Building your tomorrow.

Sandwich panel SPA

Product description

The impressive appearance of Ruukki's panel system is a combination of good thermal insulation and fire resistance. The lightness of the prefabricated panels makes construction fast and cost-efficient. We act as a partner from the beginning of the design phase all the way to installation, if necessary. Design and implementation are speeded up by ready-made and tested structural solutions and the support of our experts. The panel system is used in façades, partition walls, ceilings and compartmental structures.

Applications

- Industrial construction
- Ventilation construction
- Agricultural construction
- Construction in the food industry and clean rooms
- Logistics construction
- Power plants
- Offices and commercial buildings
- Sports buildings

Structure

Sandwich panel SPA consists of two profiled sheet metal plates and a constructive mineral wool lamella core glued in between the plates. Both the panel's sheet metal plates (facings) and the mineral wool core are connected to each other with male and female tongues and grooves.

The fibre level of the mineral wool lamellas is longitudinal to the panel and the fibres are perpendicular to the sheet metal plates. The mineral wool lamellas of panel core are step positioned. The panel's load-bearing capacity is based on the composite effect.

Thickness classes and panel types

Panels are available in different thicknesses: 100, 125, 150, 175, 200, 200+, 230 and 300 mm. There are four panel types that are grouped according to intended use as follows: External walls E, partitions I, fire structures F and special strength structures S. "ENERGY" or "LIFE" after the product code refers to an airtight energy panel or ecological panel.

Examples of the structure of the panel code:

- Sandwich panel SPA175E (= a panel for an external wall, thickness class 175 mm)
- Sandwich panel SPA100I (= a panel for a partition wall, thickness class 100 mm)
- Sandwich panel SPA150F (= a panel for structures requiring special fire resistance, thickness class 150 mm) OR
- Sandwich panel SPA200S (= a panel for structures requiring special strength, such as a compartment ceiling or an external wall with long span length/high wind load, thickness class 200 mm)

Figure 1. Sandwich panel SPA

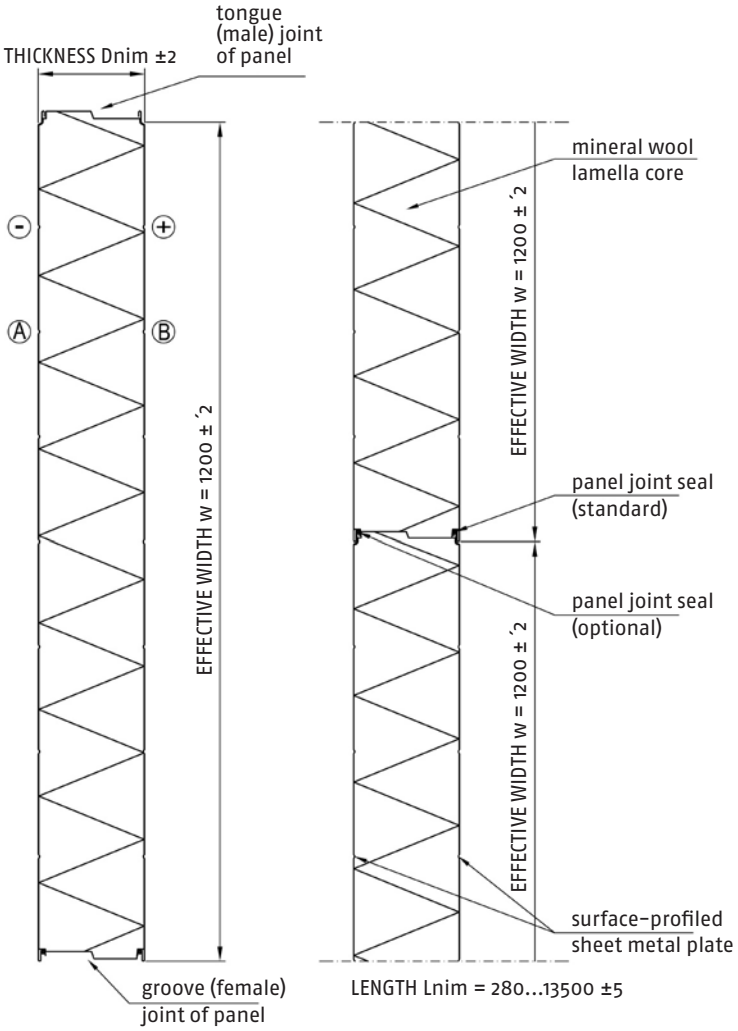


Figure 2. Panel structure, main dimensions and tolerances

Surface materials

The facings of the panels is typically hot dip galvanised sheet metal with colour coating. The exterior of the panel is most commonly Hiarc-coated steel and the interior surface polyester-coated steel.

Other materials that can be used in the panels include food-safe laminated steel, as well as stainless and acidproof steel.

For more information about the available materials and colours, please visit our website at www.ruukki.com.

Surface profiling (1/2)

The panels are available with six different surface profile designs that make the panel's surface architecturally impressive.

- In surface profiling R150, the shadow groove is repeated every 150 mm, resulting in seven shadow grooves on the surface of the element.
- In surface profiling R200, the shadow groove is repeated every 200 mm, resulting in five shadow grooves on the surface of the element.
- In surface profiling R600, the shadow groove is repeated every 600 mm, resulting in one shadow groove on the surface of the element.
- In surface profiling L50, stripes are repeated every 50 mm. The width of the stripes is 10 mm. The stripes are located in the centre of the panel surface so that the distance of the outermost stripes from the edges of the panel is 150 mm.
- In surface profiling M15, the surface of the panel is micro profiled. Pitch of the micro profiling is 15 mm.
- In option F, the surface of the panel is smooth without any profiling.

All surface profile options are available on both surfaces in the case of panels with where the surface is painted steel (Hiarc, polyester). The following surface profile options are available for panels with stainless or acid-proof steel surface plates, on both surfaces of the panel: R150, R200, R600, F.

The panel order must specify the profile for both the outer and inner surfaces.

All sheet steel panels have the same declared strength values, regardless of surface profiling.

Figure 3. Surface profile R150

Figure 4. Surface profile R200

Surface profiles (2/2)

Figure 5. Surface profile R600

Figure 7. Surface profile M15

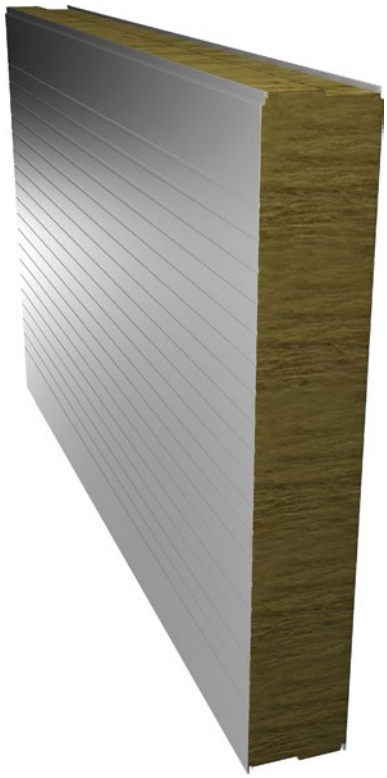


Figure 6. Surface profile L50

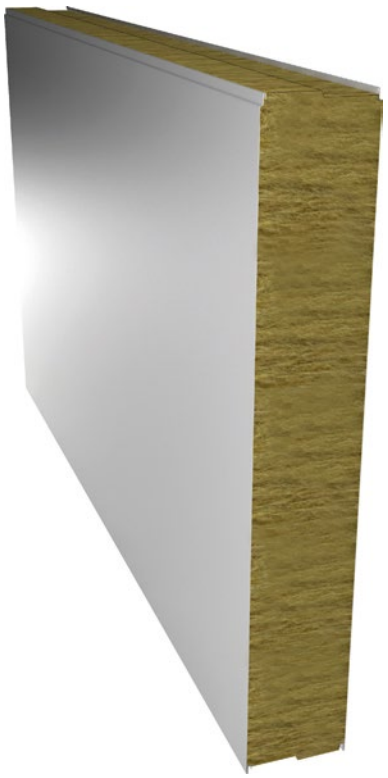


Figure 8. Surface profile F (smooth surface without profiling)

Product properties

Table 1. Sandwich panel SPA product features

Primary application	Thickness class (mm)		Panel type	U-value (W/(m²K))	Weight (kg/m²)	Sound reduction Rw (dB)	Nominal thickness (mm)
External walls	100	SPA	E	0.41	21.4	29	97
	125	SPA	E	0.32	24.5	30	125
	150	SPA	E	0.26	27.4	30	152
	150	SPA	E LIFE	0.25	19.5	29	152
	175	SPA	E	0.23	29.8	31	174
	200	SPA	E	0.20	32.5	31	198
	200	SPA	E LIFE	0.19	22.2	29	198
	200+	SPA	EE	0.18	24.8	28	202
	230	SPA	E	0.17	36.2	31	232
	230	SPA	E LIFE	0.16	24.2	29	232
	300	SPA	EE	0.12	31.9	26	303
Partition walls	100	SPA	I	0.41	21.4	29	97
	125	SPA	I	0.32	24.5	30	125
	150	SPA	I	0.26	27.4	30	152
Fire compartmenting structures	100	SPA	F	0.45	22.3	30	97
	125	SPA	F	0.35	25.1	31	125
	150	SPA	F	0.29	28.2	31	152
	175	SPA	F	0.25	30.7	31	174
	200	SPA	F	0.22	33.5	31	198
	230	SPA	F	0.19	37.4	31	232
Special strength structures	100	SPA	S	0.45	22.3	30	97
	125	SPA	S	0.35	25.7	31	125
	150	SPA	S	0.29	28.9	31	152
	175	SPA	S	0.25	31.6	31	174
	200	SPA	S	0.22	34.5	31	198
	230	SPA	S	0.19	38.5	31	232

Fire resistance properties and maximum span lengths

Table 2. Fire resistance (EI) performance levels and maximum permissible span lengths of sandwich panel SPA wall panels

Wall panel	Span length (m) in the mounting direction H/V (H = horizontal installation, V = vertical installation) Fire resistance					
	EI 30	EI 60	EI 90	EI 120	EI 180	EI240
SPA100E	7.5 / 7.5	7.5 / 7.5	4.0 / 6.0			
SPA125E	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5		
SPA150E	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	4.0 / –	
SPA150E LIFE	7.5 / –	7.5 / –				
SPA175E	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	4.0 / –	
SPA200E	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	4.0 / –	
SPA200+EE	7.5 / –	7.5 / –	7.5 / –	7.5 / –	4.0 / –	
SPA200E LIFE	7.5 / –	7.5 / –				
SPA230E	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	4.0 / –	
SPA230E LIFE	7.5 / –	7.5 / –				
SPA300EE	7.5 / –	7.5 / –	7.5 / –	7.5 / –	4.0 / –	
SPA100I	7.5 / 7.5	7.5 / 7.5	4.0 / 6.0			
SPA125I	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5		
SPA150I	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	4.0 / –	
SPA100F	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / 4.0		
SPA125F	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / –	
SPA150F	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0
SPA175F	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0
SPA200F	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0
SPA230F	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0
SPA100S	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / 4.0		
SPA125S	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / –	
SPA150S	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0
SPA175S	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0
SPA200S	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0
SPA230S	9.0 / 8.8	9.0 / 8.8	7.5 / 8.8	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0

Fire resistance properties and maximum span lengths for wall panels, stainless steel facings

Table 3. Fire resistance (EI) performance levels and maximum permissible span lengths of sandwich panel SPA wall panels with stainless steel facings

Wall panel	Span length (m) in the mounting direction H/V (H = horizontal installation, V = vertical installation) Fire resistance			
	EI 30	EI 60	EI 90	EI 120
SPA150E	7.5 / –	7.5 / –	6.0 / –	
SPA150E LIFE	7.5 / –	7.5 / –		
SPA175E	7.5 / –	7.5 / –	6.0 / –	
SPA200E	7.5 / –	7.5 / –	6.0 / –	
SPA200E LIFE	7.5 / –	7.5 / –		
SPA230E	7.5 / –	7.5 / –	6.0 / –	
SPA230E LIFE	7.5 / –	7.5 / –		
SPA150I	7.5 / –	7.5 / –	6.0 / –	
SPA100S	7.5 / 7.5	7.5 / 7.5		
SPA125S	7.5 / 7.5	7.5 / 7.5		
SPA150S	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / 7.5
SPA175S	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / 7.5
SPA200S	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / 7.5
SPA230S	7.5 / 7.5	7.5 / 7.5	7.5 / 7.5	6.0 / 7.5

Tests have been performed to determine the fire resistance, related maximum span length and other relevant properties of the panels. The fire reaction class of the panels is A2-s1,d0 (surface: Hiarc, polyester and uncoated stainless steel).

In compartment structures, the panel and its fastenings must be dimensioned at least for a variable load of 0.3 kN/m². In the event of a fire, the panels act as a rope (catenary) structure. Therefore, the fastenings and appropriate fire protection must be designed in such a way that one surface of the panel structure will always be able to carry the entire load caused by the panel in the event of a fire.

The fastenings, dimensioning and the implementation of details must comply with the instructions. In the case of an application with fire resistance requirements, the maximum permissible span lengths in the tables above must be used.

Panels can also be used to implement EI-M-classified structures up to EI-M 120.

Fire resistance characteristics of compartment ceiling structures

SPA S, the panel type for special strength structures, includes a fire-resistant solution for compartmenting ceiling structures.

Table 4. Sandwich panel SPA S, fire resistance of ceiling structure and permissible maximum span length (m)

Panel type/ Fire resistance	SPA100S	SPA125S	SPA150S	SPA175S	SPA200S	SPA230S
EI60	6.3	6.3	6.3	6.3	6.3	6.3
EI90	6	6	6	6	6	6
EI120	6	6	6	6	6	6

Please note: The fire resistances of an SPA S compartment ceiling panel structure apply to panels treated with Hiarc and polyester coatings.

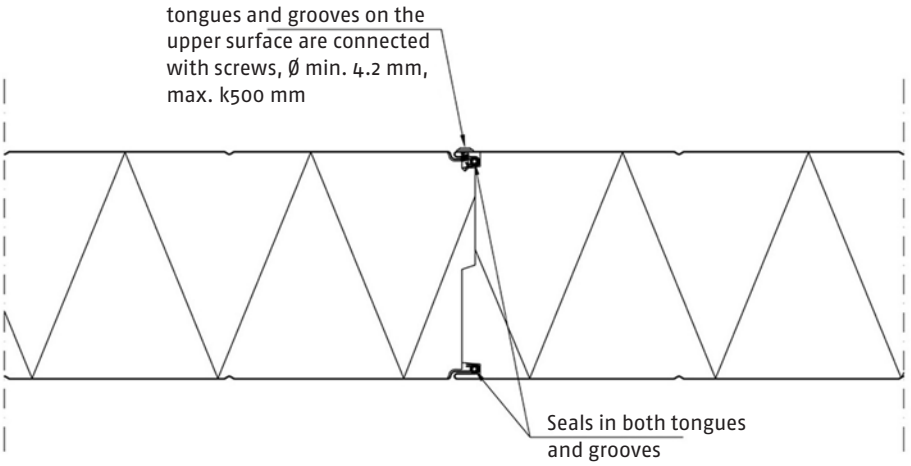


Figure 9. Fastening and sealing of panel joints in a compartmenting ceiling structure.

Tests have been performed to determine the fire resistance, related maximum span length and other relevant properties of the panels. The fire reaction class of the panels is A2-s1,d0 (surface: Hiarc, polyester and uncoated stainless steel).

In the event of a fire, the panels act as a rope (catenary) structure. Details, fastenings and their appropriate fire protection must be designed in such a way that the fastenings at the upper or lower surface of the panel can withstand the entire load caused by the panel structure in the event of a fire. The fastenings, dimensioning and the implementation of details must comply with the instructions.

Due to structural tightness requirements, seals must be installed in the panel joints on both upper and lower facings of the panel.

Due to fire resistance, the tongues and grooves at the upper facings of panel ceiling must be fastened to each other with small screws (Ø min. 4.2 mm), spacing max. 500 mm.

Dimensioning

Dimensioning of panel structures must be carried out in accordance with EN 14509 and national requirements. The primary dimensioning tool is TrayPan software and the secondary tool are dimensioning curves. The characteristic values of panel strength are based on tests and are given in DoP. For panel type SPA EE, the dimensioning is done using TrayPan. In dimensioning the location of the panels in the building must be taken in account, and the necessary initial data of the construction site must be clarified. Special attention must be paid to loads at the edge zones.

Loads are usually higher in corner areas, at the eaves and around openings, which means that dimensioning of the panel and fastenings is particularly important. In places where there is a high risk of damage to the surfaces (due to traffic, accumulating snow, etc.), we recommend using a high plinth and separate supports at the edges of openings.

In the designing of the panel structure the following requirements must be taken in account, for example:

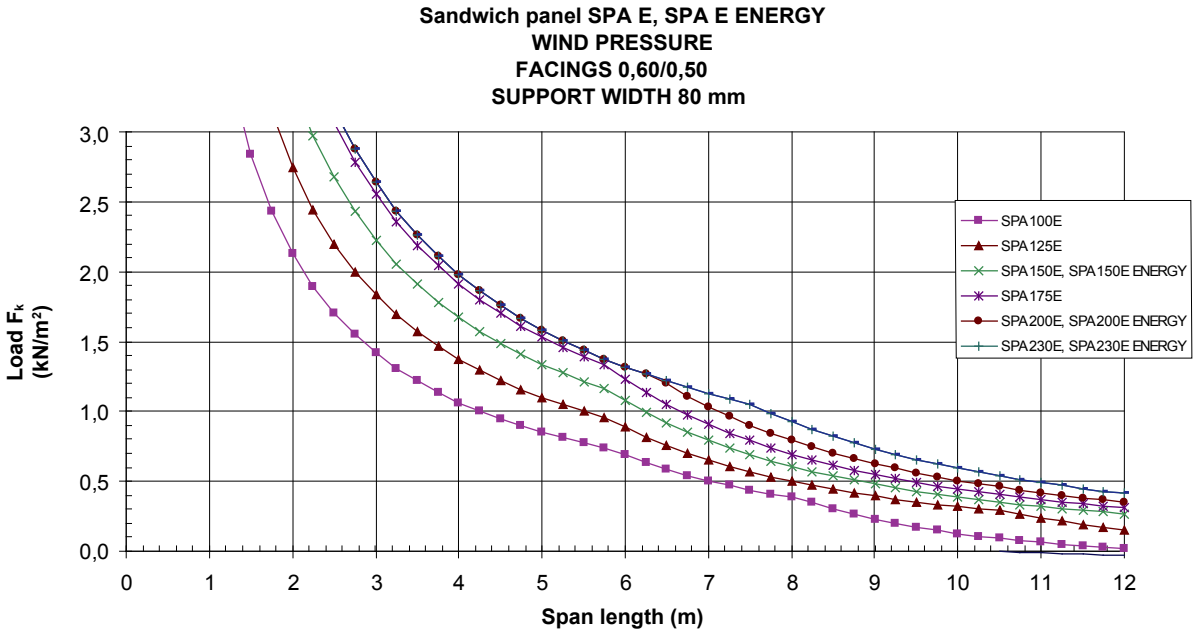
- Load
- Frame and reinforcing structures
- Air tightness
- Thermal insulation capacity
- Fire resistance
- Sound reduction
- Fastenings and openings

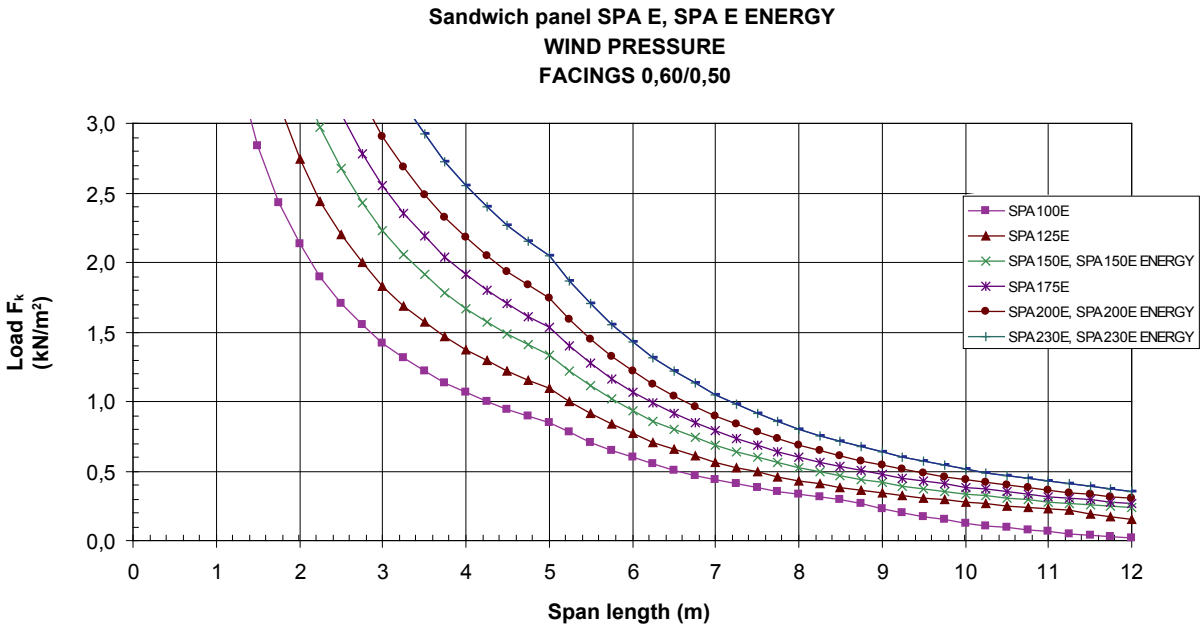
The strength and stiffness of the panels allow rather long spans. Panels are usually dimensioned as single-span structures. Dimensioning curves have been prepared for the design of basic single-span wall structures (see the section on Dimensioning curves). Particular attention must be paid to deflection caused by wind loads and temperature differences and to ensuring that all connections function properly. Bowing of panels due to temperature differences is a natural behavior, and the total deflection movement throughout year may be large, depending on the dimensions and location of the panels, for example. Deflection caused by temperature differences may also have influence during the installation of panels.

Dimensioning curves

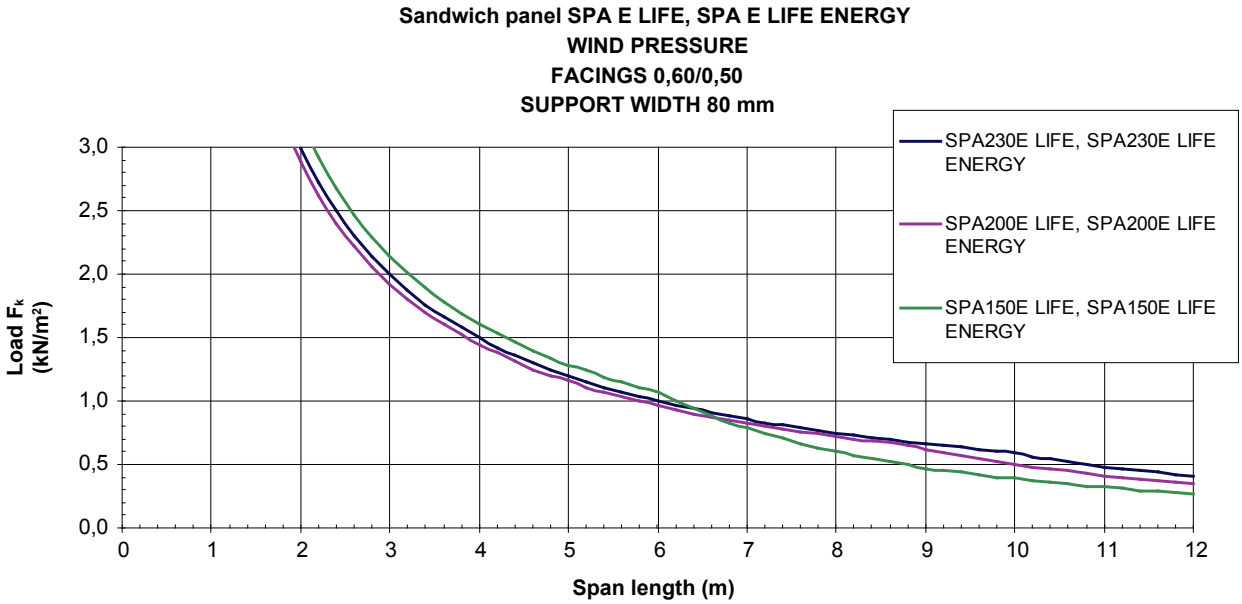
- The dimensioning curves have been calculated in accordance with EN 14509.
- Temperature difference of 45°C between the inner and outer surfaces has been used in the case of wind suction and temperature difference of 50°C in the case of wind pressure.
- The deflection limit of an external wall panel is L/100 and the deflection limit of a partition wall panel is L/150.
- The presented permissible loads require fixing of the panel according to the instructions.
- The following support surface widths have been used in the dimensioning curves: SPA E, SPA E LIFE, SPA F and SPA S: 80 mm, SPA I: 50 mm.
- The loads in the curves (Fk) are specific loads.
- The curves include the partial factor (γ_F) 1.5 for wind load and partial factor (γ_m) for material according to EN 14509.
- If there are openings in the panel or if it is subjected to additional loads, the permissible span length must be shortened.
- Ruukki's TrayPan dimensioning software can be used for more specific load calculation.
- PLEASE NOTE: If you cannot find a panel that meets the load requirements in the curves, please contact Ruukki's technical support for a more specific dimensioning analysis.

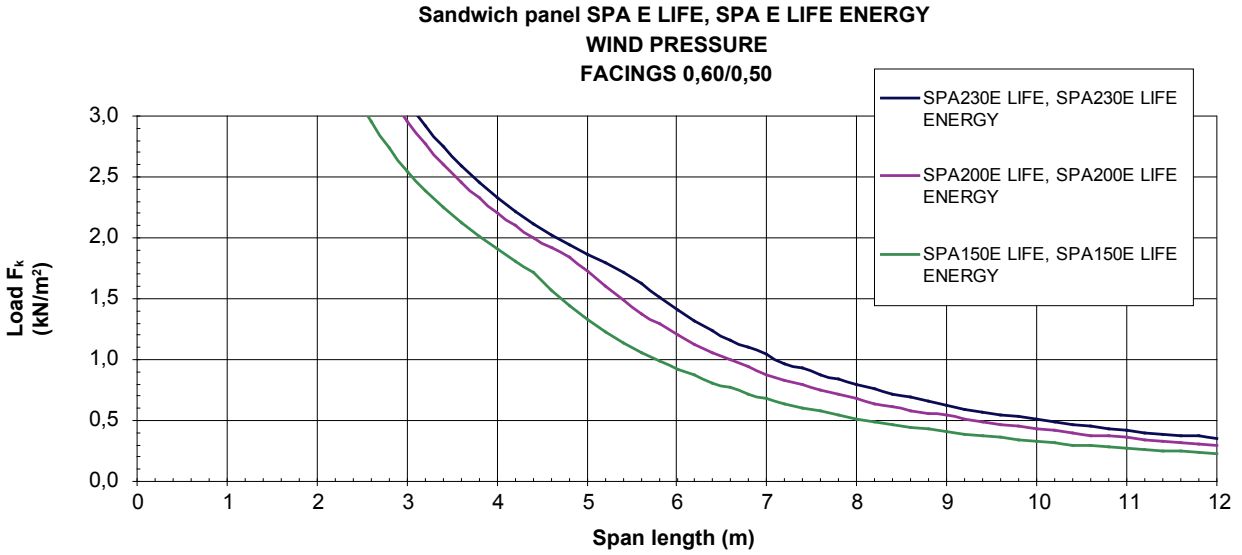
Panel dimensioning curves SPA E





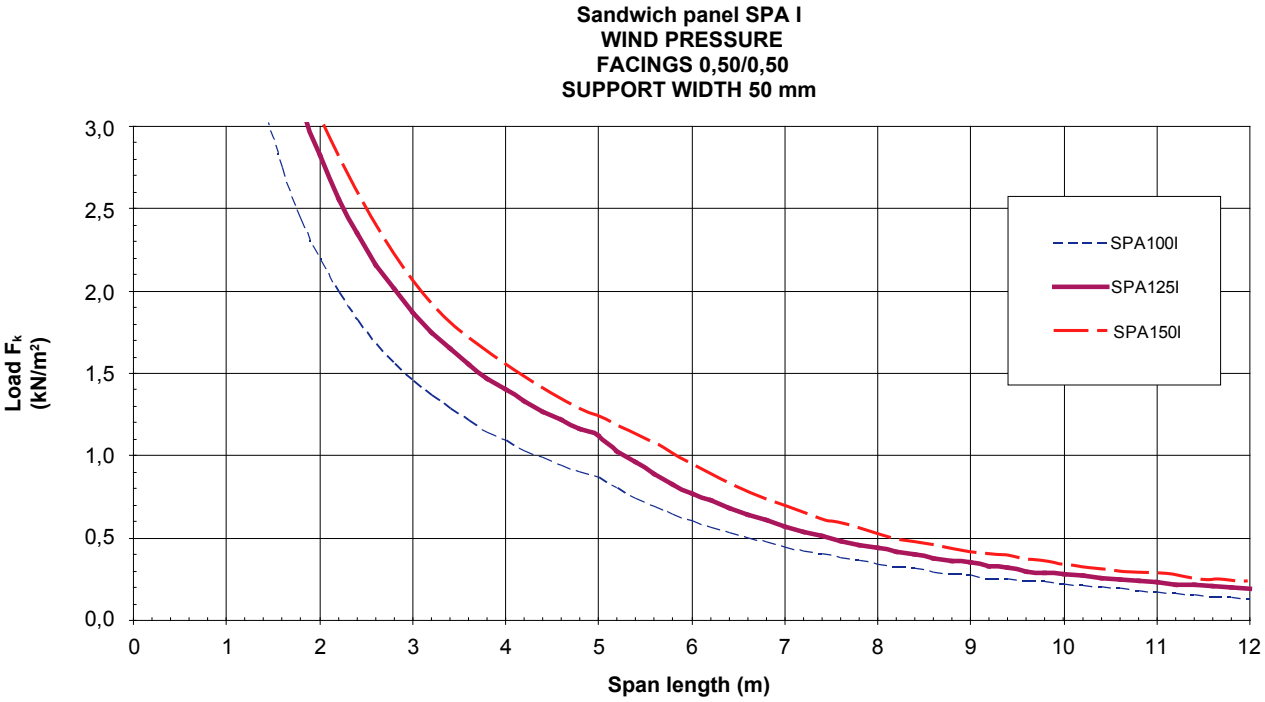
Panel dimensioning curves SPA E LIFE

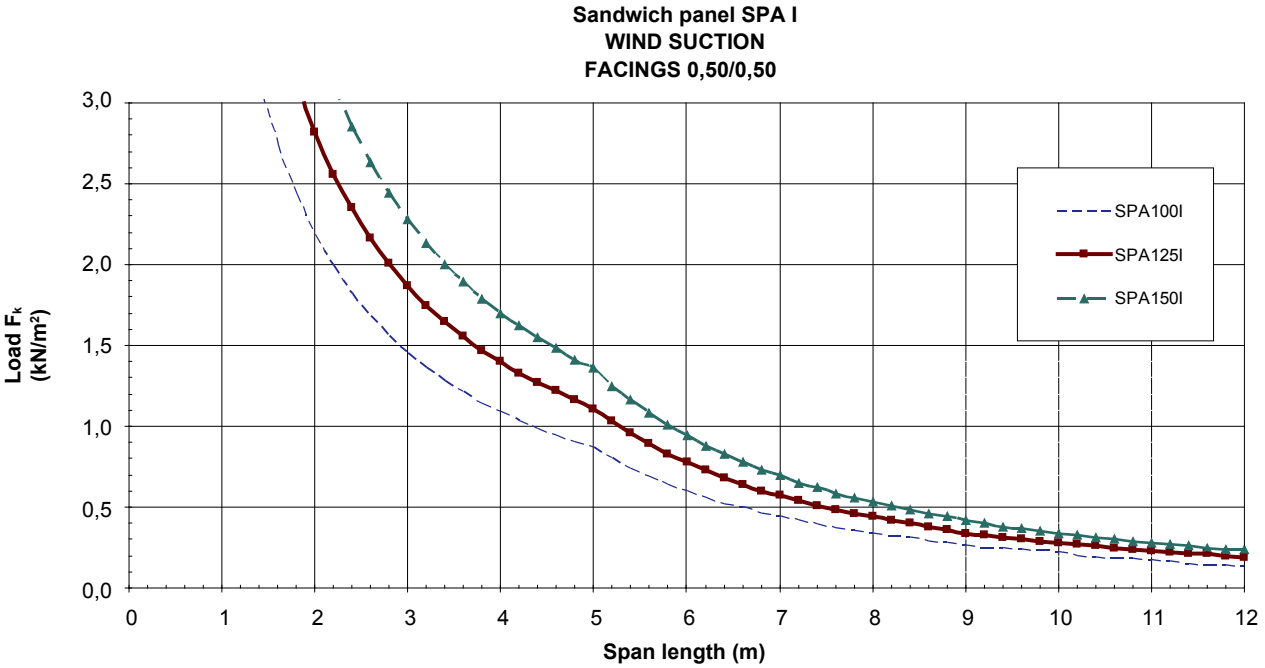




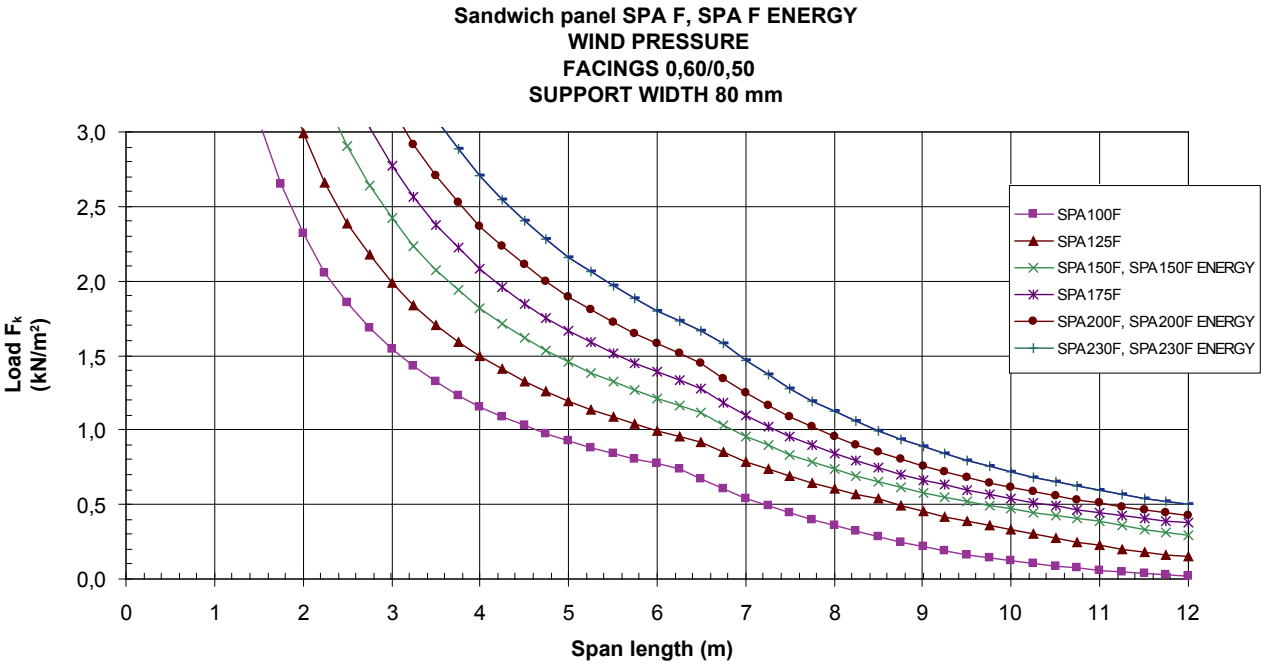
Panel dimensioning curves SPA I

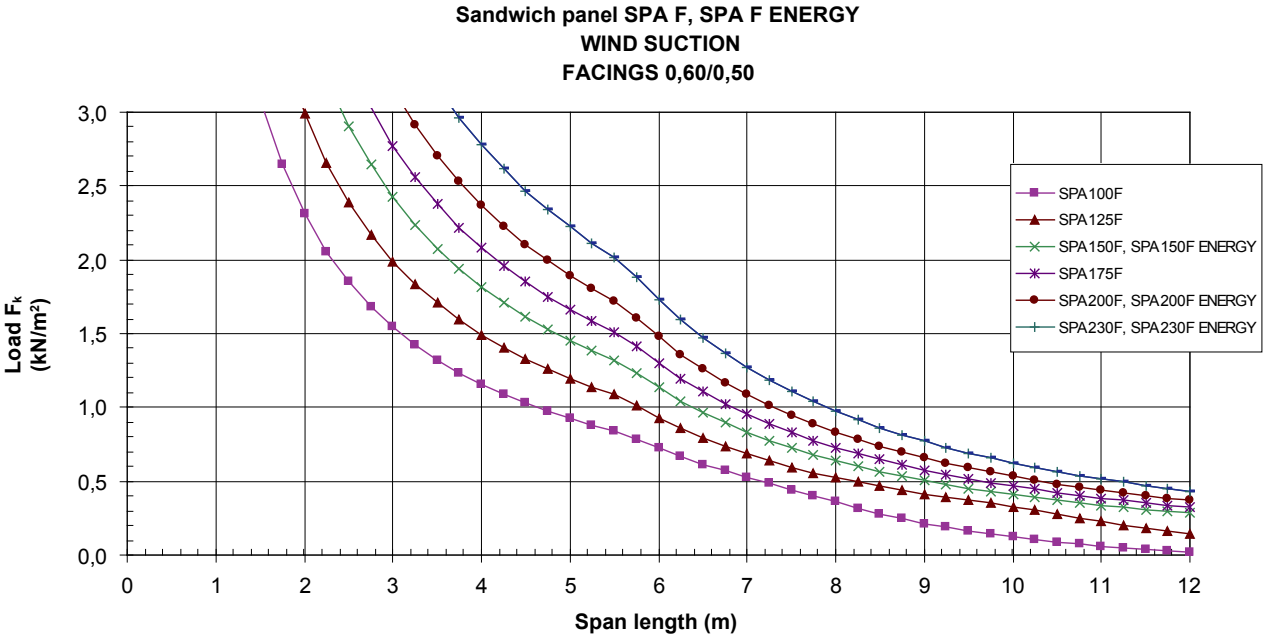
PLEASE NOTE: Always dimension partition panels for a load of at least 0.3 kN/m². This ensures that the panels can withstand the typical loads caused by handling and installation. In some cases, higher loads must be used in dimensioning to take into account loads during construction.



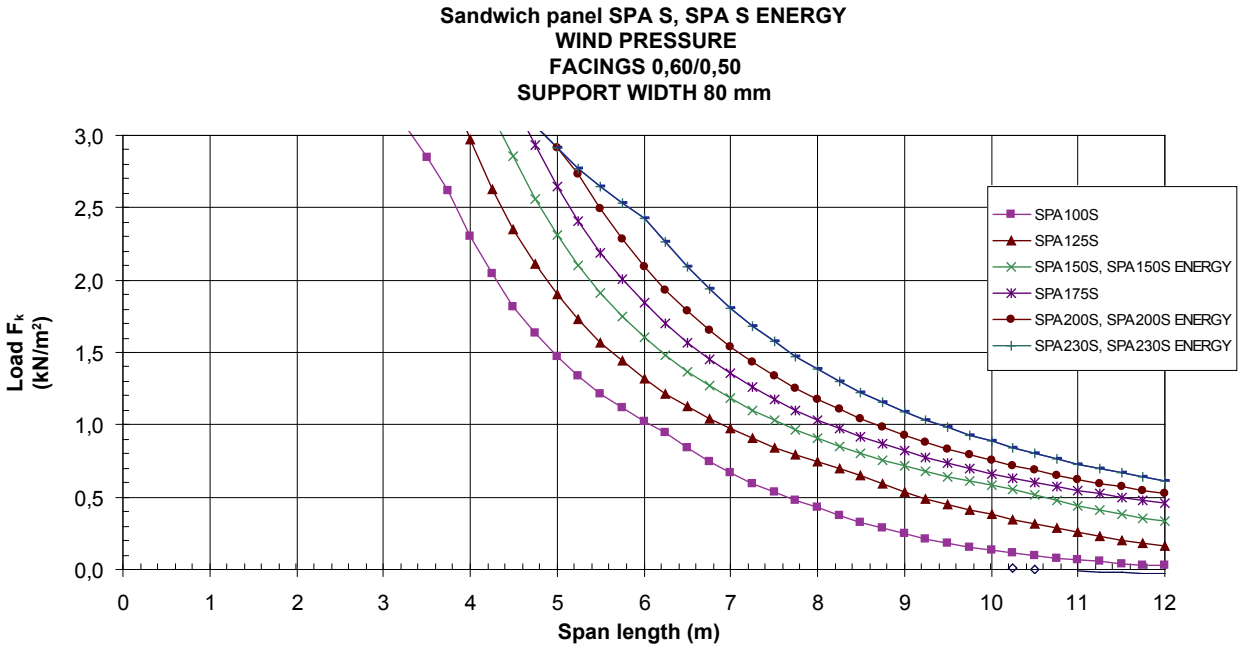


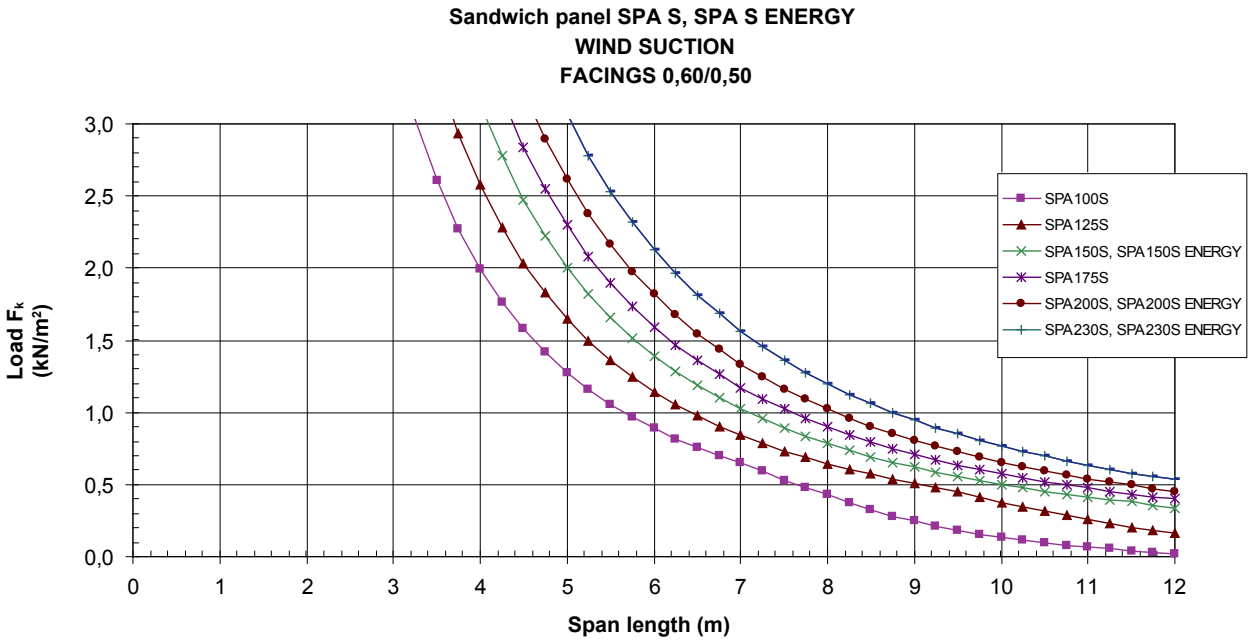
Panel dimensioning curves SPA F





Panel dimensioning curves SPA S





Dimensioning of fastenings

The most typical fastening method is fixing the panel at both ends with screws straight into the frame (see Fig. 10). Correct use of high-quality fasteners ensures both the long-term performance of the fastening of the panels and corrosion resistance. When selecting fasteners, attention must be paid to the requirements of the service conditions, e.g. loads and aggressiveness of the end use environment. If the end use environment is very aggressive or humid, stainless steel fasteners must be used, and we recommend always using stainless steel fasteners. Over-tightening shall be avoided so that the fastening maintains its strength and the panel under the fastener is not damaged. The fastener must not be punched through the surface of the panel during installation. We recommend using fasteners with seals in external wall structures.

The number of fasteners used in fastenings through panel depends on the load exposed to the panel, wind suction load, panel weight, panel width and span length, as well as any other loads affecting the panel. Panel fastenings must be dimensioned for both suction and shear loads. Basis of the design is the design value of the support reaction at the panel support. The minimum number of fasteners is 2 pcs per panel end. The fastenings shall be placed at a distance of a minimum of 30 mm from the edges of the panel. Width of the support must also be taken into account in the fastening of the panel. It must not be less than 50 mm per panel end. Dimensioning of fixings of SPA EE panels is always done using TrayPan.

The number of fasteners required for fastening can be calculated as follows: $n \geq b \cdot F_d / (F_{Rk} / \gamma_m)$.

Durability of the fastener and the fastener's tensile strength and shear strength from the substructure must also be checked.

In the expression above:
n = Number of fasteners (pcs per panel end)
b = Panel width 1.2 (m)
F_d = Design value of the support reaction (kN/m)
F_{Rk} = (Declared) characteristic value for resistance of the fastening according to Table 5
γ_m = Material's partial safety factor for fastening 1.33

Table 5. Characteristic values for pull through strength and shear stability of the panel fastening, according to the fastener type, edge distance and thickness of facing.

Fastener type	Edge distance [mm] 1)	Characteristic value for pull through strength F_{Rtk} [kN]		Characteristic value for shear strength F_{Rvk} [kN]
		t=0,6 mm 2)	t=0,5 mm 2)	t=0,5 mm 3)
Self-drilling screw Ø ≥ 5.5 mm and spike Ø ≥ 6.3 mm, washer Ø 19 mm	30	2.5	1,6	1.6
	100 4)	3.0	2,3	
	> 100	3.0	2.3	
Self-drilling screw Ø ≥ 5.5 mm and spike Ø ≥ 6.3 mm, washer Ø 29 mm	30	3.2	1.9	
	100 4)	3.9	2,7	
	> 100	3.9	2,7	
Self-drilling screw Ø ≥ 5.5 mm and spike Ø ≥ 6.3 mm, Countersunk washer (40-9)	35	2,8	2,6	1.6

1) 30 mm and 35 mm are the minimum permissible edge distances.
2) Thickness of panel's exterior facing
3) Thickness of panel's interior facing
4) Resistance values between edge distances of 30 and 100 mm may be linearly interpolated. With an edge distance of more than 100 mm, resistance values for edge distance of 100 mm must be used.

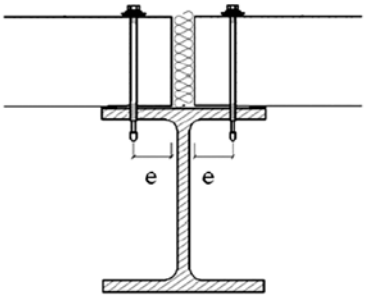


Figure 10. General principle drawing of fastening through the panel to the frame structure with edge distance of e.

The dimensioning must also take into account the partial load safety factor, which for pull-through strength of the fastening (wind load) is 1.5 and for shear strength (self weight) is 1.35.

The easiest way to dimension fasteners is to use Ruukki's panel dimensioning software TrayPan.

Windows and doorways in dimensioning

Any openings in the panels (such as windows and doors) reduce the strength of the panel relative to the width of the opening and the modular width of the panel. For example, a window that is 400 mm tall in a horizontally mounted panel that is 1,200 mm tall reduces the strength of the panel by 33% (400 mm / 1,200 mm). Using the dimensioning curves below or Ruukki's TrayPan dimensioning software, it is possible to check whether a panel with openings is strong enough to carry the loads to which it will be subjected.

If an opening in the panel exceeds the panel's load-bearing capacity, the loads of the panel with the opening will be transferred to adjacent panels over the male/female tongue and groove structure. Therefore, such extra transferred loads must be taken into account in the dimensioning of the adjacent panels. These load transfer factors are illustrated in Fig. 11. For example, if the panels are subjected to a wind load of 0.6 kN/m², the panels next to the panel with an opening must be dimensioned to wind loads of 1.35 x 0.6 kN/m² and 1.15 x 0.6 kN/m².

Partition walls

The stress on partition wall panels is usually at its highest during the construction period. When designing partition wall structures, high wind loads during construction must also be taken into account if such loads may occur before the building envelope is closed. The recommended minimum surface pressure during dimensioning for partition walls is 0.3 kN/m² (=30 kg/m²). A partition wall panel can also be covered with a gypsum board and fiberglass wallpaper or tiled. The designer must take into account the requirements due to the attachment of the surface structures and deflection.

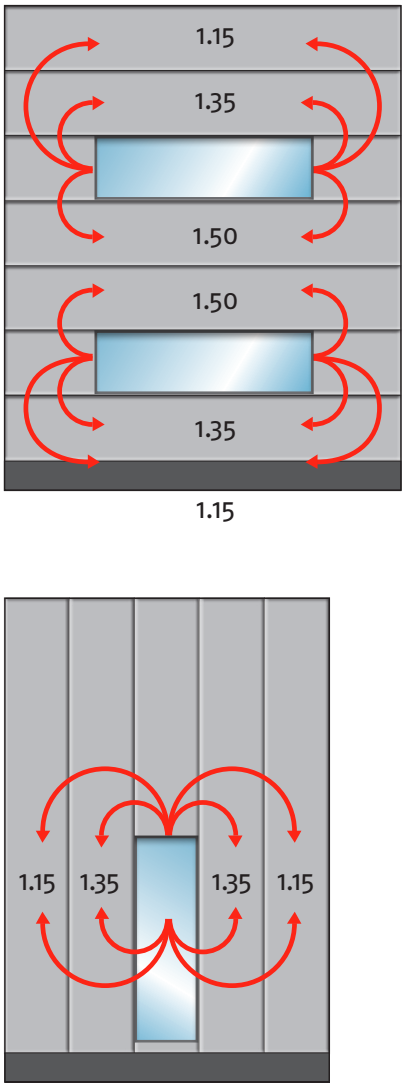


Figure 11. Load distribution factors

Panel joint seals

A joint seal will be installed in the panel's female joint during manufacture. In the case of external wall panels, the seal is a standard on inner facing of panel, as the inner surface of the external wall must be vapourproof. A joint seal must be used at both the inner and outer surfaces under harsh climate conditions, in horizontal installations in tall buildings and in all vertical and diagonal installations and we recommend to use joint seal on both facings of panel always. The panel order must specify the joint seal to be installed in the panel joint of outer facing.

Packaging

Panels are usually packaged on a pallet and in plastic wrapping. If the panels are of different lengths, the shorter panels will be placed over the longer ones to avoid transport damage. Panels for the certain column spacing will be placed in the same package to simplify the installation. If there are panels with variable colours in one column spacing, the panels with differing colours will be placed in separate packages.

There are different packaging options for different needs. The available packaging options also depend on the transport destination.

When designing packaging, the type of transport equipment must be taken into account so that the parcels will not be too tall. The maximum dimensions of a single package are: length 13.55 m x width 1.23 m x height 1.32 m.

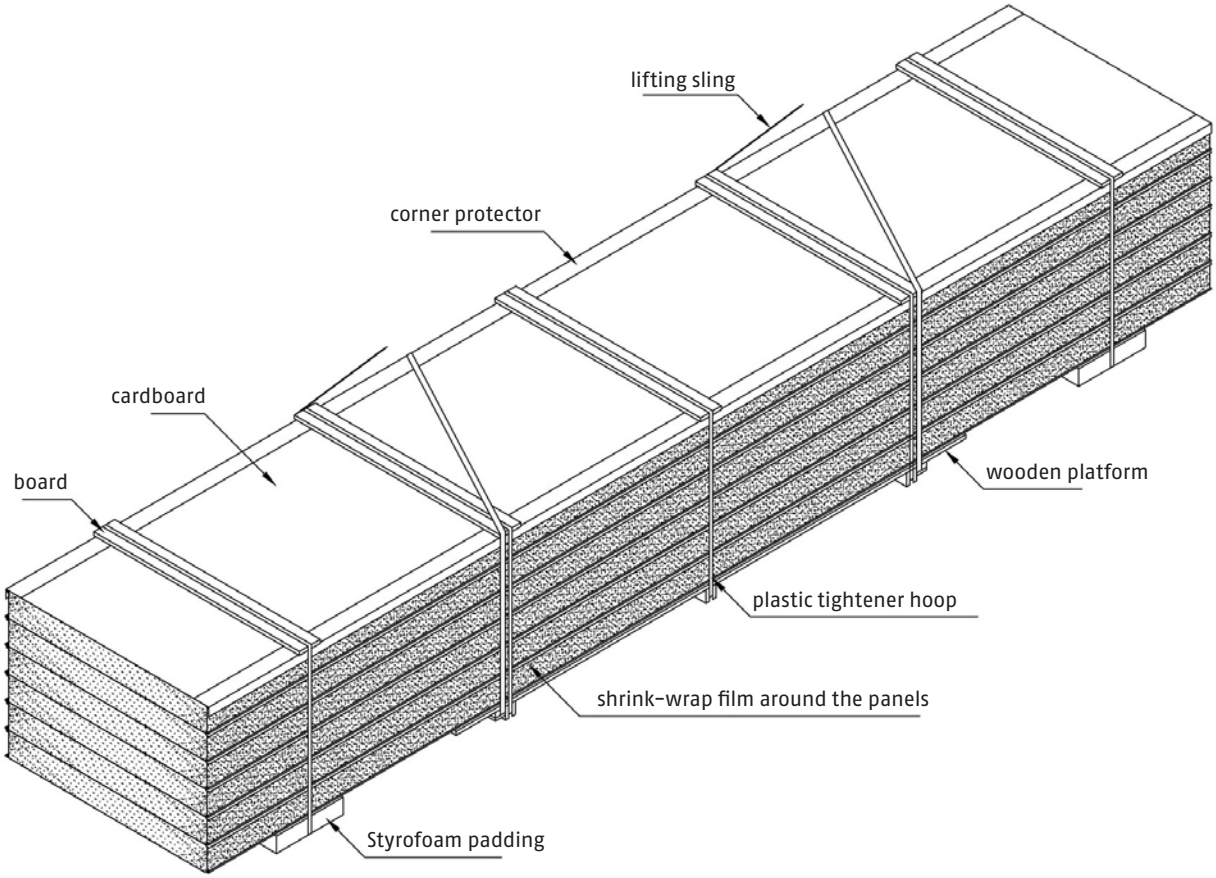


Figure 12. Standard package

Standard accessories

Standard and order-specific accessories and installation tools are available with the panel delivery.

The most typical standard acessories are:
- Fasteners (panel fasteners for various frame materials, flashing fasteners, fastening plates for threaded sleeve fastening)
- Seals (plinth seals, sealing strips for frame and flashing connections, sealant mastics, joint sealing strip, insulation and fire-protective mineral wool)
- Studs (U-plinth purlins and studs for window and door frames)
- Flashings (plinth flashings, vertical joint flashings and corner flashings)

For more information on the accessories, please see the separate "Sandwich panel SPA Accessory Product Description".

Strip windows

Strip windows are also available as part of the panel delivery. The frame structure consists of aluminium profiles connected to each other with a thermal break strip. Weatherproof EPDM rubber and sealants are used as the seal on the outside. The frame is powder painted in the required colour.

The strip window will be installed as a prefabficated element in conjuction with the installation of the panels. The installation does not require any special tools or methods.

Corner panel

Separate corner panels can be manufactured for the outer corners of buildings. Corner panels are available for all panel types and thickness classes with all surface profile options. The standard bending angle is 90°.

Minimum and maximum dimensions:
SPA100–200: A/B external dimension min. = 300 mm, max. = 2 400 mm,
SPA230: A/B external dimension min. = 350 mm, max. = 2,400 mm.
SPA300: A/B external dimension min. = 420 mm, max. = 2,400 mm.

A case-by-case agreement must always be made on using corner panels in the inner corners of a building or panels bent at different angles.

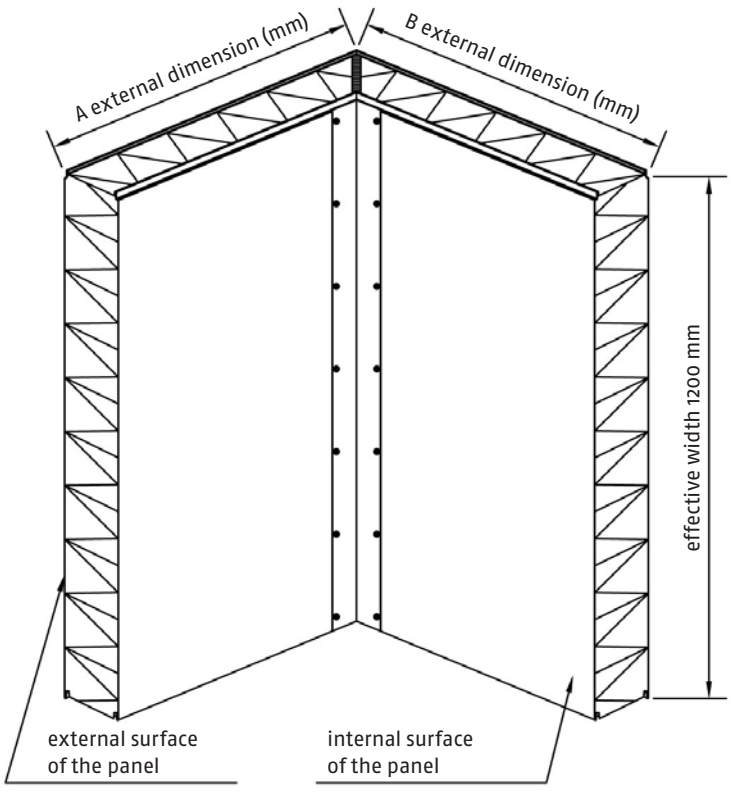


Figure 13. Corner panel

Handling

The panels must be handled appropriately to prevent damage; the panels must not be allowed to get wet or dented. Cutting of panels and any other machining must be carried out with appropriate tools to ensure proper occupational safety and health, and to achieve the best final results; for example, using an angle grinder for cutting is strictly prohibited, as it will damage the painted surface on the panel.

Single panels must be lifted with a lifting tool that can be rented from Ruukki (panel joint lifting tool or a vacuum lifting tool).

The protective films on the panel surfaces must be removed before lifting the panel.

Sealing the structure

Sealing panel structures both from inside and the outside is especially important to achieve proper tightness and ensure long-term durability of the structure. Sealing is usually done with sealing strips and sealants.

Identification

During manufacture, information on the manufacture of the panel is printed on the male joint of panel, such as the panel type, the time of manufacture and the order number. During manufacture, a code given by the customer can also be printed onto the panel so that a predetermined location in the building can be assigned to the individual panels.

A printout containing package-specific information, including the contents of the packaging, weight and handling instructions, is attached onto the package.

The panel delivery also includes installation and maintenance instructions for the panels.

Installation and maintenance

For more information on the installation and maintenance of the panels, please see the separate "Sandwich panel SPA Installation and Maintenance Instruction". For more information on installation, also see "Sandwich Panel SPA principle details".

Conformity with standards and quality control

The panels comply with EN 14509.

The panels are subjected to external quality control and Ruukki's own quality control.

- **Our customer service will be happy to give you more information.**

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