

BALEX METAL

SANDWICH PANEL ASSEMBLY INSTRUCTION

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1. BALEX METAL SANDWICH PANELS: OVERVIEW

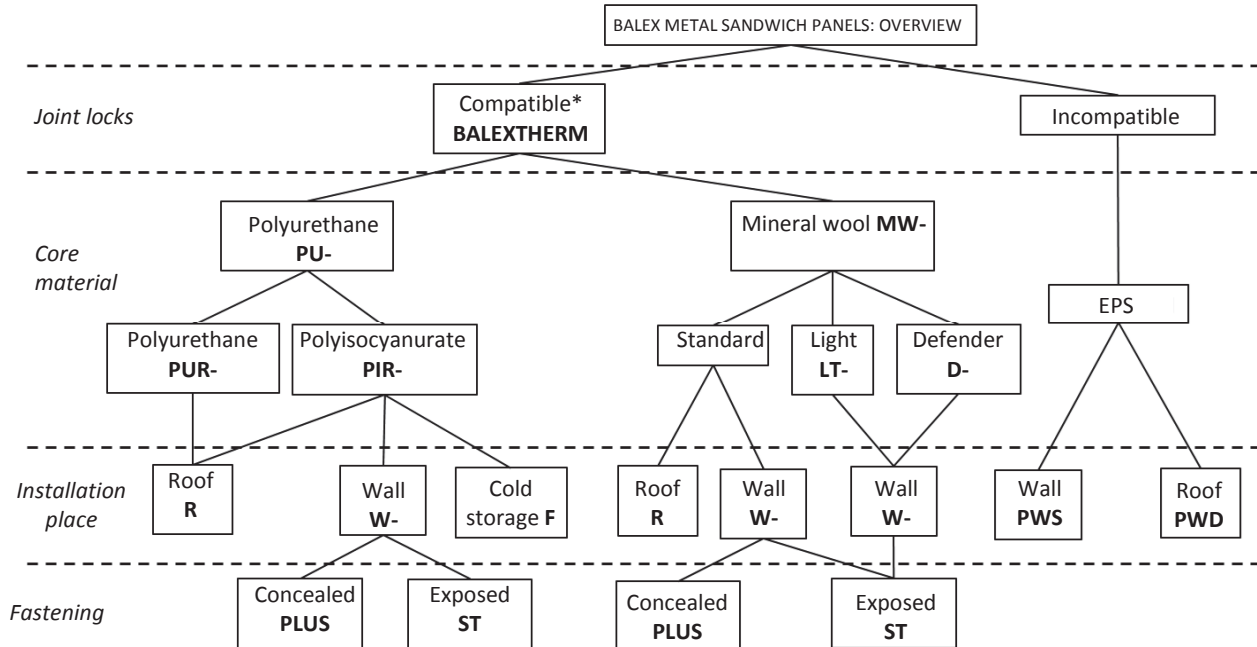
Project makers, architects, general contractors and installers all seek products which ideally satisfy all of the following criteria:

- clear aesthetic finish
- high quality
- specified technical performance (including thermal insulating power, load capacity, and fire resistance)
- easy installation

Balex Metal meets these expectations with a range of proprietary sandwich panels, each comprising of steel sheet cladding on both sides, which are bonded to a thermal-insulating core. Balex Metal’s product range includes sandwich panels available with three different core materials:

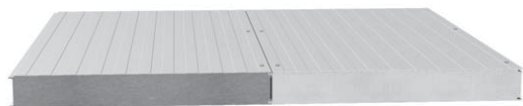
- BALEX THERM-MW mineral wool core sandwich panels with wool fibres perpendicular to the cladding
- BALEX THERM-PUR or BALEX THERM-PIR sandwich panels with either polyurethane or polyisocyanurate core
- BALEX THERM-PWS and BALEX THERM-PWD EPS (expanded polystyrene) sandwich panels.

Coding of sandwich panel commercial names:



*The compatibility indications apply to BALEX THERM wall sandwich panels, as these vary in the core material while featuring the same thickness and fastening methods. The joining of compatible sandwich panel types can be useful in designs which feature either fire-rated wall joints, or non-fire rated wall joints. It should be noted that non-flammable mineral wool core sandwich panels are compatible with fire-rated wall joints. Also, that non-fire rated wall joints are compatible with polyurethane core sandwich panels and feature a much

better insulating power than mineral wool core panels. For roof sandwich panels, PU-R sandwich panels can be combined with MW-R sandwich panels. However, this requires the contractor to fabricate a part of the joint lock on site.



MW-W-ST and PU-W-ST



MW-W-PLUS and PU-W-PLUS

For BALEX THERM-PU-F cold storage sandwich panels, the PUR core is precisely milled to form double tongue and groove locks. This provides a high final thermal insulating power of installed cold storage sandwich panels. It does this by removing linear cold bridges and providing the highest fire integrity, water tightness, and air and steam infiltration ratings.

Aside from the sandwich panels, Balex Metal carries a wide selection of accessories and building trim parts. These include sheet steel flashings, fasteners, bolts, rivets, sealing materials, skylights, gutters and downpipes.

2. SANDWICH PANEL APPLICATIONS

2.1. General

BALEX THERM sandwich panels are intended for operation at temperate to low temperatures. The maximum continuous surface temperature of a sandwich panel should be no more than 60°C. With their low heat transfer coefficient, the BALEX THERM sandwich panels are perfect for insulating façades in heated buildings to minimise indoor heat losses.

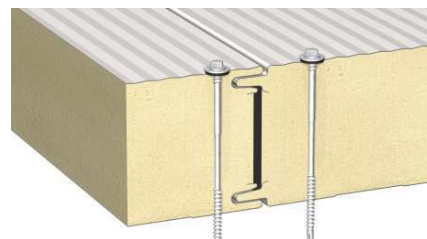
All applications of the sandwich panels should conform to a specified building plan, which respects the PN-EN 14509 European harmonised standard and Polish construction standards and regulations. Especially so, the Polish Regulation of the Minister of Infrastructure dated 12 April 2002, which concerns the technical requirements for buildings and locations (Dz.U. 2002.75.690, as amended).

2.2. Wall sandwich panels

All BALEX THERM sandwich panels can be installed in horizontal or vertical orientation. In either orientation, the same support design applies. The minimum width of both edge and inner supports should be 40 mm and 60 mm respectively. Any support material (substructure) can be used, including steel, reinforced concrete and wood. There must be consideration when selecting the fasteners for the sandwich panels, and the correct selection should be made in consultation with a fastener manufacturer. An optional factory application of the gasket in one or both grooves of the panel joint lock will improve the joint seal. Under certain design requirements, this will also improve the fire resistance rating. Wall sandwich panels can also be installed as self-bearing ceiling layers. Under certain conditions, this application helps in the building of sealed cold storage rooms or freezer boxes.

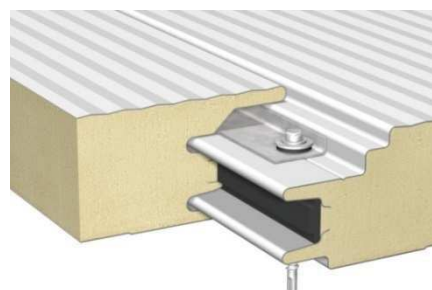
2.2.1. Sandwich panels with exposed fasteners

The lengthwise joint tongue and groove locks in standard wall sandwich panels (ST and PWS) are formed by purpose-profiled double hemming in the steel sheet cladding. This increases the fire integrity and assists with installation. The sandwich panels with exposed fasteners have a higher fire resistance rating than sandwich panels with concealed fasteners.



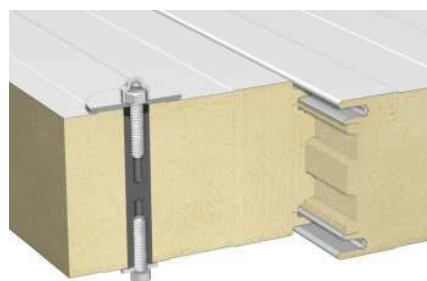
2.2.2. Sandwich panels with concealed fasteners

The lengthwise joint tongue and groove locks in standard wall sandwich panels (PLUS), feature an additional purpose-profiled lip in the outer steel sheet cladding. The lip conceals the lock of the sandwich panel preceding in the order of installation. To fully enjoy the benefits of concealed fasteners, the sandwich panels need to be installed in a vertical orientation (where horizontal orientation will require flashing around columns).



2.2.3. Cold storage sandwich panels

The BALEX THERM-PU-F cold storage sandwich panels are intended for outer partition layers of enclosures, which require superior thermal insulating power. They are also intended for the inner partition layers of stationary cold storage facilities, refrigeration rooms and large freezers. Finally, they are intended for ceiling coverings which have an additional outer cladding layer.



In outer partition layers, the sandwich panels transfer thermal and wind loads. In ceiling coverings and under an additional outer cladding layer, the sandwich panels transfer thermal and deadweight loads.

Depending on the core thickness and the differential temperature across the partition, the following application ranges are recommended (for heat flux densities below 10W/m²):

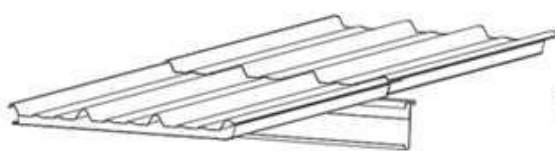
- BALEX THERM-PU-F 120: max differential temperature $\geq 50^{\circ}\text{C}$
- BALEX THERM-PU-F 160: max differential temperature $\geq 70^{\circ}\text{C}$
- BALEX THERM-PU-F 180: max differential temperature $\geq 80^{\circ}\text{C}$
- BALEX THERM-PU-F 200: max differential temperature $\geq 90^{\circ}\text{C}$

2.3. Roof sandwich panels

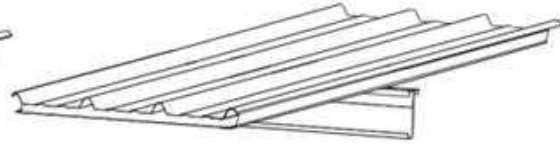
Balex Metal roof sandwich panels are the only sandwich panel types in the product range with an enhanced load capacity to withstand snow loads, and more. The increased load capacity comes from a box profile of the top cladding sheet (which is why wall sandwich panels are unsuitable for roofing applications). The BALEX THERM roof sandwich panels can be installed with skylights oriented along or across the roof length. Skylights should be designed with fastening to dedicated substructures.



The recommended roof slope for roof sandwich panel installation is:



>7% with sandwich panels joined and locked lengthwise or with skylights



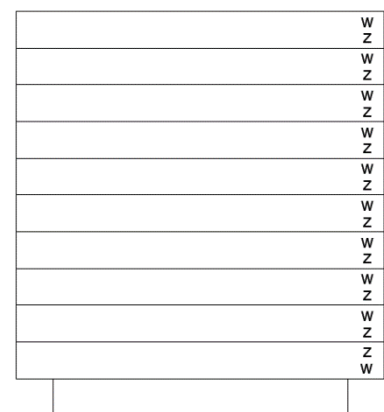
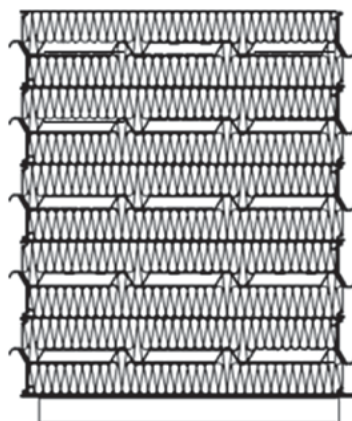
>5% for continuous sandwich panels and without skylights

Failure to maintain the minimum roof slope specifications may result in accidental infiltration of water into the building through the sandwich panel layer.

3. RECOMMENDATIONS FOR TRANSPORT

3.1. Packaging

Balex Metal sandwich panels are by default, packed with the inner cladding side facing the top, with the exception of the first panel on the top of the stack in the package. This arrangement protects the outer cladding side (left exposed after the installation) from damage during transport and handling. Balex Metal provides other packaging options on request, which are available for polyurethane core sandwich panels only. For roof sandwich panels, other stacking formats of the packages would be unreasonable.



W – panel inner side
 Z – panel outer side

3.2. Mode of Transport

The primary mode for the shipment of sandwich panels are trucks with closed or open bodies capable of admitting a load of long panels from both vehicle sides. The sandwich panels shall not extend beyond the body floor and should be lashed with straps, whereby securing the sandwich panel packages placed on each sleeper. The lashing straps also need to be tensioned to avoid any deformation of the sandwich panels. Long sandwich panels (above 13.60 m in length) can extend beyond the tail edge of the body floor by up to 2 m (this is the maximum limit imposed by the Polish traffic code). Whenever the sandwich panel length is more than the vehicle body floor length, consult the feasibility of delivery with the carrier and Balex Metal.

Purchase orders split into more than one delivery are managed by Balex Metal sales specialists in coordination with Balex Metal Shipping.

3.3. Handling on and off vehicles

3.3.1. Handling by hand or with basic construction equipment

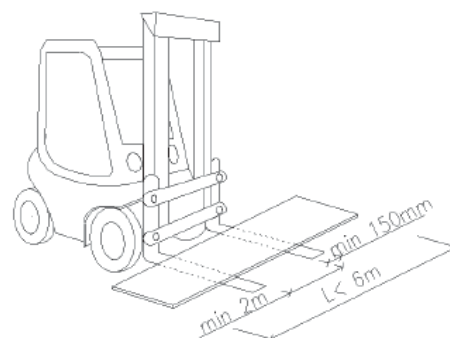
Handling the sandwich panels on and off vehicles requires caution due to the weight of the products. Avoid supporting the handled loads at focused points. Otherwise, the cladding of the lowest sandwich panel in the stack may fail. To prevent this, the supports placed under the loads for handling should be long and wide. Note that the sandwich panels should not be ‘pulled out and off’ the stacks one after another. If this occurs, the cladding finish can be scratched and damaged. Support the sandwich panels securely while lifting heavy sandwich panels stacks and/or packages.



Check that the delivery is complete against the proof of delivery upon reception, and identify all non-conformities if any exist. Report all non-conformities of the delivery condition and contents on the waybill, and to the shipment loading order – in adherence to the Balex Metal General Terms and Condition of Sale.

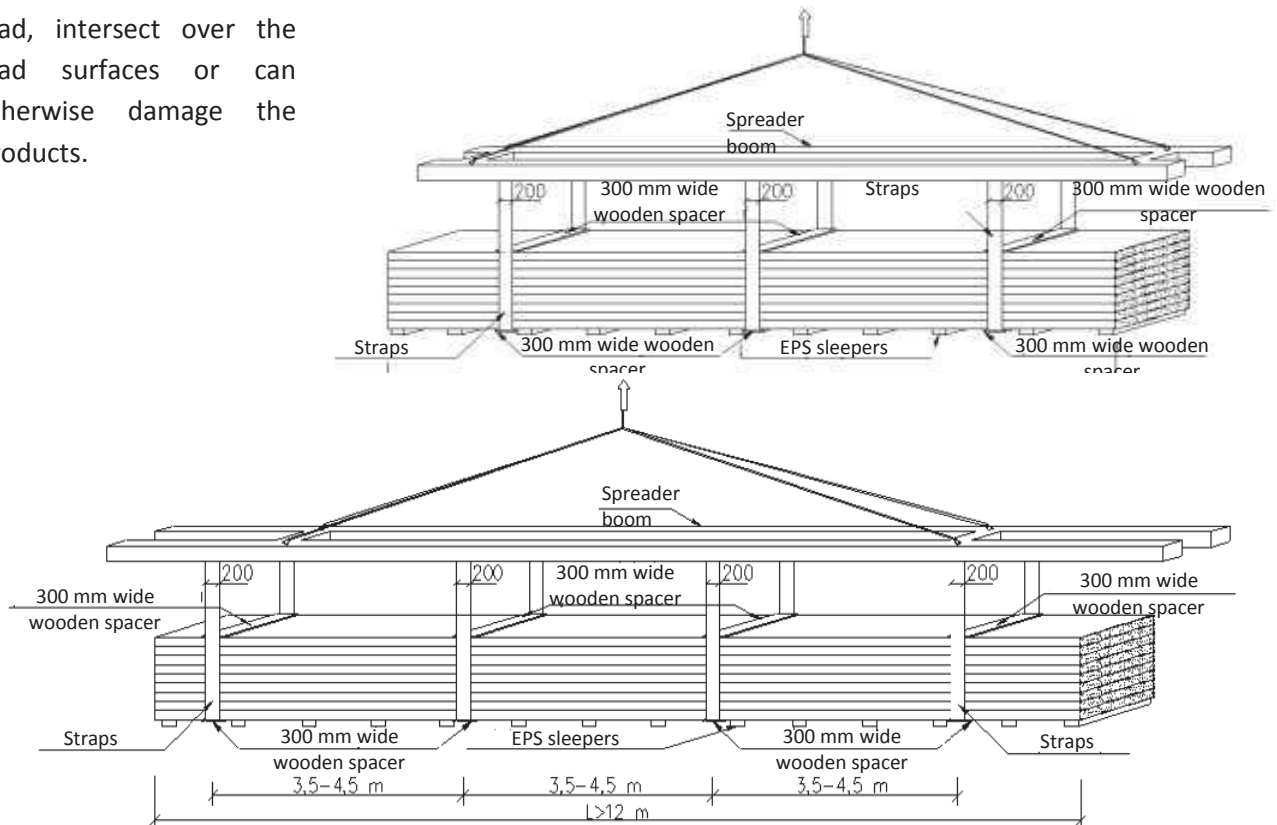
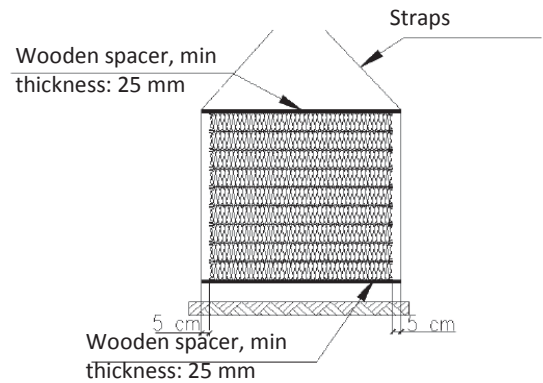
When unloading the delivery by hand, do not exceed the maximum load limit for one-man handling. Follow general health and safety regulations.

Shipments in packages up to 6 m long can be handled with forklift trucks that feature adjustable fork spacing. Use a minimum fork spacing of 2 m for forks with 150 mm wide top flats. When handling sandwich panels off vehicles with forklift trucks, choose the length and top flat width of the forks to avoid damage of the



second stack layer on the truck or the top cladding of the bottommost packages.

Shipments in packages over 6 m long should be lifted with strap slings on a spreader boom. The recommended spacing of strap slings to handle 6 m to 12 m packages is 2-4 m. For shipments in packages over 12 m long, use strap slings spaced at 3.5-4.5 m. It is recommended to place wooden spacers at least 300 mm wide and at least 25 mm thick between the top and bottom sandwich panel in each package and each strap of the sling. Never use steel cable or chain slings. Never lift or handle the loads with straps which tighten themselves around the load, intersect over the load surfaces or can otherwise damage the products.



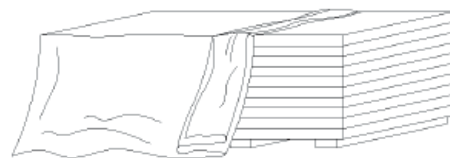
3.3.2. Vacuum suction lifts

There are commercially available options for renting specialised sandwich panel installation equipment. This installation equipment – a vacuum suction lift – is a handling unit which operates with vacuum suction cups. It is the most recommended equipment for installation at heights, or when the sandwich panels are too heavy to be handled manually. Note the default arrangement of the sandwich panel stack in the package when operating vacuum suction lifts. For maximum efficiency of the installation process, provide space and facilities for flipping the sandwich panels over once they are removed from the stack. The supports for the flip-over operation should be lined with felt or other material which will prevent scratching of the cladding coating.



3.4. Sandwich panel storage

Keep sandwich panels stored on sleepers which provide a minimum clearance of 250 mm above the ground. Do not stack packages in more than two layers. If installing sandwich panels from stacked packages, start installing the sandwich panels from the top layer packages and leave the panels from the bottom layer packages free to relax before installing them. Store sandwich panel packages on sleepers which have full contact along the length with flat, hard-paved ground. The ground should have a slight downgrade to drain rain and melt water and condensation from between the packages. It is highly recommended to store sandwich panels indoors with a good ventilation and away from fertilizers, acids, alkali, salts and other corrosive materials. Do not store the sandwich panels without any shelter. If storage is required outdoors and under a tarpaulin cover, do not exceed two weeks and provide a free flow of air around the sandwich panels. If the sandwich panels need to be stored for more than two weeks, keep them in a well-ventilated indoor room and without any covering to enable free access of air to all layers in the stacks. Failure to comply may result in discolouration of the finish coating.



4. INSTALLATION

4.1. General installation guidelines

Before assembling and installing light lining BALEX THERM sandwich panels, it is recommended to:

- Verify the substructure alignment and trueness to the vertical. Check that the substructure has been built accurately to dimensional specifications and also in compliance with the building plans.
- Check the quality of all anti-corrosive preservation (including galvanic or paint coatings) of the main substructure and its elements, including purlins and girts, and ensure that they have been properly fastened.
- Prepare storage and lay-off yards and assembly areas for the sandwich panels.
- Understand the detailed design of the sandwich panel lining and the manufacturer's technical catalogues.

4.1.1. Weather conditions

Assemble and install the sandwich panels in conditions which ensure safety of the installation crew and retention of all specified properties of the products to be installed. Do not attempt the installation whenever:

- The wind speed is above 10 m/s.
- The ambient temperature is below 0°C (note that gaskets and sealants suffer from decreased performance in temperatures that fall below 5°C).
- There is heavy rain, heavy snowfall, or heavy fog.

4.1.2. Protective plastic film

For the duration of shipping, each BALEX THERM sandwich panel is protected against dirt and damage with an outer plastic film. The plastic film is applied at the production plant. Having opened the packages and removed the sandwich panels prior to installation, remove all plastic film. Leave the plastic film on the sandwich panels if the installation will not begin immediately after unpacking. However, the plastic film must be removed within two months from the date of production. Otherwise, it might bond permanently with the protective coating of the cladding sheets of the sandwich panels. This may occur through the effect of curing. The date of production is found on the label of each sandwich panel package.

4.1.3. Symmetrically-shaped sandwich panels

For symmetrically-shaped sandwich panels, identification of the inner and outer sheet steel cladding is made clear in order to avoid installation errors:

- The aluminium foil applied by the production plant (within the lengthwise joint edges of each panel) features the BALEX METAL logo and an arrow labelled 'Str. Zew.' which points to the outer side of the cladding.



- An identification of the inner cladding side is located inside the male part of the joint lock profile, approximately 50cm from each transverse end of the sandwich panels (on cold storage versions).



- A red adhesive sticker is applied on the protective plastic film on the inner cladding side (on mineral wool core sandwich panels).



For wall sandwich panels with both cladding sheets are made as follows:

- With the same sheet thickness.
- With the same coating.
- In the same colour (an identical RAL code).
- With the same profiling.

the sandwich panels can be installed with any side outward (to be decided by the installer).

4.1.4. Processing of sandwich panels on site

To avoid damage to the paint coating of the sandwich panel cladding, it is recommended to trim the panels and sheet flashing on trestles lined with soft material, such as felt or EPS.

Trim the sandwich panels with circular saws that have finely-pitched disc teeth, sabre saws, or jigsaws. Use hand shears for the trimming of flashing. Do not use angle grinders or other power tools which generate high temperatures of the material being processed. If heat is generated, the paint coating and/or anti-corrosive preservation will be damaged. Remove all filings and swarf from trimming, otherwise they will start corroding on the sandwich panel cladding and leave marks on the paint coating. To remove filings, swarf and other debris from the paint coating:

- Clean the surface with a nylon-bristle brush.
- Degrease the surface with a detergent (do not use any petrochemical degreasers, like petrol — once petrol evaporates, it will leave visible stains). Slightly dirty surfaces can be cleaned with regular dishwashing soap or similar detergents.
- Wait until the detergents evaporate completely or wipe the clean surfaces dry.

All damage to the cladding paint coating caused by the installation process should be repaired with touch-up paint. Small defects can be repaired with small brushes. Large defects can be repaired with spray paint.

4.1.5. Gaskets and sealants

To achieve the the declared thermal insulating power of a sandwich panel lining and protect the sandwich panels against damage, gaskets should be installed:

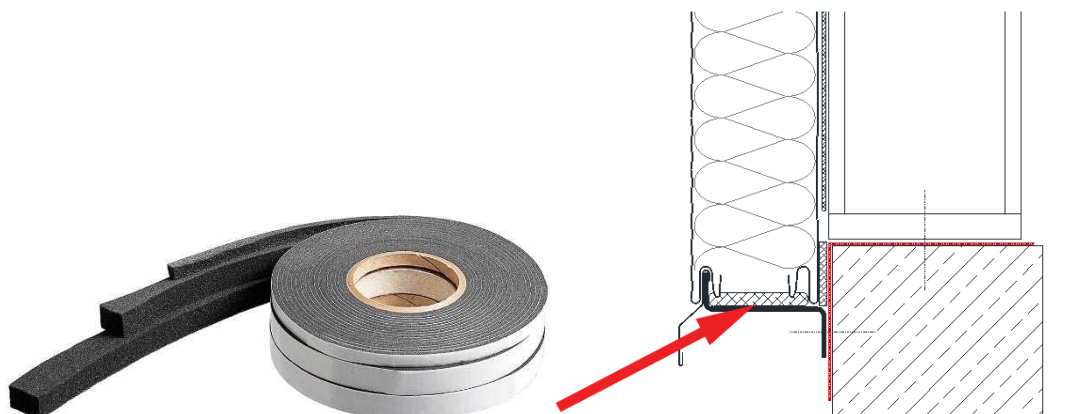
- PES (polyethylene) sealing tape is a self-adhesive gasket product for the separation of the sandwich panel from the substructure. The PES sealing tape levels out fabrication irregularities and protects the cladding coating against damage from the natural expansion, contraction and displacement of the substructure. For wide substructural supports, apply the PES sealing tape as close to the support edges as possible. The PES sealing tape can be applied to the sandwich panel or the support pieces.



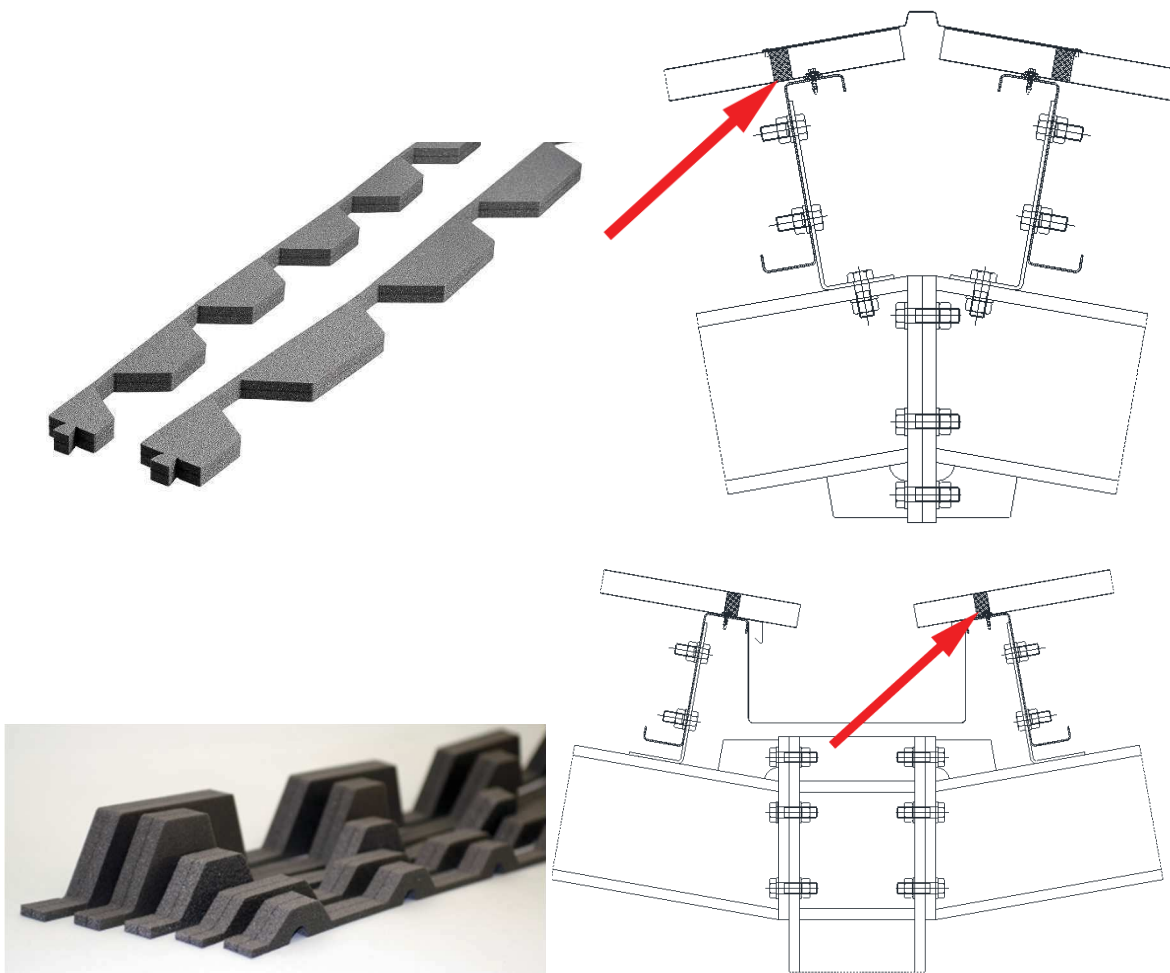
- PUS (polyurethane) sealing tape: in the form of factory-installed gaskets inside the joint lock profiles of the sandwich panels. When two adjoining sandwich panels are pressed to one another along the joint, the PUS sealing tape seals the whole gap between the panel cores to minimise the cold bridges. The PUS sealing tape can be applied on surfaces with uneven contact with the substructure where the PES sealing tape is too thin and the PURS sealing tape would be too thick.



- PURS (polyurethane) expanding sealing tape: a water-proofed gasket tape which can expand up to 5 times of the original volume to fill and seal off large gaps. These gaps can include those which form between the sandwich panels and the substructure.



- TUN and TUP polyethylene gaskets: profiled sealing strips for application on and under components with pronounced profiles. For example, on box profile roof sandwich panels.



- EPDM round gasket: an additional sealing product which (on request) is factory-installed within the joint lock profiles of the sandwich panels. The gasket improves the fire resistance class by sealing the joints between the sandwich panels.

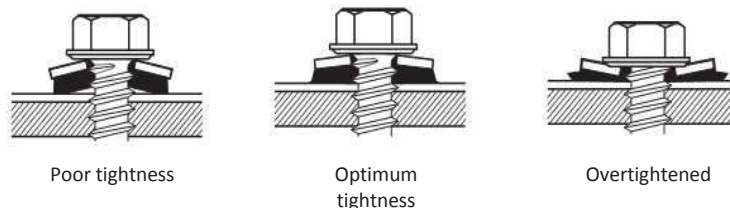


For the sealing of gaps and voids against water, sealants are recommended with a neutral pH and made from silicone, butyl or low-expansion polyurethane foam. Sealants with an acidic pH are NOT recommended. The sealant type should be chosen according to the intended use of the sandwich panel lining specified in the detailed design and the manufacturer’s product data sheets. All seals should be periodically inspected and replaced as required.

4.1.6. Fasteners

Install sandwich panels with fasteners optimal for the sandwich panel core thickness (which determines the fastener length) and the substrate/substructure type (which defines the fastener type):

- For steel profile substructures, use self-tapping fasteners compatible with the profile to be pierced through.
- For concrete or reinforced concrete substructures, use fasteners intended for installation in pre-drilled holes.
- For wooden substructures, use self-drilling fasteners.



All fasteners feature washers with cured EPDM seals to ensure years of operation with the seal flexibility retained. For the installation of roof sandwich panels, it is recommended to use washers that match the box profile form, such as bench washers (*figure left*). When fastening the sandwich panels to the substructure, drive the fasteners in perpendicular to the substructure. Use at least two fasteners to compensate for the interaction of the sandwich panel lining with its substructure.

Balex Metal's product range includes relief hardware fixtures, which minimise the stress from tightened fasteners. They also reduce the risk of cladding failure within the joint locks. The relief hardware fixtures distribute the loads imposed by tightened fasteners to a larger area over the cladding. This is especially beneficial for wall sandwich panels with concealed fasteners.



4.2. Fastening of wall sandwich panels to the substructure

4.2.1. Horizontal panel orientation

1) INSTALLATION OF THE STARTER PROFILE

Always monitor the level of the starter profile during the installation process. Use a long spirit level.



2) APPLICATION OF THE PURS SEALING TAPE TO THE STARTER PROFILE



3) APPLICATION OF THE PES SEALING TAPE TO THE SUBSTRUCTURE



For wide substructural supports, apply the PES sealing tape as close to the support edges as possible.

4) INSTALLATION OF BASE FLASHING



Note that a lining structure made with Balex Metal sandwich panels is not a system and the illustrated installation is purely indicative. More solutions of the base flashing details are shown in the technical catalogues available at the Balex Metal official website.

5) REMOVAL OF THE PROTECTIVE PLASTIC FILM

The plastic film can be easily removed by winding it on a long object, starting from the detached end of the film.



6) PLACING AND PRESSING A SANDWICH PANEL ON AND INTO THE STARTER PROFILE



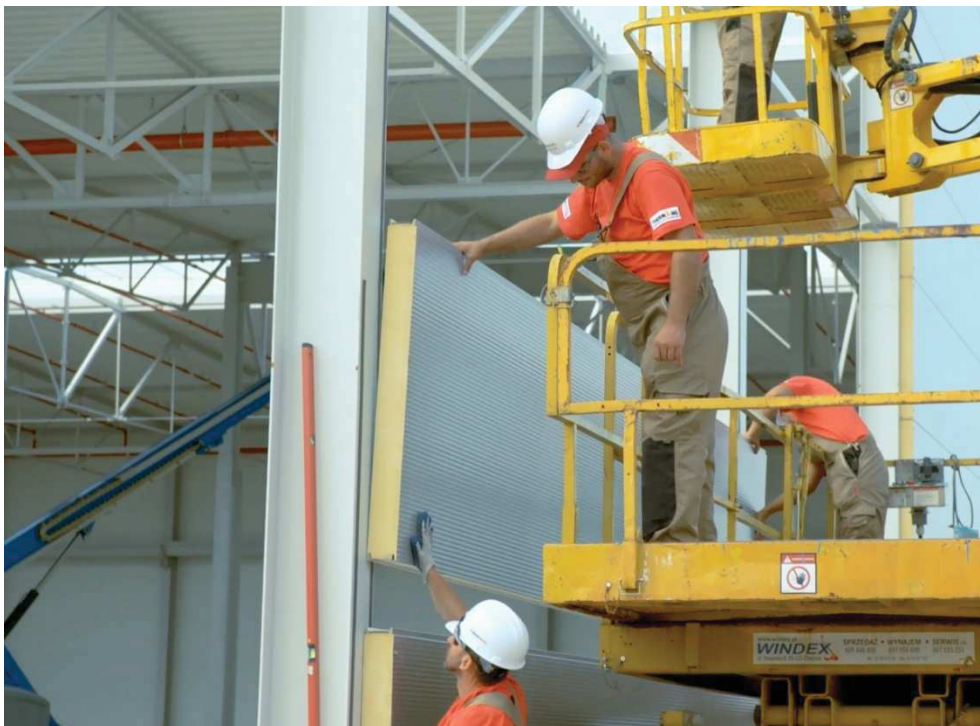
7) ATTACHMENT TO THE POSTS WITH FASTENERS

Select optimum fastener length and type. See Section 4.1.6 for more information.



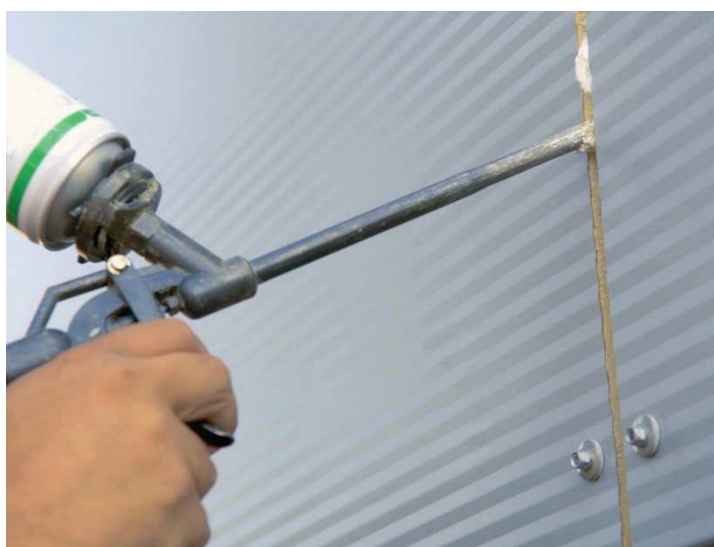
8) FASTENING OF SUBSEQUENT SANDWICH PANELS

Press each subsequent sandwich panel to the previous one, in order to completely seal the gaps between the joint lock profiles.



9) FILLING OF VERTICAL JOINTS WITH SEALANTS

See Section 4.1.5 and the applicable detailed design of the sandwich panel lining for more information.



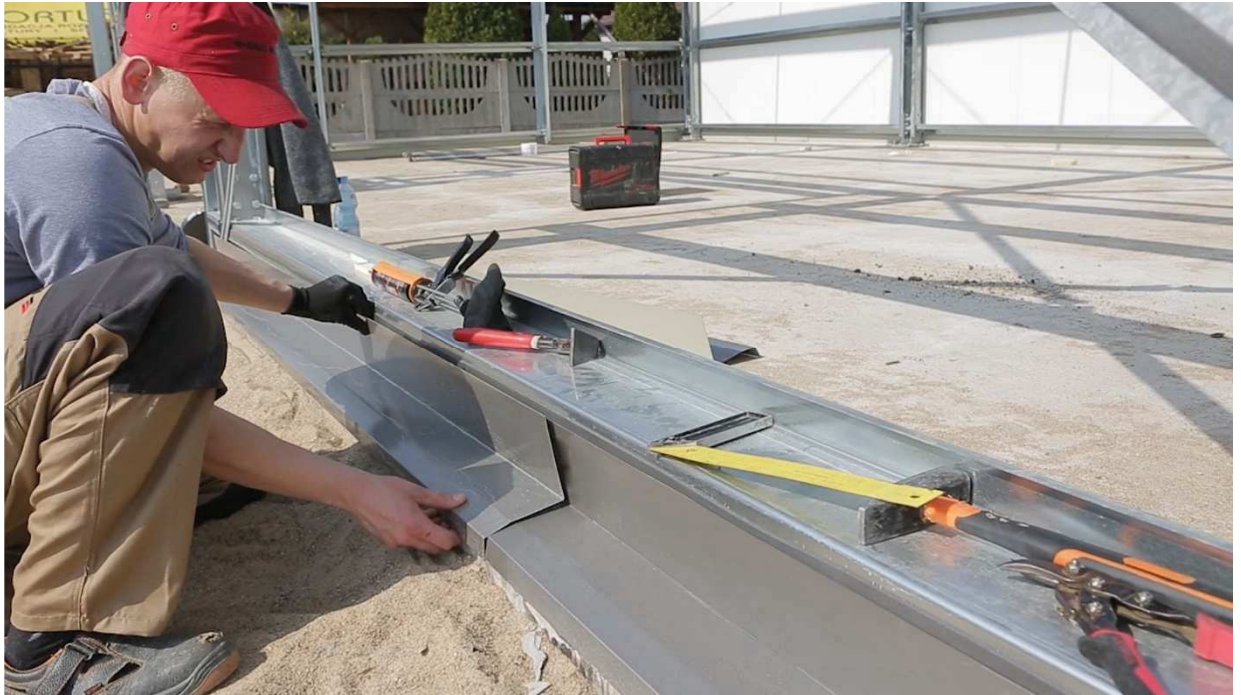
10) INSTALLATION OF FLASHING

- Vertical joint flashing
- Corner flashing
- Opening trim flashing
- Custom flashing, as specified in the applicable detailed design of the sandwich panel lining



4.2.2. Vertical panel orientation

1) INSTALLATION OF THE STARTER FLASHING



2) APPLICATION OF THE PES SEALING TAPE TO THE SUBSTRUCTURE



3) REMOVAL OF THE PROTECTIVE PLASTIC FILM



4) PLACING A SANDWICH PANEL ON THE STARTER PROFILE



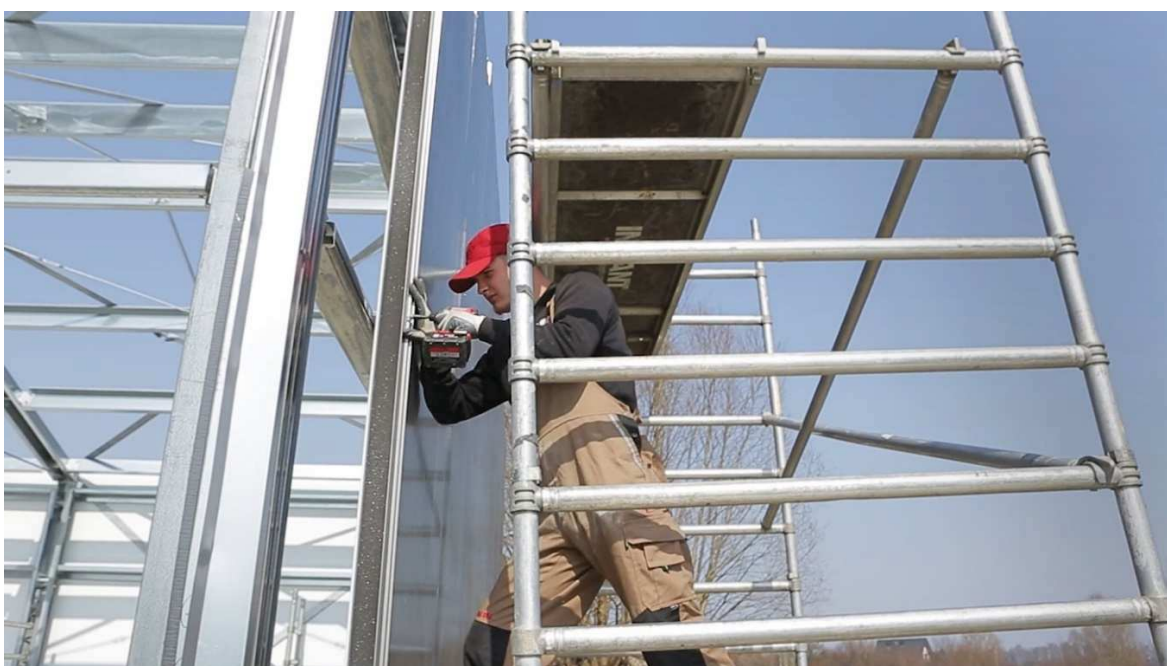
5) ATTACHMENT TO THE GIRTS WITH FASTENERS

Select the optimum fastener length and type. (See Section 4.1.6 for more information). For sandwich panels with concealed fasteners, relief hardware fixtures are recommended (see the image below).



6) FASTENING OF SUBSEQUENT SANDWICH PANELS

Press each subsequent sandwich panel to the previous one to completely seal the gaps between the joint lock profiles.



7) INSTALLATION OF FLASHING

- Base flashing



- Corner and eaves flashing



- Opening trim flashing



- Custom flashing as specified in the applicable detailed design of the sandwich panel lining

4.3. Fastening of roof sandwich panels to the substructure

1) REMOVAL OF THE PROTECTIVE PLASTIC FILM



2) APPLICATION OF THE PES SEALING TAPE TO THE SUBSTRUCTURE SUPPORT ELEMENTS



3) LIFTING THE SANDWICH PANELS TO THE ROOF (A VACUUM SUCTION LIFT IS RECOMMENDED)



4) LAYING OF THE FIRST SANDWICH PANEL

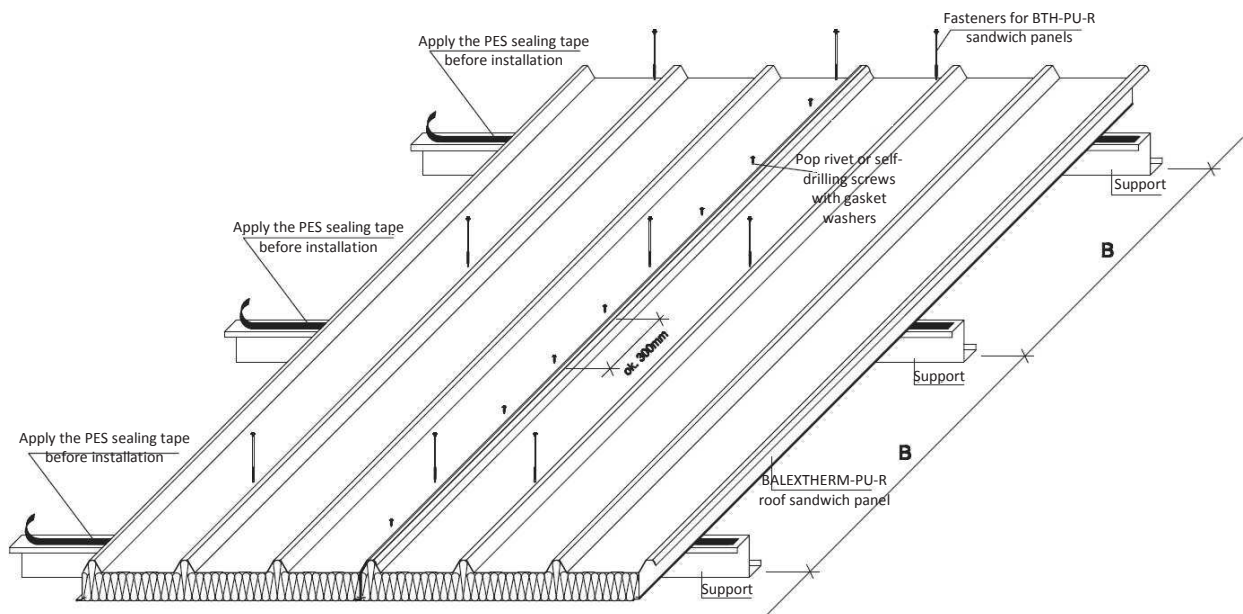


The sandwich panel must be precisely aligned when laid down. Use a string line to make the process easier.

5) FASTENING OF SANDWICH PANELS TO THE SUBSTRUCTURE



Sandwich panel fastening plan:



Fastening the sandwich panels lengthwise and the proper application of a sealant, provides properly finished joints and a consistent dynamic performance of the roof lining. The recommended spacing of the fasteners is 30 cm.

6) PRESSING DOWN THE SANDWICH PANELS



Left: a properly pressed and engaged joint lock between BALEX THERM panels

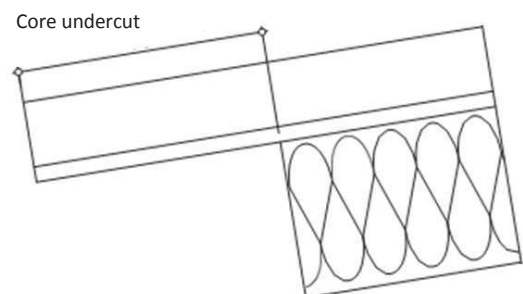


Right: the process of pressing in the joint lock profiles between PU-R 40 sandwich panels (not applicable to sandwich panels with double tongues)

7) FASTENING OF SUBSEQUENT SANDWICH PANELS

The roof sandwich panels feature factory-made core profiles at the ends for easier installation of gutterwork along the eaves or lengthwise joining. This profile is an undercut of the core sized as follows:

- 50 mm at the eaves (standard version).
- 200 mm at the overlap along the roof slope length (standard version).
- 10 mm (minimum size, available on request).
- 300 mm (maximum size, available on request).



8) INSTALLATION OF FLASHING

- Ridge flashing



- Eaves flashing



- Wind plate

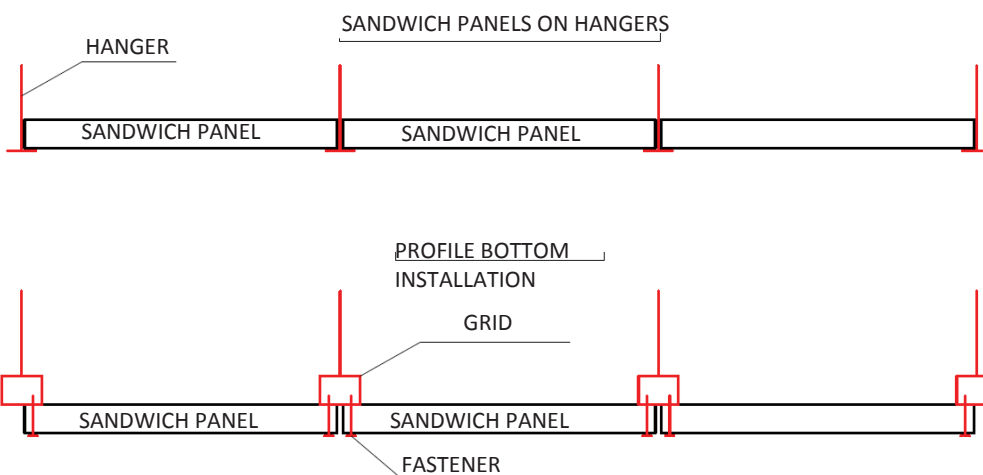


- Custom flashing as specified in the applicable detailed design of the sandwich panel lining.

Each BALEX THERM sandwich panel is a right-hand profile design. A left-hand (mirrored) profile design is available on request.

4.4. Installation of suspended ceiling systems made with sandwich panels

The sandwich panels can be installed as suspended ceiling systems. There are two installation options. Firstly, the sandwich panels are installed on the grid profiles, or fastened underneath the grid profiles. For the installation on the grid profiles, the profiles available from Balex Metal can be used (as shown to the right). NEVER have the sandwich panels resting on the walls without a substructure!

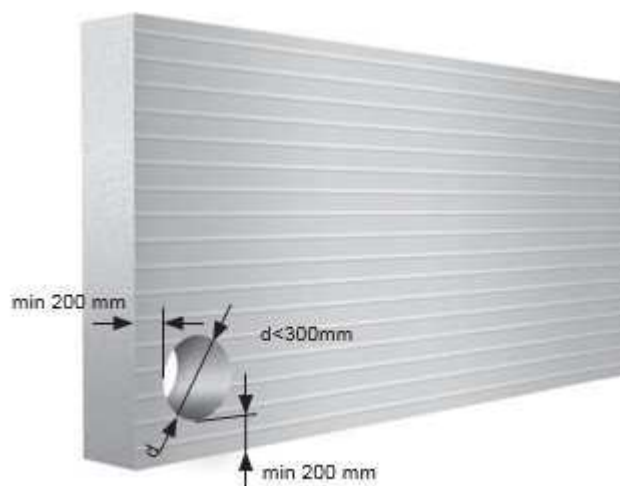


4.5. Guidelines for the trimming of BALEX THERM sandwich panels to openings in partitions

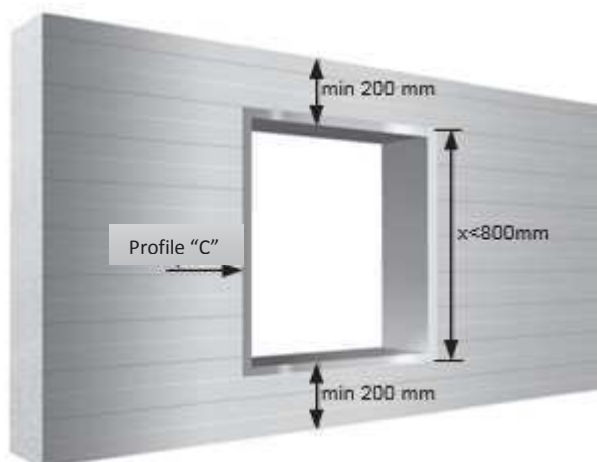
When planning the trimming of the sandwich panels to fit in the façade and roof slope planes, carefully plan the location of partition openings in which doors, windows and other penetrations are or will be installed. Trimming the sandwich panels to fit the openings will reduce the load capacity of the panels.

Even if trimmed to conform to the clearance of an opening, the sandwich panel must transfer the loads applied. If the required load capacity cannot be achieved by sandwich panels trimmed to opening clearances, an additional substructure should be installed with support profiles capable of accepting and distributing the loads. This should be analysed, designed and approved by a licensed design engineer.

Small openings, like cable penetrations, can be fabricated in BALEX THERM sandwich panels without specific restrictions. Wall and roof sandwich panels can have openings fabricated for penetrations of round pipes, square ducts and cables with the maximum opening diameter of 300 mm. However, the opening edge should be at least 200 mm from each edge of the sandwich panel. Each opening should be sealed with elastic cable sealant products.



An opening can be fabricated within a single sandwich panel to accept PVC or aluminium windows with a maximum installation size of 700 mm in width and 800 mm in height. The windows can be fastened to the sandwich panels if these limits are adhered to. The opening trim should be made from channel bars sized as follows: (A-10)x30x3 mm (where A is the opening clear size). Also, the trim channel bars must be installed between the cladding sheets. The minimum distance between the opening edge and each sandwich panel edge should be 200 mm. The design engineer of the installation project must position the openings relative to the support members (girts) under the sandwich panels, and choose a spacing of the openings to keep the sandwich panel sag at or below $L/100$.

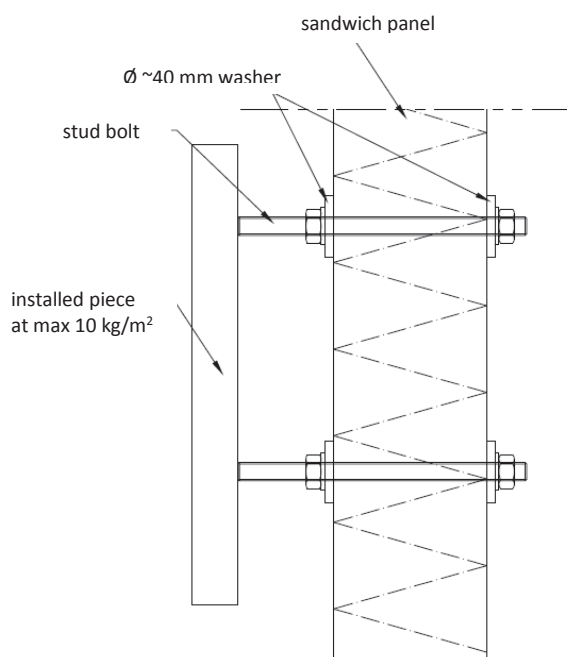


Fabrication of openings in the sandwich panels requires extreme caution. To avoid damage to the colour coating of the sandwich panel cladding, it is recommended to trim the panels on trestles lined with soft material, such as felt or EPS. Compass saw bits and power drills can be used to fabricate the openings. Do not cut out the openings with angle grinders or other power tools which generate considerable heat during processing.

4.6. Installation of small sandwich panel lining pieces

Balex Metal permits the installation of small sandwich panel lining pieces without any additional supports in the substructure, if the following restrictions are respected:

- The maximum load imposed by each piece should be 10 kg/m^2 .
- The fasteners go through the sandwich panel (both cladding sheets and the core — do not leave either cladding sheet unpierced!).
- Opposite to the installed piece, use a washer with a minimum O.D. of 40 mm (which is required to distribute the load to the largest surface possible).



4.7. Visual value considerations

All visual imperfections due to the nature of the sandwich panels and more specifically, the cladding and its finish are sometimes claimed as defects on warranty. These claims are rejected. Note that certain rules apply while specifying the operation of the sandwich panels, and the sandwich panel colours already at the design stage of the project. Here, imperfections are most prominent on sandwich panels in dark colours and/or in smooth (plain) cladding.

4.7.1. Dark-coloured sandwich panels

Wall sandwich panels with the cladding in dark colours rapidly absorb ambient heat. During exposure to strong sunlight (especially in summer), this may lead to localised deformation of the cladding surface. Based on EN 14509, it is specified that dark-coloured sheet steel can achieve 80°C by exposure to ambient heat. This always requires a verification of the sandwich panel load capacity in relation to the induced heat strain.

Dark-coloured sandwich panels should be installed on single-span supports. Installation of dark-coloured sandwich panels on multiple spans may result in deformation and damage of the panels, especially

Balex Metal shall not be liable for any damage caused by heat. This may result in localised loss of stability of the sandwich panel lining.
E.3.3.

Code	Name	Group
9010	pure white	Very light
9002	grey white	
7035	light grey	
1015	light ivory	
6011	reseda green	Light
9006	silver metallic	
9007	grey aluminium	
1003	signal yellow	
9005	black	Dark
5010	signal blue	
6005	moss green	
6020	chrome green	
7024	graphite grey	
7016	anthracite grey	
8019	grey brown	
8017	chocolate brown	
8012	red brown	
8004	copper brown (incl. Rustika)	
3016	coral red	
3011	brown red	
3009	oxide red	
3000	flame red	

4.7.2. Plain-cladding sandwich panels

Balex Metal recommends installing plain-cladding sandwich panels on single-span supports. Otherwise the panels will be exposed to a risk of deformation which are not valid as claimable defects. Always perform a proof of load capacity of the panels.

5. Miscellaneous

An annual inspection is recommended of a building where Balex Metal sandwich panels are installed. The inspection should include the following check points:

- Deposition of snow layers or debris on the roof slopes and gutterwork (snow should be cleared frequently in periods of heavy snowfall).
- Water drainage performance (standing water might freeze and cause damage).
- Contamination with metal swarf, filings and debris (if not removed, they might corrode and damage the paint coating of the cladding).
- Joints between the sandwich panels and the flashing (improper contact may permit ingress of water into the panel core).
- Sandwich panel edges (if the cladding coating is damaged, have it repaired with touch-up paint).
- Damage of fasteners (if loose, have retightened or replaced; if corroded, have replaced).
- Seals (have the surfaces with detergents which will not cause the seals and gaskets to fail). All defects of seals and gaskets require repair or replacement.