Design guidelines for CORE PIR and CORE WOOL sandwich panels

Sandwich panels are now one of the most widely used materials in the construction industry. It is characterized by good physical and mechanical parameters, which allows it to be used for roofs and walls of various buildings for various purposes and applications. This material is easy to design and install, but requires careful knowledge of the strengths and weaknesses of this material. When choosing the right sandwich panel to meet the designer and investor's expectations, it is most important to consider, in addition to parameters such as heat transfer coefficient, fire resistance, acoustic insulation, etc., the layout in which the sandwich panel will be used. In the case of SPR CORE roof sandwich panels, single-span and multi-span systems with a minimum roof slope of 5% are applicable. In a situation where there are technological passages, stacks, skylights, etc. or the slab is joined along its length, the minimum slope is set at 7%. A roof slope of 10 % is required for SPR SKY skylights. A single-span arrangement is recommended for SPW CORE wall panels; use of other arrangements is only recommended after static verification by an approved structural engineer. The SPW - S CORE and SPW- C CORE sandwich panel can be installed both horizontally and vertically, while for the SPW - H sandwich panel a vertical installation arrangement is recommended, otherwise the static calculation of the sandwich panels must be verified. In the case of horizontally installed SPW-S and SPW-C panels, the designer must provide for stiffening of the panel in the starting strip and attic so that the so-called free ends have adequate anchorage, while in the case of vertically installed panels, the static scheme must be analysed taking into account the support and its effect on the load-bearing capacity of the panel. It is allowed to install windows on sandwich panels without a nogging piece, but after a more detailed analysis of the statics by the constructor and consultation with the manufacturer's technical department. In other cases, a nogging piece is absolutely required for the installation of windows, doors and gates. All open elements of the sandwich panel system need to be secured for watertightness and properly protected with flashings. If the designed structure has different requirements regarding dimensional tolerance than the sandwich panel, it is required to design an additional substructure. The same applies to the installation of the panel to monolithic or traditional brick partitions, where it is required to design appropriate air circulation in accordance with the applicable standard and select the appropriate coating on the inside, so that there is no corrosion of the metal elements of the sandwich panel, substructure and connectors. It is up to the designer to select the thickness of the external and internal cladding and to use an appropriate coating that will meet the specific requirements of the project. Guidelines for the installation of sandwich panels with dark-coloured cladding. For the correct operation of installed sandwich panels, it is recommended to follow the guidelines set out by the manufacturer when designing and installing them on buildings, in particular for sandwich panels with dark-coloured cladding. This is regulated by EN 14509:2010, which divides the colours into 3 basic colour groups: very light, light and dark. For each colour in these groups, temperature values for the external cladding of sandwich panels are assigned and are as follows:

1. +55 °C for very light colours

2. +65 °C for light colours
3. +80 °C for dark colours.

When designing façades and roofs covered with sandwich panels in specific colours, temperature differences must be taken into account in static calculations, assuming a base temperature for the external environment of +20 °C. It is also recommended to avoid multi-span systems when designing, which are very unfavourable for dark colours. For wall panels in colour group III, the maximum length should not exceed 9.5 m and for roof panels 13.5 m.

When installing dark-coloured sandwich panels, it is recommended that the outside temperature should not be below 10 °C.

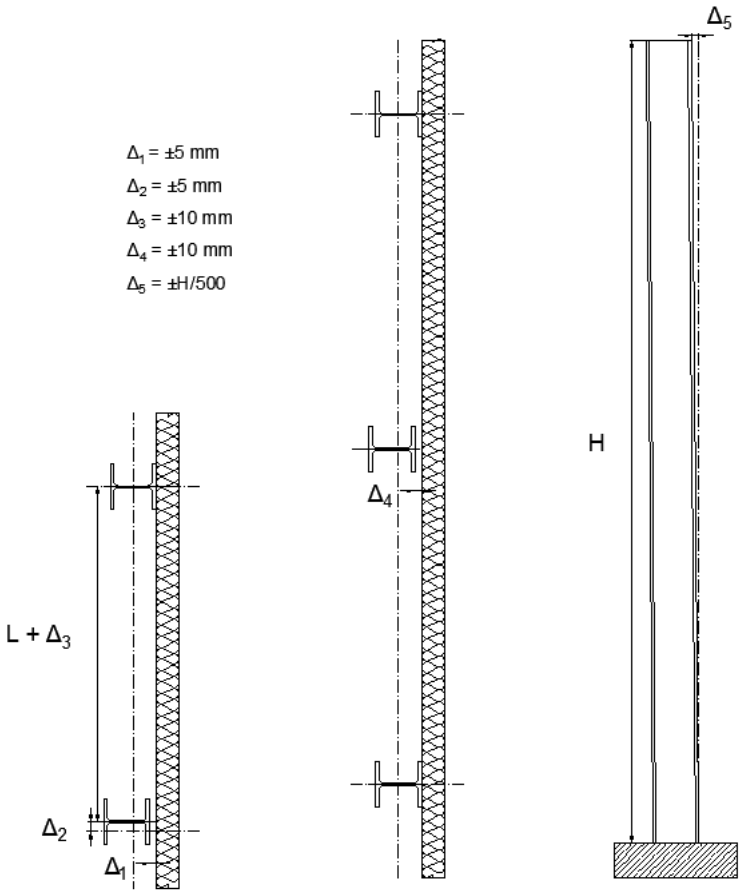
Failure to meet all of these conditions may compromise the aesthetics of the cladding made of sandwich panels.

Colour group	**Colours according to RAL**
Group I - very light	1015, 7035, 9002, 9010
Group II - light	1002, 6011, 9006
Group III - dark	3000, 3005, 3009, 3011, 5010, 6005, 6020, 6029, 7016, 7024, 8004, 8017, 8019, 9005, 9007

Installation guidelines for CORE PIR and CORE WOOL sandwich panels

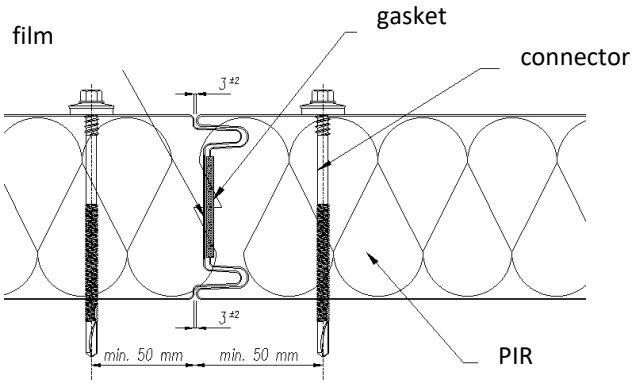
Before starting the installation of the sandwich panels, the contractor is obliged to familiarise him/herself with the lightweight cladding design and make an inventory of the materials and tools which will be used for the installation of the sandwich panels on the façade or the roof in accordance with the applicable Construction Law, relevant Standards in this respect, Technical Conditions and generally accepted building practices. The work can be carried out in favourable weather conditions when the wind speed does not exceed 10 m/s. If the unloading of sandwich panels is his/her responsibility, it is necessary to familiarize with the conditions of transport, unloading and storage of them at the construction site and proceed in accordance with the manufacturer's recommendations. The contractor is also obliged to be familiar with and verify the preparation of a suitable work front for the installation of the sandwich panel. In particular, the main structure and substructure in terms of corrosion protection and tolerances of execution. Verifying that scaffolding or access for horizontal or vertical transport equipment can be set up in accordance with current health and safety regulations. Safeguarding the site from third parties, using efficient tools and having the required certificates for the construction machinery used. Determination of development ordinates in accordance with the design. Before installing the sandwich panels, the contractor must check that the delivered materials: sandwich panels, flashings and other accessories are in accordance with the order and verify them in terms of quantity and quality. In case of discrepancies, follow the manufacturer's procedures and

report it to the relevant person. The dimensional tolerances for the structure or substructure must comply with the following assumptions and be checked on site before installation work begins:

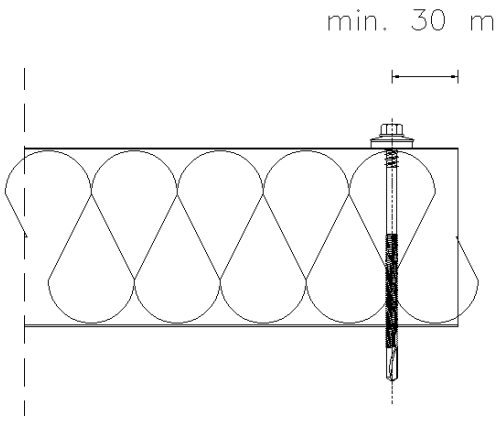


The contractor must check that is equipped with the right screws for the sandwich panels, i.e. the selection of screws depending on the type of material to which the sandwich panel will be mounted (steel, concrete or wood), depending on the thickness of the material in the case of steel or the class of concrete; in the case of determining the diameter of the drilled hole - its depth and spacing. A screwdriver with a power range of 600-750 W, an operating speed of 1500-2000 rpm and a torque of 600-700 Ncm is recommended for screwing. Checking the minimum support widths, which are specified in the standard for end supports of at least 40 mm and intermediate supports of at least 60

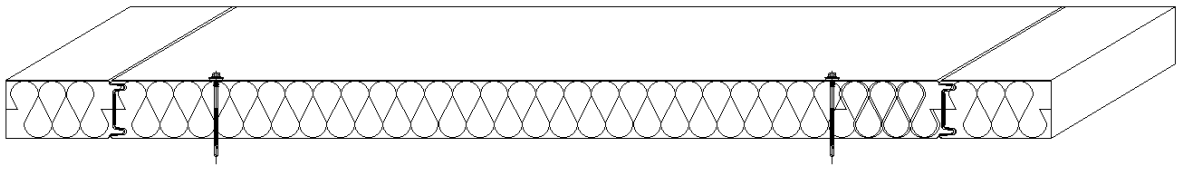
mm. The location and number of screws to be fastened must be in accordance with the design, with the proviso that the minimum distance between the screws to be fastened must not be less than 50 mm and the gap of the assembled boards must be within the tolerance of 3±2 mm

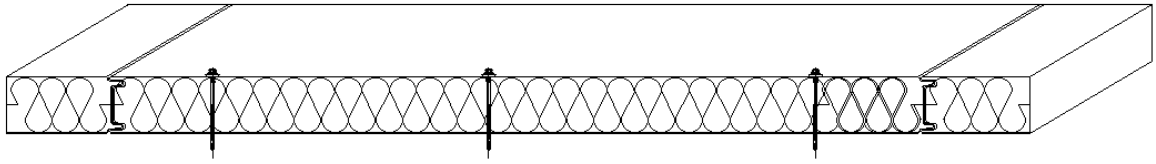


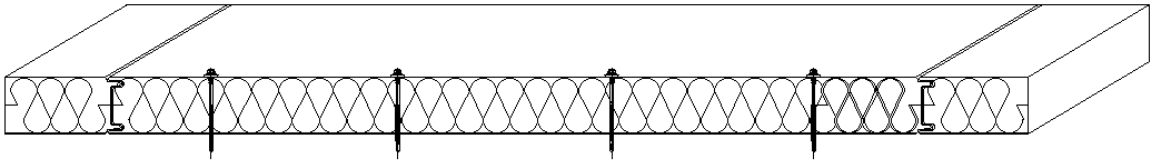
Minimum distance of screws from the edge of the panel is 30 mm



The fastened screws should be symmetrically distributed so that they take on relatively identical loads. An example of the distribution of fastened screws:

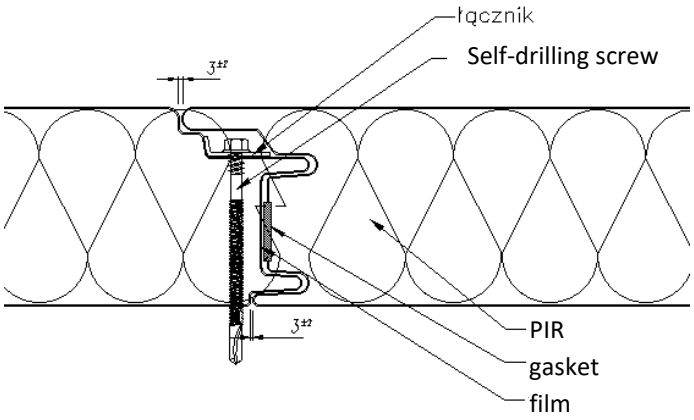




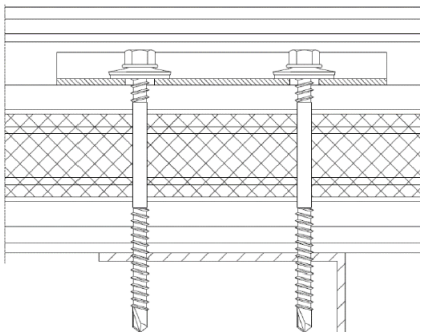


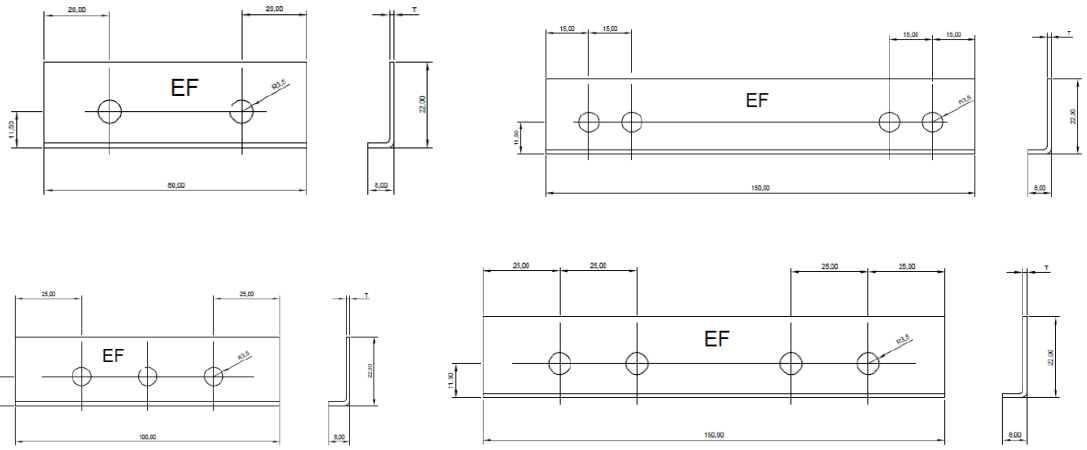
In the case of the sandwich panel with SPW H CORE concealed fastener, the installation looks a bit different. The sandwich panel is installed using a set of fasteners, i.e. a so-called stress spreader plus screws. The stress spreader is selected by the constructor depending on the magnitude of the loads to be dealt with on a particular project and the type of substrate - steel, concrete or timber. An example of such a solution:

connector



Example of installation of a stress spreader in the lock of an SPW-H CORE sandwich panel and different types of stress spreaders (drawings from the manufacturer's website):





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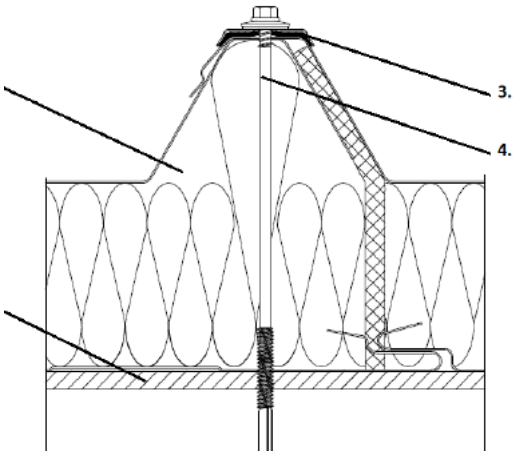
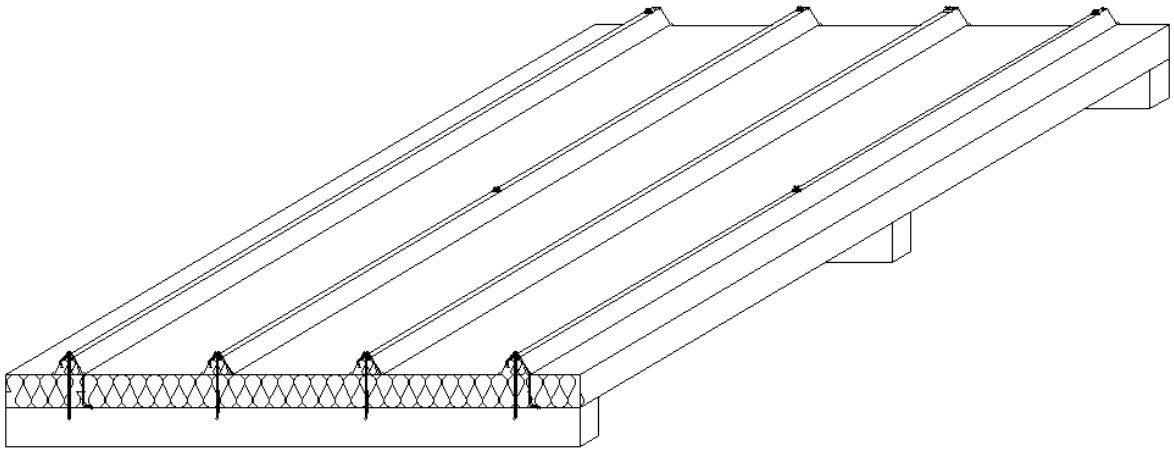
In the case of roof sandwich panels, installation is also carried out using self-drilling screws and the selection of these is made according to the type of substrate, thickness, grade, etc. It is recommended to use a set of fasteners called calotte plus screw. Calotte increases the load-bearing capacity of such a fitting and distributes the resulting stresses over a larger area, also compensating for any mounting imperfections and the flatness of the substructure. Diagram of such a solution (drawing from the manufacturer's website)



Example of fastener distribution on an installed SPR CORE roof sandwich panel, in the eaves and ridge with 3 screws per support in the intermediate support zones with 2 screws each.



The sandwich panels are packed in accordance with the manufacturer's instructions; information on storage and unloading is provided on each package, and the recommendations contained therein must be followed without fail. After unpacking the foil packages, removing the transport protection and checking their quality and quantity, the unloading may begin. The panels must not be slid; unloading must be carried out safely in order to prevent damage to the cladding and the panel itself; for this purpose, it is recommended to use special tools, e.g. holders with suction cups for mounting the panels or special holders prepared for this purpose according to the manufacturer's recommendations.

Examples of handles and tools (photos and drawings from the manufacturer's website):

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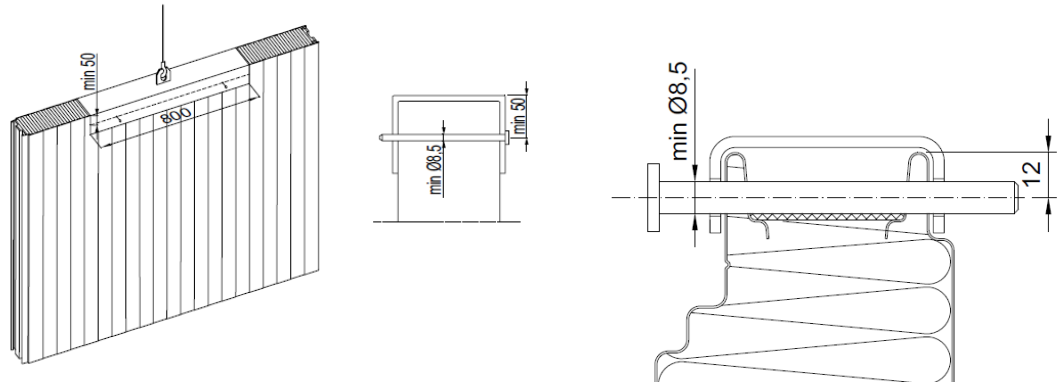
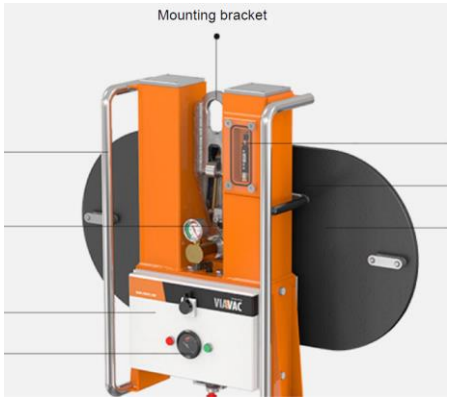
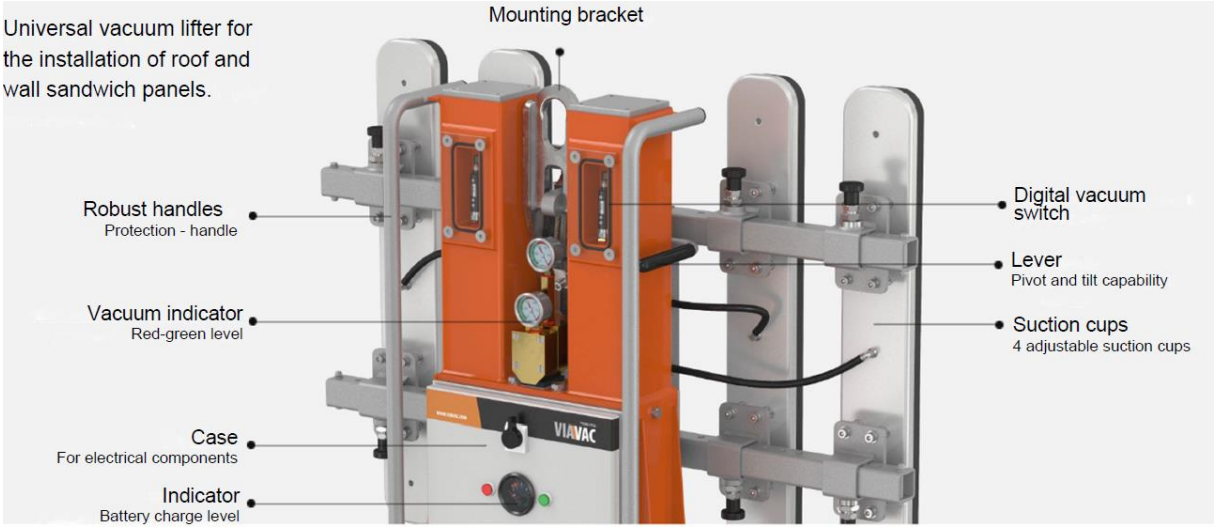




Universal vacuum lifter for the installation of roof and wall sandwich panels.



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Universal vacuum lifter for the installation of roof and wall sandwich panels.

Rotatable and tiltable Suction cups 4 adjustable suction cups

On request, the cladding of the panels can be protected by a protective film during the production process, but the film must be removed during installation, no later than 2 months after the date of manufacture of the panels. Failure to remove the foil within this timeframe may result in problems with its easy detachment from the cladding due to the susceptibility of this material to atmospheric factors such as sun, rain etc. It is important that the panels are laid in accordance with previous agreements. The description of panel numbers and their parameters is placed on the package or the delivery document. This must be verified with the project so that the boards are not installed in a different place than intended. Panels of type SPW-S and SPW-C are symmetrical and, at first glance, their sides are identical, which is why the manufacturer marks which side is the outer and which the inner; the panels cannot be turned by 180 degrees, which may result in differences in shade when installed on the façade. Their arrangement in the package is not random but carefully planned. It is recommended that the sandwich panels and flashings are cut on site using fine-toothed saws or special circular saws with suitable blades for this purpose. Angle grinders and other such devices are not permitted for cutting sandwich panels. It is also important to remember to protect the panels in case additional grinding or welding work is carried out during the installation of the sandwich panels; unprotected panel cladding can be damaged by hot metal filings and permanently damage the panel surface. It should also be remembered that trimming the panels before installation weakens them at this point and can cause damage during transport or installation itself. Laying of complete composite panel packages on the roof may only take place with the approval of the site manager. The installation of the sandwich panels must be monitored and verified at all times for dimensional and colour conformity so that it is carried out as designed. Columns and beams, if required by the design, should be lined with PES gaskets so that the surface of the sandwich panel is separated from other materials (steel, concrete, wood) where corrosion could occur, or to provide acoustic protection for areas that would cause noise nuisance to occupants during operation. All panel joints in the length or with other building elements such as the starting strip, attic, openings for windows, doors, gates, etc., should be protected with insulation material such as foam, loose wool to reduce thermal bridges and protected with flashings to prevent water penetration, air penetration, etc. All details of the sandwich panel construction should be built in accordance with the design and construction techniques in order to ensure proper operation in the future.