SANDWICH PANEL'S HANDLING & INSTALLATION MANUAL



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MANUFACTURING SUSTAINABLE INNOVATIONS



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1. Packing

Panels are delivered in packages, each of them consisting of a certain number of piled-up panels. The number of panels per package is defined taking into consideration:

- Panel's type,
- Panel's thickness,
- Panels' length,
- Type of transportation means,
- Optimization of loading plan.

Each package is supported by foam spacers with standard thickness, along package's length, every 900/1000mm. Packages are wrapped – together with the foam spacers – with several layers of polyethylene film, and are labeled with the necessary information (package identification number, packing list, handling instructions, etc.)



2. Transportation

Panels are loaded either on truck platforms or in containers. In both cases, the floor of transportation means should be level, without any protrusion that might damage the panels, and equipped with suitable anchorage points and adequate number of nylon straps (every ~2.00m) for the securing of packages during transportation, as per in-force legislation.

2.1. Trucks

Panel packages, depending on their total height, are stacked-up in two, three levels. Two piles of packages (one next to the other) are placed across truck platform width (figure 1).

Figure 1



Typical packing/loading plan for trucks with trailer length 13.50m is available on Table 1. For a case per-case optimization of the loading plan, please address to our sales offices.

2.2. Containers

In case of transportation by means of containers, please inform accordingly our sales offices prior to panels' order confirmation

3. Handling and Storage

Panels' packages handling (unloading and movement) and storage at project site is a delicate phase during which panels might get damaged. For this reason, the following instructions should be thoroughly observed:

Unloading with forklift

- Recommended only for short (<6.00m) and light packages, and only in case of leveled and smooth terrain.
- Forks should be longer than packages width.
- Forks should be spread apart as much as possible.
- Forks' upper surface should be clean and smooth, in order to avoid damages on panels' surface.
- Never unload more than one package at a time.

Unloading with crane

- Lift the packages with at least 2 nylon straps/belts.
- Make sure straps are not twisted.
- Make sure straps remain at their position (one apart from the other) by using a spreading truss of adequate length.
- Protect panels' edges (tongue and groove joint configuration) from getting damaged by the straps, by placing wooden planks between package and straps, both at bottom and top of the package. Wooden planks should be of adequate strength, width minimum 200mm, and longer than packages' width by approx. 2cm.
- Never unload more than one package at a time.

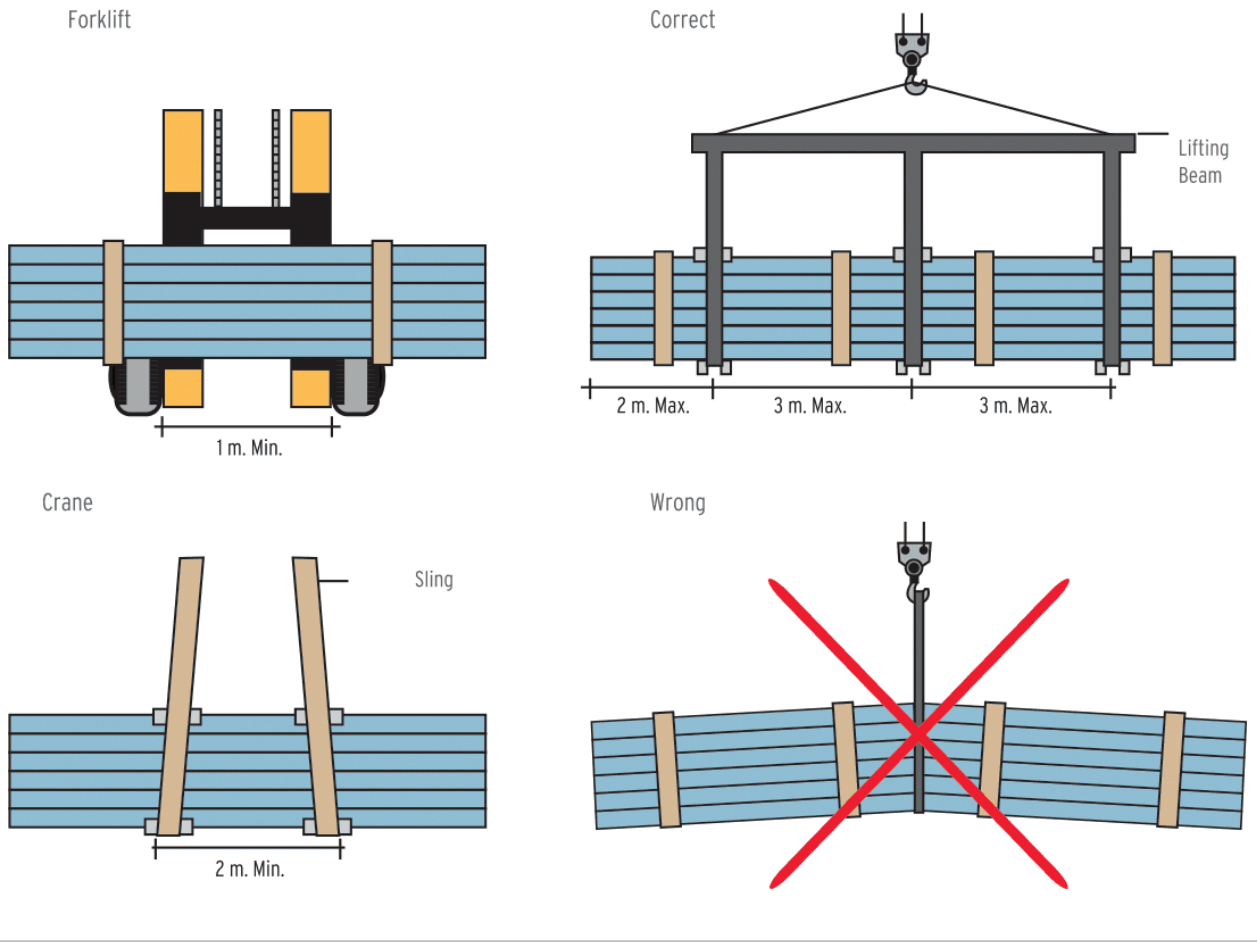
Storing panels at project site

- Place packages on smooth, level and rigid terrain.
- Support packages on wooden or polystyrene spacers width 200mm, every 1.00m
- Packages should be placed slightly inclined (min. 5%), to allow for eventual infiltration/condensation water drainage.

- Maximum 2 or 3 packages should be stacked in height (as transported).
- Packages should be stored at sheltered places. If not possible, they should be protected from rain and sun rays with rainproof membrane, ensuring, at the same time, adequate ventilation of the packages.
- The removable protective film of panels' surface should not be exposed to sun rays for prolonged periods. In any case, it should be removed within 21 days from panels' production date.

Appropriate labeling (figure 2) on each of GEOPANEL'S panels package indicates the above mentioned recommendations.

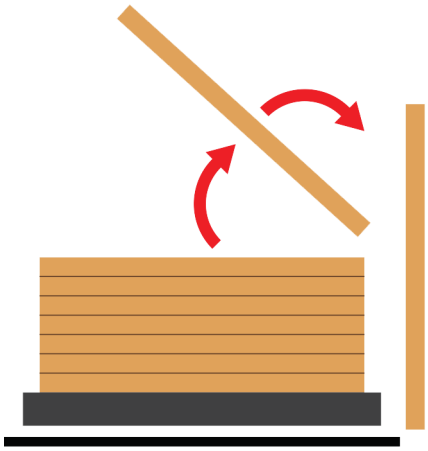
Figure -2

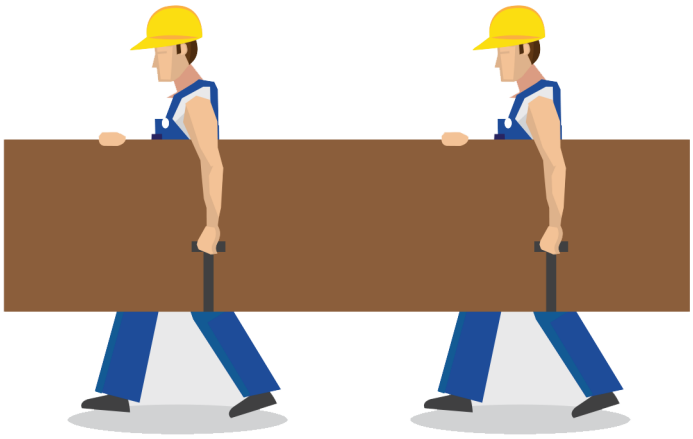


When panels have to be moved one by one at project site (figure 3):

- Each panel should be tilted along its longitudinal edge, and then lifted; it should never be dragged over the package.
- Each panel should be carried with its plane in vertical position; never in horizontal position.

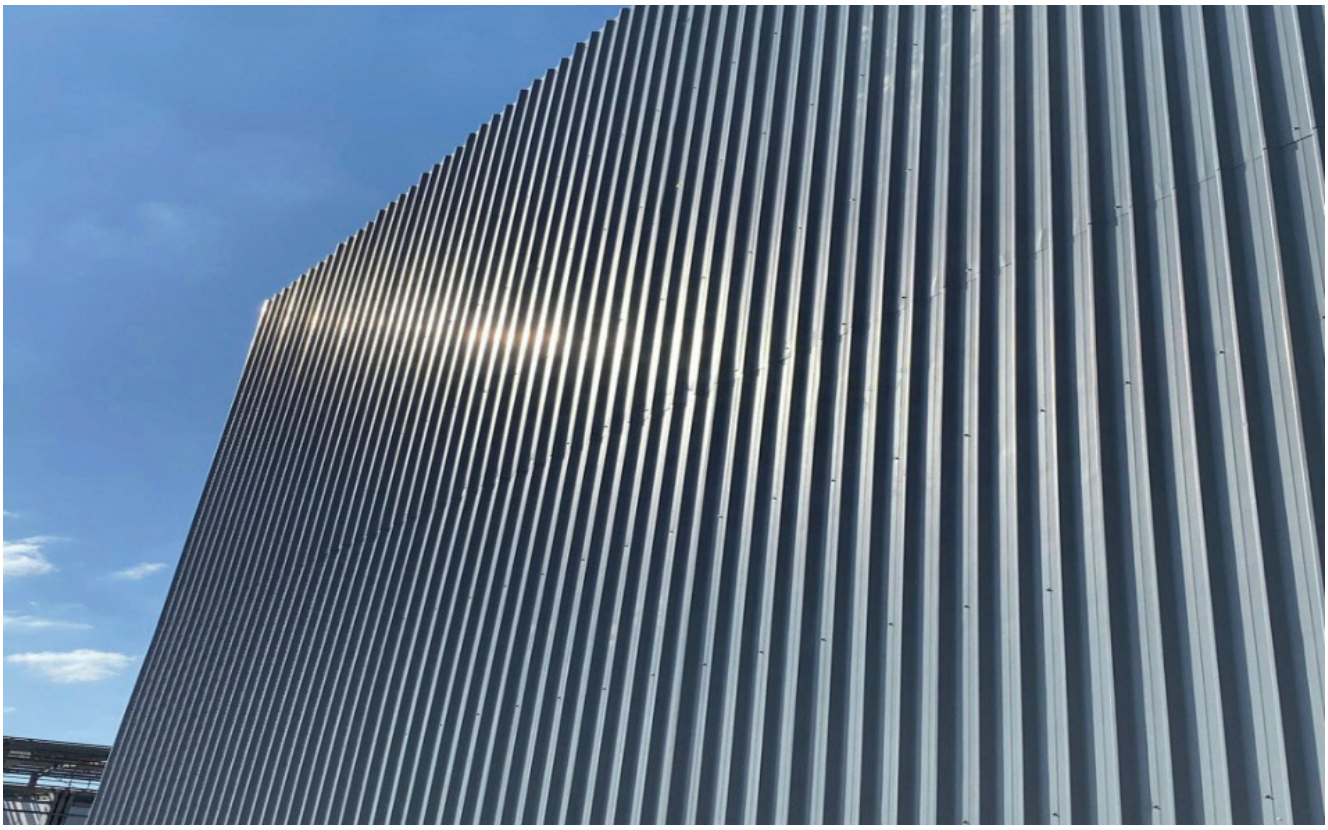
Figure -3











4. Installation

4.1. Roof cladding

4.1.1. Preliminaries – Safety considerationst

- Check that the panels have been stored as recommended in chapter 3.
- Check that the purlins (supporting structure of the panels) comply with the project drawings (span length, width of purlin's flange, etc.), they are not deformed, and they form a plane. Panels are designed for installation on plane surfaces, of minimum slope 7%.
- Check that safety measures have been implemented as per current regulations for working at height (parapets, anti-fall safety net, life line, etc.)
- Check that installation workers bear the appropriate personal safety equipment, as per current regulations.
- Prepare the power supply lines for the power hand-tools, as per current regulations.
- Check for eventual overhanging power lines, and strictly observe precautions and safety measures, as per current regulations.
- Installation workers are recommended to bear hand gloves (cutting precaution) and footwear with soft soles in order avoid eventual panels' surface scratching/damaging.

4.1.2. Lifting

When panel packages are lifted directly on the roof structure, instructions as per chapter 3 (unloading with crane) should be followed (figure 4).

In addition, a rope fixed on one package's end would allow for better handling (swinging rotation) of the package.

Packages should be placed on the roof purlins, close to the main trusses (load bearing structure), and distributed along roof's length, taking into consideration the
installation direction (figure 5).

Packages should be secured on the roof structure against slipping and wind uplifting forces.

Figure 4

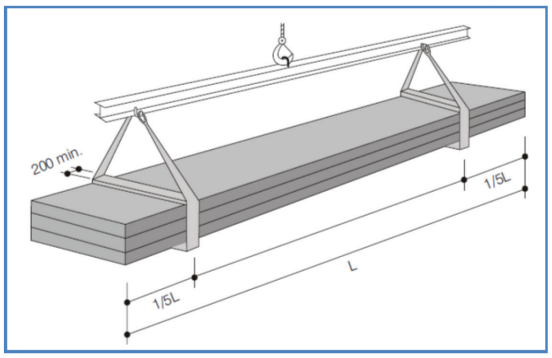
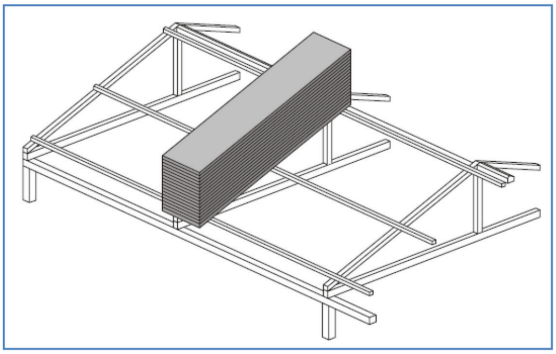


Figure 5



Moving long and heavy panels on the roof by hand, could be difficult or even dangerous. In such cases it is recommended that packages are not lifted on the roof structure, but left on the ground, and panels are lifted one by one on the structure, by means of crane and special lifting clamps (figure 6&7).

Figure 6



Figure 7



Lifting clamps should be applied on the full rib of the panels. Lifting clamps are connected with ropes on a spreading truss, which is lifted by crane. At least two (2) clamps should be used (figure 8 & 9). In this way, roof panels are transferred directly to their final installation position.

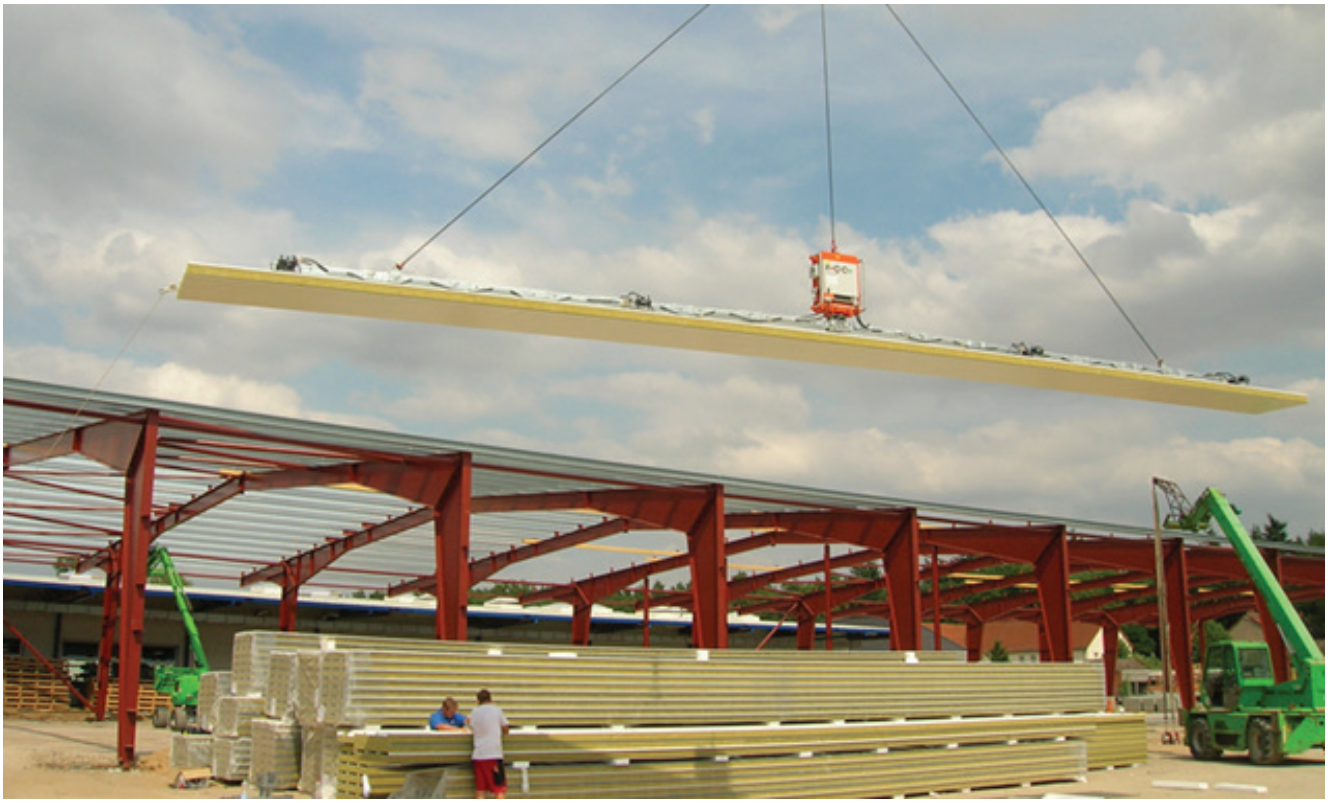
Figure 8



Figure 9







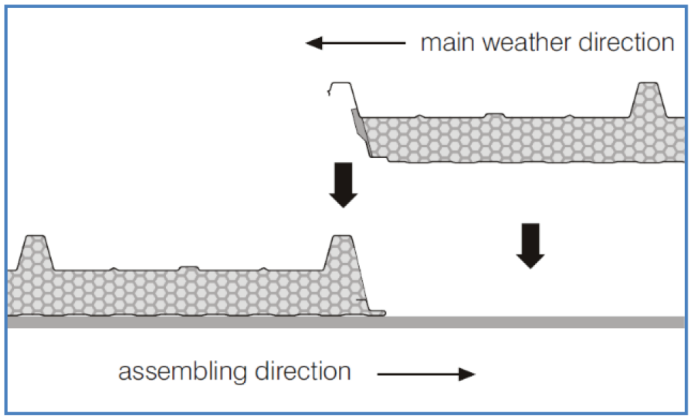
4.1.3. Installation procedure

The polyethylene protective film on the internal side must be removed before panels' installation. On the external side, the protective film should be partially removed (along panel's edges – joint), in order to allow for additional protection during installation works. Film should be completely removed by the end of the working shift, and in any case, before panels' fixing on the internal trapezoidal ribs.
Any eventual traces of adhesive (from the film) on panel's surfaces should be removed, with the use of a water-detergent mixture.

Before panels' installation, consult project's construction details, and check for accessories and flashing elements that should be installed prior to panels (e.g. gutter, under-ridge, containing profile on the gable edge of the roof, gaskets, etc.)

ATTENTION: Installation direction of the panels should be opposite to the prevailing wind direction (figure 10).

Figure 10



Place the first panel and fix it in place, making sure that it is perfectly aligned and squared with the roof structure.

The first panel is secured on the roof gable edge, by fixing it in the "valley", immediately after the first (empty) rib (figure 11).

Fixing element: self-drilling screw with metal washer & EPDM gasket.

Figure 11

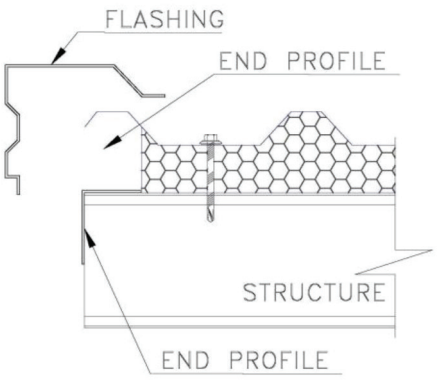
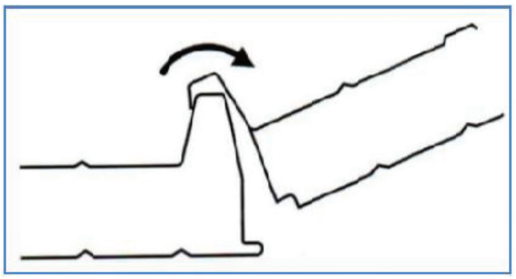


Figure 12

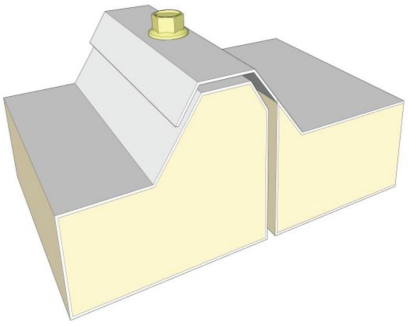


The second panel is installed by overlapping its first (empty) rib on the last (full) rib of the first panel (figure 12), and fixing them together on the roof purlins (figure 13).

Fixing element: self-drilling screw with metal washer & EPDM gasket..

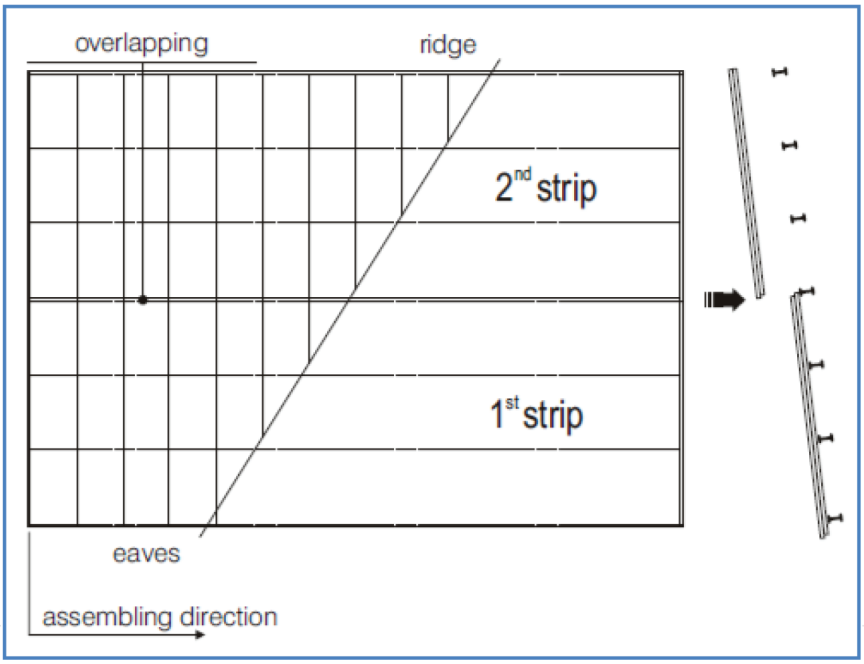
Fixing element should be placed perpendicularly to panel's surface, and positioned in the middle line of the rib.

Figure 13



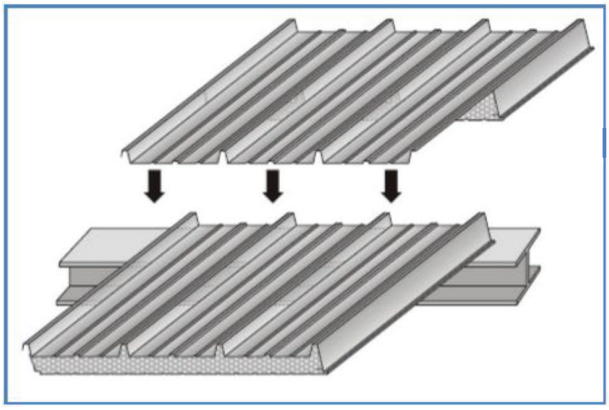
In cases where the pitch length of the roof is covered by more than one panel, panels should be installed in strips (figure 14).

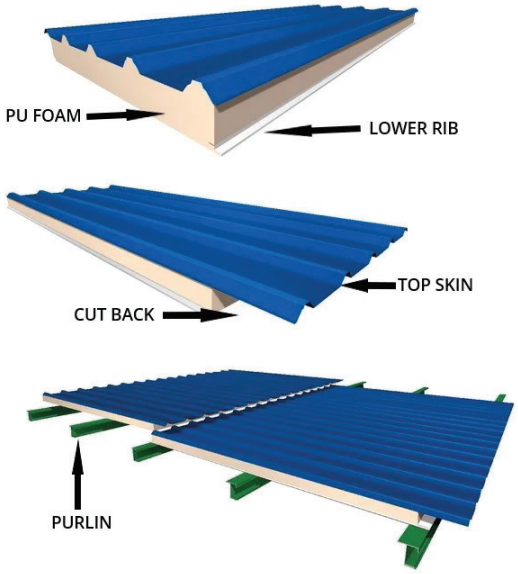
Figure 14



After installation of the first strip panels (downstream), the second strip panels are installed by longitudinal overlapping (figure 15).

Figure 15





Longitudinal overlapping should be effected only on a purlin of adequate width or putting addition angle screwed to purlin (also depending on project's snow and wind loads, as well as on insulation material of the panels); indicative width:

- 150mm/200mm for PU/PIR panels.

Longitudinal overlapping length can vary between 100mm and 300mm, also depending on roof slope.

Longitudinal overlapping preparation of the upstream panel consists in:

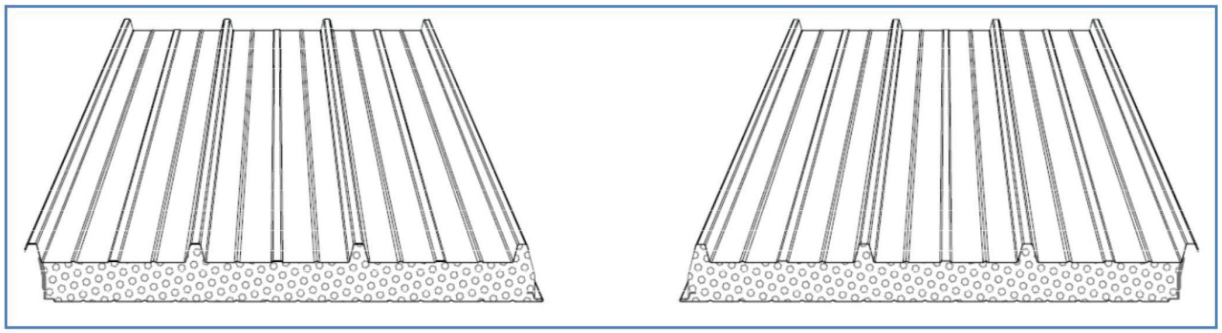
- Cut-back (by overlapping length) of the internal steel sheet
- Removal of the internal steel sheet
  Removal of the insulation material

Overlapping preparation can be done either on the project site, or during panels' production. In case of factory made overlapping, panels of the 2nd strip will have a pre-defined direction (overlapping R, or overlapping L), which should be specified in advance, according to installation direction, as follows (figure 16):

Looking at the panel, from the gutter towards the ridge,

- Overlapping R should be requested, when the empty rib of the panel is on the left (installation direction from the left to the right)
- Overlapping L should be requested, when the empty rib of the panel is on the right (installation direction from the right to the left)

Figure 16



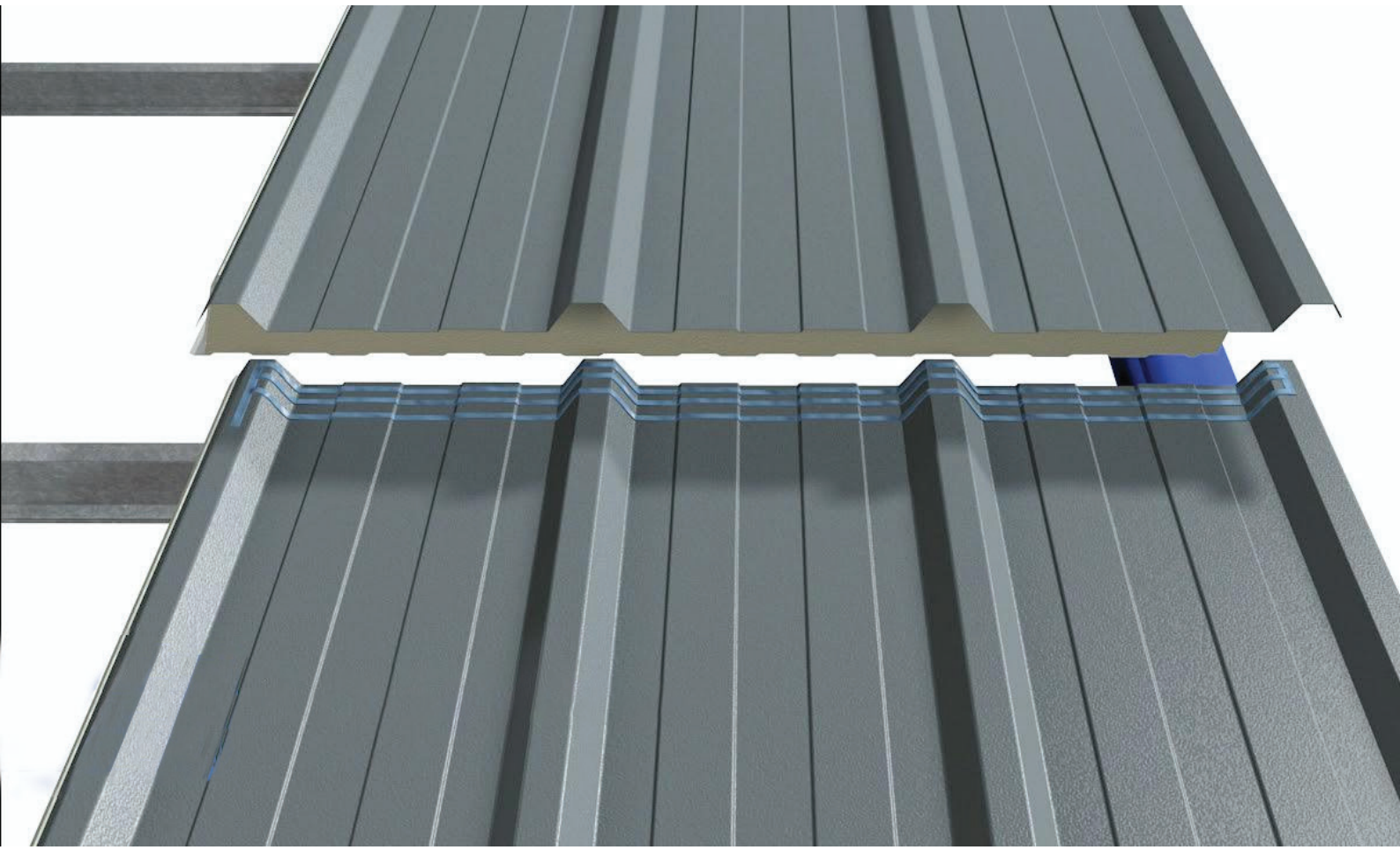
Overlaping A

Overlaping B

Similarly, overlapping preparation is highly recommended on panels' downstream edge, ending inside the gutter.

- It is a good practice for polyurethane panels, in order to prevent local corrosion of the steel, and mold formation.

To prevent insulation material from absorbing rain water, and therefore, to avoid dead load increase, steel corrosion, and loss of adhesion to steel sheets.



4.1.4. Fixing of roof panels

Roof panels should be secured on roof structure as per fixing scheme indicated in figure 17.

Figure 17

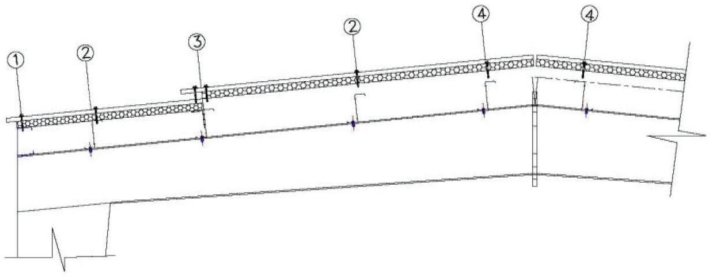
Fixing positions:

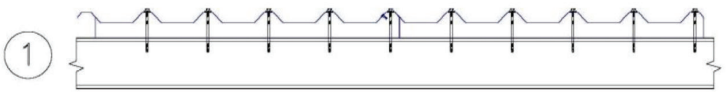
1. Panels' downstream edge (gutter). One screw with washer, on each rib.

2. Intermediate supports. One screw with with washer, on joint rib, plus
one more on alternating ribs.

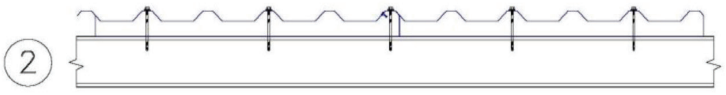
3. Eventual overlapping position. One screw with washer, on each rib.

4. Panels' upstream edge (ridge). One screw with metal washer and EPDM gasket, on each low rib (between main ribs), underneath ridge flashing element.

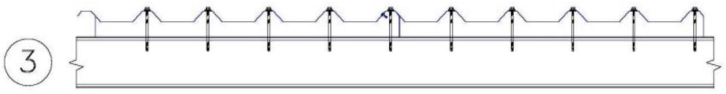




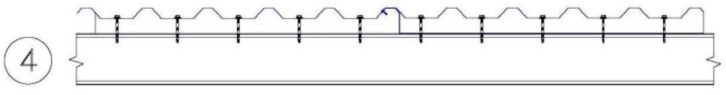
ROOF PANEL FIXING AT THE END OF THE ROOF EDGE (EAVE)



ROOF PANEL FIXING DETAIL @INTERMEDIATE PURLINS



ROOF PANEL FIXING DETAIL @ OVER LAP PURLINS



ROOF PANEL FIXING DETAIL @ RIDGE

The required number of screws to be used will be decided by project's engineer, on the basis of:

- Project wind loads,
- Type of panels' supporting structure,
- Steel thickness of panel's faces,
- Type of screws to be used, and relevant supplier's instructions.

For recommended screws length, see Annex A.

In addition to primary fixing (securing panels on structure), secondary fixing elements should also be applied along panels' joint, in order to improve joint tightness, avoid bending on lapping side and ensure a uniform effect of panels. Such fixing elements (e.g.rivet/ 6.3x25mm plus Steel washer with EPDM gasket), are placed on lapping of joint rib, at maximum distance of 600mm (figure 18).

Figure 18

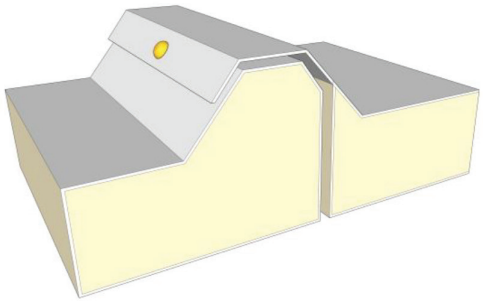


Figure 19

During drilling, fixing (and eventually cutting) operations, metal chippings are produced, that will combine with other dust can damage panels' surface either by scratching, or by their rapid corrosion. Such metal chippings should be carefully removed with a vacuum cleaner, immediately after each operation (figure 19).



4.2. Wall cladding

4.2.1. Preliminaries – Safety considerations

- Check that the panels have been stored as recommended in chapter 3.
- Check that the purlins (supporting structure of the panels) comply with the project drawings (span length, width of purlin's flange, etc.), they are not deformed, and they form a plane. Panels are designed for installation on plane surfaces.
- Check that project terrain along building's perimeter is smooth and even; it is critical for the safe placement of panel packages on the ground, and for the safe movement of eventual elevated working platforms.

- Check that safety measures have been implemented as per current regulations for working at height (parapets, anti-fall safety net, life line, etc.)
- Check that installation workers bear the appropriate personal safety equipment, as per current regulations.
- Prepare the power supply lines for the power hand-tools, as per current regulations.
- Check for eventual overhanging power lines, and strictly observe precautions and safety measures, as per current regulations.
- Installation workers are recommended to bear hand gloves (cutting precaution).

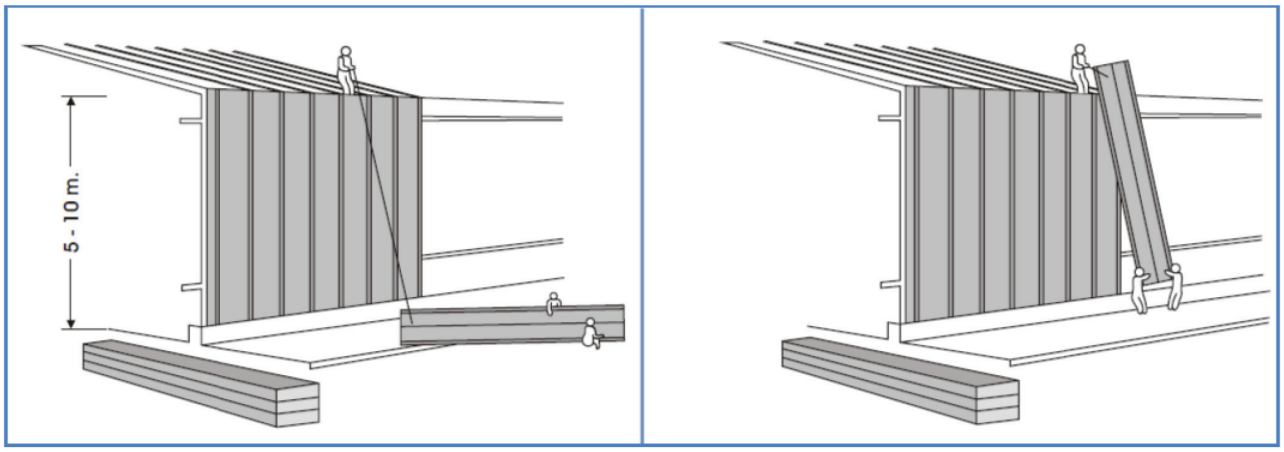
4.2.2. Lifting

Panel packages should be distributed along the building facades to be clad, close to their installation position, in order to optimize individual panel's handling during installation works. Packages should be moved inside the project site as per instructions of chapter 3 (unloading with forklift and/or crane).

In case of using a crane, a rope fixed on one package's end would allow for better handling (swinging rotation) of the package.

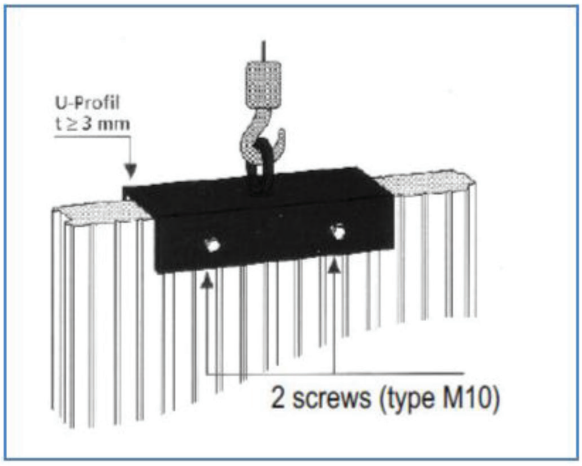
Short and light panels can be lifted to installation position by hand, with the eventual use of ropes (figure 20).

Figure 20



In case of heavier panels, or when panels should be lifted up at a height where working from the ground is not possible, special lifting equipment should be used (figures 21,22, 23, 24, 25, & 26). In any case, special care should be given at keeping panels' plane at vertical position.

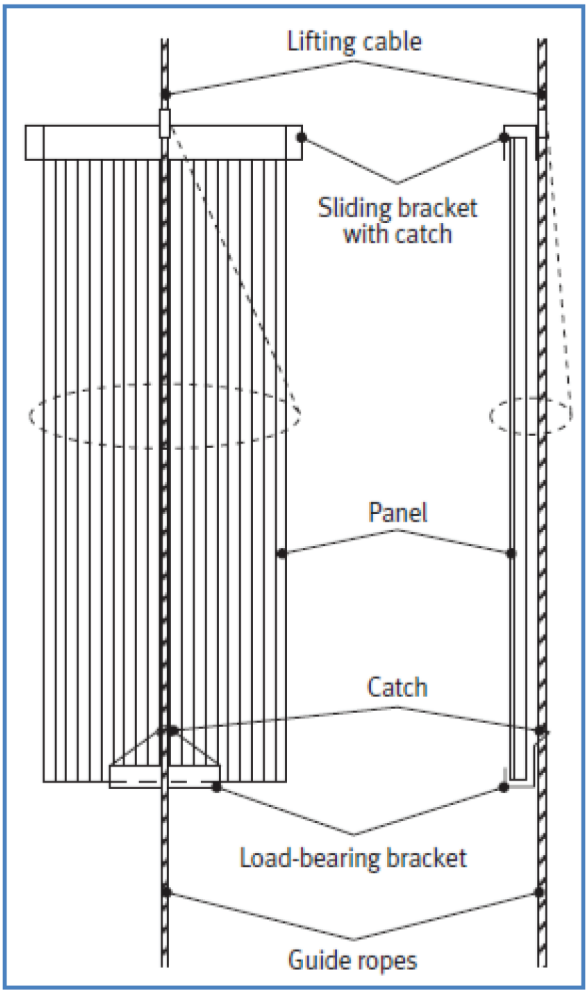
Figure 21



Lifting of panel with crane, with the use of a U profile fixed at the upper end of the panel (for vertical installation of wall panels).
Recommendation:

- Minimum steel thickness of panel's faces 0.50mm,
- Maximum panel's weight 200kg.
- Minimum distance of screws from panel's edge 100mm.

Figure 22



Lifting of panel with crane, with the use of a lifting
cable (wire rope).
The panel is supported at its lower end by a load
bearing bracket fixed on the lifting cable, and is secured at its upper end by a bracket, the position of which is adjustable along cable's length, according to panel's length

Lifting of panel with vacuum grippers.

Vacuum grippers can be used with crane, but they can also be adjusted on telescopic scaffolds or on working platform vehicles. Both vertical and horizontal installation is possible.

Figure 23



Figure 24

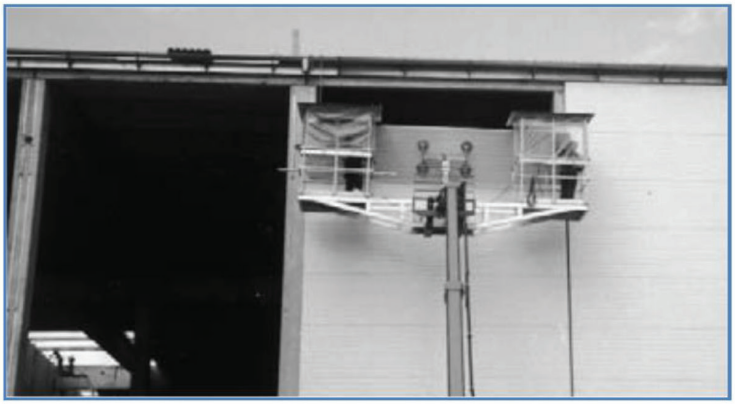
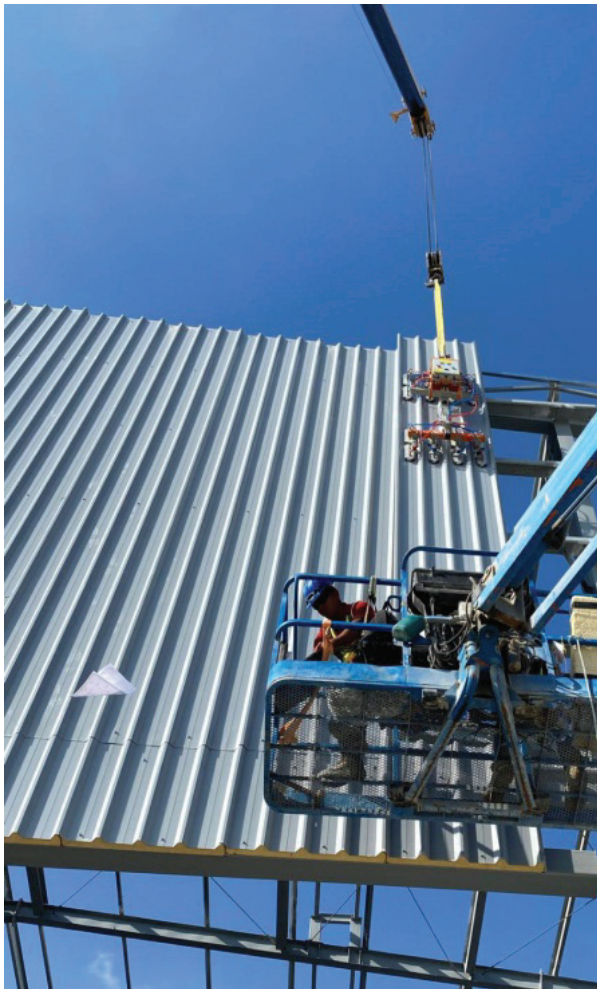


Figure 25



Figure 26







4.2.3. Installation procedure

The polyethylene protective film must be removed before panels' installation.
Any eventual traces of adhesive (from the film) on panel's surfaces should be removed, with the use of a water-detergent mixture.
Before panels' installation, consult project's construction details, and check for accessories and flashing elements that should be installed prior to panels (e.g. base-drip profiles, internal corner profiles, gaskets, etc.)
Base-drip flashing element is fixed on the sub-structure at perfectly horizontal position. Immediately after, wall panels' installation can start.

4.2.3.1. Vertical installation of panels

ATTENTION: Installation direction of the panels, on each façade, should be opposite to the prevailing wind direction (figure 27).

Figure 27

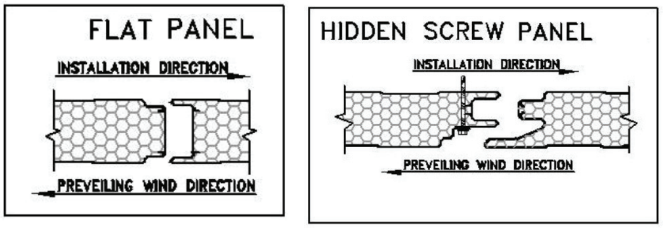
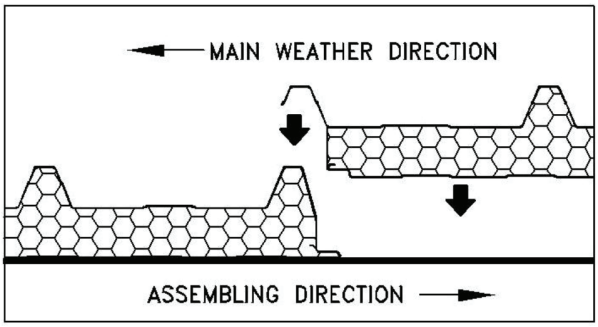
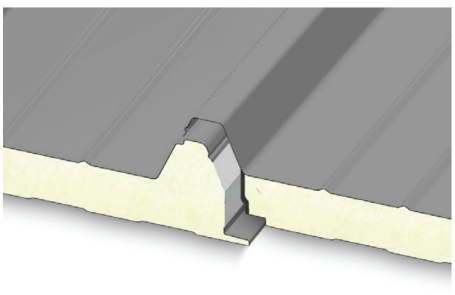


Figure 28



As indicated in figure 28, wall panels are positioned on the sub-structure with their "groove" joint facing towards the starting point of installation.

Place the first panel and fix it in place, making sure that it is perfectly vertical and aligned with the wall structure. The use of mechanical clamps – before fixing the panel – can assist the plumbing procedure.



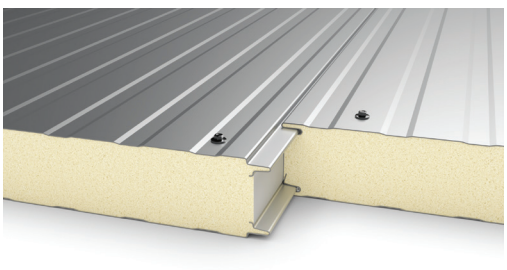
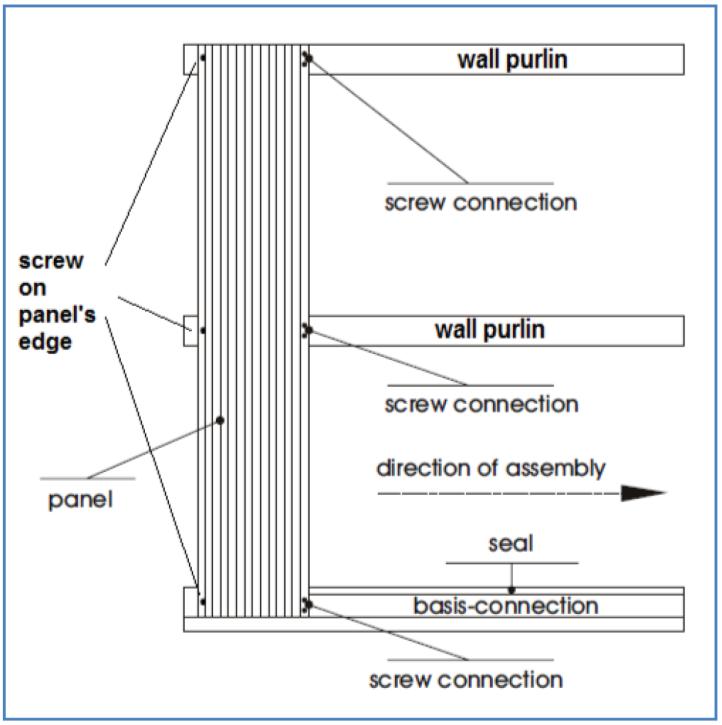
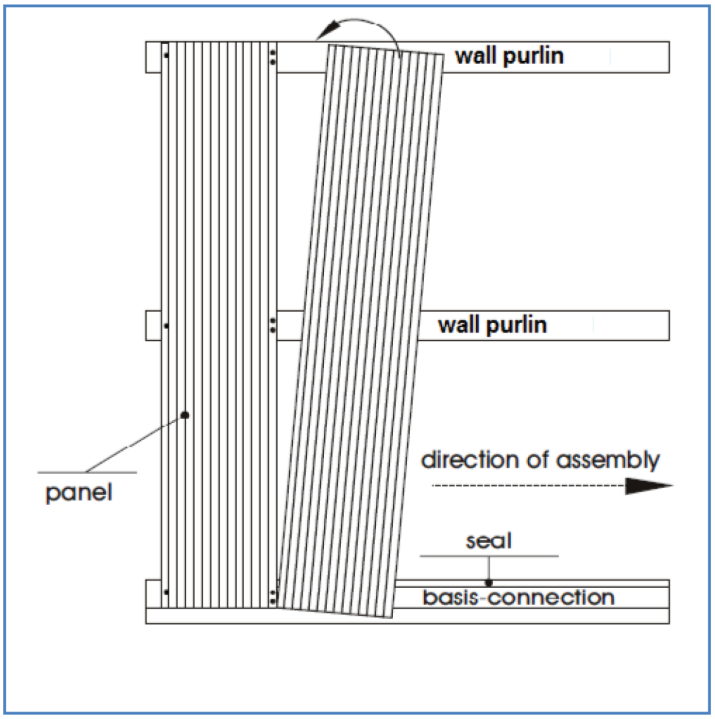


Figure 29



The first panel – either it is of visible (NORMAL MF FLAT) , or of hidden (MF HS WALL) fixing screw joint – is secured on the wall sub-structure with a visible fixing element, close to its "groove" joint, on each wall purlin (figure 29). Those fixing elements (self-drilling screw with metal washer & EPD M gasket) can be hidden later on by appropriate flashing elements (external corner profiles, base-drip cover profiles, etc.).

Figure 30



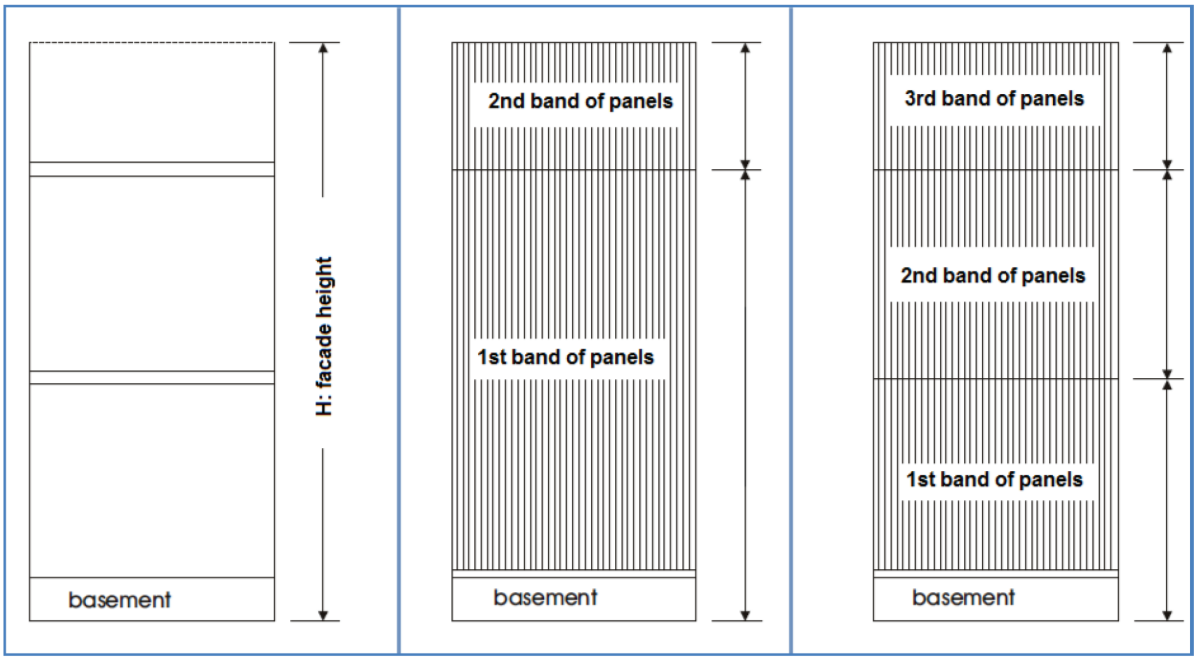
The second panel is approached to the first one, and with a slight inclination it must be pushed against the previous panel, in order to obtain a perfect coupling between the two panels (figure 30). After fixing the second panel, the installation of every next panel is performed in a
similar way. It is recommended to check the panels' verticality every 3 or 4 panels.

In cases where the façade is covered – in the sense of height – with more than one panels, panels should be installed in bands (figure 31).

Such cases can be:

- Façade height bigger than producible panel's length.
- Panels of different color on their external side (on each band), for architectural reasons.
- Long panels with dark color on their external side; due to the increased temperature differential between external and internal side of such panels, panels tend to deform (bimetallic effect), and depending on the supporting system, either increased deflection or deformation of the external steel face at intermediate supports can occur. The phenomenon is proportional to panel's length, and therefore, it can be reduced or even eliminated by reducing the length of individual panels.

Figure 31



The connection between adjacent bands of panels can be performed as indicated in figures 32& 33.

Figure 32

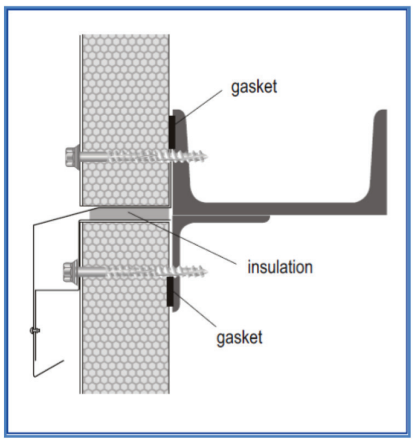
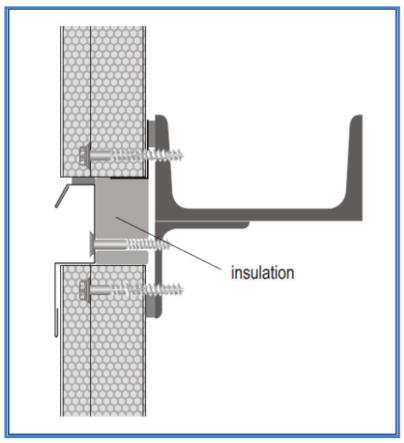


Figure 33







4.2.4. Fixing of wall panels

Wall panels should be fixed on all purlins of wall sub-structure, as indicated on figures 34, 35, 36 & 37.

Figure 34

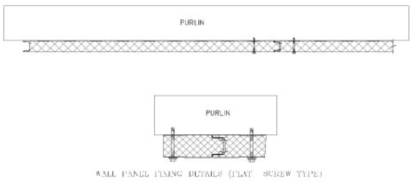
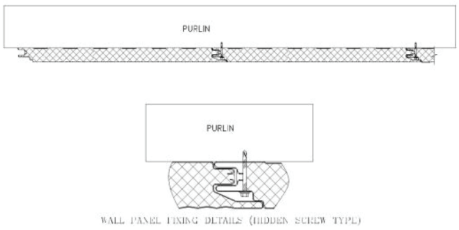


Figure 35



When fixing elements are exposed to weather, it is recommended to use stainless steel screws in combination with metal washer and EPDM gasket. On one hand, stainless steel screw have increased corrosion resistance and present lower heat transmission (reduced thermal bridges), while on the other hand, metal washer with EPDM gasket allow for an even distribution of fixing pressure on panels' face, and also protect panels' painting from being scratched by screw-head rotation during drilling operation.

Figure 36

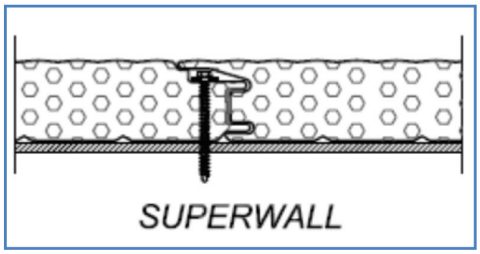
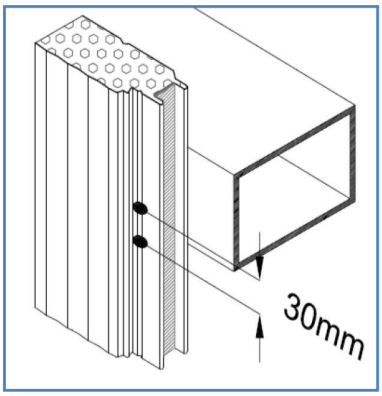


Figure 37



It is recommended that Superwall panels are fixed with two screws on each support, at an axial distance of approximately 30mm one from the other (figure 37).

Keep in mind that on facades with MF H S WALL panels (hidden fixing screw joint), it might be necessary to use visible fixing screws too, because of increased wind loads at certain positions (buildings of increased height, corners of the building), and/or because of increased span length between adjacent supports.

The required number of screws to be used will be decided by project's engineer, on the basis of:

- Project wind loads,
- Type of panels' supporting structure,
- Steel thickness of panel's faces,
- Type of screws to be used, and relevant supplier's instructions.

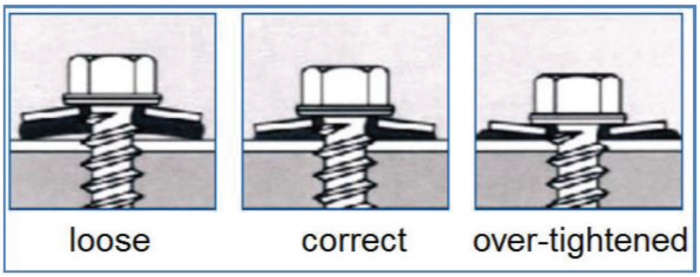
For recommended screws length, see Annex A.

5. Fixing panels

The role of panels' fixing elements is to hold panels in position and to allow for loads' transfer from panels to the supporting sub-structure.
For an optimal fixing result, the following recommendations should be followed:

- For fixings at positions exposed to weather, use stainless steel screws/corrosion resistance coated GI in combination with: metal washer and EPDM gasket (e.g. wall panels' surface), or (e.g. trapezoidal rib of roof panels).
- Screws should be installed perpendicularly to panel's surface, in order to allow for a water tight connection.
- Screws should be neither loose, nor over-tightened, in order to ensure water tightness of the fixing (figure 38), and at the same time, to avoid denting of panels' surface. The use of screw fixing equipment with depth locator is highly recommended.

Figure 38



- The appropriate type of screws should be used, case per case, taking into consideration: Panels' thickness (screw length) Type and thickness of sub-structure (drilling capacity of the screw)
- Residual metal chippings and dust should be removed immediately after drilling operations.

Recommended diameter of fixing screws 6.3mm or 5.5mm.

6. Cutting Panels

Even though panels are delivered already cut at the desirable lengths, it is often required that panels are also cut at project site, in order either to adjust their shape to façade or roof outline (e.g. wall connection with roof gable-edge), or to create openings on panels surface (e.g. windows).

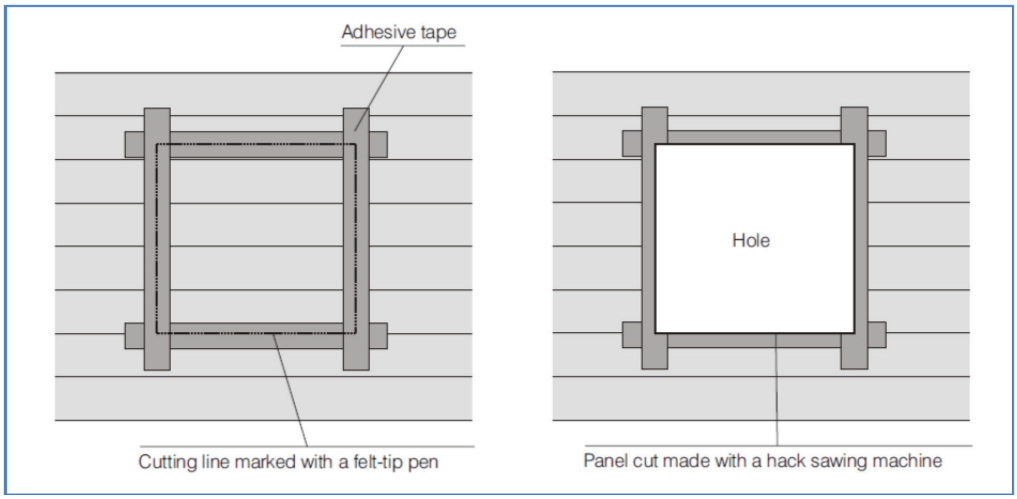
Any cutting operations on panels should be performed with a circular saw or a jigsaw; the use of angle grinder is not acceptable.

Proceed as follows, when cutting of panels is required (figure 39):

- Protect the surface to be cut with adhesive tape
- Draw the outline of the cut to be made on the tape with a felt-tip pen
- Cut with the use of suitable cutting tools

- Clean panel's surface from shavings and chippings formed during cutting
- Remove the remaining adhesive tape

Figure 39



When cutting operations on panels are performed, make sure that cutting sparkles cannot reach flammable materials, such as packing materials (paper, carton, plastic films, etc.), solvents, oils, glues, etc.

7. General Recommendations

7.1. Safety Notice

Each individual involved in panels' installation works must be aware of all possible hazards related to such works; a safety plan should be prepared before commencing any installation works, in order to prevent dangerous situations.
Therefore, GEOPANEL reminds you to strictly comply with current regulations on:

- Safety in workplaces
- Safety in building yards
- Equipment safety

7.2. Maintenance

Sandwich panels are cladding elements that are designed to have an excellent performance in time, Requiring low maintenance operations.
Panels' maintenance regards two phases:

First phase; panels' installation period

Panels should be handled and installed as per instructions described in chapters 3, 4 & 5, by professional and skilled personnel. Special attention should be paid on the following topics.

- Metal chippings deriving from drilling or cutting operations should be immediately removed from panels' surface.
- Roof surfaces should be cleaned – on daily basis – from any foreign metal objects, such as screws, rivets, nails, washers, saddle caps, etc.
- Flashing elements in horizontal position (e.g. window/door lintel profile, base-drip cover profile, etc.) can potentially block dirt, metal dust, metal chippings, small screws, etc. Inspect those elements, and remove any foreign objects before applying eventual sealing materials.
- Upon completion of installation works roof surfaces and gutters should be thoroughly cleaned.
- Panels' surfaces should be inspected for eventual damages (scratches, abrasions, etc.) as a result of installation operations; if found, immediate action should be taken (e.g. cleaning and touch-up painting).

Second phase; building's useful life period

It is recommended that building user schedules a maintenance plan:
Roof should be inspected at least once every Three months:

- Deposits of aggressive substances should be removed by jets of water, when rainfalls cannot sufficiently clean the roof surface. If necessary, mild non-abrasive detergents (e.g. soap-water Solution) should be used. Extra attention should be paid at areas close to chimneys, due to eventual deposits of combustion products.
- Check fixing elements, overlapping joints, ridge and panels' end in the gutter for early signs of eventual corrosion in progress.
- Gutters are often filled with foreign objects, such as sand, dirt, trash, plants, etc. They should be thoroughly cleaned in order to make sure that the metal water-flow surface is not damaged, and rain water drainage is not obstructed.
- Fixing screws should be checked, and if necessary they should be re-tightened.

Walls should be similarly inspected. Extra attention should be paid at flashing elements in horizontal position, for eventual dirt and moisture accumulation, in order to prevent start-up of corrosion process.

7.3. Disposal

During installation works a certain amount of waste material (panels) derives, either as cut-out pieces (e.g. for doors/windows openings, shaping of panels, etc.), or as rejected pieces (e.g. damaged and non-usable panels). The disposal of such waste materials should be assigned to appropriately authorized companies, and in any case it should be carried out in compliance with current local legislation.

ANNEX A

Recommended minimum screw length – primary fixing of panels on steel structure

	panel type	panel thickness (mm)	panel thickness at the point of screw location (mm)	minimum recommended screw length (*) (mm)	
ROOF	ROOF PANELCORRUGATED (GP-2 Rib panel,3 Rib panel,4 Rib panel)	30	High Rib	100	In combination with metal washer with EPDM Gasket/saddle cap
		50		115/125	
		70		130/150	
		80		150	
		100		175	
WALL	ROOF PANELCORRUGATED(GP 40/250)				In combination with metal washer with EPDM Gasket/saddle cap
		50	90	125	
		70	110	130	
		80	120	150	
		100	140	175	
	WALL PANEL-tongue and groove WALL PANEL-H S (Hidden screw)	50	50	75	in combination with
		60	60	85	metal washer
		70	70	95	
		80	80	105	with EPDM gasket
		100	100	125	
		120	120	145	
		150	150	175	

(*) in case of self-drilling screws, the above mentioned minimum screw length does not include the length of screw's drilling head.

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