



TECHNONICOL



Manual

for installation of roofing shingles

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

- Shingles are used as a main roofing cover for roof pitch angles from **12°** to negative angles. When installing at angles exceeding **90°**, shingles shall be bonded by asphalt mastic with heating by a hot air gun, if necessary;
- Required temperature and humidity conditions may be ensured for the roof only if the roof design includes a continuous vapor seal covering, a thermal insulation with a thickness required for the given region, diffusional waterproof and windproof layer and a ventilated underroof space;
- Do not use products with different color codes on the same roof. Slight deviation in color tones, typical for shingles of any manufacturer, is allowed;
- In order to minimize tonal misbalance, shuffle the contents of **5-6 packages** randomly. Carry out installation in diagonal strips;
- To avoid damage to integrity of roofing, cut material on the roof on a special wooden pad only;
- To avoid premature fusing of adhesive layer with siliconized protective film, do not expose pallets with roofing material to direct sunlight. Do not stack pallets on top of each other;
- For easy detaching shingle sheets from each other, slightly bend and shake the shingle package before opening.

NOTE: To avoid stains and traces of footwear, do not walk on roof in sunny weather at temperature above **+25°C**. For moving along the roof slope use work platforms installed on special brackets.

1.2. Materials

1.2.1. Main materials



Roofing shingles

Piece-type bitumen-containing single-layer or multi-layer roofing material. Produced by cutting sheets from rolled material manufactured by impregnation and coating of glass fiber base with bitumen binder with subsequent application of various types of protective coatings.



UNDERLAY NEXT SELF

Carrierless bituminous polymeric self-adhesive underlayment membrane. Top coat: multi-layer polymer fabric. Lower coat: siliconized removable film.



ULTRAFLEX SA

Self-adhesive polyester reinforced SBS-modified bitumen underlayment membrane with self adhesive bitumen layer on the bottom surface. Top side of the material is protected by a fine-grain granules, and the bottom side by siliconized removable film.



UNDERLAY PRO (S) 500 / UNDERLAY PRO (S) 500 stick

Polyester reinforced SBS-modified bitumen underlayment membrane with non-slippery protective propylene coating (spunbond). UNDERLAY PRO (S) 500 stick has adhesive bitumen-free lengthway installation strips.



UNDERLAY BASE 900 / UNDERLAY BASE 1500

Underlayment membrane based on glass fiber impregnated with bitumen binder with SBS-polymers additives and subsequent protection of the top and bottom layers with fine-grain granules.



Valley roll material

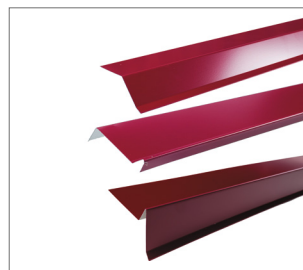
Rolled waterproofing material based on a polyether impregnated with bituminous polymer binder with protected by multi-fractional basalt granules at the top side and by fine-grain sand at the bottom side.



TECHNINCOL HIP & RIDGE & STARTER SHINGLES

Rectangular sheets with basalt granules based on glass fiber mat impregnated with a bituminous polymer binder. There is a frost-resistant self-adhesive layer on the bottom side.

1.2.2. Accessories



Metal polyester-coated strips

Fabricated from metal with special coating. Designed to reinforce eaves and gable overhangs of the roof and ensure efficient water drainage. Length of strips with polyester coating: **2 m**.



TECHNINCOL special anti- corrosive roofing nails

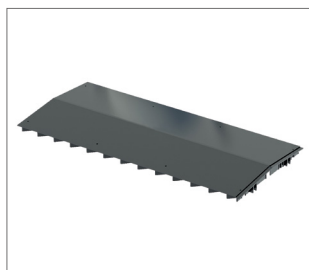
Length: **30** and **45 mm**. Head diameter: **9 mm** (min). Shank diameter: **3 mm** (min). Used to reliably fix the shingles and the accessories.



MASTIC TECHNONICOL FIXER

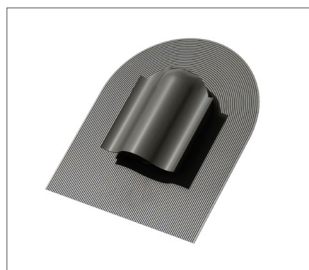
A multi-component substance consisting of bitumen, butadiene-styrene thermoplastic elastomer or its modifications, filler, solvent and technological additives. Designed for sealing of shingle joints, binding the valley membrane, gluing of underlayment membrane joints and sealing of abutments to the brick chimneys and walls. Package options: **310 ml** tube, **3.6** and **12 kg** metal buckets.

1.2.3. Ventilation components



TECHNOCOL continuous ridge vent / STANDARD ridge vent

Designed to remove excessive underroof moist. Equipped with a polyurethane foam filter to block entry of insects and atmospheric precipitation. Continuous TECHNOCOL ridge vent is capable to ventilate up to **25 m²** of underroof space, STANDARD ridge vent – up to **20 m²**. Ridge vent is supplied together with fasteners: nails **3×70 mm (8 pcs.)**, self-tapping screws **3.5×41 mm (8 pcs.)**.



TECHNOCOL KTV air ventilation element

Used to remove excessive underroof moist on shingle roofs that have no roofing ridge element. Is to be installed at a **0.5-0.8 m** distance from the roof ridge, a flow of air on the overhangs shall be provided. One air vent ventilates **10 m²** of underroof space. Opening diameter is **110 mm**.



TECHNOCOL SKAT vent

Used on pitched roofs having a slope from **12°** and flat surface (shingles, metal seam roofing, flat asbestos-cement boards) installed directly on the roofing cover. It is equipped with a seal on the bottom surface, which ensures watertight joint when the vent is fixed on the roof. Opening diameter is **110 mm**.



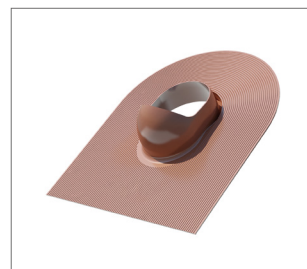
TECHNOCOL adapter

Used to connect air pipes to the TECHNOCOL KTV ventilator. Diameter from **110** to **130 mm**.



TECHNOCOL SKAT passage element

Serves as a base for installation of ventilation or sewage vents. Used on pitched roofs having a slope from **5°** and flat surface, installed directly on the roofing cover, that is on installed roofing. It is equipped with a seal on the bottom surface made from special long-life rubber, that ensures a watertight connection.



Shingles by TECHNOCOL passage element

Serves as a base for installation of ventilation or sewage vents on roofs covered with shingles.



TECHNONICOL multi-purpose seal

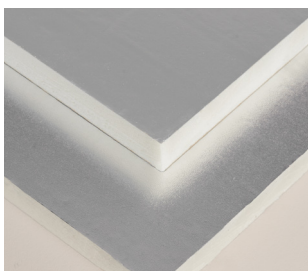
Designed for reliable sealing of protruding round elements on the roof (pipes, antennae, posts, racks). Is produced with diameter of **90-175** and **10-70 mm**.

1.2.4. Thermal insulation and construction films



TECHNOLIGHT EXTRA / TECHNOLIGHT OPTIMA

Non-flammable hydrophobic thermal and sound insulation boards from stone wool based on basalt group rocks. Used for thermal insulation of mansard roofs and cold roof floors.



LOGICPIR

A polyisocyanurate (PIR) foam material with a closed cellular structure. These boards have a low thermal conductivity coefficient, low water adsorption and high strength. Used for thermal insulation of mansard roofs and cold roof floors.



TECHNONICOL ALPHA TOP

A double-layer watertight material with a strong unwoven polyester base and an external vapor permeable thermoplastic polyurethane coating. Resistant to mold, bacteria and UV irradiation. Used to protect thermal insulation layer from weather impact.



TECHNONICOL ALPHA VENT

A three-layer extra-strong vapor permeable material. Consists of a micro-porous watertight layer with unwoven polypropylene fabric attached from both sides. Has an adhesive strip for simple and convenient installation. Resistant to mold, bacteria and UV irradiation. Limited air permeability protects the insulation from convection heat losses. Used in one-layer ventilation systems to protect thermal insulation layer from weather impact.



TECHNONICOL ALPHA BARRIER 4.0

A four-layer vapor insulating foil laminated film with practically zero vapor permeability. High-strength mesh-reinforced film, retains plasticity even at subzero temperatures. Aluminum reflective layer, allows to reduce heating and air-conditioning costs. Used as a vapor insulation layer. Suitable for premises with normal and high humidity.



TECHNONICOL ALPHA BARRIER 3.0

A three-layer vapor insulating reinforced film. Due to semi-transparent structure, allows timely detection and elimination of thermal insulation defects and visual control of the quality of installation. Used as a vapor insulation layer. Suitable for premises with normal humidity level.



TECHNONICOL ALPHA BARRIER 2.0

Double-layer vapor insulating film with limited vapor permeability. Prevents penetration of vaporized moist into insulation from inside the building. Used as a vapor insulation layer in dry premises with normal humidity level.

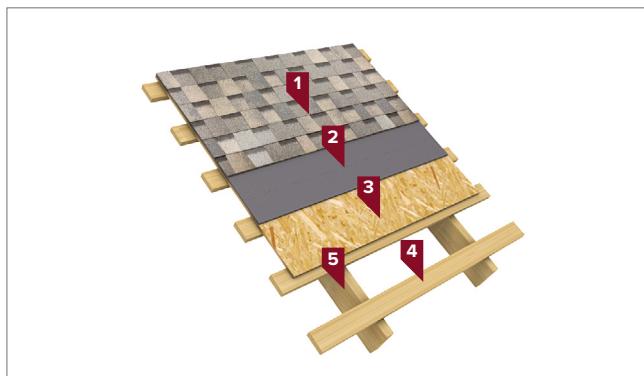
1.3. Roofing systems

Solution for a pitched roof without thermal insulation

The system is applied for pitched roofs of residential houses and administration buildings with a slope of **12°** or greater.

The base for roofing materials must be solid, rigid and flat, and is normally made of OSB-3 or exterior plywood with increased moisture resistance.

SBS-modified bitumen membranes of UNDERLAY series are used as an underlayment for roofing shingles over the whole roof surface. These lightweight materials provide secure protection from wind-driven rain.

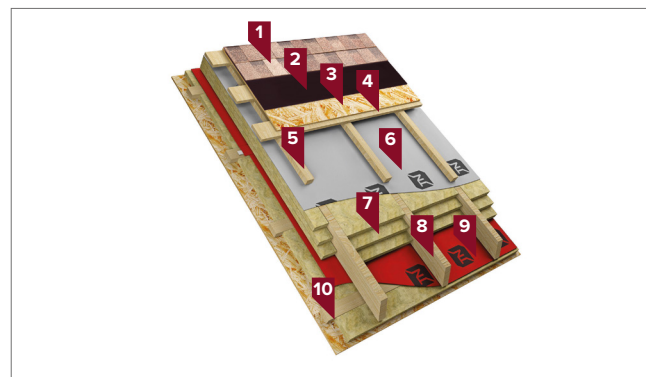


1. Roofing shingles by TECHNOMICOL;
2. Underlay bitumen membrane by TECHNOMICOL;
3. Wood decking;
4. Counter battens;
5. Rafter.

Solution for a pitched roof with thermal insulation of stone wool

The solution represents a reliable watertight system for pitched roofs with thermal insulation made from stone mineral wool. Non-flammable stone wool slabs are used to arrange effective thermal insulation, therefore increasing the energy efficiency of the overall construction. At the same time, mineral wool significantly reduces the noise level from outside, making the life of habitants more comfortable.

From the inside of the construction, the stone wool slabs are protected from the vapor ingress by vapor barrier films of TECHNOMICOL ALPHA series. From the opposite side, diffusion membranes TECHNOMICOL ALPHA are used to preserve the slabs from harmful impacts of water, wind and dust, as well as to contribute to the removal of excess moisture from building structures via the provided ventilation system.

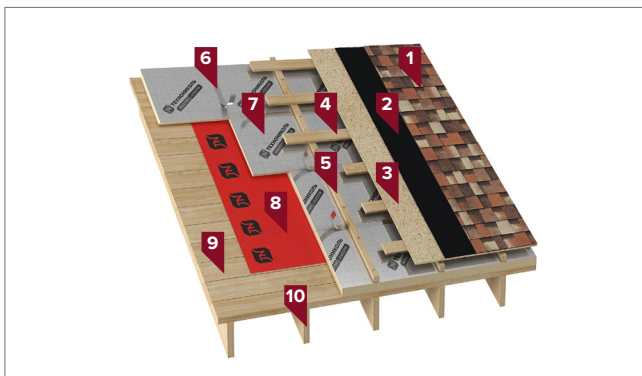


1. Roofing shingles by TECHNOMICOL;
2. Underlay bitumen membrane by TECHNOMICOL;
3. Wood decking;
4. Counter battens;
5. Ventilation space battens;
6. Diffusion membrane TECHNOMICOL ALPHA;
7. TECHNOMICOL stone wool slabs;
8. Rafter system;
9. Vapor barrier film TECHNOMICOL ALPHA;
10. Attic ceiling.

Solution for a pitched roof with thermal insulation of PIR boards

The solution represents a reliable watertight system for pitched roofs with thermal insulation made from PIR boards. This boards are used to arrange effective thermal insulation, therefore significantly increasing the energy efficiency of the overall construction. The very rigid and perfectly flat material has high compressive strength and a record low thermal conductivity value.

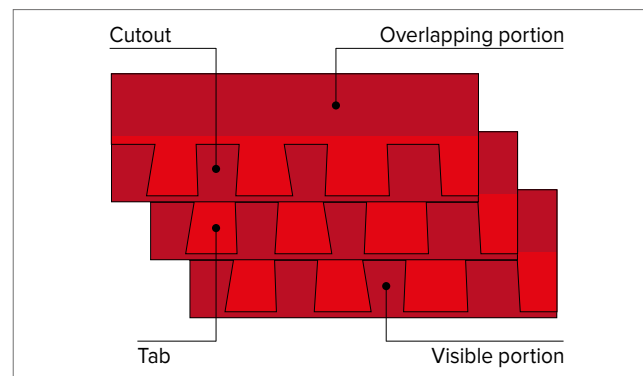
From the inside of the construction, the PIR boards are protected from the vapor ingress by vapor barrier films of TECHNONICOL ALPHA series. From the opposite side, the boards' joints are sealed with NICOBAND self-adhesive sealant tape, which removes the necessity of a diffusion membrane.



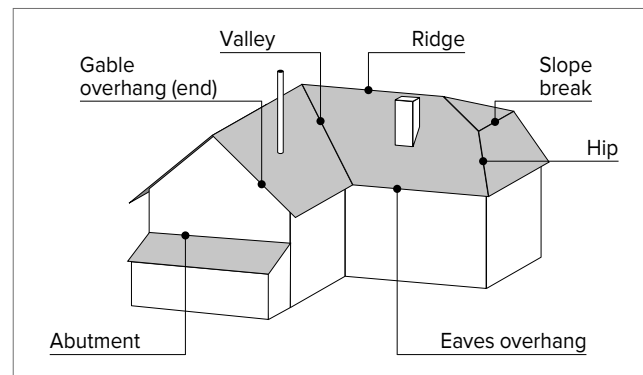
1. Roofing shingles by TECHNONICOL;
2. Underlay bitumen membrane by TECHNONICOL;
3. Wood decking;
4. Counter battens;
5. Ventilation space battens;
6. NICOBAND self-adhesive sealant tape;
7. LOGICPIR boards with aluminium foil covering;
8. Vapor barrier film TECHNONICOL ALPHA;
9. Wood decking;
10. Rafter system.

1.4. Terminology

Sheet elements of TECHNONICOL roofing shingles



Elements of a building structure



2.

Work preparation

2. Work preparation

2.1. Safety information

Roofing works are classified as highly hazardous works that may only be performed by persons at least **18 years** old who are trained in safe work practices and having successfully passed exams and received relevant certificates.

All roofers must pass a medical examination, orientation, and safety briefing. The briefing shall be held each time a work place or work type is changed.

Roof works are prohibited in rain or at wind speed higher than **15 m/s** and in the case of poor visibility.

During work breaks and at the end of work shift all remaining materials and fixtures must be reliably fixed.

Before starting work, make sure that the trestles and temporary fences are reliable, tools are in good order and walking bridges are safe.



For movement of people and convenience of work special adjustable platform brackets must be used.



These brackets are fixed by roofing nails or self-tapping screws.



Install step boards for convenience of work.



Upon completion of work remove the brackets and close places of their attachment with a tab of the above shingle sheet.

When constructing roofing from easily flammable or igniting materials the site and the work place must be equipped with fire extinguishers and other means of fire-fighting.

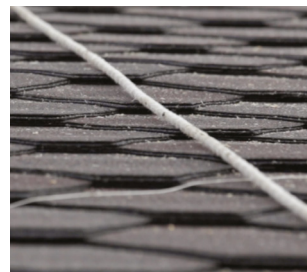
When applying painting and plastering materials, wear a respirator, safety goggles and gloves to prevent ingress of materials into respiratory tract, eyes and open parts of the body.

When using electrical tools, study the operation manual and rules of application and main causes of malfunctions and safe troubleshooting measures.



Roofing workers are provided with special clothes and personal protection equipment: a helmet with chin strip and safety harness.

NOTE: Use of safety belts is not allowed!



Roofing works require use of safety anchor lines. To attach such lines, end anchor points must be installed.

Various options for fixing the anchor points are presented below.



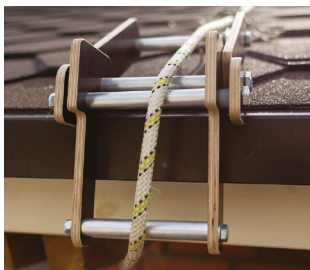
Anchor point around a rafter beam.



Anchor point using a **10-12 mm** stud.



After the anchor points are fixed, attach the end of anchor line to a selected point with a snap hook.



To protect the roof from damage by the rope and to protect the rope from rubbing through, it is recommended to install prefabricated or self-made protectors.

Vertical anchor line

Vertical anchor line is a vertical handrail attached to an anchor point and run over the ridge to the opposite roof slope.

NOTE: Vertical anchor line is recommended to use when climbing the ridge. When working on the roof with a vertical anchor line, keep deviation of the handrail from water fall line to a minimum. The more deviation, the more swinging movement of the worker will be in case of fall.



Attach the end of the anchor line to an anchor point with a snap hook.



Climb the roof to the ridge.



For movement on the roof special guided type fall arresters are used that allow the roofing worker to move freely. These arresters are blocked automatically in case of fall or loss of balance.

Horizontal anchor line

A horizontal anchor line is a horizontal handrail tightened along the ridge between two anchor points on the opposing sides.

NOTE: Horizontal anchor line is recommended to use for movement and working on the roof. One line may be used by up to 3 workers at a time.



Attach the loop by a snap hook to an anchor point below the ridge. Run the loop outside through the roof ridge.



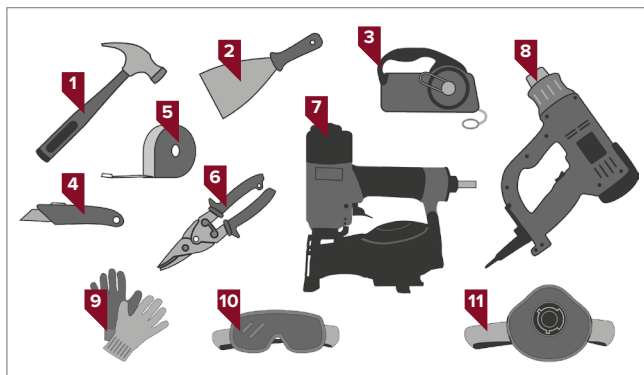
Climb the roof ridge using a vertical anchor line. Install the horizontal anchor line fixing it to the loops earlier led onto the ridge.

Emergency and rescue plan should provide for the implementation of measures and the use of evacuation and rescue equipment that allow for the evacuation of people in the event of an accident or incident during work at height.

To reduce the risk of injury to a worker who, after a fall, hangs in the safety system, measures and means (for example, a self-rescue system) should be provided to release the worker as soon as possible (within no more than **10 minutes**).

2.2. Equipment

Required materials and tools for installation are listed below. When working with the stone wool materials, use gloves, respirator and safety glasses.



1. Hammer;
2. Spatula;
3. Chalk line;
4. Roofing knife (with straight or hooked blade);
5. Tape measure;
6. Metal shears;
7. Pneumatic gun;
8. Hot air gun;
9. Gloves;
10. Safety glasses;
11. Respirator.

2.3. Storage requirements

For convenience of storage, all items in the warehouse shall be divided by type of material, grades and sizes and also be freely accessible.

Roofing shingles by TECHNOMICOL must be stored on pallets separated by grades in closed dry premises under conditions providing for safety of packing and prevention of direct sun light.

NOTE: Pallets with roofing shingles by TECHNOMICOL must be transported and stored at a temperature not exceeding **40°C** no more than in one tier in height. It is allowed to transport and store pallets in two or more tiers in height provided that there are racks or specially equipped stands.

Warranty period for storage of single-layer roofing shingles by TECHNOMICOL is **18 months** from production date, for double-layer – **2 years** from production date, three-layer (architectural) – **3 years** from production date.

Rolls of underlayment material shall be stored separated by grades in vertical position in one tier in height under conditions providing protection from effects of moisture and sun at a distance no less than **1 m** from heating devices at a temperature from **-35 to +35°C**.

Construction films storage shall be arranged in closed dry premises excluding direct or indirect sunlight at a distance no less than **1 m** from heating devices at an ambient temperature not above **+30°C**.

Stone wool may be stored without shelter provided that the transportation package of the pallet is not broken (stretch hood and the pallet are intact). Therein the place for installation of the pallet shall be not subject to accumulation of water or dirt. Otherwise the material shall be stored in closed storerooms in a horizontal position.

Accessories shall be stored in dry conditions on pallets in undamaged original packing protected from UV irradiation.

The boards of LOGICPIR must be stored in closed dry premises in horizontal position in stacks at a distance no less than **1 m** from heating devices. LOGICPIR boards may be stored under a shelter that protects them from precipitation and sunlight. Storage in open air is allowed in a special package protecting the boards from external atmospheric effects.

3.

Vapor barrier

3. Vapor barrier

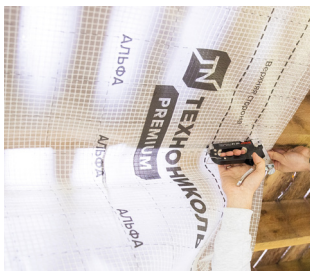
3.1. Basic principles of vapor barrier installation

- Vapor barrier is intended to prevent convectional and diffusional penetration of moisture from premises into thermal insulation materials and the structural elements of roofing and walls. The main purpose of vapor barrier is to obstruct ingress of water vapors from inner space into thermal insulation and to reduce moisture content in the latter;
- Highly efficient vapor barrier films are having on one side an aluminized coating that further improves their vaporproofing properties and reflects part of dissipated heat back to inner space of a building;
- Vapor barrier films are used in combination with thermal insulation from glass wool and stone wool, insulation foam, materials of polystyrene foam type, etc. Highly efficient vapor barriers are recommended in structures obviously having high temperature and humidity from the interior side (high partial pressure);
- Before using chemical substances (antiseptics, antipyrenes, plastering mixes, etc.), check them for compatibility with vapor barrier films and make sure that substances do not damage the film. If vapor barrier is installed prior to thermal insulation and the diffusion membranes, the wooden structural elements, on which the vapor barrier is mounted, should be protected with covering materials as the rain may cause washing out of impregnation and ingress thereof onto the vapor barrier material. Do not allow ingress of motor oil from gasoline-powered tools on the film as it may result in film damage. Vapor barrier films are not permanently resistant to UV irradiation;
- In premises with direct or indirect UV irradiation installed films must be protected by coating from the inner side or by covering material from the top, if vapor insulation was installed earlier than the thermal insulation layer and diffusion membrane;
- The vapor barrier layer must be continuous (integral) over the entire area of the structure protected from steam. Vapor barrier rolls can be laid lengthwise or crosswise relative to rafter beams. The direction of the overlap does not matter, because it must be hermetically sealed;
- Film must be laid with a deformational fold (about **2 cm**) towards the wall that is intended to compensate walls and rafter framework setting. If supporting battens below the vapor barrier are to be installed some time after installation of the vapor barrier, prior to installation of film it is recommended to use support for thermal insulation in the form of a cord tied in a zigzag pattern along lower rafter edges.

3.2. Installation of vapor barrier with stone wool



The marked side of the film should be facing the installer. The films are installed overlapping (approximately by **10 cm**), appropriate marking lines are applied to each roll. The film should be mounted with tension, avoiding sagging and creases, in order to reliably glue the overlap of the rolls and eliminate deformation of the insulation.



Perform the initial (temporary) attachment of film to wood by stainless steel staples or zinc-coated flat head nails in increments of **20-30 cm**.



Sheet overlap is **100-200 mm**. Joints and places where film is attached with stapler must be sealed with sealing tapes.

NOTE: Film damages are repaired by sealing band with subsequent applying of the vapor barrier film **TECHNICONICOL ALPHA BARRIER** on the section with an overlap of 100 mm in all directions.

The final fixing of vapor barrier films is always performed by framework battens or interior decoration profiles, which will perceive the tensile load from the insulation and will not allow the vapor barrier joint to separate.

For maximum insulation protection, it is recommended to use sealing tapes in places where the vapor barrier film is perforated by nails or staples. When insulating flat roofs (with a slope of less than **30°**), and using insufficiently dense insulation (less than **30 kg/m³**), installation of supporting battens or decking is a mandatory requirement. Ceiling and wall cladding shall be attached to counter battens in such a way that the fastening elements do not damage the vapor barrier. Space between vapor barrier and cladding may be efficiently used for electric wiring and other services. Efficient operation of vapor barrier film with an aluminized layer requires that there is a **4-6 cm** gap between vapor barrier and wall or ceiling cladding.

3.3. Installation of vapor barrier with LOGICPIR



Before starting the insulation works, the rafter system must be installed and covered with a planed wooden decking. The decking is not a mandatory roofing element and it works as a finished cladding of the ceiling.

TECHNICONICOL ALPHA BARRIER vapor barrier film must be laid with the marked side towards the building. Perform the initial (temporary) attachment of film to wood by stainless steel staples or zinc-coated flat head nails.



Sheet overlap is **100-200 mm**. Joints and places where film is attached with stapler must be sealed with sealing tape.

NOTE: Try to minimize the number of perforations, all perforations must be sealed with sealing tape in order to ensure layer tightness.

NOTE: Attachment to metal or concrete surfaces shall be done using two-sided adhesive tape or sealing glue.

Individual film strips must be sealed between each other and also to the adjoining structures or protruding construction elements (antenna posts, ventilation pipes, chimney, skylights, etc.).

If after film installation it is necessary to install plasterboard cladding or other decorative material, a special installation screen must be provided from wooden planks or other profile so that the fixing perforations will be made in these materials rather than in the vapor barrier.

Failure to observe the above rules results in penetration of water vapor subsequently resulting in condensation of moisture in thermal insulation, biological damage to the wooden rafter system and other negative effects related to undesirable condensation.

For vapor barrier on a concrete base it is recommended to use self-adhesive polyether-based ULTRAFLEX SA bituminous polymeric material, which has vapor barrier properties and resists possible mechanical damages during installation.

4.

Thermal insulation

4. Thermal insulation

4.1. Basic principles of thermal insulation installation

- When working or interrupting work on installing thermal insulation, protect the insulation from atmospheric precipitation;
- Open material packages only directly at the work place;
- When working with the stone wool materials, use personal protective equipment, thoroughly wash hands after work;
- Use a knife or a handsaw to cut boards of stone wool or LOGICPIR. Do not break the insulation boards.

4.2. Installation of stone wool thermal insulation



Recommended distance between rafters is **580-590 mm** on the inside. Wooden structures must be treated with protective compositions.

NOTE: If the distance between rafters on the inside does not match the width of stone wool board, cut the material to measured distance between rafters $\pm 10-20$ mm.



Install insulation boards between rafters with tight fit. If there are several layers of insulation, install boards overlapping the joints between them.

If required thickness of insulation exceeds the thickness of rafters, or, if an installation screen is to be made, it is possible to construct additional framing with subsequent insulation.



It is required to install additional wooden or metal battens of suitable thickness from the room side. Guiding battens for such framing are fixed across the rafters so that to close all possible cold bridges. A second layer of insulation is installed within such additional framing.

After installation of thermal insulation boards, a diffusion membrane and vapor barrier are to be installed, see section 3.2. and section 5.2.

4.3. Installation of PIR thermal insulation



Install LOGICPIR boards above the vapor barrier. It is advisable to design thermal insulation of roofing so as to install insulation boards in several layers with overlapping of joints.



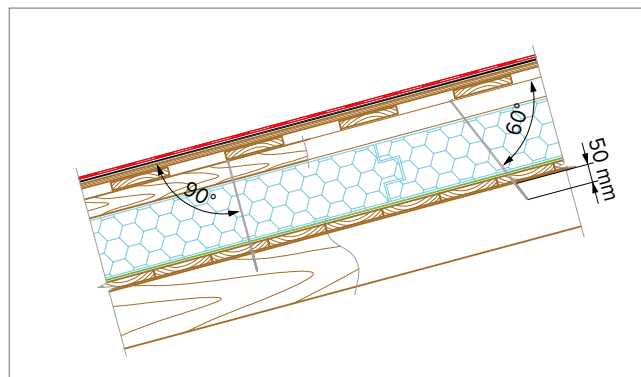
Join the boards along the L-edges. Seal all joints with self-adhesive tape.

NOTE: Aluminum cover of LOGICPIR boards in combination with sealing of joints with adhesive tape provides a continuous water proof layer. In this case it is possible not to use diffusion membrane.



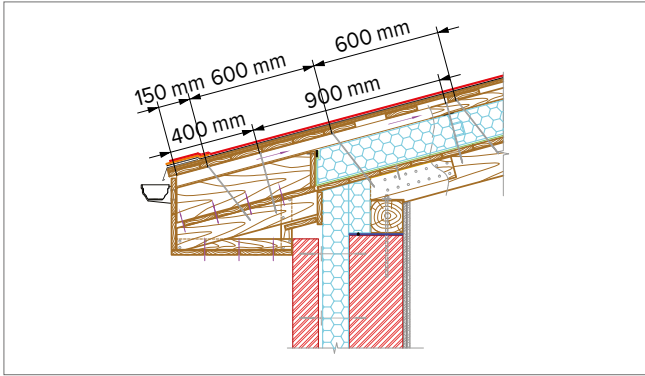
Fix the boards with special constructional fasteners through the beam so as to create a ventilation gap. Pitch of beams shall match the pitch of rafters.

To compensate for the wind and the weight of the roofing sandwich itself, fasteners of LOGICPIR boards shall be installed as straight (at 90° to the top surface of rafters) at **900 mm** pitch or inclined (at 60° to the top surface of rafters) at **600 mm** pitch.



Fasteners shall be of a sufficient length to penetrate the ventilation gap beam (minimum **50 mm**), the layer of insulation and enter the rafter beam to a depth of minimum **50 mm**.

NOTE: End 90° fasteners are installed in the eaves and ridge at a distance of 400 mm from the eaves and ridge respectively, for the rest of fasteners the pitch shall be 900 mm. End 60° fasteners are installed in the eaves and ridge at a distance of 150 mm from the eaves and ridge respectively, for the rest of fasteners the pitch shall be 600 mm. To install fasteners at 60° it is possible to use a factory or self-made template-protractor.



5.

**Diffusion
membrane**

5. Diffusion membrane

5.1. Basic principles of diffusion membrane installation

- This is a diffusional layer protecting wooden framing and thermal insulation layers from the effects of sunlight, wind and atmospheric precipitation, and ensuring at the same time exit of vaporized moisture from thermal insulation;
- In case of stone wool thermal insulation installation diffusion membrane is mandatory requirement;
- If thermal insulation is made from LOGICPIR boards with sealing of joints by self-adhesive tape, diffusion membrane may not be installed;
- Do not install diffusion membrane in direct vicinity of open fire sources;
- If wooden roofing elements are subject to chemical treatment, application of this material is allowed only after the wood treatment composition is completely dry and not earlier than **24 hours** after treatment.

5.2. Installation of diffusion membrane



Unroll the membrane on top of the roof perpendicular to the rafters. It is recommended to lay the membrane on top of stone wool insulation without any gap.



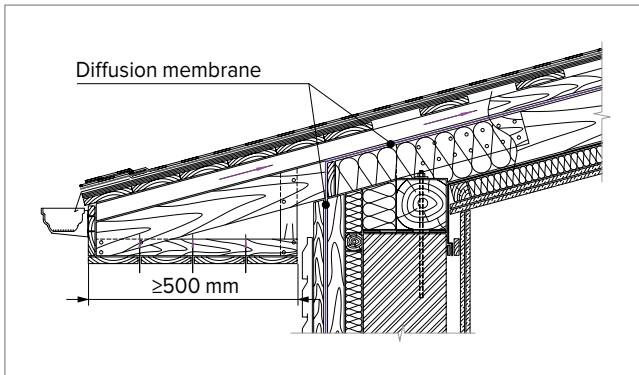
It is mandatory to fix the membrane with counter battens nailed to the rafters.

NOTE: It is not allowed to use staples or nails directly on the membrane without a wooden plank placed on top of the membrane for fixing.



When laying the membrane, overlap the sheets by at least **100 mm** horizontally and vertically. Overlaps of membrane sheets must be sealed with sealing tape.

NOTE: In places where TECHNOMICOL membrane joins the structural elements, sealing with joining tape or glue sealant is mandatory. If the membrane is torn, it is possible to seal it with similar tapes.



6.

Preparation of roofing base

6. Preparation of roofing base

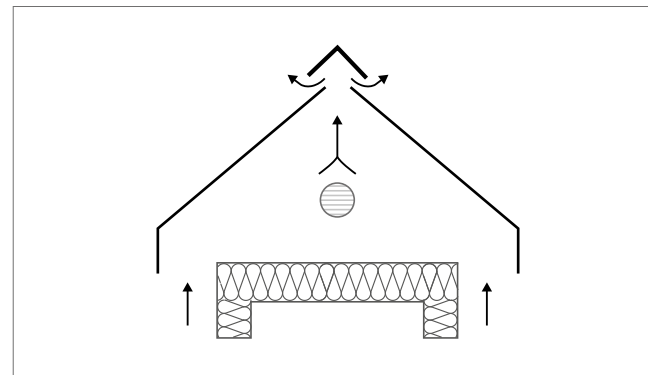
6.1. Arrangement of ventilation

The rafter system and other load-bearing elements of the structure shall be designed and constructed in compliance with construction regulations acting in the region of construction. Before installation it is necessary to wait until the framing of wooden building and the wooden base itself are settled over entire area.

Under-roof ventilation ensures long service life of the roof and improves microclimate in the building, prevents leaks, eliminates condensate and prevents rotting. With a properly designed roof, ventilation is going on without any mechanical devices or electricity consumption.

6.1.1. Arrangement of ventilation for a cold roof

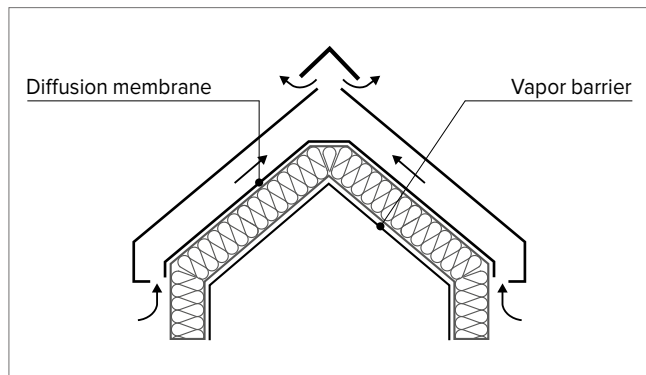
When designing a cold roof (with no thermal insulation between rafters) it is required to prevent thermal exchange between residential premises and the attic by insulating of the attic floor and sealing of ventilation ducts and chimney, passing through the attic. It is necessary to ensure intensive ventilation of entire attic space by ambient air.



In case of natural ventilation of attic spaces, the most efficient way is to locate ventilation openings under the roof overhang evenly along the perimeter of the building and in the roof ridge over its entire length. With such arrangement the ventilation openings under roof overhangs work for intake, while in the ridge the openings work for extraction. Such arrangement of ventilation openings ensures intensive air exchange within entire attic space.

6.1.2. Arrangement of ventilation for a operated warm attic

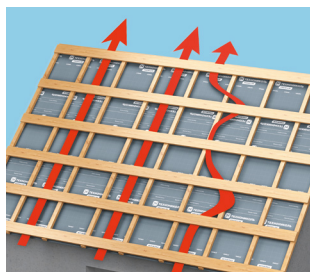
When designing a roof with a warm mansard, it is necessary to prevent heat loss into under-roof space, installing a high-quality thermal insulation and providing for efficient ventilation of entire under-roof space by ambient air.



The system of under-roof ventilation comprises three main elements: fresh air intake opening, ventilated gap for air circulation and extraction openings in the top portion of the roof (usually in the ridge area).

6.1.3. Space battens for creation a ventilation duct

Proper ventilation is necessary for normal functioning of the roofing.



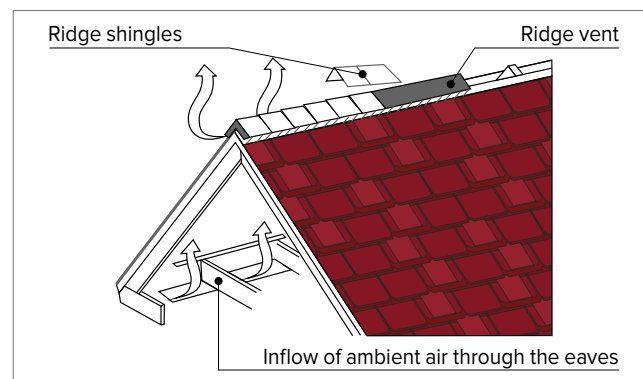
Ventilation duct above the thermal insulation and diffusion membrane shall have airway height of **50 mm** if the roof pitch angle is more than **20°**. If the roof pitch angle is reduced (less than **20°**), the height of airway shall be increased to **80 mm**.

Ventilated duct is constructed with wooden ventilation space battens. Pitch of beams shall match the pitch of rafters. Beam is fixed mechanically: for system with stone wool insulation by ring shank roofing nails or self-drilling wood screws; for system with insulation from LOGICPIR with special fasteners through a batten to create a ventilation duct.

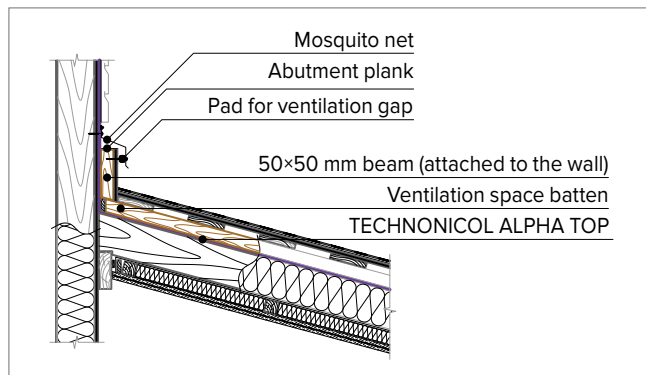


NOTE: It is necessary to ensure unrestricted air flow within the ventilation gap, for that purpose counter-battens are installed on top of ventilation space-battens to provide a ventilation gap. Interruption of air flow is not allowed. In case when the roofing base is made from wooden boards, 50 mm crossflows (ventilating cuts) shall be made in ventilation space-battens every 1.5 m.

The air must freely enter the ventilation gap and exit from it. Therefore, airways must be provided in the eaves area as well. Extraction ventilation systems are represented by ready-made ridge and spot air vents.



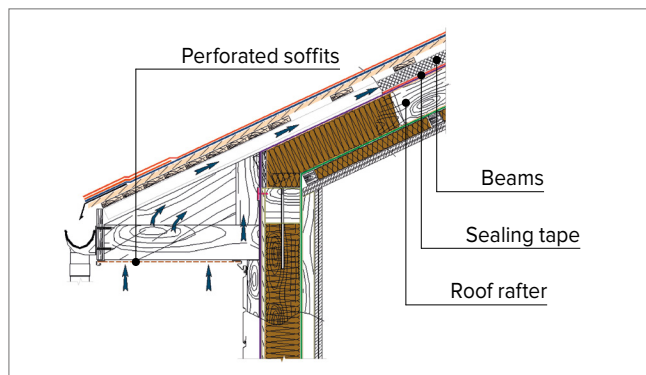
When roofing abuts the wall, ventilation openings shall also be provided.



NOTE: Failure to observe above recommendation on ventilation arrangement may result to accumulation of moist resulting in condensate on the rafters and sub-structure, further leading to development of mold and fungi, destroying wooden elements, overheating of the roofing material, moistening of thermal insulation and increased costs for air conditioning inside.

6.2. Counter battens

Clear distance between battens in regular zone: according to calculation; in eaves overhang: continuous base from wood boards to a width from the edge of eaves overhang to internal surface of the wall. Attach by **2 nails** or self-drilling screws per joint.



Arrange cross-joint of two elements of counter battens in one row so that the joint is on the rafter beam, fix mechanically by 2 pcs. per each board end. Attach by nails or self-drilling screws.

Joints of counter battens in neighboring horizontal rows must be shifted by at least one rafter span. Board length must be not less than two rafter spans.

6.3. Continuous base

Base surface for laying of roofing shingles by TECHNICONIC shall be dry, continuous, rigid and even. Height differences must not exceed **1-2 mm**.

Installation of large-sheet decking must be done with shifting of joints, fixing is done with ring-shanked roofing nails or self-drilling wood screws. FSF EN 300 plywood may be used for decking; when installing, leave **3-5 mm** gaps between sheets to compensate for linear expansion.

OSB-3 sheets may be fixed to wooden beams and rafters by wood screws, nails or staples in compliance with instructions of manufacturer. Wood screws are different by having a large-pitch thread and sharply shaped tip, the shank is cylindrical or conical. Screw diameter must be not less than **4.2 mm**.

NOTE: It is not allowed to use gypsum board screws.

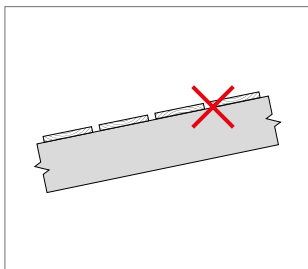
OSB-boards have a tendency to change their linear dimensions depending on the temperature and humidity, therefore, such boards shall undergo ageing at the construction site in order to avoid deformation of a finished roofing cover.

Recommended thickness of OSB-3 decking for shingles is not less than **12 mm** for multilayer roofing shingles and **9 mm** for single-layer roofing shingles.

On domed and conical surfaces of small radius it is possible to use for decking **2 sheets** of FSF plywood **6 mm** thick placed in **2 layers** with staggered joints.

Selection of continuous base thickness depends on the rafter pitch, cross-section and pitch of wooden battens. Minimal pitch of counter battens for a base made from **9 mm OSB-3** must be not more than **300 mm** along axes.

6.3.1. Grooved or edged board



When installing a continuous wooden decking, see that the fragments of annual ring on wood boards are oriented with their convex part down.

Before laying it is necessary to select thickness of boards so that the thickness of decking is changed gradually, thicker boards must be placed closer to the eaves overhang. Board joints lengthwise must be located on supports, use no less than **4 nails** to fix the joints.

If wet wood is used, ends of grooved or edged boards are to be fixed with two self-drilling screws on each side.

Treat all wooden elements (except for OSB-3 or FSF plywood sheets) of rafter system with wood antiseptic. In addition it is recommended to treat all wooden elements of roof structure with fire and wood protection composition.

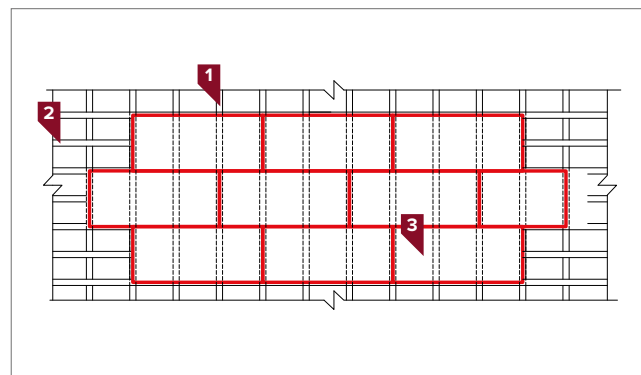
6.3.2. OSB-3 or FSF



Install continuous decking with staggering of the joints. Minimal displacement of a joint shall be equal to rafter pitch.



Leave a **3-5 mm** gap between sheets. Fix by ring-shanked roofing nails or self-drilling wood screws.



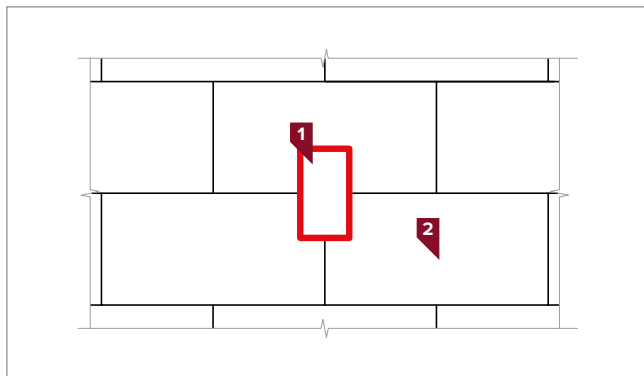
1. Rafter beam;
2. Counter battens;
3. Continuous decking from OSB-3.

Place sheets of continuous decking so that the main axis (long side) is perpendicular to the rafter beams. Horizontal joints (long edges) must rest on an auxiliary support (counter battens).

Position fixing nails along the perimeter of the sheet with a pitch as per the calculation.

To avoid tightness in the center of a valley membrane, place a board with a width equal to the chute. Therefore, the angle of cover bending is less acute.

When installing a skylight on the roof, ensure staggering of continuous base sheets, avoid alignment with window planes.



1. Skylight;
2. Wooden decking (OSB-3, FSF).

6.4. Reinforcement of eaves overhang



Eaves overhang of the roof is reinforced with metal eaves strips.



Place the strips with the rib on the edge of continuous base before the underlayment is installed. Attach by roofing nails in staggered arrangement with a pitch of **120-150 mm**.

NOTE: Eaves strips must be connected to each other with an overlap of 30-50 mm.



Before making the valley or a hip cut the eaves strip to suit place, leaving a part of strip for going on the opposite slope.



Fix the eaves strip in the valley using roofing nails.



Strips covered with granules have special **5 cm** wide overlapping areas.

6.5. Installation of underlayment

- Before placing the underlayment on the roof, unroll it and leave to lie freely. Installation of membranes on a humid base is not allowed;
- Installation of underlayment with mechanical fixing must be carried out within the same temperature conditions (without sharp changes of temperature, for instance from evening to morning);
- When unrolling the material on the surface and fixing it, ensure that the underlayment is tight and, when fixing, see that it lies on the base without waves or folds;

- If installing mechanically fixed underlayment in a cold period (at an ambient temperature from **0** to **+5°C**), keep the materials before installation in a room at **23°C** temperature for at least **24 hours**. Bring the materials on the roof by portions in a quantity that would be fixed immediately;
- Installation of self-adhesive underlayment must be done at ambient temperature no less than **+10°C**;
- It is allowed to install self-adhesive underlayment within a temperature range from **0** to **10°C**. In this case the materials shall be stored in a warm room at **23°C** temperature for at least **24 hours** and delivered onto the roof by portions in a quantity that would be fixed immediately with additional mechanical fixing by ring-shank roofing nails after installation;
- Additional warming of binding bitumen mix on self-adhesive underlayment by hot air guns with air feed temperature not above **70°C** is allowed if ambient temperature is from **0** to **+10°C**. Use of gas torches for installation of these materials is prohibited.

6.5.1. Installation of self-adhesive membranes



Installation of self-adhesive underlayment begins from valley area.



Try the membrane to suit place and align by the middle. Fold the membrane in half by length.



Neatly cut the protective film along entire length of the sheet.

NOTE: Do not damage the underlayment when cutting the protective film in order not to break the tightness.



Remove the protective film from one part of underlayment.



This part of the underlayment is glued to the base. When fixing, be careful to flatten the sheet avoiding wrinkles.



Then, similarly, remove protective film from the other part of the underlayment.



Then glue the underlayment sheet to the base entirely.

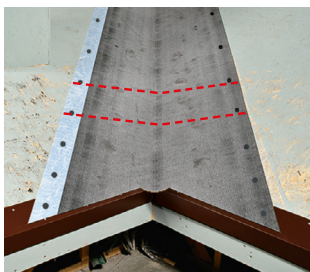
NOTE: When cutting the material, place under top sheet a rigid support (a piece of plywood, etc.) to avoid damage to the bottom sheet.



On eaves overhang cut and lay the underlayment so that there is a **10-20 mm** gap to the bend of the eaves strip. On the bottom end of a valley cut the membrane with a slight rounding ("tab") so as to close the eaves strip joints in the valley and ensure correct water drainage.



At ambient temperature from **0 to +10°C** additionally fix the underlayment by large head roofing nails. The distance between the nails must be **300 mm**.

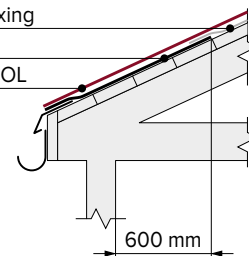


If there is an overlap of material in the valley area, such overlap is arranged at the upper part of the valley. The width of a cross overlap in the valley area must be **300 mm**.

Cross overlap of ULTRAFLEX SA underlayment is to be sealed with a thin layer of MASTIC TECHNOMICOL FIXER. Arrangement of cross overlap for UNDERLAY NEXT SELF underlayment does not require any mastic application.

Thereon self-adhesive underlayment is laid along the eaves overhang to the width of eaves overhang plus **600 mm** from the inner wall plane to the inside of the building or structure.

Underlayment with mechanical fixing
Self-adhesive underlayment
Roofing shingles by TECHNOMICOL



Align and glue part of the membrane to the base, roll up the remaining part to the glued portion.



Then glue the remaining part of membrane unrolling the material and removing protective film therefrom at the same time.



Cross overlaps are 150 mm. Cross overlap of ULTRAFLEX SA underlayment is to be sealed with a thin layer of MASTIC TECHNOLICOL FIXER. Arrangement of cross overlap for UNDERLAY NEXT SELF underlayment does not require any mastic application.



Perform mechanical fixing of the material using ring-shank roofing nails in the area of long overlap. Distance between nails is **150 mm**, nails to be placed in staggered order.



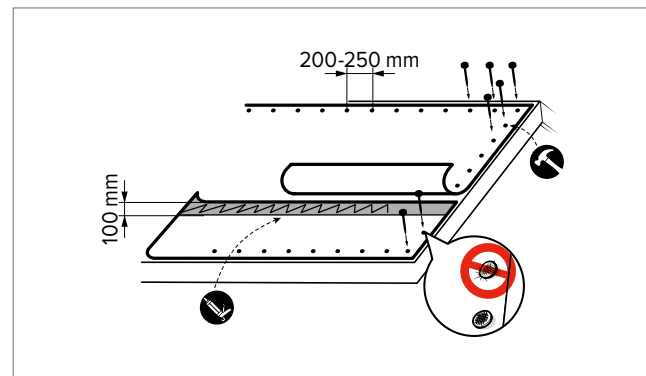
Place the next sheet of material on top of fixed sheet.

6.5.2. Installation of underlayment with mechanical fixing

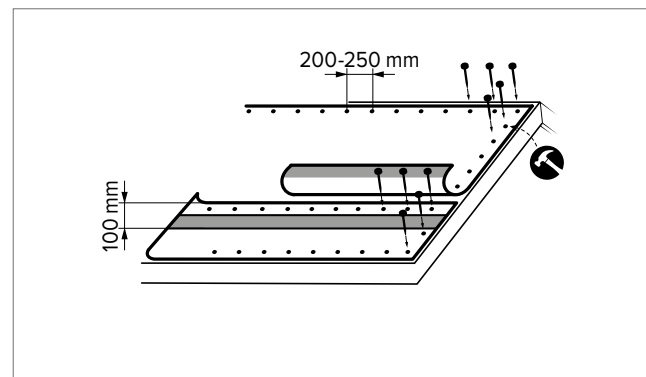


Try the underlayment to suit place, spread, fix and tighten so that there are no waves or folds between nails.

Fixing of UNDERLAY PRO (S) 500, UNDERLAY BASE 900, UNDERLAY BASE 1500



Fixing of UNDERLAY PRO (S) 500 stick, UNDERLAY BASE 1500 stick



6.5.3. Main rules for installing underlayment

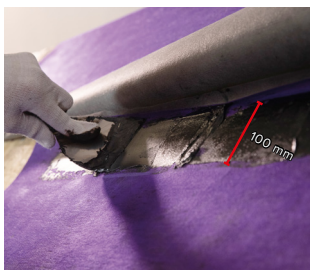


Underlayment is fixed to base by special zinc-coated roofing nails with a large head.

NOTE: Nail head must tightly press the membrane to base but not punch it. Directly before nailing the underlayment spread and tighten the material to remove any folds or irregularities.



Places where mechanically fixed underlayment overlap each other must be sealed with MASTIC TECHNONICOL FIXER. Thickness of applied mastic layer must not exceed **1 mm**. The width of a cross overlap must be **150 mm**.



Long overlap of underlayment must be **100 mm**. Long overlaps of underlayment UNDERLAY PRO (S) 500, UNDERLAY BASE 900 and UNDERLAY BASE 1500 are sealed with MASTIC TECHNONICOL FIXER in not more than **1 mm** thick layer.



To seal the long overlap of UNDERLAY PRO (S) 500 stick, UNDERLAY BASE 1500 stick membranes match the thermo-active strips of the top and bottom sheets and remove protective films.



Long overlaps of UNDERLAY PRO (S) 500 stick, UNDERLAY BASE 1500 stick are sealed with adhesive mounting strips. To seal the overlap remove protective films from the top and bottom sheets at the same time and tightly press the sheets together.



The distance between cross overlaps of neighboring sheets must be no less than **500 mm**.

NOTE: Install the material on a dry, rigid, even water-resistant base free from dust and debris. Before installation it is necessary to wait until the framing of wooden building and the wooden base itself are settled over entire area (releasing all accumulated moisture) in order to exclude possibility of waving and unevenness of the installed roofing.

6.6. Reinforcement of gable overhang



Gable overhang of the roof is reinforced with metal gable strips. Place the gable strip on top of the underlayment with an overlap of **30-50 mm**, preliminarily cutting the strip to place.



Attach the strip by roofing nails in staggered arrangement with a pitch of **120-150 mm**.

There are two types of granule covered strips – left and right, depending on the position of area free from granules. During installation the strip is placed so that the strip edge without granules coat was oriented towards the ridge.

6.7. Preparation of valley

Installation of roofing shingles by TECHNOMICOL in the valley may be performed by two methods: open method and "cutting" method. Preparation of valley depends on a selected method. The open method is described below. The "cutting" method of shingles installation a separate valley roll material is not required. More detailed installation of this method is described in next chapter.

Due to the open method, valley roll material is placed along the valley axis on top of self-adhesive underlayment.

NOTE: Valley roll material must be laid with a 20-30 mm displacement relative to underlayment.



Valley roll material must be cut at the bottom with a small rounding ("tab").



Fold the valley roll material along entire length of the valley, press the folding line.

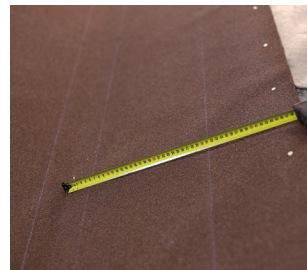


Then unfold the valley roll material.

NOTE: Carefully flatten the cover sheet avoiding wrinkles and unevenness.



Seal the valley roll material on the periphery from the back side with MASTIC TECHNOMICOL FIXER bitumen mastic applied to a width of **100 mm**.



Fix the valley roll material from the face side with special roofing nails placed at **20-30 mm** distance from the edge at a pitch of **200-250 mm**.

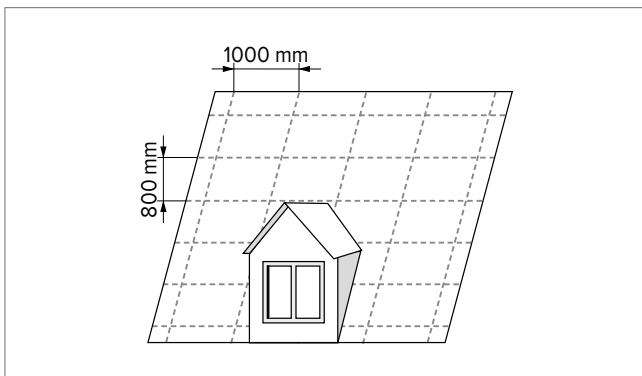


Whenever possible try to use a continuous length of valley roll material (without overlaps) for entire valley length. Otherwise, place valley roll material with overlaps, thoroughly sealing the joint at the upper part of the roof. The overlap shall be **300 mm** wide.

NOTE: In case of applying the open valley method, it is possible to use a metal sheet with anti-corrosive coating instead of valley roll material (recommended for hot climate regions).

6.8. Slope marking

Marking lines act as guidelines and help to align roofing shingles by TECHNONICOL both vertically and horizontally. Moreover, marking lines help to align shingles when there is some roofing element on the slope or when the geometry of the roof slope is not right. The pitch of vertical lines corresponds to the width of regular shingles, while the pitch of horizontal lines covers every **5 rows** of shingles (**800 mm**).



NOTE: The marking lines are no more than guiding lines. They are not precise orientation to follow when nailing shingles.

7.

Installation of roofing shingles

7. Installation of roofing shingles

7.1. General recommendation

Do not use products with different color codes on the same roof. In order to minimize tonal misbalance, shuffle the contents of **5-6 packages** randomly.



If the ambient temperature is below **+5°C**, additionally warm up the self-adhesive strip on the shingles with a hot air gun.

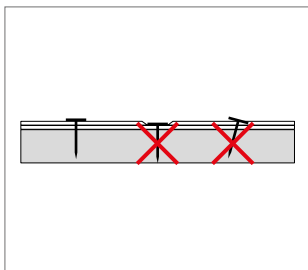


When cutting shingles on the roof, place under them a piece of board, plywood or other material to prevent the underlayment from cutting. Shingle sheets must be installed perpendicular to water run-off direction.

NOTE: To avoid stains and traces of footwear, do not walk on roof in sunny weather at temperature above **+25°C**. For movement along the roof slope use work platforms installed on special brackets.

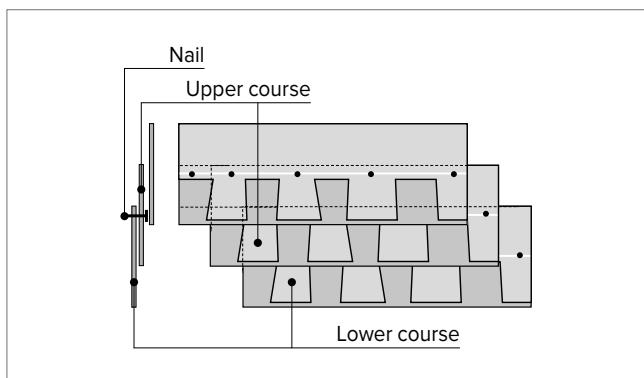
7.2. Fixing the course shingles

Every sheet of course shingles is fixed to the roof base by special zinc-coated wide head nails, the number of nails depending on the roof pitch angle. Correct nailing with special nails is a very important factor.



Drive in the nails so that the nail head stays at the same level with the surface of shingles by TECHNOMICOL material without punching it.

In correct installation procedure the nail goes through two shingle sheet courses.



NOTE: When shingles are cut in a “Castle” pattern, the nail must fix the overlapping of two parts of shingles. For guidance there is a special installation line applied at the factory on the face surface of laminated shingles. For all multilayer roofing shingles collections that are cut in a “Castle” pattern, nails must be set so that the places of fixing do not coincide with the shingle joint of the next row.



For speed up the work and increase labor productivity, use special nail guns.

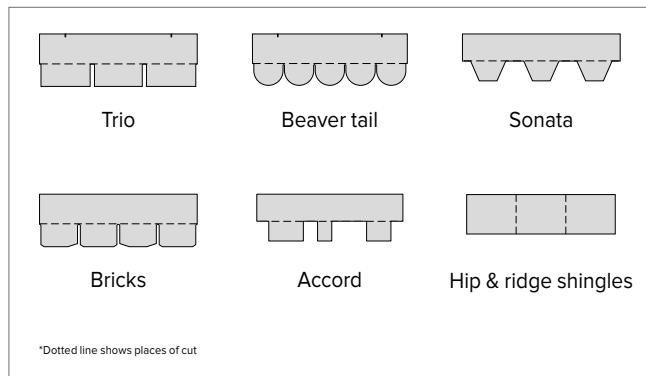
7.3. Fixing the starter course shingles

For the starter course it is possible to use multi-purpose hip & ridge shingles, a cut made from regular shingles or just regular course shingles. Options for arrangement of a starter course depend on the cut pattern of shingles.

CUTTING PATTERN	STARTER COURSE ON THE EAVES
Sonata	HRS / cut from regular shingles
Accord	HRS / cut from regular shingles
Trio	HRS / cut from regular shingles
Beaver tail	HRS / cut from regular shingles
Bricks	Course SH
Castle	HRS
Western	HRS
Continent	HRS
Atlantica	HRS

HRS is TECHNOMICOL hip & ridge shingles; cut from regular shingles – a shingle sheet with cut tabs divided according to the cutting pattern.

For cutting patterns “Sonata”, “Accord”, “Trio” and “Beaver tail” the starter sheet may be cut from a regular course sheet. In case of “Castle” cut pattern the starter course is laid using regular course shingles without preliminary cutting.

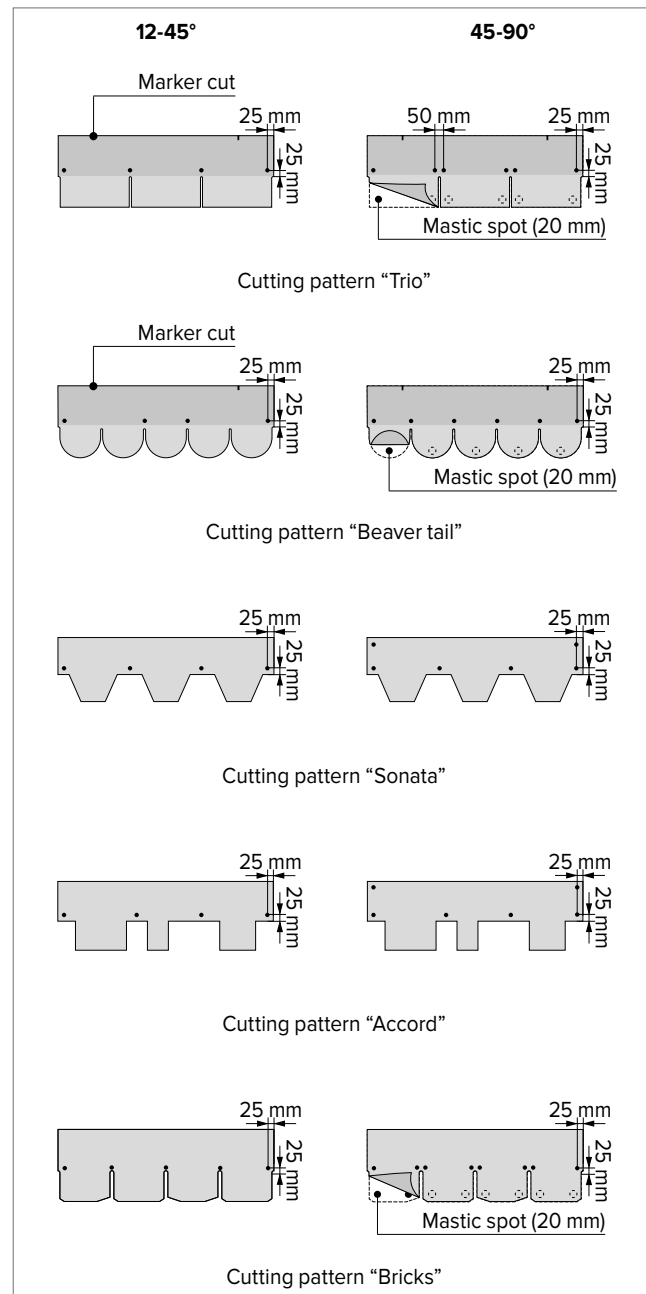


In case of making cuts from regular course shingles cut the sheet tabs along the marked line.



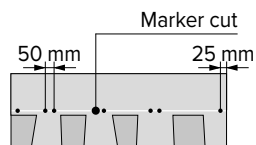
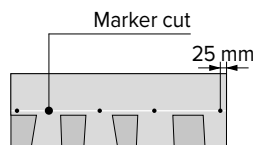
If necessary, remove film from cut sheets.

NOTE: For all collections of multi-layer shingles by TECHNOCOL cut in the “Castle” pattern DO NOT REMOVE anti-adhesion film that has “do not remove” marking.

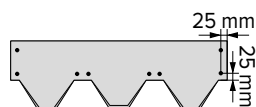
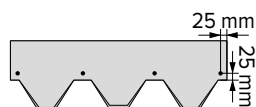


12-45°

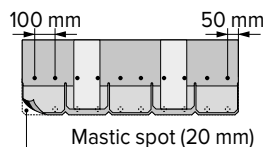
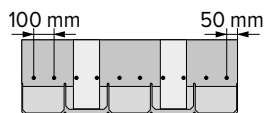
45-90°



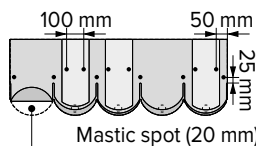
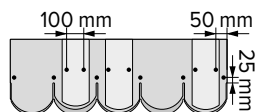
Cutting pattern "Castle"



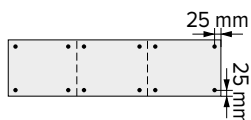
Cutting pattern "Western"



Cutting pattern "Continent"



Cutting pattern "Atlantica"



Hip & ridge shingles

Double-layer shingles reinforced with glass fibers – is an innovation from TECHNOCOL. Due to reinforcement the general wind resistance is improved and the strength of the roof covering and attachment zones is higher. Better flexibility at the place of layers overlap provides for more comfortable installation at lower temperatures. Exquisite color palette, the play of hues and a 3D effect create an impression that the roof is made from natural piece material: wood shakes or slates.



In case of cutting a starter strip from regular course shingles or using regular course shingles for a starter course, cover the back side of shingles where adhesive layer is not present with MASTIC TECHNOCOL FIXER applied in a layer maximum **1 mm** thick.

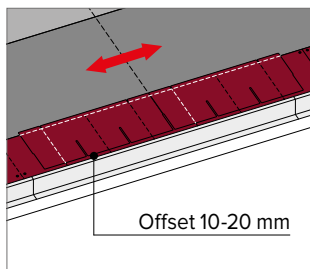


Hip & ridge shingles, cuts from regular shingles or regular course shingles, are glued on top of underlayment with a **10-20 mm** offset from eaves strip bending place. Offset distance depends on the length and roof pitch angle; if these are increased, the offset is increased as well.



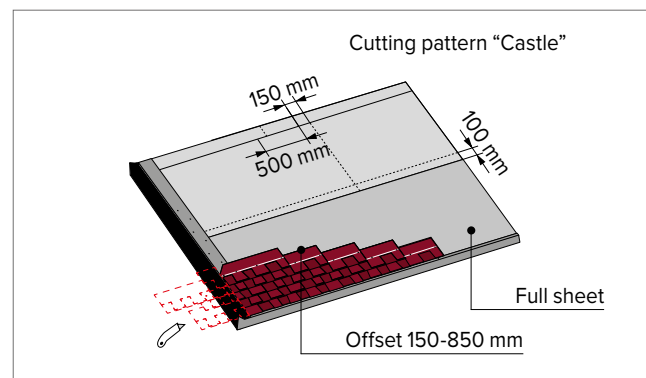
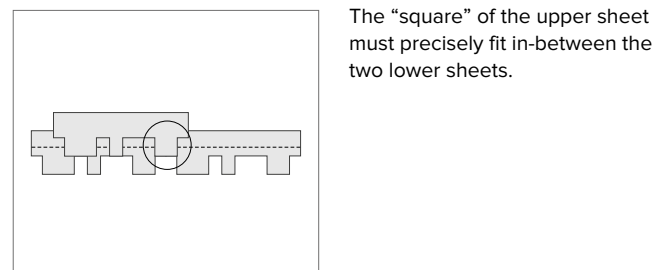
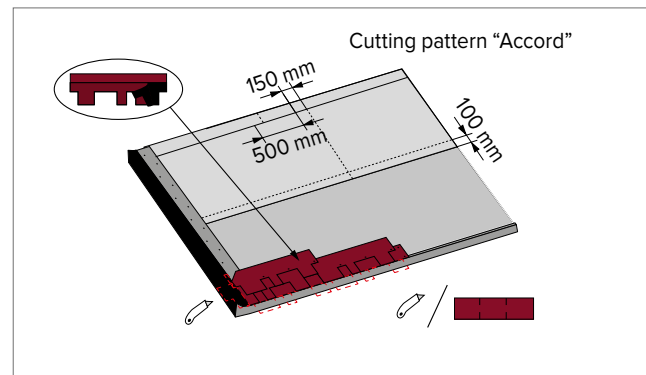
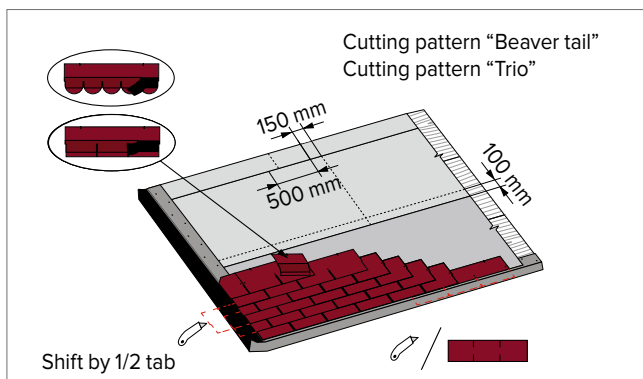
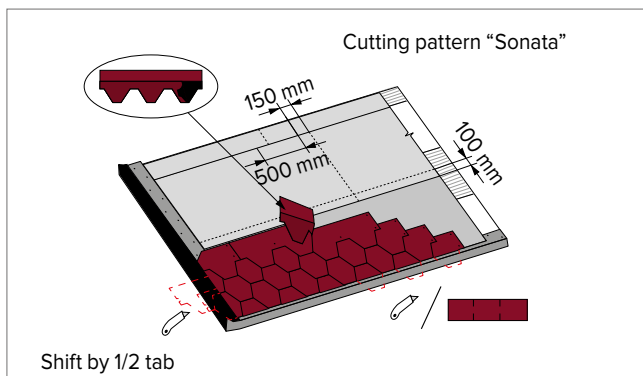
Fix the hip & ridge shingles and cuts from regular shingles using roofing nails in quantity not less than **12 nails** per sheet. Fix the regular course shingles as per the diagram.

7.4. Fixing the first and subsequent rows of course shingles

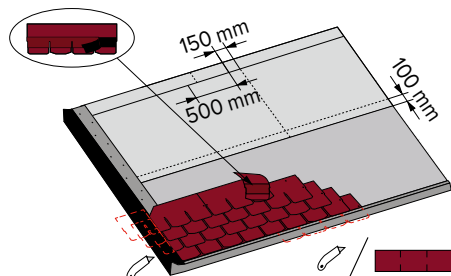


On long slopes it is recommended to start the first course from the slope center thus ensuring convenience for horizontal levelling. The first course is laid with a **10-20 mm** offset from the starter course.

NOTE: The first course of shingles must cover fixing places of the starter course. Carry out installation in diagonal strips.

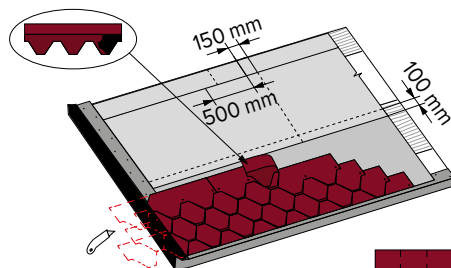


Cutting pattern "Bricks"

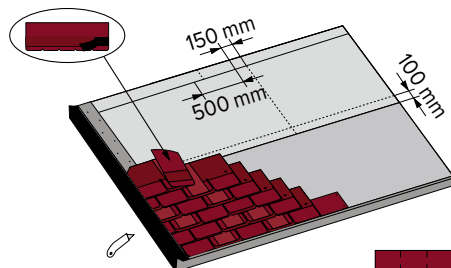


Shift by 1/2 tab

Cutting pattern "Western"

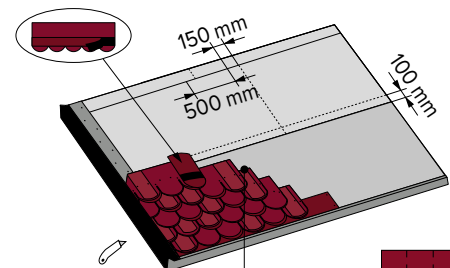


Cutting pattern "Continent"



Shift by 1/2 tab

Cutting pattern "Atlantica"

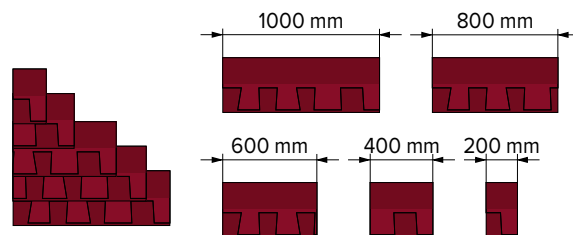


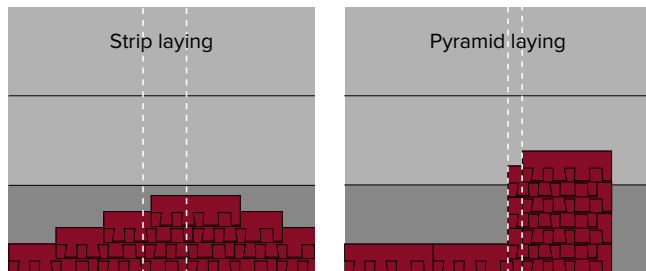
Offset 100 mm

Start the second course from the slope center moving by half a tab to the left or right. Nail the shingles so that the lower edge of the tabs is at the same level with top edge of the cuts in the first course of shingles.

Place the third course moving shingles by half a tab to the left or right relative to the second course depending on the initially selected direction.

Start laying shingles from the slope center in a form of a strip or a pyramid.





For maximum efficient protection from slanting rain, cover the course shingles in the gable area with MASTIC TECHNONICOL FIXER.



Bitumen mastic is applied both on the gable strip and the non-visible part of shingle sheet that joins the gable strip. Apply a layer of MASTIC TECHNONICOL FIXER in a layer maximum **1 mm** thick to a width of **100 mm**.



Install shingles with a **15-20 mm** offset from the inner bend of the gable strip. For three-layer shingles select the sheets so that the hips, faces and gables are joined by the two-layer part of the sheet.

NOTE: Cut upper corners of shingles by TECHNONICOL that join the metal gable strip by 20-30 mm in order to repel water.



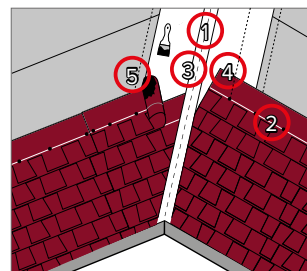
Minimal distance between the gable and fixed shingle sheet shall be no less than **200 mm**.



Fix a cut piece made from regular course shingle sheet no less than **200 mm** wide minimum by **2 nails**.

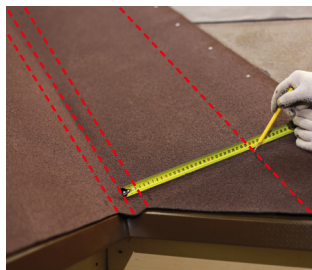
7.5. Valley arrangement

7.5.1. Open valley method



1 – central axis of valley;
2 – line of fixing shingles (distance no less than **300 mm** from valley axis); **3** – cutting line (distance no less than **25-75 mm** from valley axis); **4** – cutting shingles to repel water; **5** – applying mastic on the back side of shingles.





Mark out the valley roll material cutting lines towards the valley axis. Width of valley chute is varying from **50 to 150 mm**. If the building is surrounded by trees, increase the chute width for unrestricted removal of tree leaves. Recommended chute width is **70 mm**. Mark out the line of fixing shingles placed at a distance no less than **300 mm** from valley axis.



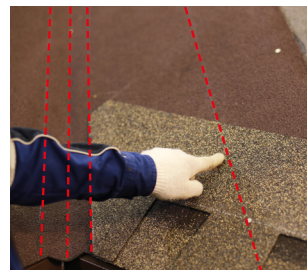
Apply the marked cutting and nailing lines using a chalk line.



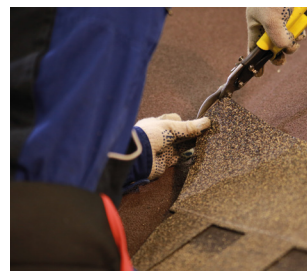
Lay the course shingles to the cutting line towards the valley axis and mark out the cutting line.



Cut the course shingles along the cutting line, when cutting use a piece of wood board not to damage the waterproofing layer.



Fix every sheet of shingles on each slope surface placing roofing nails along the nailing line (at a distance no less than **300 mm** from the valley axis).



Cut every sheet of shingles by **20-30 mm** to repel water in the valley.



Cover shingles with MASTIC TECHNICONICOL FIXER applying it to the back side in a layer maximum **1 mm** thick to a width of **100 mm** where there is no self-adhesive layer.



Coating of shingles with MASTIC TECHNICONICOL FIXER is to be done on each surface of the slope.

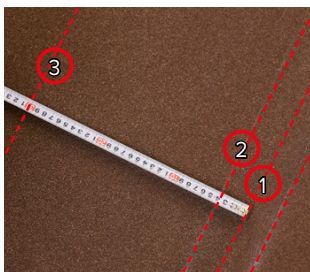
NOTE: Apply mastic not only on the valley roll material but also on the below course of shingles to ensure better waterproofing.



Valley installed by open method.

NOTE: If water drainage from slopes is significantly different, move the valley chute towards poorer drainage in order to compensate washing by water of the joint between the course shingles and valley roll material.

7.5.2. Californian method



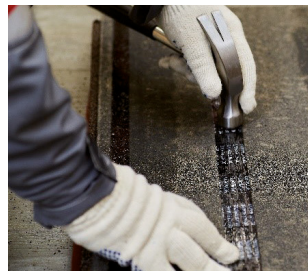
Mark out the valley roll material:
1 – central valley axis; **2** – installation line of vertical sheet set off by **40 mm** from central valley axis to both sides; **3** – line of fixing of vertical sheet of shingles at a distance no less than **300 mm** from valley axis.



Apply the marked lines for installation of vertical sheets and lines for nailing of the vertical sheet using a chalk line.



It is allowed to additionally reinforce the sheets lamination with zinc-coated staples using a construction stapler.



Bend the staples from the back side in order not to damage the valley roll material. Before nailing, apply mastic to the back side of the sheet to a width of **100 mm** from the valley chute.



Install the prepared sheets parallel to the valley axis, fixing them with roofing nails by **5-8 nails** per sheet depending on the roof pitch angle. To **45°** – **4 nails**, more than that – **8 nails**.



Cut a corner of sheet protruding beyond the limits of slope so that there are **10-20 mm** left to the edge of eaves strip.



Follow the same procedure to install sheets on the neighboring slope.



Install horizontal regular course shingles from the line of vertical sheet installation. Mechanical fixing must be done at a distance of **300 mm** from the valley axis. Follow the same procedure to install course shingles on the neighboring slope.

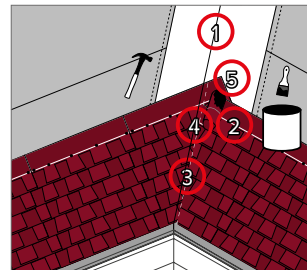


Cover the back side of sheets that join the valley in places where there is no self-adhesive layer with MASTIC TECHNICONICOL FIXER at a distance of **100 mm** in a layer no more than precisely **1 mm** thick.



"Californian" valley is ready.

7.5.3. Cutting method



1 – central axis of valley;
2 – line of fixing shingles (distance no less than **300 mm** from valley axis); **3** – cutting line (distance no less than **70-80 mm** from valley axis); **4** – cutting shingles to repel water; **5** – applying mastic on the back side of shingles.



Mark out on the underlayment the shingle nailing lines at a distance no less than **300 mm** from the valley axis.



Lay the shingles starting from the less angled slope overlapping to the more angled slope to a distance of no less than **300 mm**. Apply the marked nailing line using a chalk line.



Fix every sheet of shingles placing roofing nails along the nailing line (at a distance no less than **300 mm** from the valley axis).



Do not place the roofing nails closer than the nailing line (at a distance of **300 mm** from the central valley axis).



Apply the marked cutting line on the more angled slope using a chalk line (at a distance of **70-80 mm** from the valley axis). Place the shingles on the more angled slope (red contour) on top of the earlier installed shingles of the less angled slope (green contour) so that the shingle edge is passing the cutting line.



Cut the course shingles of the more angled slope along the cutting line, when cutting, use a piece of wood board not to damage the water insulation layer.



Cut every sheet of shingles by **20-30 mm** to repel water in the valley.



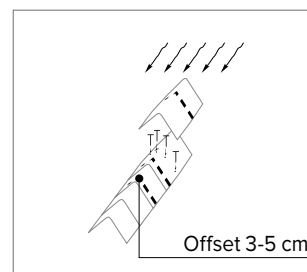
Cover shingles with MASTIC TECHNOMICOL FIXER applying it to the back side in a layer maximum **1 mm** thick to a width of **100 mm** where there is no self-adhesive layer.



Apply mastic not only on the shingles of the less angled slope but also on the below course of shingles on the more angled slope to ensure better insulation.

7.6. Roofing of slope hips and ridges

Roofing of hips and ridges is done with the hip & ridge shingles.



The ridge must be covered from the side opposite to the side of prevailing winds in the given area.



Before starting installation of covering on hips and ridge, divide hip & ridge shingles into **3 parts** as per perforation places; course shingles into **3 parts** as per the cutting diagram.



Remove anti-adhesion film from the back side of hip & ridge shingles.



Cut course shingles extending to the hip so that there is a **50 mm** distance between cover of joining slopes.



Do not fold the hip & ridge shingles in halves ("like a sheet of paper") as in this case the carrier (glass fabric) will break and cracks will appear on the face side of the shingles.



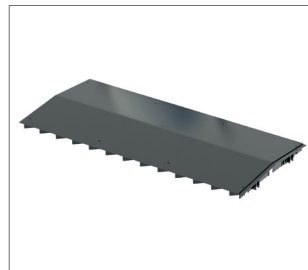
Lay the shingles from bottom to top after marking the limits of the future hip (two lines along the hip) with a chalk line. Fix every shingle with **4 nails** (by two on each side).



Fix the shingles with **30-50 mm** overlap. The edge of the upper shingle must close the nails of the lower shingle.



To ensure more solid appearance of the ridges and hips a double ridge method may be applied. The method includes placement of eaves-ridge shingles onto each other with an offset of **2 cm**.



In order to provide air extraction opening in the ridge, use a **TECHNONICOL** continuous ridge vent or **STANDARD** ridge vent.



Cut a **50-100 mm** wide opening in the continuous base along the ridge.



Fix the ventilation element by roofing nails or self-drilling screws not less than 41 mm long positioned in places marked at the manufacturing factory. The length of the ridge ventilation element is **500-610 mm**, if needed, two or more ventilation elements may be joined together.

NOTE: Fixing of ridge shingles through the ventilation element is to be done with special roofing nails no less than 60 mm long.



Fix by **2 nails** no less than **60 mm** long placing the nails along the nailing line marked on the ridge ventilation element.



Fix the shingles with **30-50 mm** overlap, the upper shingle must be closing the nails of the lower shingle.

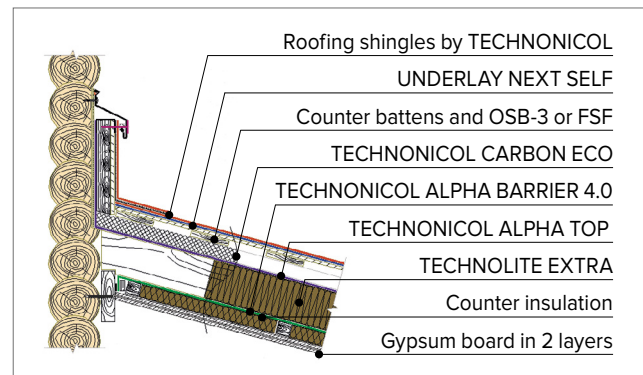


Ready ridge with ventilation element.

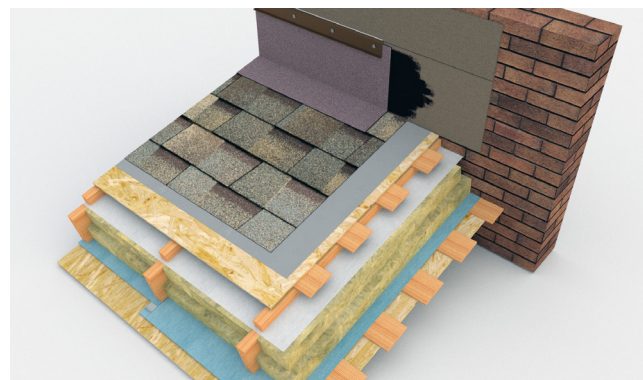
7.7. Arrangement of abutments

7.7.1. Abutment to a vertical surface

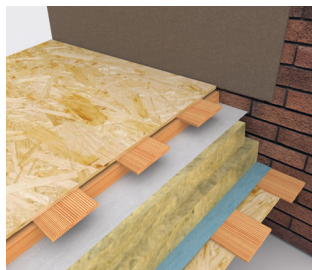
Direct abutment



General view of abutment for slope angle to vertical wall more than **135°** is presented below.



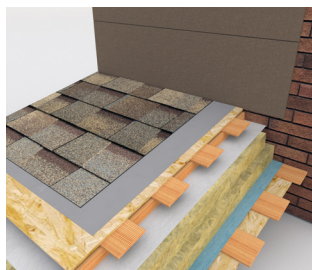
NOTE: If a direct abutment angle: is up to 135° inclusive – an angle fillet is required; if more than 135° – angle fillet is not required. A wooden beam 50×50 mm cut diagonally or an ordinary wooden plinth may be used as an angle fillet.



If the wall is made of bricks, it must be plastered and primed.



Cut a chasing at a height of no less than **300 mm** from the horizontal portion.



Install the underlayment and course shingles.



Apply MASTIC TECHNOMICOL FIXER onto entire back surface of pre-cut valley roll material. Width of membrane shall be not less than **500 mm**.



Place strips of TECHNOMICOL valley roll material on top of the course shingles: not less than **300 mm** shall be placed on the primed area, and **200 mm** – on the course shingles.

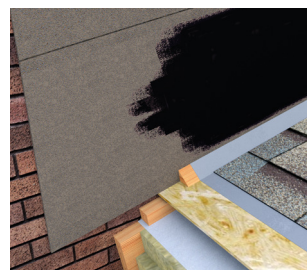


Mechanically fix the abutment cover. Seal the cover with a silicon, thiokol or polyurethane sealant.

Side abutment



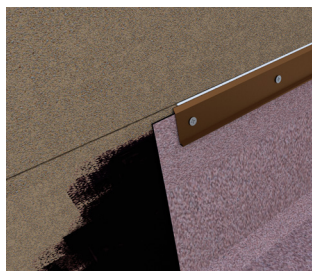
Arrangement of a side abutment requires installation of an angle fillet.



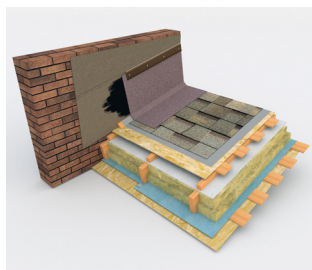
For a wall higher than **1 m** place the underlayment above the angle fillet extending the cover to the primed vertical surface. Install shingles until the angle fillet.



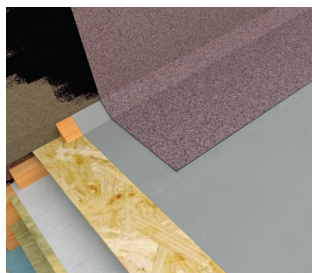
Glue the valley roll material on bitumen mastic in the same way as for the direct abutment, run the cover onto the primed surface by at least **300 mm**, on course shingles – by **200 mm**.



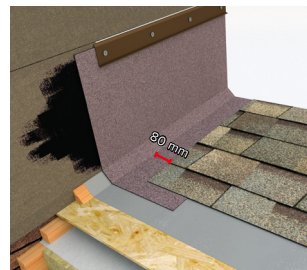
Mechanically fix the abutment cover. Seal the cover with a silicon, thiokol or polyurethane sealant.



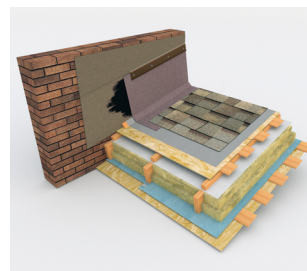
General view of a side abutment for a wall more than **1 m** high.



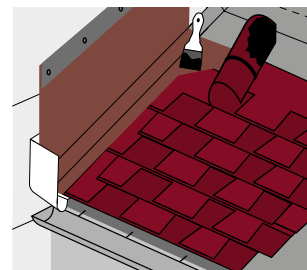
For a wall less than **1 m** high place the underlayment above the angle fillet extending the cover to the primed vertical surface. Glue the valley roll material on bitumen mastic: run the cover onto the primed surface by at least **300 mm**, on underlayment – by **200 mm**.



Mechanically fix the metal cover. Seal the cover with a silicon, thiokol or polyurethane sealant. Shingles must be extended to the pre-cut valley roll material so that the chute between the shingles and the angle fillet is **80 mm** wide.

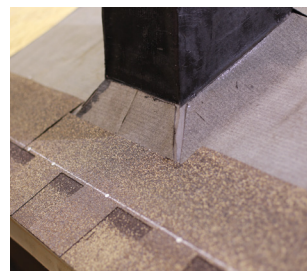


General view of a side abutment for a wall no more than **1 m** high.



If a roof slope ends with an abutment to a wall, make the abutment using valley roll material and install at the end of the slope a wall-mounted turning drain from the range of TECHNICAL plastic water drainage system.

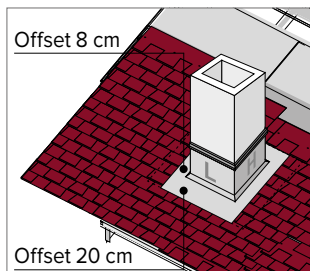
7.7.2. Joints with chimneys and ventilation pipes



When arranging joints with a chimney, install an angle fillet in the place where the roof slope joins a vertical surface. Extend the underlayment onto angle fillet, cut to suit place.

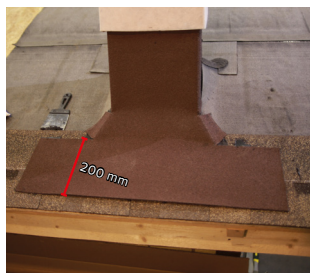
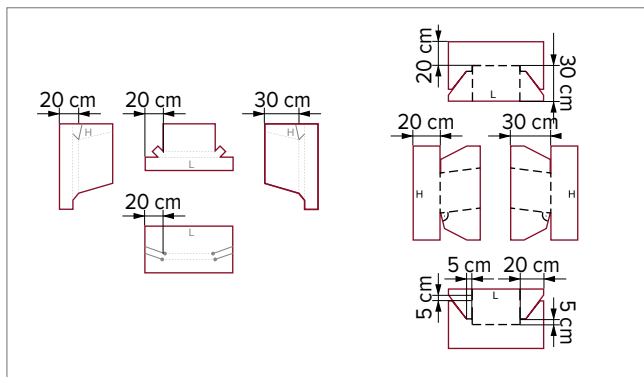
If the chimney is made of bricks, it must be preliminarily plastered and primed with BITUMEN PRIME COATING.

Then make a cut pattern from valley roll material. The pattern may be also made from metal with anti-corrosive coating.



The cut cover is installed onto vertical surface: no less than **300 mm** from the slope plane (depending on the snow load in particular region this value may change); onto horizontal section: **200 mm** (depending on the type of angle fillet used).

Obtained cut patterns are bent or undercut in certain places according to the diagram.

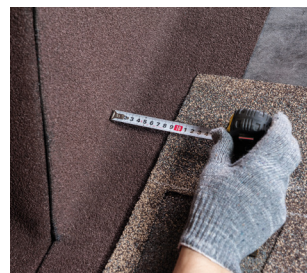


Install the face pattern extending it to course shingles by not less than **200 mm**.

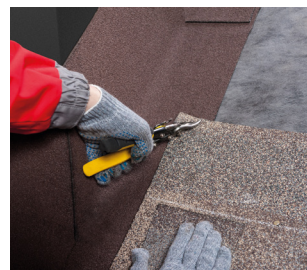
Install left and right parts that are to be extended under the shingles so that at a later stage to make a chute between shingles and angle fillet to a width of **80 mm**.



At the last turn install the back part that is to be extended under the shingles so that at a later stage to make a chute between shingles and angle fillet to a width of **80 mm**.



Lay the shingles. On the left and right parts the shingles are placed on the pre-cut valley roll material patterns so that the chute between the shingles and the angle fillet is **80 mm** wide.



Cut every sheet of shingles by **20-30 mm** to repel water in the valley.



In places where the cut pattern joins the course shingles cover the back side with MASTIC TECHNOMICOL FIXER to a width of **100 mm** where there is no self-adhesive layer.



Lay the shingles on the back side. Shingles must be extended to the pre-cut valley roll material so that the chute between the shingles and the angle fillet is **80 mm** wide.



Mechanically fix the joint cover.



Seal the cover with a silicon, thiokol or polyurethane sealant.



In case when the chimney is not rectangular (for example, round) as one of the sealing options a rectangular casing may be used with arrangement of the joint using a valley roll material.

7.8. Installing shingles on domed and conical surfaces

There are two recommended methods of installing roofing shingles by TECHNOMICOL on curvilinear surfaces – segmentary and seamless. In both cases primarily an underlayment is installed.

Segmentary method provides for dividing the surface of dome or cone into equal segments with the help of chalk line. Then course shingles are placed on each segment. Joints between segments are covered with ridge shingles similar to hips and ridges. The size of segments and width of ridge shingles must match the size of the surface to be covered.



Place marks at the dome base over every **900 mm**. This width is sufficient for ensuring overlap of the underlayment. Use chalk line to place vertical marking lines from dome center to the marks at the dome base.



Install the underlayment. For convenience of orienting the underlayment its center must be aligned with the marked vertical line. Use ULTRAFLEX SA, UNDERLAY NEXT SELF in places of bending (transition of horizontal slope to vertical surface of the dome) and at flatter sections of the dome. Use UNDERLAY PRO (S) 500, UNDERLAY BASE for the rest of the slope surface.



After installing the first vertical row of underlayment mark out the sector for cutting underlayment: use a chalk line to mark vertical lines from the dome center to each edge of the underlayment at the dome base.



Following the marked sector, cut the underlayment. Remaining cut pieces of membrane may be used for installation of subsequent sectors.

NOTE: If the radius of dome is large and the width of obtained cut pieces of underlayment is small, divide the dome into sections, each of which would be started with a full width of underlayment.



Fix the underlayment mechanically, seal overlaps with MASTIC TECHNONICOL FIXER.



Similarly, install subsequent sections of the underlayment.

NOTE: Underlayment must be installed by a cascade principle to avoid counter-flow in case of water getting on the membrane.



Prepare a pattern from valley roll material to seal the transition of horizontal slope to the vertical surface of the dome. The cut pattern is overlapped on vertical surface – no less than **300 mm**; on horizontal surfaces – no less than **200 mm**.

NOTE: Width of the pattern is selected to suit place as it depends on the dome radius.



Cut the valley roll material in equal parts. Cover the back side of the valley roll material with MASTIC TECHNONICOL FIXER.

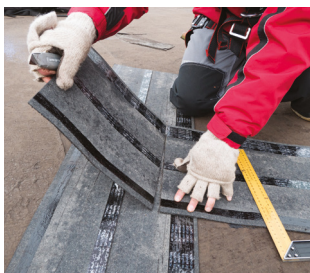
NOTE: Shift the joints of the underlayment and valley roll material.



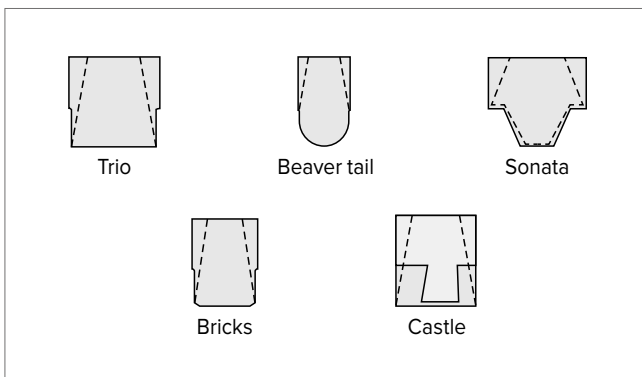
Fix the valley roll material mechanically, seal overlaps with MASTIC TECHNONICOL FIXER. Overlap should be minimum **100 mm**.



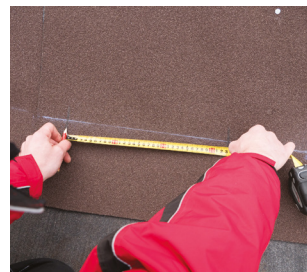
Similarly, install subsequent sections of the valley.



Cut a shingle sheet in **3 parts** – patterns of **330 mm** each.



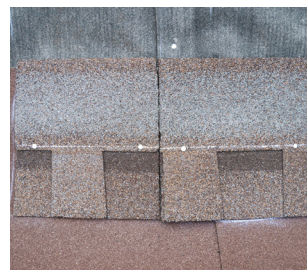
Mark a horizontal line along dome base with a chalk line – this line will serve as a starting line for laying of shingles.



Mark ticks over each **330 mm** on the horizontal line according to the pitch of shingle patterns.



Use a chalk line to mark out the dome with vertical lines – from dome center to tick marks made for shingle pattern cuts.



Cover the starting strip of a shingle pattern on the back side with MASTIC TECHNOCOL FIXER. Fix each shingle pattern by **2 nails**.



Install subsequent shingle courses shifting shingle joints to half width of a pattern. Cut the shingles along the vertical marking lines. Install shingles on the bottom slope extending it under the valley roll material in place of transition to the dome portion.

NOTE: When the width of pattern becomes less than half width, start a new course from the full pattern of shingles.

The top of the roof is finished with a metal cap or a cap made from valley roll material.



if shingles are used on roofs with a slope close to 90° , or on spherical or bulbous shapes, it is necessary to cover the back side of the visible shingles part with MASTIC TECHNICONICOL FIXER.

7.9. Arrangement of roof penetrations

Bottom parts of roof penetrations, antennas and utility pipes are sealed with special passage elements.

7.9.1. Ventilation arrangements

Roof ventilation arrangements are vital for correct performance of the roofing system. Ventilation serves to remove excessive moisture from underroof space and prevents overheating of the roof.

Lack of ventilation may result in problems related to loss of thermal insulation efficiency, development of mold and fungi, rotting of wooden roof structures, etc.

Mold and fungi

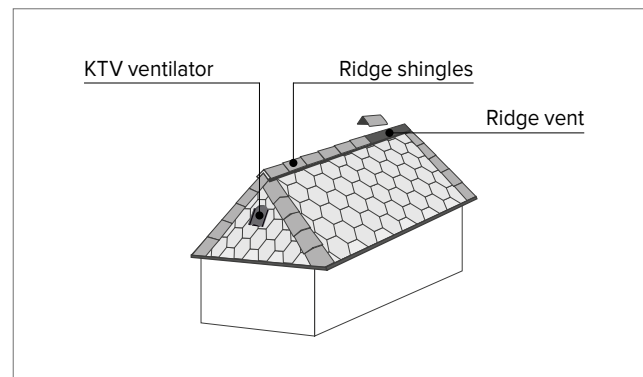
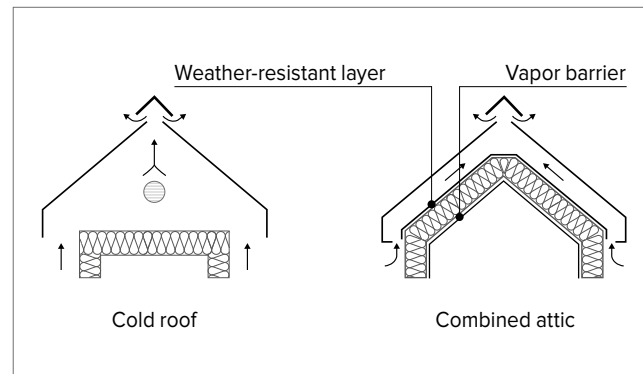
Excessive moisture in the structures may result in development of mold and fungi inside premises, as over-humidified environment facilitates growth of various bacteria. Development of mold negatively influences the living comfort, there is a risk of respiratory diseases.

Rotting of wooden structures

Wooden structures (rafter system, counter battens and battens) – in case of prolonged contact with moisture may lose their load-bearing properties due to rotting of wood. If moistening process was continuing for a long time, complete reconstruction of roof with replacement of load-bearing elements may be required.

Ventilation of underroof space will help to avoid such problems. The main principle in roof ventilation is based on presence of three mandatory elements: air inflow, ventilation duct and air extraction. Each of these elements shall be properly selected with due account of all factors.

The main factors influencing selection of ventilation elements are: mansard roof or cold roof; shape of slope (rectangular slope, hipped roof, gabled roof, etc.); presence or absence of ridge; presence or absence of eaves; slope angle.



Air inflow

Optimal location for the air inflow openings is on the eaves overhang. Air inflow must be distributed evenly along entire length of the eaves. Inflow of air may be organized either through the gap between the waterproof and windproof membrane and the base carrying the shingles, or through the soffits of eaves overhang (for example, through TECHNICONICOL perforated soffits). Minimal total area of intake ventilation openings at the eaves portion – **200 cm²/m.**

Ventilation duct

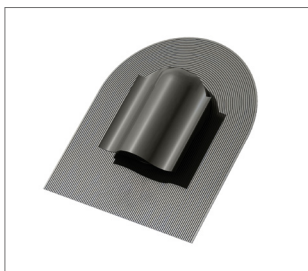
When constructing a mansard roof, the ventilation duct must be formed by counter battens and battens. Counter battens define the height of ventilation duct – **50 mm** with roof pitch angle above **20°** and **80 mm** with roof pitch angle from **12°** to **20°**. Counter battens additionally facilitate air exchange between neighboring ducts. In case of a cold attic, the attic space itself works as a ventilation duct. It is important that there are no obstacles on the way of air flow.

Air extraction

The optimal area for air extraction is the ridge. If there is no ridge – the top part of the slope. The total area of extraction outlets at the ridge must be **100 cm²/m**. Ridge vents and spot vents are used for arrangement of extraction openings. For maximum efficiency ridge vents shall be arranged along entire length of the ridge. Spot vents shall be placed based on calculation of one vent per **10-15 m²** of the roof.



For better aesthetics of the roof it is allowed to use the decorative cap without internal splitting of airflow. Therein, ingress of precipitation or leaves into the outlet does not create problems, because everything goes into water drainage system of the building or structure.



If it is not possible to arrange air extraction from underroof ventilation through TECHNOMICOL continuous ridge vent, spot vents, such as KTV ventilator, are used.

Sealing of antennae and pipes is done with TECHNOMICOL antenna and pipe seals.

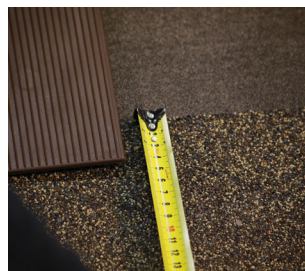


To simplify installation, every penetration is provided with various seals for installation either onto ready roof, or during installation of various types of roofing covers.

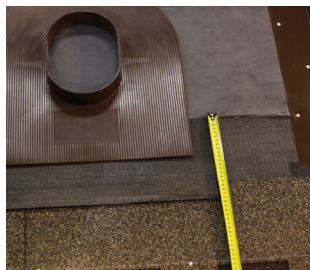


TECHNOMICOL adapter is designed for joining ventilation ducts to roof penetrations.

7.9.2. Sealing of TECHNOMICOL KTV spot ventilator /air passage



Position the air passage so that its lower edge overlaps the course shingles by at least **20 mm**.



If it is not possible to arrange an overlap of the air passage lower edge with the shingles, prepare a cut from an underlayment so that the valley roll material extends under the penetration for at least **100 mm**.



Mark the future position of penetration on the continuous base and cut out the opening.



Apply MASTIC TECHNONICOL FIXER on the base or the lower side of air passage flange and glue to the base.



Fix the air passage mechanically with **8 roofing nails** placed along the periphery.



Apply bitumen mastic on the face surface of air passage flange.



Install course shingle sheet preliminarily cutting it to suit the air passage.



Use bitumen mastic to seal the joint between the passage element and the shingles.



Apply granules onto bitumen mastic to prevent from UV irradiation. Air passage is installed in the same manner.

NOTE: You can obtain granules by rubbing pieces of shingle waste against each other.



Thereafter, install the necessary air vent onto the air passage element.



Installed TECHNICAL KTV ventilator.

7.9.3. Sealing of joint with a rubber seal



Apply MASTIC TECHNICAL FIXER onto lower side of rubber seal flange.



Glue the rubber seal to base.



Apply bitumen mastic on the front surface of rubber seal flange.



Install course shingle sheet preliminarily cutting it to suit the air passage.



Fix the metal clamp.



Seal the clamp with a silicon, thiokol or polyurethane sealant.



Use bitumen mastic to seal the joint between the passage element and the shingles. Apply granules onto bitumen mastic to protect from UV irradiation.



Installed penetration sealed with rubber seal.

7.10. Skylights

Skylights are installed at the same time with roof installation. In order to avoid leakages through skylights make sure that all insulation layers of the roofing sandwich are attached to the skylight elements.



Mark out and cut the skylight opening after completing installation of insulation layers, ventilation gap and counter battens. If necessary, install a frame from sheet material around the opening so that in future the skylight stays at the same level with continuous base of the roof.

Install an anti-condensate strip above the window opening. Install continuous base of the roof and underlayment after installation of thermal insulation and levelling the window frame relative to planes.



If the roof already has a continuous base, install skirting around the window frame and fasten it to the base with staples.

NOTE: The installation of skirting is possible before the installation of a continuous base, in this case skirting shall be connected to the diffusion membrane and then covered with the continuous base.



Install shingles to the lower edge of window frame.



Install lower part of flashing.



Install side and top parts of flashing and cover straps. Observe the cascade rule – side flashing extends atop the bottom flashing and top flashing extends atop the side flashing.



Cover the side flashing with MASTIC TECHNONICOL FIXER. Install shingles on the remaining portion. Cover the side flashing and shingles where they join the flashing with MASTIC TECHNONICOL FIXER.

8.

Vinyl soffits and rainwater systems

8. Vinyl soffits and rainwater systems

8.1. Rainwater systems

OPTIMA plastic 120/80 rainwater system

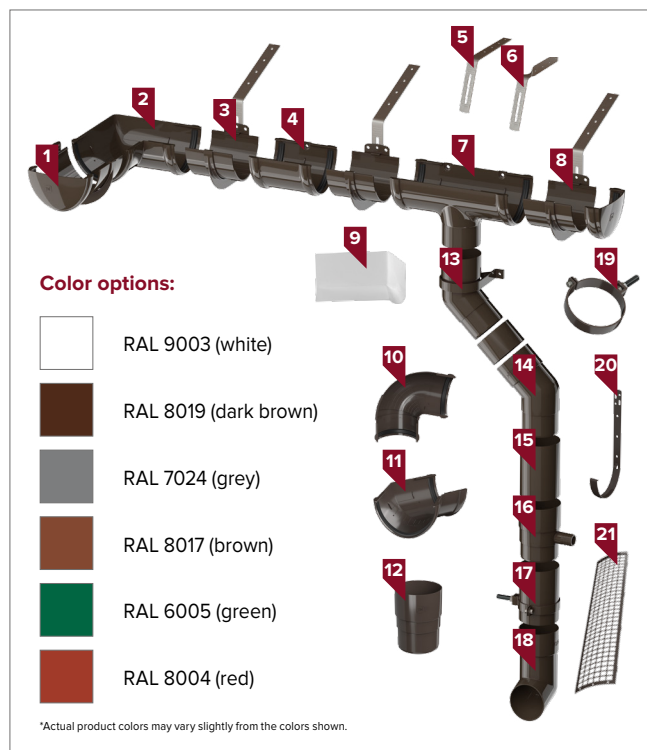
- Operating temperature range from **-50°C** to **+50°C**;
- Overall guarantee **10 years**;
- Guaranteed service life **50 years**.



- | | |
|-------------------------------------|---------------------------------|
| 1. Gutter cap; | 9. Universal pipe clamp; |
| 2. Gutter angle 90° ; | 10. Pipe; |
| 3. Gutter; | 11. Pipe connector; |
| 4. Gutter connector; | 12. Pipe outlet. |
| 5. Gutter bracket; | |
| 6. Gutter funnel; | |
| 7. Pipe clamp; | |
| 8. Pipe bend 135° ; | |

Plastic 125/82 rainwater system

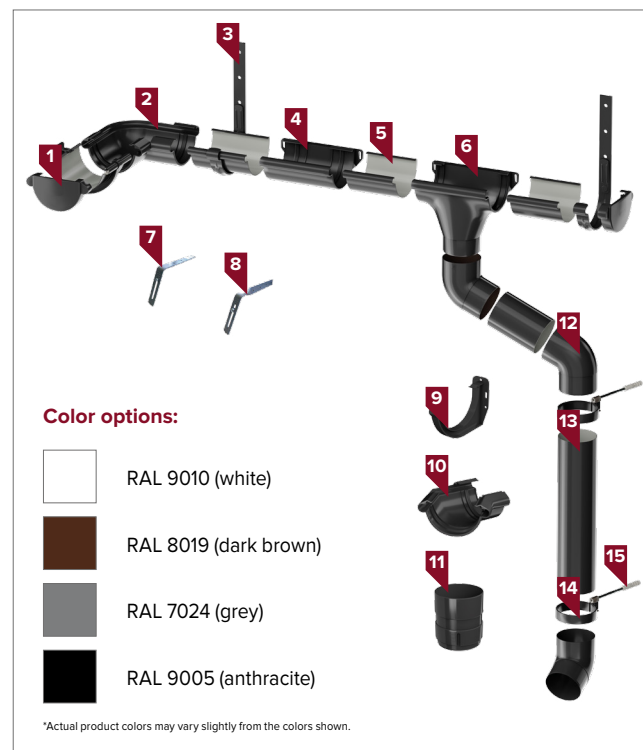
- Operating temperature range from **-50°C** to **+50°C**;
- Overall guarantee **15 years**;
- Guaranteed service life **50 years**.



- | | |
|---|--|
| 1. Gutter cap; | 12. Pipe connector; |
| 2. Gutter angle 90° ; | 13. Pipe clamp; |
| 3. Gutter; | 14. Pipe bend 108°, 135° ; |
| 4. Gutter connector; | 15. Pipe; |
| 5. Gutter bracket extension (straight); | 16. Water drainage; |
| 6. Gutter bracket extension (side); | 17. Pipe clamp (metal) 140 mm ; |
| 7. Gutter funnel; | 18. Pipe outlet; |
| 8. Gutter bracket (plastic); | 19. Universal pipe clamp 180 mm, 140 mm ; |
| 9. Wall-mounted turning drain; | 20. Gutter bracket (metal); |
| 10. Gutter elbow 90°-150° ; | 21. Gutter protection grill 0.6 lm . |
| 11. Gutter elbow 135° ; | |

MAXI plastic 152/100 rainwater system

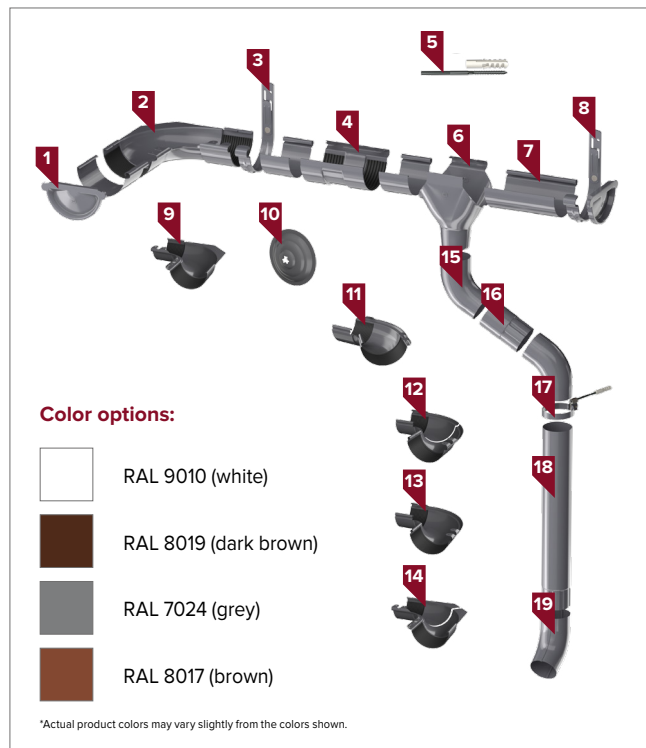
- Operating temperature range from **-50°C** to **+50°C**;
- Overall guarantee **15 years**;
- Guaranteed service life **50 years**.



- | | |
|-----------------------------------|-----------------------|
| 1. Gutter cap; | 14. Pipe clamp; |
| 2. Gutter angle 90° ; | 15. Clamp attachment. |
| 3. Bracket (reinforced); | |
| 4. Gutter connector; | |
| 5. Gutter; | |
| 6. Water outlet funnel; | |
| 7. Extension (straight); | |
| 8. Extension (side); | |
| 9. Gutter bracket; | |
| 10. Gutter elbow 135° ; | |
| 11. Pipe connector; | |
| 12. Pipe bend 67° (drain); | |
| 13. Drain pipe; | |

Metal 125/90 rainwater system

- Operating temperature range from **-100°C** to **+60°C**;
- Guarantee for appearance **7 years**;
- Guarantee for penetrative corrosion **50 years**.



- | | |
|------------------------------------|------------------------------------|
| 1. Gutter cap; | 14. Inner elbow 100°-165° ; |
| 2. Inner elbow 135° ; | 15. Elbow 60° ; |
| 3. Gutter bracket (reinforced); | 16. Pipe connector; |
| 4. Gutter connector; | 17. Pipe clamp; |
| 5. Clamp attachment; | 18. Pipe; |
| 6. Gutter funnel; | 19. Pipe drain. |
| 7. Gutter; | |
| 8. Gutter bracket (short); | |
| 9. Inner elbow 90° ; | |
| 10. Clamp pad; | |
| 11. Outer elbow 135° ; | |
| 12. Outer elbow 100°-165° ; | |
| 13. Outer elbow 90° ; | |

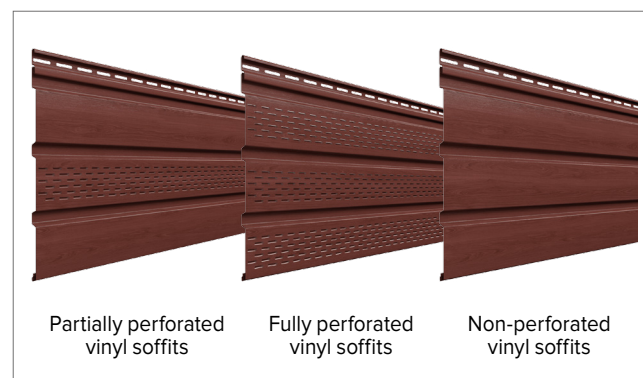
8.2. Vinyl soffits

Soffits and connection profiles from polyvinyl chloride (PVC) are double-layer coextruded articles. Use of PVC with different compositions guarantees stability of the shape and color resistance in all climatic regions.



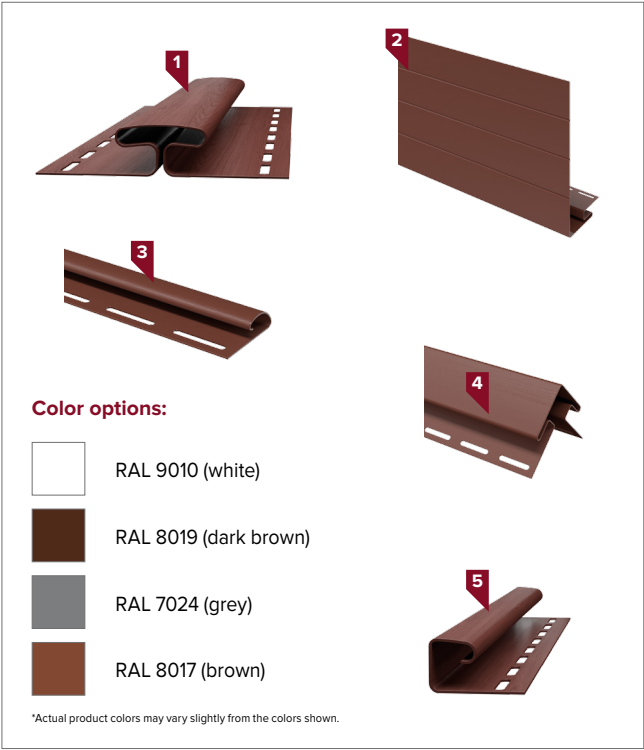
- Do not create load to roof overhang structure;
- Not flammable;
- Quick and easy installation;
- Operating temperature range from **-50°C** to **+50°C**;
- Manufacturer's guaranty **30 years** / service life **50 years**.

Vinyl soffits by TECHNINICOL used to arrange inflow of air into the underroof space and for decorative finishing of roof overhangs.



- Panel dimensions: **3×0.34 m**;
- Usable panel area: **0.924 m²**;
- Usable panel width: **0.308 m**;
- Panel thickness: **0.93 mm**.

Accessories



- 1. H-profile;
- 2. J-chamfer;
- 3. Finishing profile;
- 4. Outer corner;
- 5. J-profile.

9.

Recommendations on roofing maintenance

9. Recommendations on roofing maintenance

- Check the condition of roofing at least two times a year;
- Remove leaves, branches and other small debris from the roof with a soft brush. Use of sharp tools is prohibited;
- Sharp objects on the roof must be removed manually;
- Clean the water drain gutters and funnels as necessary to provide unrestricted water drainage from roof;
- As a preventive measure – check and, if necessary, repair installation openings, holes, cracks and metal parts;
- In case of formation of moss and lichen, use special algicide composition to remove;
- Apply the antiseptic solution using a sprayer, sponge or brush and moving from the ridge to the eaves overhang until the surface is substantially wet, let dry;
- As a preventive measure – treat the roof two times a year.



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For additional information please contact us at:
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