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Thexpan[®]/Thexpan[®] *plus*
Thermont[®]/Thermont[®] *plus*
ASSEMBLY MANUAL

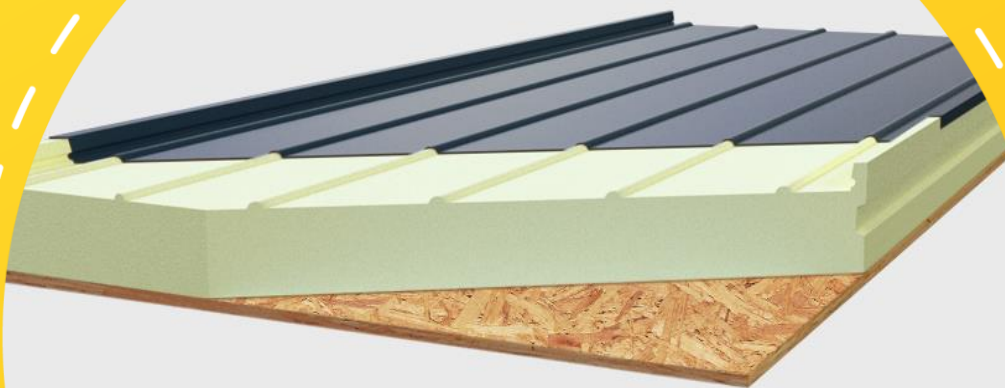


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NOTE: This manual should be read and analyzed together with the Thermont®/Thexpan® technical details.

When installing the roof, follow the rules presented below, which will ensure long-term and satisfactory use of the roof in the Thexpan® / Thermont® system. We suggest that you read these rules very carefully and do not skip any of them while reading and then - during the installation of the roof.



1. Unloading at the construction site

Thexpan® / Thermont® panels arrive at the construction site packed in a pile of panels turned 180 degrees in relation to their subsequent laying on the roof. The boards are fitted with polystyrene spacers protecting them against mutual damage. The stack is additionally wrapped with foil, which also covers the surface of the plates. When picking up the boards at the construction site, remember that:

- a. Unloading should be performed with the use of a crane or a forklift.
- b. The trolley can unload shorter panels - up to approx. 4-5 m. The forks of the trolley should be wrapped with a material securing the contact surface of the roof panels with the forks of the trolley. Due to the inversion of the plates, the forks rest against the protruding locks of the roof plate and careless use of the forks of the truck can destroy these locks.
- c. The crane can unload plates of any length using straps. It should be remembered that the distance between the strips should not exceed 3-4 m.
- d. The unloaded stack of boards should be placed on a hard surface, on polystyrene pads placed transversely to the board length, at a maximum distance of 2-3 m from each other.
- e. Avoid stacking more than 2 stacks of plates on top of each other. Placing another stack may destroy the locks of the plate at the bottom of the stack. The second stack should be placed on the first one, also on polystyrene spacers placed transversely to the board length, at a maximum distance of 2-3 m from each other, and should be aligned vertically with the spacers in the stack below.

2. Preparatory works

When preparing for installation, perform the following steps:

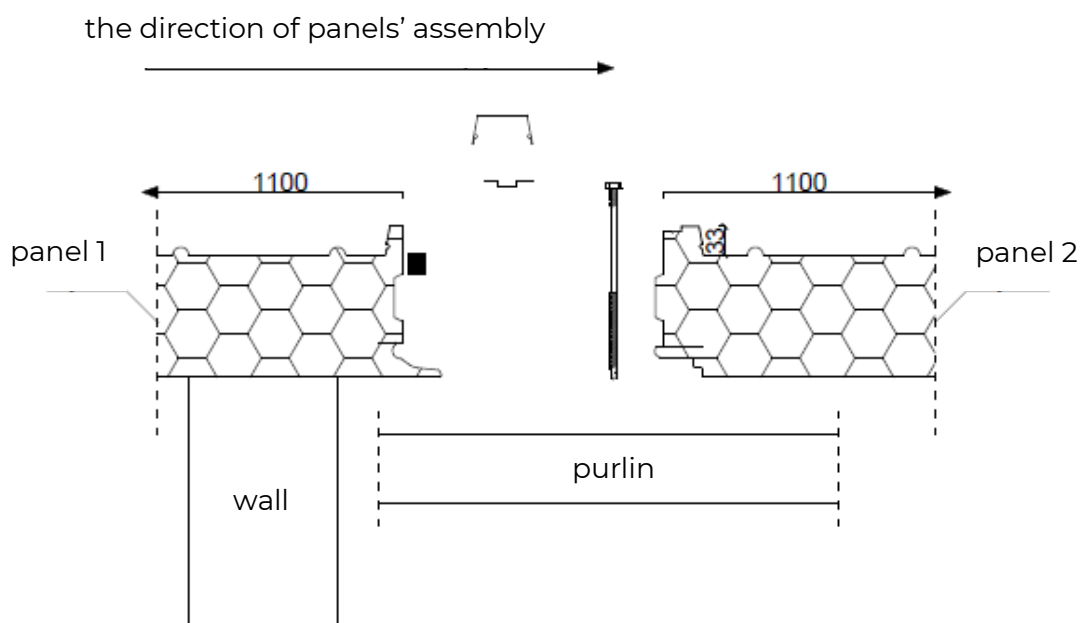
- a. Remove the foil covering the stack of plates and expose the plates.
- b. Prepare a storage area next to the stack on which the boards are stacked and prepared for assembly.
- c. Place polystyrene spacers transversely to the board length on the storage field, at a maximum distance of 2-3 m from each other.
- d. Holding the edge of the long side of the plate - preferably 2 people on each side - lift the first (then the next) plate from the stack, carefully invert it 180 degrees and gently place it on the storage field so that the upper plate locks assume the usable position (from the top). Attention! - the plates at the cut ends are sharp and can cut your hands if you do not use work gloves.
- e. In the case of long boards, they can be turned in a pile on the already lying dividers and with the help of more people. Remember to gently lower the flipped plate and place it gently on the spacers. Lowering the plate that is being inverted too abruptly may damage itself or other plates in the stack.
- f. Pry off the sheet securing the sheet and tear it off the sheet along the locks to a width of about 10 cm on each side to reveal the lock. Tearing off the remaining protective film should take place after the roof is laid, and not later than 1 month after the roof is installed. Leaving the foil protecting the roof sheet for a longer period is associated with the risk of "vulcanizing" the foil with the roof and preventing it from tearing off in a simple way.



- g. Note: when the foil is torn off, the electrostatic voltage is discharged, which (for some people) causes the unpleasant feeling of a slight electric shock. This phenomenon is harmless to health.
- h. After partial tearing of the protective foil, the straps on which the panel will be suspended and transferred to the roof should be placed under the slab. It should be remembered that the distance between the strips should not exceed 3-4 m.
- i. The foil protecting the inner roof plate may be torn off before or after installation. In this case, the "vulcanization" time is longer, because the inside of the roof is not exposed to the sun.
- j. Note: when the foil is torn off, the electrostatic voltage is discharged, which (for some people) causes the unpleasant feeling of a slight electric shock. This phenomenon is harmless to health.
- k. Some crane rental companies have attachments for lighter cranes that are suitable for handling panels with suction cups. With this method, no straps are needed. In extreme situations - when the length of the roof slope exceeds the standards for suction cups, a set of two suction cups should be used.

3. Roof panels assembly

- a. Thexpan® / Thermont® roof panel has asymmetrical (thinner and thicker) upper locks. The board is always placed from the gable wall and moved with the next ones towards the opposite wall. It should be remembered that when starting laying the slab on one slope from the wider lock, on the slope of the opposite roof (towards the ridge) and in the same gable, the first slab is also placed with the wide lock facing outwards. Such arrangement of the boards on the gable on both roof slopes will then allow the use of the same type of roof treatment for the gable gable (roof side flashing).



NOTE: It is possible to start the assembly with a narrower lock, but such assembly is difficult, because the next boards have to be inserted under the already laid board. The stacked plate must then be slightly raised.

- b. It is possible to cut the plate along the long side together with protruding top locks. It is not important then whether we start laying the slope from a narrow or a wide zipper. However, it is always necessary to remember that the panel joints on one slope should be in line with the panel joints on the other slope. Such a roof construction carries the risk of water leaking under the wind girder (roof side flashing).
- c. In the case of Thexpan® with a heat exchanger, below the surface of the sheet, the entry and exit of the heat exchanger system must be under the ridge. Such an arrangement of the panel on one slope determines the direction of the arrangement of the panel on the other slope (unless the side locks are cut off).
- d. The boards are usually laid with slopes. Nothing prevents you from placing boards on both slopes at the same time. However, it should be remembered that it is necessary (!!!) to screw the first slab from the top of the building to the wall structure with fasteners for the slab passage and at a distance of no more than 2 m between them. Such a fastener should have a wider washer to strengthen the connection with the building structure.
- e. The panels on the ridge - if they are not cut to the angle of the roof - are placed so that the bottom sheet of the panel on one slope is as close as possible to the bottom sheet of the panel on the other slope. A space with an opening equal to twice the value of the roof angle is created between the panels arranged in this way. After attaching the panels to the roof structure, the open space must be filled with a polyurethane or polystyrene wedge with a rectangular cross-section that matches the panel spacing. The wedge located in the free space should be sealed with low-pressure foam.

NOTE: do not fill such a large free space with only polyurethane foam, due to possible inaccuracies that will result in the formation of thermal bridges.

- f. The panels on the ridge - if they are cut to the roof angle - are placed so that the sheets of the panel on one roof are in one line (locks) and at a distance of 1-2 cm from each other. A space is created between the plates arranged in this way. After attaching the panels to the roof structure, the open space must be filled with low-pressure foam.

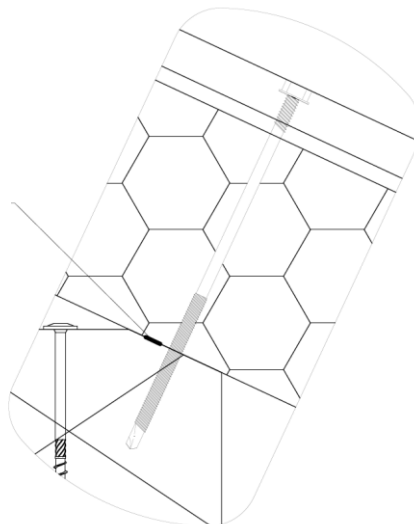
NOTE: filling such a small, free space with polyurethane foam will effectively eliminate the risk of thermal bridges.

- g. After the space between the ridge panels has been filled with foam, it has solidified and its outflows are cut off, it is recommended to cover the connection with bitumen or butyl tape, which will additionally protect the connection against rain gusts for the ridge treatment or condensation on the ridge flashing.
- h. Due to the thermal conductivity of the bottom sheet of Thexpan® / Thermont® panels, each panel should be cut to eliminate thermal bridges. Only the bottom plate of the plate is cut - the upper one serves as a protection against weather conditions.



NOTE: When installing the Thexpan[®]_{plus} / Thermont[®]_{plus} board (in the version with OSB or plywood on the bottom), no cut is needed, but both the OSB and the plywood outside the wall (eaves) must be protected against moisture.

bottom sheet metal cut



- i. Sheet metal cuts are made with a tool that does not raise the temperature of the sheet during cutting (scissors are the best). Each board placed on the gable wall should be cut along its longer side, as well as boards placed on the knee wall transversely to the direction of their arrangement.
- j. The plate is cut when it lies in the storage bay or after it has been placed on the roof, before screwing. The incision should not be less than 2-3 mm wide and should be made approximately 1/3 of the wall width from the inside of the building. After placing the cut Thexpan[®] / Thermont[®] boards on the roof, screw them to the walls in the middle of their thickness. The boards should be screwed to the elbow wall at the point of joining the locks and to the gable wall, through the board passage. In this way, the top and bottom sheets of Thexpan[®] / Thermont[®] are permanently connected to the wall.

NOTE: if the sheet has not been cut, the method to avoid a thermal bridge is to stick a polystyrene board with a minimum thickness of 5 cm on the bottom sheet (eaves), not forgetting to fill the bottom lock with foam, as mentioned later. An alternative - when there is no eaves - is gluing the plate inside the building to the bottom metal sheet, from the wall at the length of min. 1 m of polystyrene with a thickness of at least 5 cm, not forgetting to fill the bottom lock with foam, as mentioned later. It is best to use both methods at the same time.

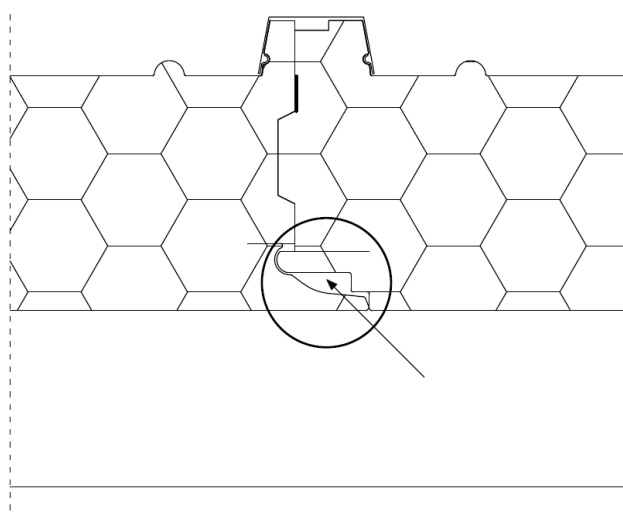
- k. For the assembly of the Thexpan[®] / Thermont[®] board to the structure, use fasteners of appropriate length intended for the assembly of the sandwich panel to a steel structure (for a steel structure) or a wooden structure (for a wooden structure).

NOTE: Steel fasteners should not be used interchangeably with wood fasteners !!!

- l. To seal the joints of Thexpan® / Thermont® panels, low-pressure polyurethane foams (side joint of the panels) and bituminous or butyl tapes in the upper lock (under the clip) are used. You can use (especially for upper connections) butyl in a tube, squeezed with a "gun" for squeezing masses.
- m. Thexpan® / Thermont® panels are laid on the roof in the following steps: cutting the sheet on a stack of panels, turning the cut panel over and putting it back on the storage field, attaching it to a crane with straps, moving it to the roof surface and laying it on the roof, screwing to the slope on the joint, cut the inner sheet of the next board, turn the cut board over and put it back on the storage bay, attach it to a crane with straps, transfer it to the roof plane, place it on the structure at a distance of about 20-30 cm from the laid board, apply foam sealant to the side joint boards, push them to the already laid board and fasten them to the structure with a fastener, etc. After the board is placed on the roof, the upper connection of the boards can (not necessary) be additionally sealed by putting butyl from a tube on them or gluing gaskets. After this operation, a snap clip should be put on closing the connection and finished to close the exposed polyurethane in the ridge and on the gutter side.

NOTE: Thexpan®_{plus} / Thermont®_{plus} panels are laid in the same way, except for cutting the sheet (instead of sheet metal, the bottom surface of the cladding is made of OSB or plywood).

- n. The final stage of the assembly of Thexpan® / Thermont® roof panels (before the assembly of flashings) is filling the side lock of the panel joint at the point of joining the sheets of this lock. The lower lock, along the slab and after it is connected to the next slab, forms a channel that must be plugged (!!!) from the outside. Lack of a pin will cause free penetration of cold air along the inner sheet of Thexpan® / Thermont® board and eventually water condensation at the joint of the boards resulting from the condensation of water vapor inside the building. To prevent this, it is necessary to create a plug that closes this part of the lock from the outside by filling this joint with injected polyurethane foam or butyl from a tube.



NOTE: Thexpan®_{plus} / Thermont®_{plus} panels do not require this kind of blocking, because the bottom panel lock is not made of sheet metal.

- o. In the event of failure to perform this important activity, the way to “save” the situation is to drill a sufficiently large hole in the lock of the bottom plate and inject polyurethane foam into the inter-castle space, which obstructs the space for air penetration.
- p. In accordance with the PN-EN 14509 standard, deformations (bulging / concavity) may occur on the surface of the roofing sheet metal as a result of chemical processes taking place in the polyurethane core. This phenomenon occurs much more often in the case of using dark colors of the roofing, which raise the temperature of the gases in the spaces between the sheet and the core and expand the gas present there, causing the sheet to bulge. In such a situation, the method of removing the bulge is to drill the inner lining directly under the bulge and pierce the polyurethane insulation with e.g. wire. This will release gases. An alternative method is to drill the outer sheet with a very thin drill, release the gases and then protect the drilled hole against corrosion.

4. Flashings

Each roof covered with Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus} sandwich panel requires flashings and guttering. The main treatments are: ridge flashing, windchest (side flashing of the roof gables), gutter flashing, gutter flashing and a clip. Other treatments, such as flashing joining the roof with the wall, are not obligatory.

Ridge

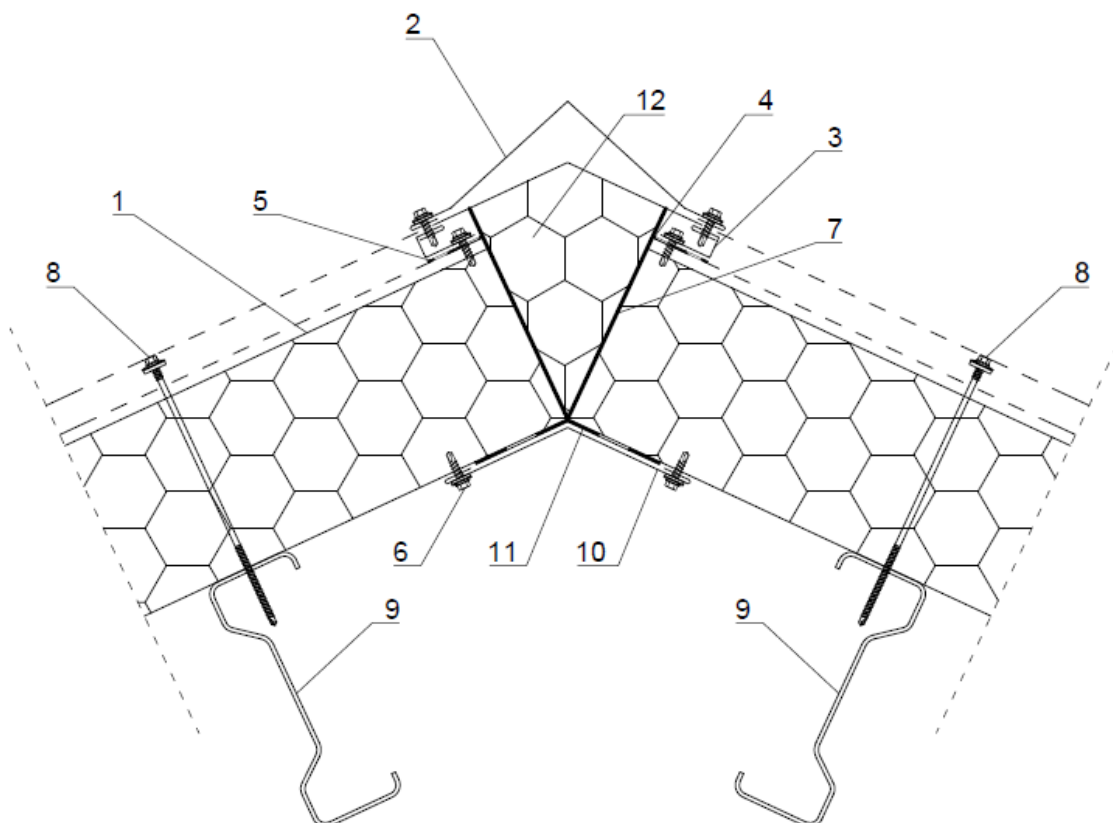
The ridge in roofs made of Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus} panels must be covered with a sheet metal flashing (so-called "ridge tile"). Due to the special shape of Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus} this treatment is two-layer. The lower flashing is to seal the ridge connection - the upper one, is to additionally seal the lower one and be an aesthetic element.

- a. Ridge flashing - the bottom one, with an angular shape adjusted to the roof slope, is placed in short sections between the side panel locks protruding above the roof plane. It is fixed with metal screws to the roof slope, between curved channels that hide (or not) the heat exchanger. Between the flashing and the surface of the roof sheet, a flexible or double-sided butyl gasket of appropriate thickness is placed before screwing. Due to the height of the channels, a flexible polyurethane gasket with long-lasting performance characteristics is a better solution.
- b. After the lower ridge flashing is installed (fixed to both slopes), the upper flashing is applied to the ridge, usually in a shape similar to the lower one, but it can be more aesthetic. The top flashing should be mounted to the clip covering the joint of the roof panels every 1.1 m, so it does not have to be mounted in short sections. A flexible polyurethane gasket, not less than 4 cm thick, is also inserted between the upper and lower ridge flashing. The purpose of this gasket is to prevent rainwater or snow from "blowing".
- c. The upper ridge flashing is mounted with the screws to the clip, but long enough to reach the polyurethane under the upper sheet of the roof panel. In order to strengthen the connection of this flashing with the roof, between the clips, the "Z" or U profile can be inserted into the space between the flashing and the roof and fastened with screws to the roof and the upper ridge flashing. This profile (can be made as a flashing) is designed to support the upper ridge



flashing and stiffen it in the section between the clips.

- d. In the absence of a supporting ridge, it is necessary to establish a sub-ridge flashing. In such a situation, the connection of the panels in the ridge is visible and for aesthetic reasons it is recommended to lay the sub-ridge flashing or to stick the joint with bitumen or butyl tape.



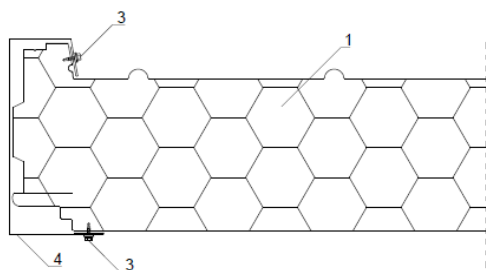
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|---|--|
| 1. Thermont® /Thexpan® | 7. Sealing |
| 2. Verge flashing | 8. Sheet metal screw for sandwich panels |
| 3. Profile filling the gap between roof clips | 9. Steel structure |
| 4. Waterproofing | 10. Flashing |
| 5. Expansion tape | 11. Vapor barrier foil tape |
| 6. Self-drilling screw for sheet metal sewing | 12. Insulation |



VERGE FLASHINGS

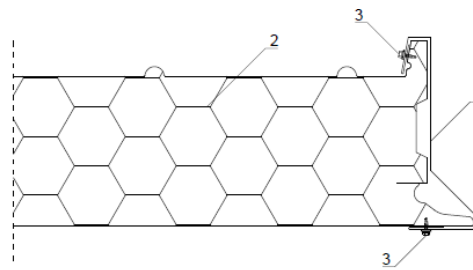
- Verge flashing is a flashing designed to cover the sides of the edge Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus} roof panels on the tops of the building. Due to the different thicknesses of the upper brackets of Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus}, the flashing of one side may be different than the other. In order to facilitate the execution of the verge flashing according to one pattern, a wider verge flashing can be installed on both edges, while the wider wind brace on the narrower roof lock must be supplemented with a strip of polystyrene.
- In order to attach the verge flashing to the roof, the polyurethane should be removed from the side lock of the panel, creating space for mounting the OSB strip or plank between the top and bottom facing of Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus}. This space can be made along the entire length of the plate or intermittently. It is easy to make using a rotating wire brush on a drill. After removing polyurethane, insert the OSB strip / board between the sheets and fix it to the sheets with screws - from the top and bottom. Before installing the OSB strip / board it needs covering with low-pressure foam for better connection with the board foam.
- After mounting the OSB strips / plank between the upper and lower steel sheet Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus}, put on the verge flashing and fix it with screws for OSB / boards and sheet metal screws - from the top and bottom to the roof cladding.

Verge flashing right



1. Thermont® / Thexpan®
2. Thermont® / Thexpan®
3. Sheet metal screw

Verge flashing left



4. Verge flashing right
5. Verge flashing left

GUTTER FLASHING – ONE OF THE VARIANTS

- Before installing the gutter flashing, cut the end of the panel so that the side surface of the polyurethane is parallel to the wall (vertical) and not inclined like the roof. The gutter flashing is fixed in the same way as the verge flashing assembly, i.e. remove the foam, insert the OSB strip / board and fix the C-shape flashing.

NOTE: The flashing should be inserted under the upper steel sheet facing of the panel and cover the lower facing of the panel. This method of attachment will allow rainwater to drain away from the panel and not inside the panel. Inserting the "C-shaped" flashing

between the facings of the sandwich panel requires special care when making the gutter flashing, which should drain water from the roof into the gutter. When the water overflows outside the gutter, a poorly fitted gutter strip will drain the water between the bottom plate of the panel and the polyurethane, which in a long time may cause the OSB boards / plank to rot.

- b. While in the verge flashing, the OSB board / plank played only a stiffening role for this treatment, in the case of the gutter flashing it is the place for fixing the gutter hooks, i.e. the gutter clamp.

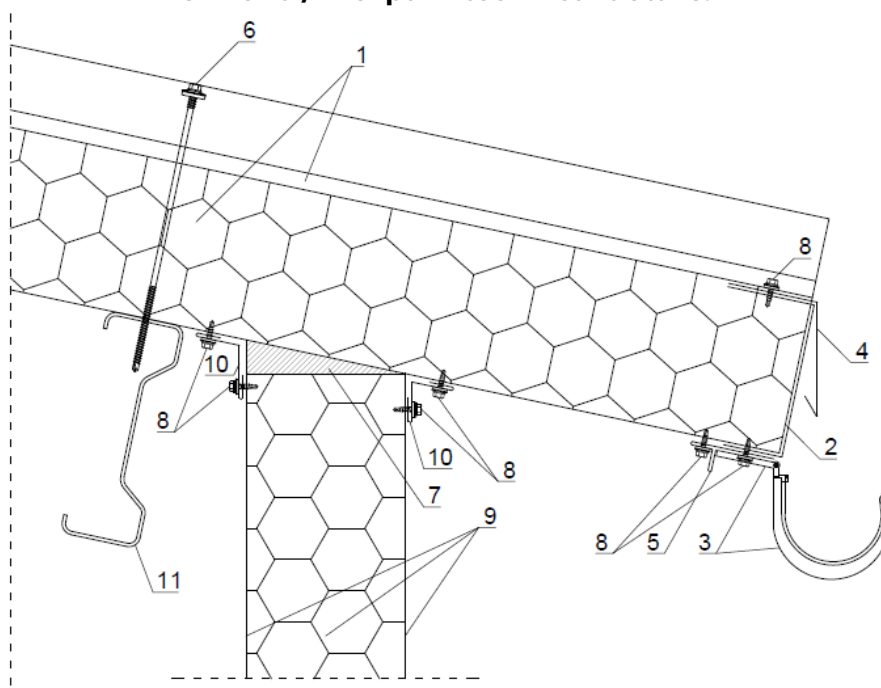
NOTE: other variants of the gutter flashing assembly are available in Thermont®/Thexpan® technical details.



GUTTER DRIP EDGE FLASHING – ONE OF THE VARIANTS

The role of this flashing is to drain water from the roof into the gutter. Such a flashing should be inserted together with the upper part of the gutter flashing under the upper sheet of Thexpan® / Thermont® / Thexpan®*plus* / Thermont®*plus* and fastened to them with a sheet metal screw. Thanks to such fastening, the water from the roof will not back up and will not get under the upper sheet of Thexpan® / Thermont® / Thexpan®*plus* / Thermont®*plus* board. It is especially important in the autumn-spring period, when the phenomenon of the so-called rising ice, that is, the rising of freezing water in the opposite direction to gravity and forcing the ice underneath the flashings.

NOTE: other variants of the gutter drip edge flashing assembly are available in Thermont®/Thexpan® technical details.

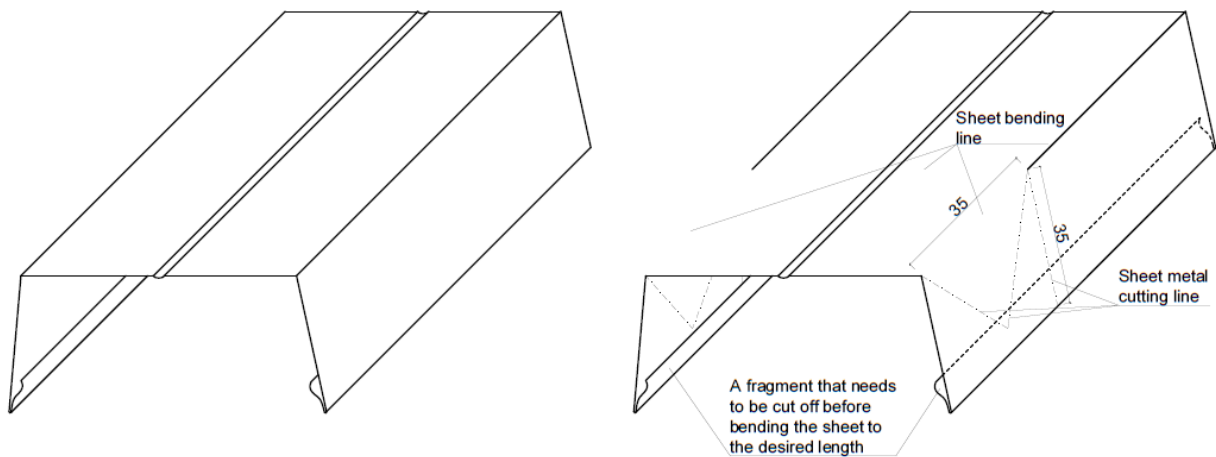


- | | |
|--------------------------|----------------------|
| 1. Thermont®/Thexpan® | sandwich panels |
| 2. Flashing | 7. Insulation |
| 3. Gutter | 8. Sheet metal screw |
| 4. Drip edge flashing | 9. Sandwich panel |
| 5. Gutter flashing | 10. Flashing |
| 6. Sheet metal screw for | 11. Steel structure |

ROOF CLIP

The roof clip is a "C" flashing supplied with the Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus} panel. This flashing is used to close the top lock of Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus} and is made in such a way that it does not need to be fixed with sheet metal screws. Its location on the joint of the roof panels additionally stiffens the roof. The lower closure of the clip is used to cover the polyurethane in the upper lock of Thexpan® / Thermont® / Thexpan®_{plus} / Thermont®_{plus} panels by cutting the side walls of the clip and then bending the upper shelf of the clip downwards so that a closing "tab" is formed.

The appearance of the sheet before it is bent inwards



The appearance of the sheet after it is bent to the inside

