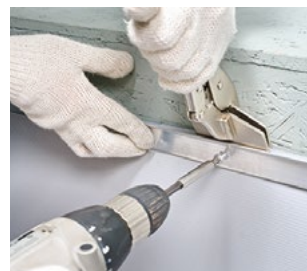


Install metal drip edges on the horizontal part of the upstand with the membrane (for sandwich panels) to protect the facade from water. The sheeting of the upstand has to be done tightly. Contact between the sheeting and the upstand should be sealed with a polyurethane or neoprene rubber sealant.



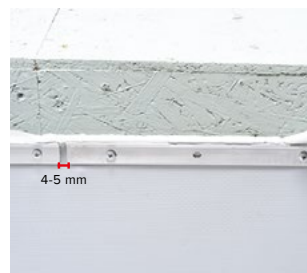
Or install drip edges made from steel sheet laminated with PVC.

8.3. Detailing a high upstand with edge bar connection

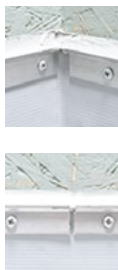


With upstands higher than **350 mm**, use edge bars. In order to evenly stretch the membrane along the length of the upstand, it is necessary to install the bar starting from the centre. Use roofing pliers to ensure the adequate tension of the membrane.

To fasten the edge bar to the upstand made from sandwich panels, use fasteners with a diameter of at least **5.5 mm**.



Leave a **4-5 mm** expansion gap between each bar. Cut the excess membrane above the edge bar with a sharp knife and apply TECHNOMICOL polyurethane sealant to the gap between the bar and the wall.



When fixing the membrane in the zone of external and internal corners, leave a gap of **4-5 mm** between the bars. Reinforce the bar edges with additional fasteners.



A possible solution to changing the membrane height on the upstand is shown in the picture.



As an alternative, special steel bars laminated with PVC could be used. Minimum width of the bar is **50 mm**

NOTE: Leave a 2-3 mm expansion gap between each bar.



Apply TECHNICOL polyurethane sealant precisely to the centre of the inner side of the laminated metal bars.



Fasten the bar to the upstand with self-tapping screws.



Weld the waterproofing membrane to the laminated bar at the level of its edge.



Apply TECHNICOL polyurethane sealant to the edge of the laminated bar.



After the mechanical fixation in the upper point of the upstand, round all corners. Weld the strip with the hidden pocket to the main horizontal membrane using the automatic welding equipment.



In the sheet end zone taper the edge of the bottom horizontal membrane and weld all overlaps.



Check the quality of the welds with the tester. Treat the manual welds with TECHNINCOL PVC liquid coating.

8.4. Detailing to the fascia

For making fascias on a concrete substrate, use laminated steel sheets with a PVC coating with a thickness of at least **800 µm**.

NOTE: Before installation, check which side has the PVC finish. Polymeric waterproofing membrane can be welded only to the plastic-coated side.



Bend the main roofing membrane over the fascia and fix it mechanically. Use metal washers for this purpose.



Start the installation of laminated drip edges from the corner zone. Cut the prefabricated laminated drip edges at an angle of **45°** using sheet metal shears. Fasten the drip edges to the load-bearing layer of the roof.



Leave an expansion gap of **2-3 mm** between laminated drip edges. Adjust the gap and fasten the next laminated drip edge.



Overlay the gap with adhesive tape to prevent its filling with the PVC membrane.



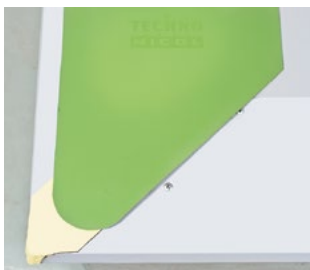
Cut out a piece of non-reinforced V-SR membrane (example highlighted in yellow) and round both corners from one side.



Stitch the patch to the surface and then weld it to the gap area between laminated drip edges; use a manual hot air gun and a pressure roller. Cut off the excess of the patch at the bottom with a roofing knife.



Cut out a strip of the main roofing membrane (example highlighted in green) with a width of **300 mm** and stitch it with a hot air gun to the main layer of the roofing membrane.



Round the corners with a pair of scissors and cut the end at an angle of **45°**.



On the inside of the roof, weld the strip to the main roofing membrane using the automatic hot air welding equipment.



Taper the edges of the non-reinforced patch membrane to the width of the weld (at least **30 mm**).



Weld the membrane to the laminated sheet metal with a hand-held hot air gun.



Check all welds with a tester; pay special attention to places where the material overlaps the non-reinforced patch membrane. Treat all welds with **TECHNONICOL PVC** liquid coating.

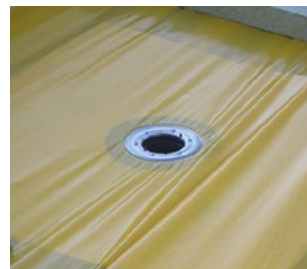


9.

Installation of other roofing components

9. Installation of other roofing components

9.1. Installation of roof outlets



It is recommended to use two-stage roof outlets. The bottom flange of the roof outlet allows for the proper sealing of the vapor barrier layer and its proper functioning.



To achieve a smooth and firm base around the roof outlet, we recommend using thermal insulation boards with higher compressive strength, i.e. XPS or PIR.

The dimensions of this area must be at least **1×1 m**.



For single-stage roof outlets, it is preferable to use a butyl-rubber band to seal the vapor barrier along the perimeter of the reinforcing board. Press the thermal insulation board firmly to the tape.



Create a hole for the installation of the roof outlet in the board. To ensure a tight connection of the roof outlet flange, taper the edge of the hole, for example by surface melting the XPS board with a hand-held hot air gun.



As a separating layer, insert a fiberglass section with a weight of at least **120 g/m²** between the board and the membrane and insert the roof outlet into the hole.



For a more reliable sealing, apply **TECHNONICOL** polyurethane sealant along the outer edge of the roof outlet and around all screws.



Place a piece of the main roofing membrane with the dimensions of **1×1 m** over the roof outlet. Cut holes for the screws in the membrane using a knife and press the membrane over the pins.



To improve the reliability of the joints, apply **TECHNONICOL** polyurethane sealant around the outer edge of the roof outlet.



Tighten the flange with nuts.

After tightening all the nuts, a small amount of sealant should be pushed out around the flange.



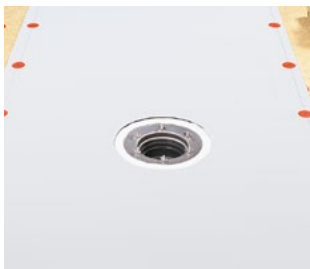
Lift a piece of the membrane and secure the roof outlet to the substrate with long self-tapping screws.



Fasten the piece of the membrane to the roof surface so that the anchors penetrate the load-bearing roofing substrate (see section 3.4.).



Continue to install the membrane on the main roof surface in a standard way. After the membrane is fastened, determine the centre of the roof outlet under the membrane as the cross of two lines between opposite screws. Mark the hole on the membrane using a strip of the material and a marker as shown in the picture. Use it as a compasses to draw a circle with a radius of **6 cm** larger than the radius of the flange.



Carefully cut through the membrane with a pair of scissors along the marked line. Avoid damaging the bottom piece of the membrane.



Make the back welding and then the finish welding of two membranes.



Treat all welds with **TECHNONICOL** PVC liquid coating.

Install the outlet cap.



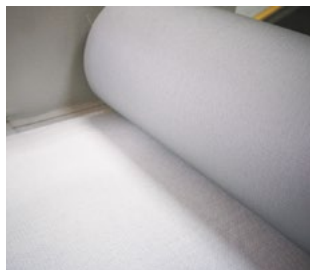
9.2. Installation of LOGICROOF NG fire retardant material around skylights and smoke vents

LOGICROOF NG is a protective material based on non-flammable fabrics that fully replaces standard solutions such as ballast and paving. On the bottom side, the material is covered with a special plastic coating that allows welding it to the main roofing PVC membranes. The application of LOGICROOF NG is possible year-round at temperatures from **-15 °C** to **+50 °C**, the material does not load the construction, and it allows the installation of fire bands on roofs with an arbitrary inclination.

NOTE: LOGICROOF NG protection membrane must be kept dry after opening. Do not use damp or wet material, do not work in the rain!



Before installing LOGICROOF NG, remove dirt, water or snow from the surface of the roofing membrane. In the case of dirty surfaces or when installing the material on the old membrane, it is necessary to clean the areas to be welded in order to achieve a high-quality weld. For cleaning, use **TECHNONICOL** cleaner for PVC membranes.



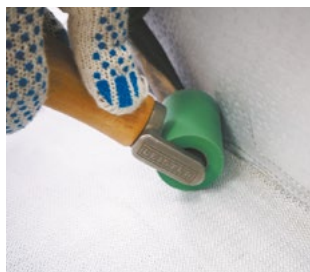
Unfold a roll of LOGICROOF NG along the edge of the smoke vent. The edge of the membrane must tightly adhere to the wall.



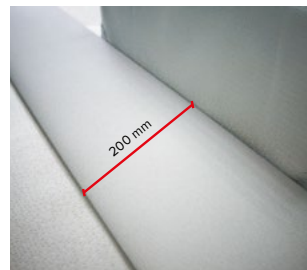
Only cut the material with a pair of scissors. Before welding, make sure the material is laid with the treated side facing down.



Make the back weld using a hot air gun and a narrow brass roller.



Weld LOGICROOF NG along the wall of the smoke vent using a **40 mm** nozzle and a silicone roller. Take care not to burn the material. A strong change of colour and a large amount of smoke indicates the burning of the material.



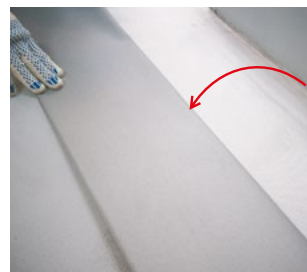
Every **200 mm**, weld LOGICROOF NG membrane to the main roofing membrane using the automatic welding equipment.



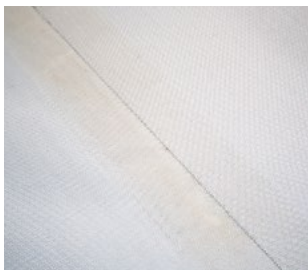
To do this, fold LOGICROOF NG into a strip with a width of **200 mm** and run over the folded area with a silicone roller.



Weld LOGICROOF NG membrane using the automatic welding equipment. When welding, make sure that the welded materials are sufficiently heated, but not burned.



Unfold the welded part of LOGICROOF NG membrane and continue welding at the next edge similarly. Repeat the process until you have finished the whole strip of the material in **200 mm** increments.



To obtain a fire band with a width of **2 m**, install two LOGICROOF NG strips along each side of the smoke vent. Weld the overlaps between LOGICROOF NG strips and then weld the second strip to the main roofing membrane by following the same procedure.



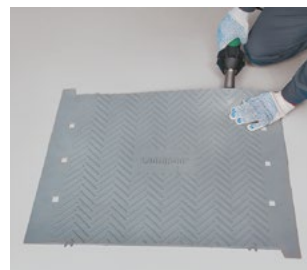
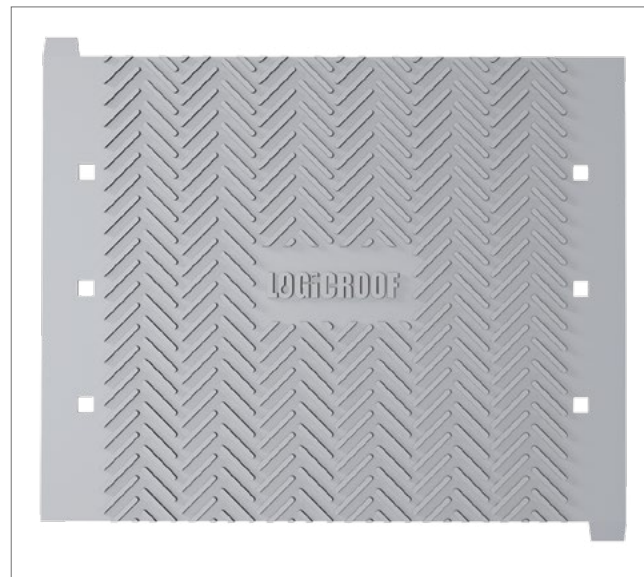
If there is any water in the installation area, remove the water and treat the substrate membrane with the PVC membrane cleaner. Weld LOGICROOF NG along the entire zone area using a hot air gun and a silicone roller.



The finished fire band around the smoke vent.

9.3. Installation of LOGICROOF WalkWay Puzzle

The roof walkway consists of separate prefabricated panels forming a puzzle. The working dimension of one element is **600×600 mm**. After laying the puzzle, the edges of the finished walkway are welded to the surface of the main roofing membrane using the automatic welding equipment. For these purposes, the elements have a smooth **80 mm** wide strip along the edges. The bottom side of the panels includes channels for water drainage, hence there is no need to make spaces between the panels. The elements are made of the same material as the membrane, so they weld easily to the roofing.



Stitch the first walkway panel on both sides of the walking direction to the main roofing membrane using a manual hot air gun.

Fit another piece into the previous one as you would a puzzle.

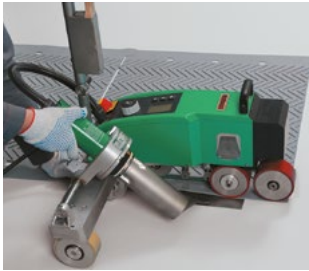


Position the “ears” of the panels so that they do not interfere with the passage of the automatic welding equipment.



The next panel needs to be stitched in one place only (on the opposite free side).

Weld the panel ears manually from both sides not forgetting to put the metal plate between the elements and the main roofing membrane in order to avoid its damaging.



After completing the row of the walkway, weld it to the main roofing membrane with the automatic welding equipment. The smooth strips at the edges of the walkway panels serve this purpose.

10.

Basic rules for roofs made from polymeric waterproofing membrane

10. Basic rules for roofs made from polymeric waterproofing membrane



Unauthorized persons must not have access to the roof. Keep a list of staff working on the roof.



When on the roof, move only across the secured routes.



When moving on the roof, the staff must use protective shoes with a flat sole, without sharp or metal heels, etc.



Avoid mechanical damage to the polymeric waterproofing membrane.



If a building is located in the area with a large presence of birds, it is recommended to install electronic or ultrasonic scare-away devices.



It is forbidden to use mechanized equipment for removing snow.



Only remove snow from the roof with a wooden shovel. Leave a protective layer of snow on the roof at least 10 cm high.



Do not step on the roof and do not move on unsecured roof areas at ambient temperatures below -15 °C.



Do not expose the roof to fire, flammable or toxic substances, lubricants, petroleum products or bitumen. If this happens, treat the membrane with TechnoNICOL PVC cleaner or replace the heavily-damaged area.

[illegible]

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