SANDWICH PANELS TENAX

HANDLING AND INSTALLATION MANUAL

2017-01

Content

1. General

1.1. Application

Self-supporting sandwich panels TENAX W are intended to be used for the cladding of internal and external walls. They can be installed both horizontally and vertically. Sandwich panels for walls TENAX W are allowed be integrated into a multi-span structure only following an approval in respect to the specific project from the manufacturer.

The sandwich panels TENAX R and TENAX TR are specifically designed for roofs within multi-span structures with a minimum slope of at least 5°.

1.2. Responsibilities and guaranties of the manufacturer

This manufacturer's manual provides general instructions for the installation of the sandwich panels. The users of the product have to follow this manual except when it contradicts the approved project documentation. In case of doubt follow the instructions provided by designer/architect.

In case of doubt or uncertainty please contact regional representative of TENAPORS.

Manufacturer is responsible for the conformity of the product providing that all the requirements of this manual are followed. Manufacturer is not responsible for the defects of the product if the instructions of this manual are disregarded.

Manufacturer reserves the right to modify the technical documentation without prior notice. Always follow the current edition of the documentation.

1.3. Safety considerations

All works for the installation of panels shall be carried out in line with the current occupational health and safety regulations valid in the place of use.

The edges, corners and mechanically tooled surfaces are sharp. Use protective gloves and clothing. Use goggles and ear protectors during mechanical treatment of panels.

Sandwich panels are massive products. Follow the safety instructions for handling. Ensure that there are no people under lifted panel. Strong winds could reduce the stability of the panel during lifting significantly. Do not install panels in windy conditions if the safety considerations are compromised. The lifting of panels is not allowed if the wind gusts exceed 10 m/s.

Follow the manuals and safety instructions for the instruments, equipment and devices used.

Follow the other particular occupational safety requirements on construction site.

1.4. Environmental protection

Utilise packing materials and working waste in compliance with provisions valid in the place of installation. Take care of nature!

1.5. Detailing

More detailed information regarding the design of assemblies is described in Drawing sets “Assemblies” and “Flashings and Accessories”. Use this manual together with respective Drawings and reference documents.

2. Preparation for installation

2.1. Storage place

Appropriate storage place for the panels shall be provided at the construction site.

Store panels on stable foundation.

If the panels with an EPS or MW core are planned to be stored for more than two months, they shall be protected from atmospheric precipitation, dirt, and solar radiation at the storage place. Panels with PIR and PUR core may not be left unprotected from solar radiation for more than 2 weeks.

2.2. Equipment and tools

2.2.1. Lifting tools

Make sure you have all the necessary lifting tools and equipment which is in compliance with occupational safety requirements.

The weight of the panel depends on its thickness and core material. Approximate figures of the weight of 1 m^2 of the panel are given in Table 1.

An accurate weight of the panel per m^2 may be found on the product label on every packaging.

Table 1. The calculated weight per m^2 of dry TENAX panels

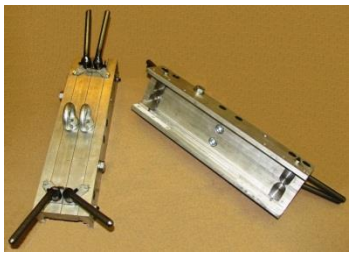
Panel Type	Weight of 1m^2 of panel [a] depending on its thickness, kg/m^2									
	50	80	100	120	150	175	200	220	240	300
TENAX W MW H2	19,1	22,4	24,6	26,8	30,1	32,9	35,6	-	40,0	46,6
TENAX W MW S	17,4	20,2	22,1	24,0	26,9	29,2	31,6	31,6	33,5	35,4
TENAX W MW S2	17,7	20,6	-	-	-	-	-	-	-	-
TENAX W MW T2	-	-	24,0	26,2	29,5	32,2	35,0	-	39,4	46,0
TENAX MW Security	-	-	-	-	-	-	36,9	39,2	41,5	-
TENAX W EPS S	13,4	13,9	14,2	14,6	15,0	15,5	15,9	16,9	16,7	-
TENAX W PUR H1	-	-	17,1	17,9	19,0	-	20,9	21,7	-	-
TENAX W PUR S1	14,7	15,9	-	-	-	-	-	-	-	-
TENAX W PUR T1	-	-	16,5	17,2	18,4	19,3	20,3	21,0	-	-
TENAX W PIR H1	-	-	17,4	18,2	19,5	-	21,5	-	-	-
TENAX W PIR S1	14,8	16,0	-	-	-	-	-	-	-	-
TENAX W PIR T1	-	-	16,8	17,6	18,8	19,8	20,9	-	-	-
TENAX TR MW S10	-	23,1	25,2	27,3	30,4	33,0	35,7	37,8	39,9	-
TENAX TR MW S12	20,2	23,4	25,5	27,6	30,7	33,3	36,0	-	40,2	46,5
TENAX TR EPS S10	14,7	15,2	15,5	15,9	16,3	16,8	17,2	17,5	17,8	-
TENAX TR PUR S11	16,0	17,2	18,0	18,8	19,9	-	21,9	22,7		
TENAX TR PIR S11	16,2	17,5	18,3	19,2	20,4	-	22,5	-	-	-
TENAX R MW B	20,1	21,1	23,2	25,3	28,5	31,3	33,7	35,8	37,9	
TENAX R EPS B	13,5	14,0	14,3	14,7	15,2	15,6	16,0	16,3	16,6	-

Note
[a] Calculation values for panels with a facing thickness of 0.7 mm / 0.7 mm, except for TENAX MW Security

Panel packages from the truck shall be unloaded by crane or forklift.

Inappropriate lifting of the panel packages may damage the panels. Use appropriate lifting tools when packages are lifted with crane. Mechanical or vacuum lifting tools are recommended.

Some examples of lifting tools are given in Figure 1. Follow the instructions of the manufacturer of the lifting tools.



a) lifting tools for horizontal lifting

b) vacuum lifting tool

Figure 1. Examples of lifting tools for panel handling

The forklift with additional supports shall be used for unloading the packages with length exceeding 7 metres.

2.2.2. Tools

For the installation of the panels at least the following tools are needed:

- saw for steel sheet (see Figure 2);
- plate cutters (for flashings);
- screwing machine;
- rivet tongs (for flashings);
- drilling machine with appropriate drills for the respective framework;
- knife (for MW sheet);
- sealant gun.

For the installation of the panels at least following measuring instruments are needed:

- measuring tape or laser distance meter (length ≥ 15 m);
- laser level or theodolite.

For cutting of panels use fine-tooth jigsaw or circular saw with hard alloy blade. Do not use tools that might cause overheating of panels (for example angle grinders).

a) Fine-tooth jigsaw

b) Circular saw with hard alloy blade

c) Angle grinder

Figure 2 Examples of cutting tools

2.3. Building framework

Check whether the building framework is in compliance with the requirements described in Drawing set “Assemblies”.

3. Handling

3.1. Acceptance control and unloading

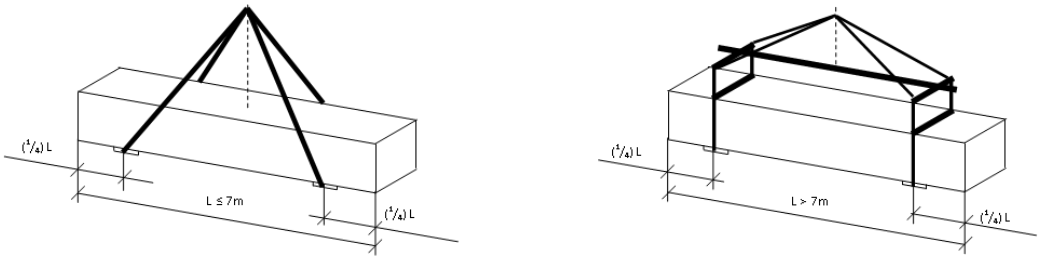
3.1.1. Panel Packages

The recipient of the sandwich panels is fully responsible for the unloading and storage. Before starting to unload sandwich panels, check whether the packaging and products are not damaged. In case of damage please contact TENAPORS regional representative immediately. Reports regarding damage shall be done in written form and signed. Delayed reports regarding transportation damage will not be considered.

Ensure that core of the sandwich panel is protected from precipitation all the time starting from unloading until the end of installation.

Ensure that panels are stored in an appropriate place after unloading from truck. Avoid repeated replacement of the panels.

Use lifting slings which are included in the package when unloading the packages with crane. In order to prevent deformation of panel use sufficiently long slings or use traverse beam.



a) without traverse beam, if length of package does not exceed 7 m b) with traverse beam, if length of package exceeds 7 m

Figure 3. Provisions for lifting of packages with crane

When using the forklift, ensure that provisions given in Table 2 are observed. Take care to avoid scratching of panel's surface with forklift. Cover the forks with soft material (e.g. polystyrene sheets).

Table 2. Provisions for lifting the panel packages with forklift

Panel Length, m	Number of lifting supports	Distance between lifting supports, m
≤ 7	2	1,50
> 7	4	1,50

Packages shall be lifted one by one. Lifting and handling of several packages at one time is not allowed. Do not pull or push panels over surface. Observe the handling signs.

3.1.2. Accessories and fasteners

Before starting to unload accessories and fasteners, check whether the packaging and the products are not damaged.

Make sure that delivered fasteners are appropriate for the particular building framework. Check whether delivery complies with purchase order.

3.2. Storage at building site

Store the panels in original packaging.

Outdoor storage of panels shall not exceed 2 months. If storage time at building site is expected to be longer than 2 months, store panels protected from the precipitation, the dirt and the sun.

Packages shall be on supports when stored or handled. During manufacturing process of panels the polystyrene supports with dimensions 1100 mm x 200 mm x 150 mm (length x width x height) are attached to the packages. Maximum distance between supports is 1,0 m for TENAX W MW panels and 1,7 m for TENAX W EPS panels.

Table 3 shows the maximum spacing between supports during the storage period.

Table 3. Spacing between supports during the storage period of sandwich panels

Panel Type	Spacing between supports, m
TENAX W MW	1,0
TENAX W EPS	1,7
TENAX W PUR	1,7
TENAX W PIR	1,7
TENAX TR MW	1,5
TENAX TR EPS	2,0
TENAX TR PUR	2,0
TENAX TR PIR	2,0
TENAX W MW	1,0
TENAX W EPS	1,7

Check whether delivered packages are supplied together with supports. If packages are received without supports, please contact supplier.

Place the panel packages with supports on even and firm surface prepared before the panels are received. Surface of the lowest panel in package shall not touch the ground. When storing the sandwich panel packages outdoor, put them in slightly inclined position to ensure free drainage of rainwater.

It is recommended to unload packages in places without intensive traffic.

Store the packages with at least 0,5 m clearance in order to allow access for workers.

Unpacked packages can be stored one on other in two rows levels provided that location of supports of the upper package corresponds vertically to location of the supports of the package beneath it. Do not stack packages one on other if the distance between supports differ or the original packaging is damaged. Do not put on the panels any loads or objects that could damage packaging material or appearance of the panel. Walking on wall panels is not allowed.

If the package is opened or wrapping of package is damaged, cover the package with waterproof material (e.g. with fixed tarpaulin or equivalent) or move it under roof.

The metal facings of panels are protected with protective film. The film shall be protected from solvents. The film should be protected from direct sunlight and precipitation. Follow the recommendations for the time of removal of the protective film.

3.3. Lifting and moving of panels

Single panels can be moved manually or using lifting tools.

Do not lift the sandwich panel by holding it at the top facing. When lifting the panel manually, hold it at the bottom facing. Prevent sandwich panels from scratching and deformation.

Use protective gloves and ensure that sandwich panels are not damaged. Draw particular attention to corners and edges. When moving the panel manually, hold it upright (see Figure 4). Do not carry the panel flatly.

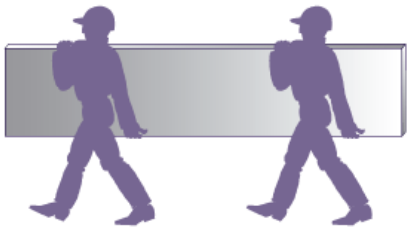


Figure 4. Moving of the panels manually

When moving the panels with lifting devices, use appropriate lifting tools. Fasten the lifting tools according to instructions of tool manufacturer.

When lifting the upper panel from the package take particular care to avoid any damage to the next panel beneath it.

4. General rules for installation

4.1. Tooling

Brush away any splinters from the cut or drilled hole immediately after tooling of the panels.

4.2. Elimination / prevention of thermal bridge

If the inside facing of panel crosses environment with different temperatures, then this facing acts as thermal bridge and it leads to significant heat losses. This could become an issue for example in outside and inside corners of the building. Whenever possible, thermal bridges shall be eliminated or measures shall be taken to prevent the development of thermal bridges.

The thermal bridge on the outside corner of the building shall be eliminated by cutting in the internal facing at the respective end of the panel. This shall be done before installation. Always check whether the cutting does not impact the stability of panel fixing.

The thermal bridge on the inside corner is eliminated by mounting thermal insulation between the end of the panel and the framework. Always ensure that thermal insulation is not squeezed and does not lose its function.

See more detailed information in Drawing set “Assemblies”.

4.3. Sealing of joints and fasteners

Joints between panels shall be tight in order to prevent air and vapour movement through them. Gaps between panels are not permitted. If there is still a gap between adjacent panels, use appropriate sealant or insulating material to fill it.

The joints and fastenings shall be sealed in order to prevent penetration of outdoor air and precipitation into building.

The joints shall be sealed with sealant and insulating materials indicated in Drawing set “Assemblies”. Always ensure that insulation is not squeezed and does not lose its function.

Check whether the surface is clean and dry before applying the sealant. Clean the surface if necessary. Apply sealant evenly without interruptions. Follow the instructions provided on sealants packaging and safety data sheets.

4.4. Fastening

Sandwich panels can be fastened to metal, concrete or wooden framework either horizontally or vertically.

More detailed information regarding the fastening is given in the Drawing set “Assemblies”.

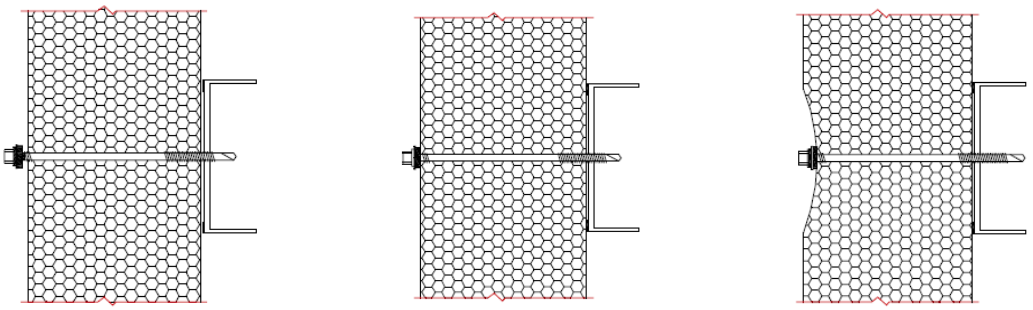
Panels with dark colour surface shall be protected from the long lasting impact of direct sunlight during installation. Panels could deform when heated up. Installation of deformed panels is more complicated. Deformed panels may significantly worsen the appearance of the wall or roof.

The fastening of panels depends on material of the framework and it shall be done as indicated in Drawing set “Assemblies”.

Follow the requirements for distance from fastener to panel edges and framework edges as well as for the depth of fastener as given in Drawing set “Assemblies”. Maximum distance between fastener and panel edge is determined by width of used flashing.

Screws shall be screwed in 90° angle to the surface of panel in order to ensure tightness of panel.

When fixing panels with screws, make sure that they are neither tightened too much nor left too loose (see Figure 5 and 6). Use screwing machine with a depth or torque adjustment.



a) too loose b) correct c) too tight

Figure 5. Tightening of screws on sandwich panels TENAX W with a standard key (side joint S or T)

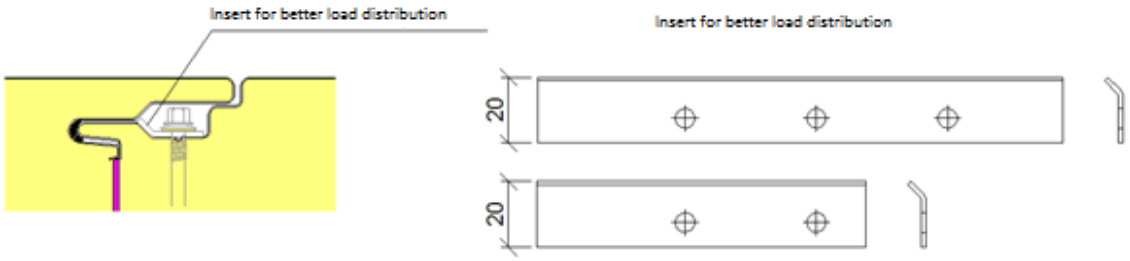


Figure 6. Tightening of screws on sandwich panels TENAX W with a hidden key (side joint H)

Use the number of fasteners defined in the project documentation.

4.5. Removal of protective film

The protective film protects the surface of the panels against contamination during construction. The environment changes the properties of film and it's adhesive with time. The protective film shall be removed from the panel not later than 2 months from the date of production of the panel. If this timeline is not observed, the removal of film from the surface of panel could become difficult.

It is advisable to remove the protective films from panel as close as possible to the finishing time of construction. Peel the protective film off in one piece starting from the cut edges of the panel. Before installation remove the protective film from the panel at places of joints and where fasteners will be inserted.

To avoid situation where protective film strips or the remains of adhesive are left on the panel, it is recommended to remove the film in temperature range from 0 °C to +30 °C. The protective film peels off more difficultly and the remains of adhesive could be left on the panel if the temperature is lower or higher.

4.6. Cleaning of panel

If there are any glue or film residuals on the metal surface after removal of the protective film, choose one of the cleaning methods described below. Start with a cleaning method that has the smallest effect on the appearance of the sandwich panel. Start with Method 1 and if it is not effective enough, move to the next option with larger effect on the appearance of the sandwich panel.

Warning! If there are any glue or film residuals on the metal surface, the cleaning should be done without any delay. The later the panels are cleaned, the more difficult it is to clean the panel.

To make sure that the cleaning method and agents are not damaging the panel, perform a test cleaning on a less visible and smaller area. Evaluate test results under sufficient amount of natural lighting after the panels have completely dried off.

Method 1. Water jet cleaning. To wash the sandwich panels, it is recommended to use clean water with low salt content and high-pressure water jet with pressure that is not higher than 4 MPa. By using a high-pressure water pump, keep the water jet at least 50 cm from the surface of the sandwich panel in a skew angle. When washing joints of the sandwich panels, make sure that the water is not entering into the joints. The water jet may not be aimed directly on the joints. Water temperature may not exceed +30 °C. If there are fats or grease on the surface of sandwich panels, water temperature may temporarily be increased to +50°C.

Method 2. Cleaning with cleaning agents. The surface may be treated with cleaning agents not containing organic solvents with pH level from 5 to 10.

Method 3. Cleaning with organic solvents. Permanent stains and residuals of the adhesive may be cleaned with isopropanol, white spirit, or ethyl acetate, or cleaning agents containing these solvents (for example, windshield washer fluids). In all cases, make sure that the solvent is not damaging appearance of the metal covering.

- Use a sponge or a textile to wet the surface of the panel with a solvent.
- Scrape off the adhesive residues with rubber or plastic scraper.
- Clean the rest with soapy water.

Warning! Environment protection measures must be taken into account when using cleaning agents and solvents.

After application of a cleaning agent, the surface of sandwich panels must be immediately washed off with clean water. Sandwich panels should be cleaned from the bottom towards the top by thoroughly washing off cleaning agents from the top to bottom. Rainwater drains and drainage channels should be rinsed as well.

It is not recommended to clean the sandwich panels with steam. Surfaces may not be cleaned with water if the ambient air temperature is below or equal to 0 °C.

Surfaces with coating intended to be used in contact with food (for example, FoodSafe coatings) may be cleaned with cleaning agents not containing solvents with pH value from 5 to 8.

5. Installation of external wall

5.1. General

Attention! For more detailed information see Drawing set “Assemblies”.

Attention! Observe the applicable occupational health and safety regulations valid in the place of installation.

Check whether the framework is clean and dry before installation. If necessary, clean the surface of framework so that the sealing permanently adheres to it.

Panels with mineral wool core shall be protected from precipitation during installation. In case of rain or snow, any unfinished horizontal joints shall be covered with waterproof film (or other adequate means). The deviation from those provisions will lead to decrease of thermal resistance of and decrease of service life of the panel.

5.2. Horizontal installation

Always follow the erection scheme for building and start the installation with the bottom panel.

Perform the horizontal installation of panels to the framework of external wall as follows.

1. Apply waterproofing and sealing tape to foundation.
2. Place the U-profile at the given distance from the frame (column). Level the U-profile so that the deviation from horizontal is not greater than ± 3 mm per panel length. Fix the U-profile to foundation.
3. Fill the support profile with insulation material (mineral wool insulation for MW panels; PU spray foam for EPS, PUR, and PIR panels).
4. Fix the plinth drip nose. Ensure at least 10 cm overlapping of linear plinth drip noses. The corner joint between flashing shall be vertical. Apply sealant to overlaps.
5. Attach the sealing tape to the vertical framework. Ensure that sealing tape has adhered firmly to the framework, its surface is even and without interruptions.
6. Remove the protective film from the panel at place of joints and where the fasteners will be inserted.
7. If necessary, perform machining of panels (for example, elimination of thermal bridge at outside corner of the building).
8. In order to ensure complete joint tightness apply sealant at joints between panels before installation.
9. Fix appropriate lifting tools and safety line to the panel. Handle panel according to the direction of installation.
10. Remove lifting tools and fix panel to framework by using temporary fastenings (for example, fix grip; ensure that it does not damage the panel). Check the position of the panel, i.e. if the support width of the panel on the framework is sufficient. The support width shall be at least 50 mm on the end support and 60 mm on the internal support.
    Check with laser level or theodolite whether the deviation of the panel from horizontal is within limits ± 3 mm per length of the panel.
11. If the panel is positioned correctly, while the temporary fastenings are not released, fix the panel permanently to the framework. Use fastenings indicated in Drawing set “Assemblies”. Follow the instructions for the distances between screws, their depth and position.
12. Continue installation of the panels according to the installation scheme. Always apply sealant on joints before installation of the next panel in order to ensure joint tightness.
13. When installing the panels in the next span, place panels in a way that the necessary gap between panel ends on vertical support of the framework is as wide as required.
14. Apply sealant and insulation materials at the joint between panels as given in Drawing set “Assemblies”.
15. Cover the fasteners at the end of panel with flashings. Before installation of flashings apply sealing materials in it. Join flashings with at least 5 cm overlap. If necessary, carefully clean away remains of any sealing materials from the surface of the panel.
16. Install the linings at wall apertures according to Drawing set “Assemblies”.

17. Mount skirting if required.

5.3. Vertical installation

Always follow the erection scheme for the building during installation.

It is recommended to install the panels in direction as given in Figure 7.

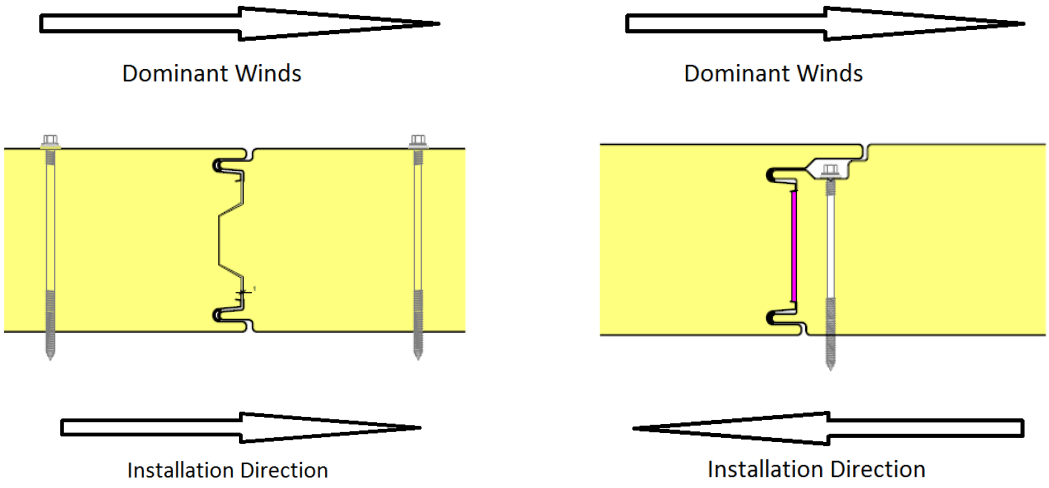


Figure 7. The recommended direction for vertical installation

Attention! In order to ensure high-quality installation of sandwich panels, it is always recommended to use installation materials and parts supplied by the manufacturer of the panels.

Perform the vertical installation of the panels to the outer wall framework as follows:

1. Apply waterproofing and sealing tape to foundation.
2. Place the support profile at the given distance from the frame (column). Level the support profile so that the deviation from horizontal is not greater than ± 3 mm per panel length. Fix the support profile to foundation.
3. Mount sealing tape in the support profile in order to form airtight joint with inner facing of the panel.
4. Fill the base near the support profiles with insulation material (mineral wool insulation for MW panels; spray foam for EPS, PUR, and PIR panels).
5. Attach the sealing tape to the vertical framework. Ensure that sealing tape has adhered firmly to the framework, its surface is even and without interruptions.
6. Remove the protective film from the panel at place of joints and where the fasteners will be inserted.
7. If necessary, perform machining of panels (for example, elimination of thermal bridge at outside corner of the building).
8. In order to ensure complete joint tightness apply sealant at joint between panels before installation.
9. Fix appropriate lifting tools and safety line to the panel. Handle the panel according to the direction of installation.
10. Remove lifting tools and fix panel to framework by using temporary fastenings (for example, fix grip; ensure that it does not damage the panel). Check the position of the panel, i.e. if the support width of the panel on the framework is sufficient. The support width shall be at least 50 mm on the end support. In the corners of the building the support width shall be at least 50 mm on the longitudinal edges of the panel.

Check with laser level or theodolite whether the deviation of the panel from horizontal is within limits ± 3 mm per length of the panel.

11. If the panel is positioned correctly, while the temporary fastenings are not released, fix the panel permanently to the framework. Use the fastenings indicated in Drawing set “Assemblies”. Follow the instructions for the distances between screws, their depth and position.
12. Continue installation of the panels according to the installation scheme. Always apply sealant on joints before installation of the next panel in order to ensure joint tightness.
13. When installing the panels in the next level, place panels in a way that the necessary gap between panel ends on horizontal support of the framework is as wide as required.
14. Apply sealant and insulation materials at the joint between panels as given in Drawing set “Assemblies”.
15. Cover the fasteners at the end of panel with flashings. Before installation of flashings apply sealing materials in it. Join flashings with at least 10 cm overlap. If necessary, carefully clean away remains of any sealing materials from the surface of the panel.
16. Fix the plinth drip nose. Ensure at least 10 cm overlapping of linear plinth drip noses. The corner joint between flashing shall be vertical. Apply sealant to overlaps.
17. Install the linings at wall apertures according to Drawing set “Assemblies”.
18. Mount skirting if required.

6. Installation of Profiled (Trapeze) Roof Panels

Installation shall always be carried out in accordance with the construction design of the building.

Panels should be installed in the direction as shown in Figure 8 by starting from cornice at the corner of building.

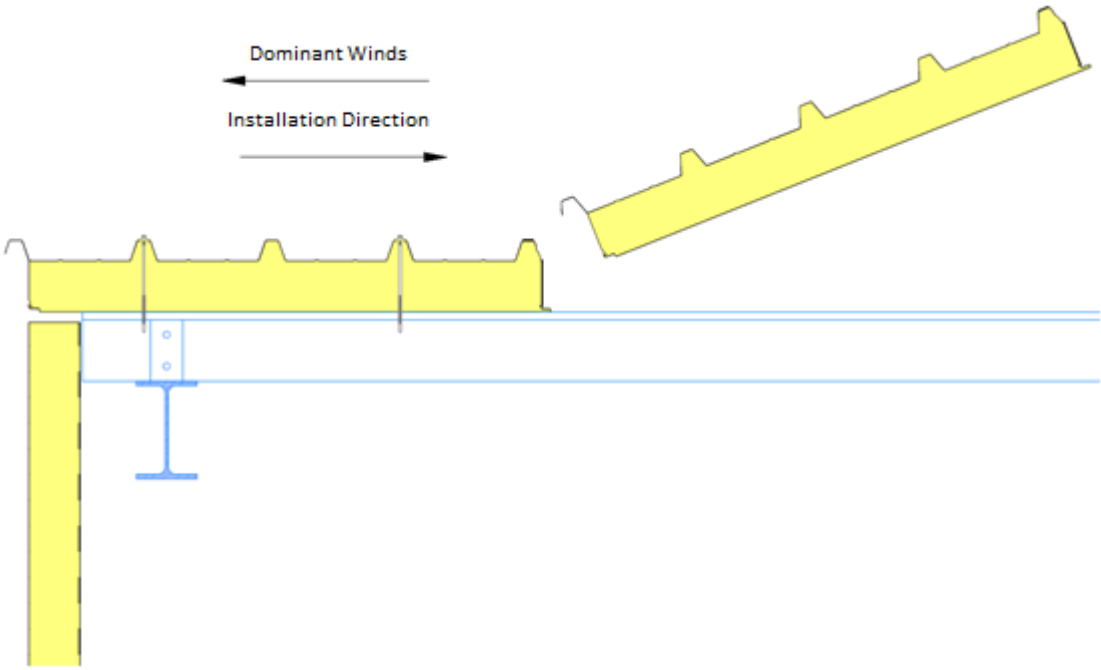


Figure 8. The recommended direction for installation of profiled roof panels

Attention! In order to ensure high-quality installation of sandwich panels, it is always recommended to use installation materials and parts supplied by the manufacturer of the panels.

Panels shall be fixed to the roof structure as follows:

1. Make sure that the load-bearing roof structures (beams, trusses, etc.) are assembled in accordance with the design documentation. Make sure that the roof slope is at least 5° (if the panels are joined on the slope) or at least 3° (if the slope is made of a single-span panel).

   Attention! The application of panels in roof structures with uneven spacing between the support profiles on the roof span is not recommended. In such structures, the support profiles may cause torsional deformation and leakage at the panel joints.

2. Before placing the panel, glue a sealing tape onto the first and last load-bearing profile in order to obtain an tight and waterproof joint between the support structure and sandwich panel.
3. Place the sandwich panel in its intended position and remove the protective film from fastening points.
4. Screw the sandwich panel onto support structure by using an appropriate amount of self-drilling screws. If the building is not exposed to strong winds, screw in 3 fasteners at each end of the sandwich panel (in every second crown) and 2 fastenings at every second support profile throughout the whole span of the sandwich panel. If the building is located in a windy area (for example, a coastal zone), please contact a representative of the manufacturer to find out the required number of fasteners. Screws at the lateral side shall be screwed in only after placement of the next panel row.

Attention! Do not screw the sandwich panel onto every single support profile - otherwise the panel may be exposed to increased loads that are caused by steel heating up and expanding under solar radiation. If the panel is screwed on too tight and may not bend, such loads may cause the facing to wrinkle.

5. If there are multiple joined panels on a single slope, first install the panel which is closer to the cornice by leaving the one which is sealing off the panel row at the roof ridge as the last.
6. Joints shall be formed in accordance with the solution described in the «Assemblies" detail drawing (including, the choice of materials).

   Attention! Strong wind flows may push water upwards against the roof slope. The smaller is the roof slope, the more attention shall be paid to sealing of the overlap joints. If the roof slope is small and the building is exposed to strong wind flows, overlap joints should be waterproofed with special sealing tape. It is not recommended to reinforce (with rivets or screws) the overlap joint at the valley of the overlap (the lowest plane).

   Please note that before lifting a panel onto the roof, the bottom coating and insulation layer shall be removed from the overlapping panel so that an overlap of at least 200 mm would be formed between both panels.

7. Continue installation of the panels in each following row by starting from the cornice. If there is no factory-made rubber sealing strip or sealing tape on the longest (lateral) side of the panel at the joint area, apply a sealant or sealing tape before installation of every following panel in accordance with the "Assemblies" detail design.
8. Connect the panels tightly. Fasten them together by screwing trough the panels and the load-bearing profiles. In addition, connect the lateral sides of the panel at the overlap areas by using screws for steel sheets with a spacing of 500 mm (see the "Assemblies" detail design).
9. Carry out installation of ridge cap and cornice elements as well as any auxiliary materials along with installation of the roof cladding in accordance with the solution shown in the "Assemblies" detail design.

7. Installation of Roll-Folded Roof Panels

Installation shall always be carried out in accordance with the construction design of the building.

Panels should be installed in the direction as shown in Figure 9 by starting from cornice at the corner of building.

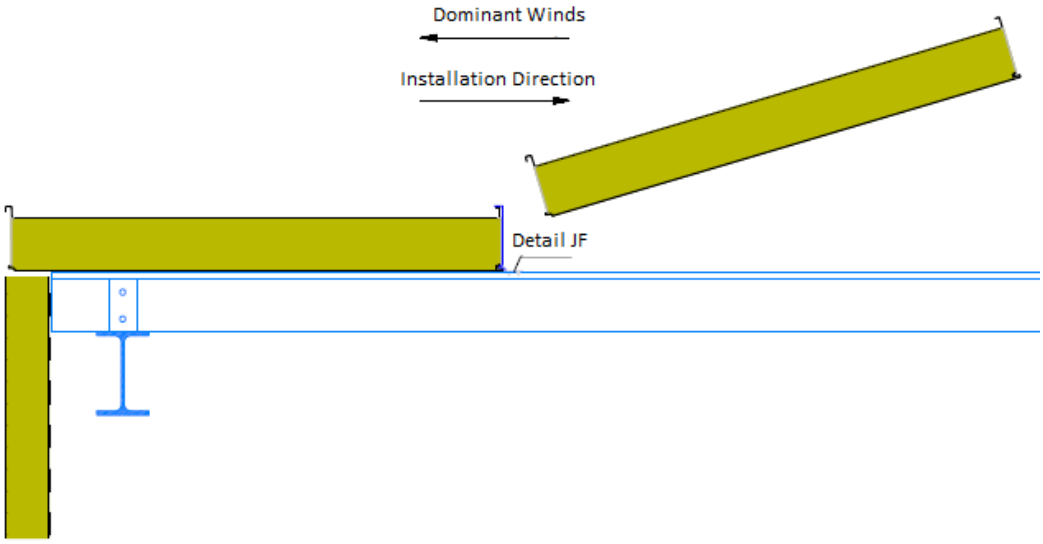


Figure 9. The recommended direction for installation of roll-folded roof panels

Attention! In order to ensure high-quality installation of sandwich panels, it is always recommended to use installation materials and parts supplied by the manufacturer of the panels.

Panels shall be fixed to the roof structure as follows:

1. Make sure that the load-bearing roof structures (beams, trusses, etc.) are assembled in accordance with the design documentation. Make sure that the roof slope is at least 5° (if the panels are joined on the slope) or at least 3° (if the slope is made of a single-span panel).

   Attention! The application of panels in roof structures with uneven spacing between the support profiles on the roof span is not recommended. In such structures, the support profiles may cause torsional deformation and leakages at the panel joints.

2. Before placing the panel, glue a sealing tape onto the first and last load-bearing profile in order to have a tight and waterproof joint between the support structure and sandwich panel. The heavier is the panel, the smaller spacing shall be made between the profiles that are covered with sealing tape. Lighter sandwich panels will require less sealing tape respectively. The recommended spacing between sealing tapes in longitudinal direction of the panel is shown in Table 4.

Table 4. Spacing between sealing tapes for roll-folded roof panels

Panel Type	Panel Thickness	Recommended spacing between the support profiles with sealing tape
TENAX R EPS	from 50 to 150 mm	from 3 to 6 m
	from 151 to 250 mm	from 2 to 5 m
TENAX R MW	from 50 to 100 mm	from 2 to 4 m
	from 101 to 150 mm	from 1, 5 to 3 m
	from 151 to 250 mm	from 1 to 2,8 m

Attention! Sealing tape shall be glued onto the support profile in a way that it is supporting the whole width of the panel, except for the fastening points! Sealing tape may neither be glued underneath, nor on top of the fastening parts.

3. Place the sandwich panel in its intended position and remove the protective film from fastening points.
4. Screw the sandwich panel onto support structure by using an appropriate amount of self-drilling screws. Screw the edge of the first panel which is placed along the wall of the building on each of the support profiles. At the cornice area, the panel shall be fixed to the support profile with 3 screws.
5. Apply sealant and place a self-adhesive tape on the open side of the panel (area where the next panel row is going to be placed) in accordance with the “Assemblies” detail design.
6. On its open edge, the sandwich panel shall be fixed to each of the support profiles with the JF fastening element and 2 rivets.
7. Each of the following panel rows shall be placed tightly next to the previous row.
8. Treat the areas that are going to be roll-folded with thick (viscous, non-leaking) lubricant (for example, Vaseline or other type of grease) that will provide an airtight joint after the panels are roll-folded.
9. Tighten the JF fastening elements together with the panels by using a particular roll-folding machine.
10. If there are multiple joined panels on a single slope, first install the panel which is closer to the cornice by leaving the one which is sealing off the panel row at the roof ridge as the last.
11. Joints shall be formed in accordance with the solution described in the «Assemblies” detail drawing (including, the choice of materials).

    Attention! Strong wind flows may bring water upwards on the roof slope. The lower is the roof slope, the more attention shall be paid to sealing of the overlap joints. If the roof slope is low and the building is exposed to strong wind flows, overlap joints should be waterproofed with special sealing tape. It is not recommended to fix (with rivets or screws) the overlap joint at the valley of the overlap (the lowest plane).

    Please note that before lifting a panel on the roof, the bottom coating and insulation layer shall be removed from the overlapping panel so that an overlap of at least 200 mm would be formed between both panels.

12. Continue installation of the panels in each following row by starting from the cornice. If there is no factory-made rubber sealing strip or sealing tape on the lateral (longest) side of the panel at the joint area, apply a sealant or sealing tape before installation of every following panel in accordance with the “Assemblies” detail designs.
13. Carry out installation of ridge cap and cornice elements as well as any auxiliary materials along with installation of the roof covering in accordance with the solution shown in the “Assemblies” detail designs.