

**PIR FROST
SANDWICH
PANELS**
**TECHNICAL
CATALOG**

PIR FROST Sandwich Panel

Sandwich panel with polyurethane core

September 2023

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I. TECHNICAL INFORMATION ON ENCLOSURE MADE OF SANDWICH PANELS

1. GENERAL INFORMATION – ABOUT THE COMPANY

Balex Metal Sp. z o.o. is the leading manufacturer of steel construction materials in Poland. The Company's offer includes complete solutions as well as steel roofing and façade systems for housebuilding industry, commercial and agricultural construction.

The range of products is recognised by customers in Poland, Belarus, Lithuania, Latvia, Estonia, Ukraine, Czech Republic, Slovakia, Germany, Denmark, Sweden and Norway. Consulting and sales services are provided through own network of regional branches, cooperating distributors and a team of professional sales advisors.

Balex Metal owes its leading position in the market of manufacturing double-clad insulating core sandwich panels to its technologically advanced production lines purchased from the most renowned European companies, the team of employees with excellent qualifications as well as its special attention to quality.

2. SANDWICH PANEL CONSTRUCTION

Balex Metal company provides wide range of steel faced sandwich panels with polyurethane core marked with PIR trade name. The range of products includes wall and roof sandwich panels for industrial halls, warehouses, sports halls, production facilities, commercial pavilions and facilities, offices, social and public utility buildings. More detailed information concerning sandwich panels for the above mentioned applications is available in the Technical Catalogue of PIR STANDARD, PIR LIGHT & PIR PLUS wall panels and PIR STANDARD roof panels. The thickness of these panels ranges from 40 mm to 160 mm.

The panels described in this catalogue supplement the range of products and are modern cold storage panels for cold stores under the PIR FROST trade name. They are considerably thicker ranging from 120 mm to 200 mm.

PIR FROST sandwich panels consist of two steel claddings and a structural-insulating core. The core is made of non-freon polyurethane foam foamed with pentane, with density of 40 kg/m³ (environmentally friendly due to the applied foaming agent). It is responsible for transmitting shear stress, maintaining fixed distance between the claddings and ensuring high thermal insulation values. The calculation thermal conductivity coefficient equals $\lambda_0 = 0.022 \text{ W/m}^2\text{K}$ with average temperature of a division wall of 0°C.

Panel claddings are responsible for transmitting normal stress and securing a particular facility against weather conditions.

PIR FROST sandwich panel's claddings are made of S250GD steel metal sheet galvanized, plated with organic coating or made of stainless steel (1.4301).

Standard steel cladding of sandwich panels is coated with polyester varnishes. Due to often increased anticorrosive requirements and contact with food in the case of warehouses, cold stores and carrying freezers the claddings can be coated with PVC(F) "Foodsafe".

The polyurethane core in the longitudinal joint is milled in the production process to the shape of a double tongue and groove in order to obtain maximum tightness and improved thermal insulation value.

Such construction of the panel guarantees fulfilling high requirements concerning thermal insulation, high load-bearing capacity and rigidity with wide range of acceptable temperature differences of outside and inside claddings. It enables application of considerable spans of supports both in the ceiling and on the walls at the same time.

3. PRODUCTION TECHNOLOGY

The production of PIR FROST sandwich panels is continuous and performed on a fully automated assembly line delivered by one of the leading suppliers in the trade, Hennecke company (Germany). Pentane is used as the foaming agent which makes the production process environmentally friendly i.e. not damaging the ozone layer.

The technological process of producing sandwich panels with polyurethane core consists of injection of mixed components forming rigid polyurethane foam between two continuously moving metal sheet panels of the upper and lower steel cladding (with previously profiled longitudinal joints and the main profile) and using paper tape preventing foamed polyurethane from sticking to side chains forming the core's longitudinal profile at the same time. Panels' sections cut to appropriate dimensions with the use of a saw slide along the so called cooling conveyor in order to undergo the process of double-side milling of the core's longitudinal profile at the final stage. In the course of milling the paper tape is removed and pure polyurethane is exposed. At the final stage of the production process panels are automatically packed in transport packages and wrapped in shrink film.

High quality and fixed repeatability of technical parameters has been achieved due to the application of top class materials and continuous control of production.

4. PANEL TYPES

PIR FROST wall and ceiling panels are provided in different thicknesses with the modular width (so called covering width) 1000 mm or 1100 mm. Profiling marked with: M = micro-profiled, L = lined, 1L = clearline, 2L = double clearline, G = flat, while the inner one can be L = lined or G = flat.

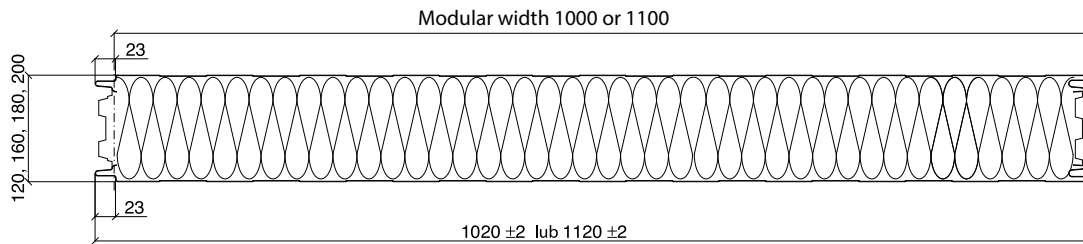


Fig.1 PIR FROST sandwich panel

5. BASIC TECHNICAL SPECIFICATION

Tabela 1. Technical specification

Type of panel	Panel's thickness [mm]	Standard thickness of claddings [mm]		Panel's length [m]		Panel's weight [kg/m ²]
		external	internal	min.	max.	
PIR FROST sandwich panel	120	0,50-0,70	0,40-0,70	2,0	18,0	13,4
	160					15,0
	180					15,8
	200					16,8

6. DESIGNATION, SCOPE OF APPLICATION

PIR FROST sandwich panels are to be used as external walls, ceilings (in this case covered with additional panels like e.g. corrugated sheet) and internal partitions in stationary stores, cold stores and carrying freezers as well as elements of chambers (of the same application) inside other facilities or as wall warming elements or ceilings in existing buildings.

Panels used as external partitions transmit heat and wind load and ceiling panels covered with additional coat, so called tropical, transmit only heat load.

Depending on the thickness of the core and indoor temperature of a room the following scope of application is anticipated:

- the core 120 mm - temperature difference to 50°C
- the core 160 mm - temperature difference to 70°C
- the core 180 mm - temperature difference to 80°C
- the core 200 mm - temperature difference to 90°C

The application of PIR FROST sandwich panels should be in accordance to the technical design regarding the harmonized European norm PN-EN 14509 concerning PIR FROST panels as well as the requirements of local standards and building codes.

7. PANEL CONNECTIONS

The whole product line of BALEX METAL sandwich panels includes constructional solution concerning the shape of steel claddings in the longitudinal joint of panels. A unique shape of longitudinal joints with optimal proportion between the thickness of the tongue and the depth of the groove in both claddings, internal and external one, had considerable effect on increasing fire resistance parameters of panels.

In addition in the case of PIR FROST sandwich panels we introduced precise milling of the polyurethane core in the shape of a double tongue joint.

In the case of PIR FROST sandwich panels the solution described above guarantees good thermal performance and minimizes linear thermal bridge and satisfies requirements concerning fire resistance, fastness to rain waters, air and steam infiltration.

8. LONGITUDINAL PANEL JOINT

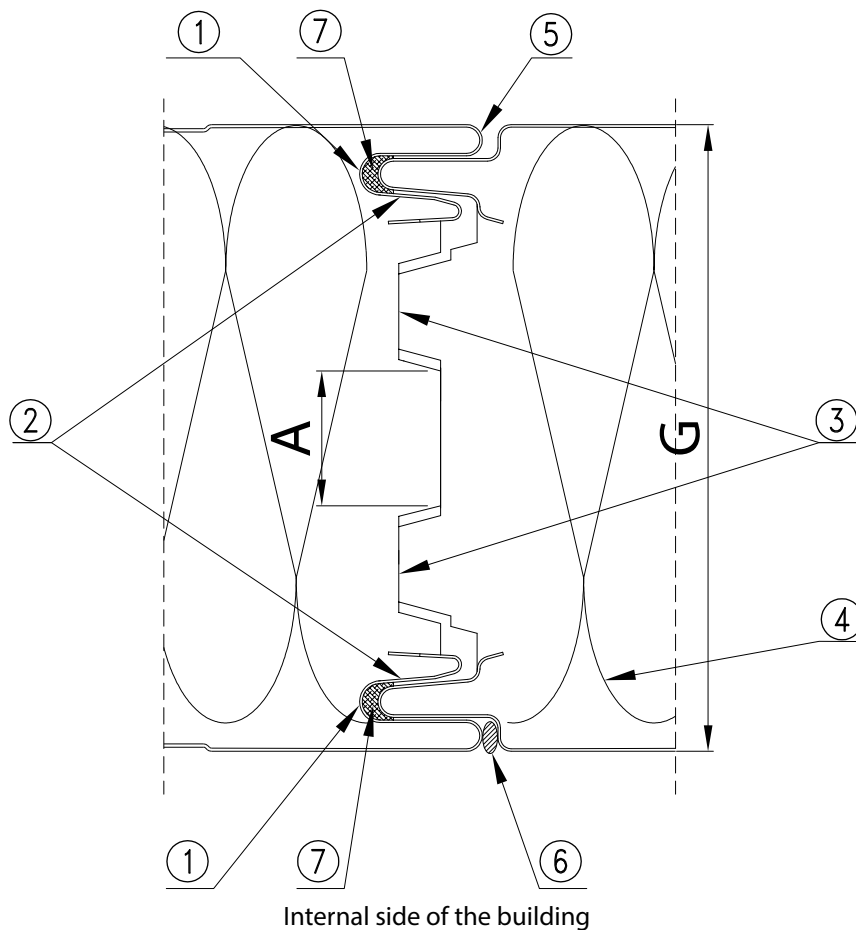
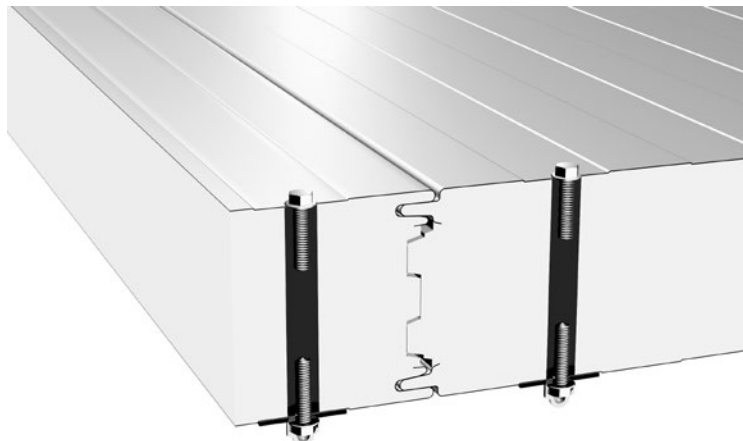


Fig. 2. Longitudinal PIR FROST sandwich panel joint

1. Double-sided unique shape of the panel joint in the form of a double lock.
 2. Conic inclination of the surface of the internal panel's joint facilitating assembly.
 3. A milled joint in the shape of a double tongue joint minimizing linear thermal bridge where $A = 26$ mm for $G = 120$ and $A = 61,7$ mm for $G = 160, 180, 200$ mm
 4. A core made of rigid polyurethane foam
 5. Appropriately formed shape of claddings ensuring high resistance of anticorrosive coatings
 6. A gap enabling application of permanently plastic sealing compound
 7. Sealing compound preventing steam and air infiltration
- *option on demand



9. FASTENING PIR FROST SANDWICH PANELS TO THE BEARING STRUCTURE

BALEX METAL provides designers and contractors with four different systems of fastening cold storage panels to the load-bearing structure. Two first systems of fastening minimize point thermal bridges and are designed mainly for cold stores and carrying freezers.

A designer should decide on selection of an appropriate fastening system taking into consideration appropriate law regulations.

The **Version I** of fastening PIR FROST sandwich panels with the use of insulating nuts with steel insert consists in fastening panels to the structure with the use of M 10 galvanized steel bars twisted from the side of the structure with a galvanized nut and from the side of the chamber with a special PVC nut with a steel insert placed inside it. A special PVC washer Ø60 mm in diameter enables transmitting heat and wind load to the steel claddings. Plastic PVC elements are provided in basic colours RAL 9002 and 9010.

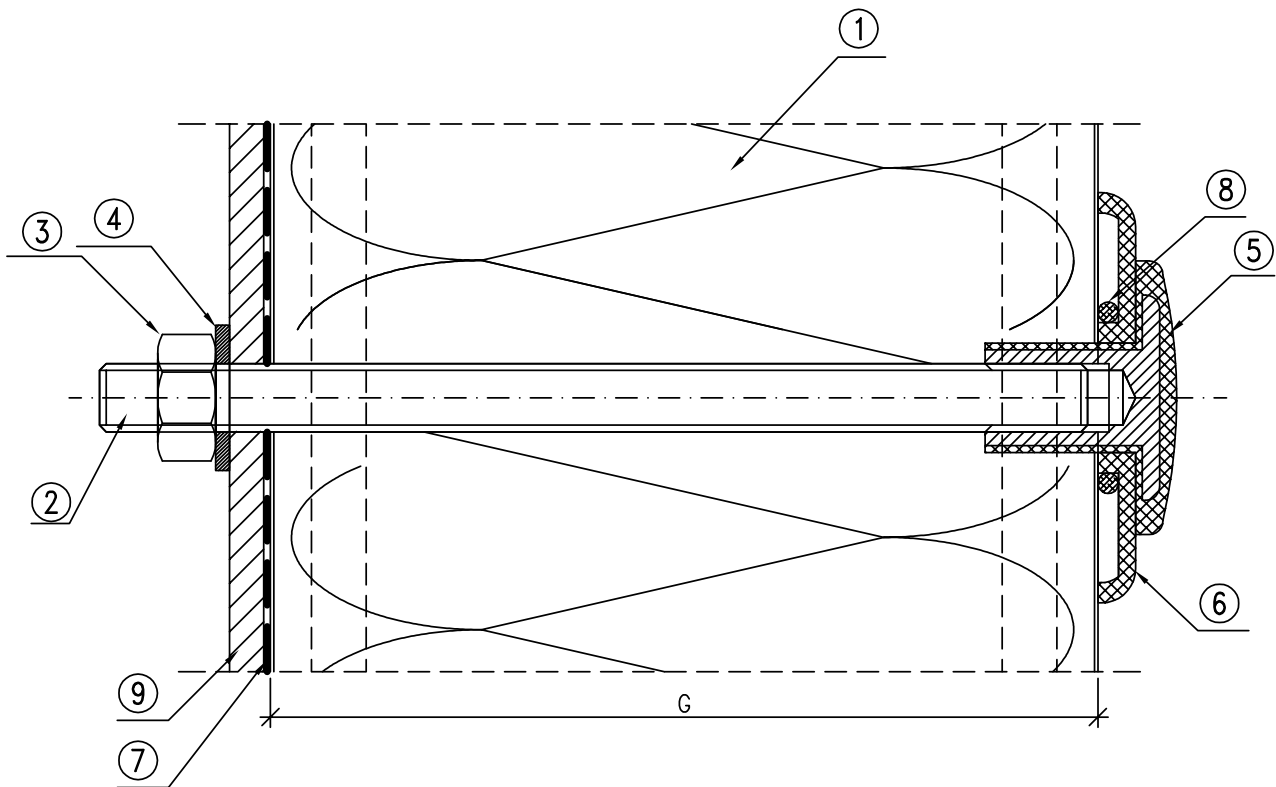


Fig. 3. The fastening system of PIR FROST sandwich panels with the use of insulating nuts with a steel insert.

1. PIR FROST sandwich panel
2. M 10 XL galvanized bar, where $L = G + 25$ mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Element of the building's structure

Version II of fastening PIR FROST sandwich panels consists in fastening panels to the load-bearing structure with the use of a polyamide sleeve screwed on both sides with the help of two M 10 screws. A special steel washer $\varnothing 70$ mm in diameter (galvanized and varnished in the colour of the panel) is responsible for transmitting heat and wind load to steel claddings.

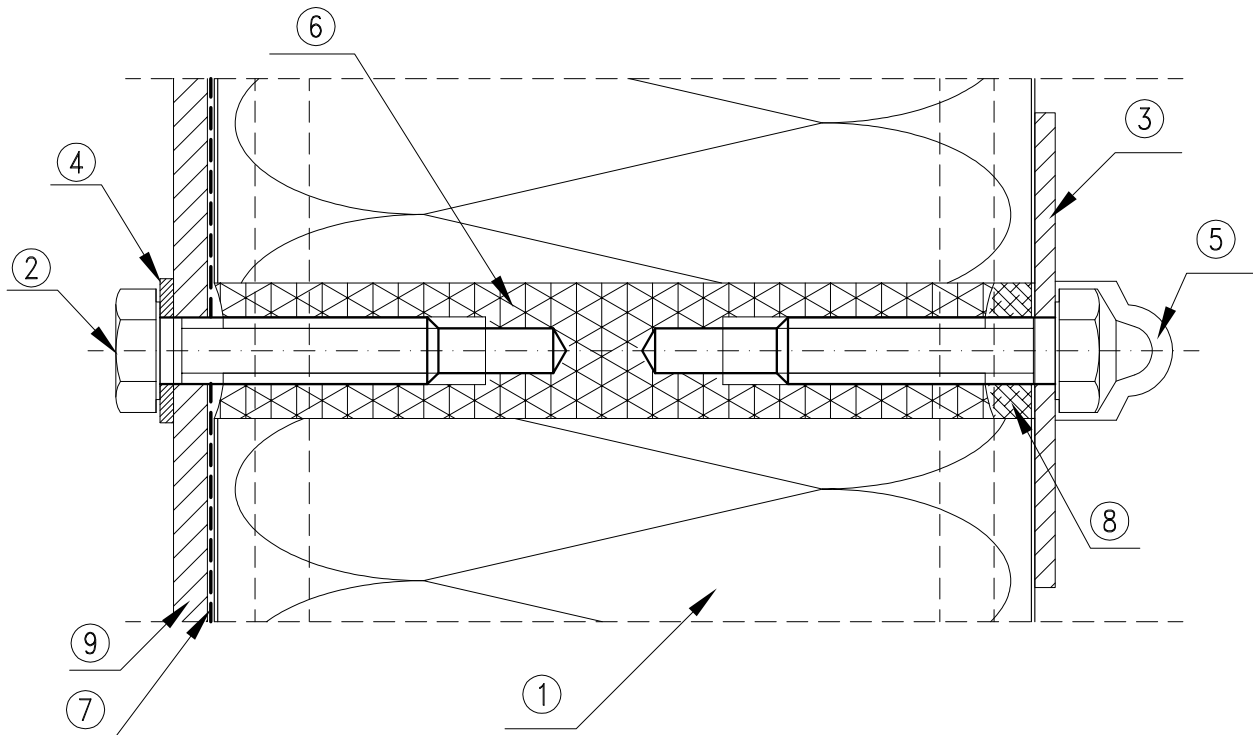


Fig. 4. The fastening system of PIR FROST sandwich panels with the use of insulating polyamide sleeves.

1. PIR FROST sandwich panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB 71 load carrying washer $\varnothing 70/\varnothing 10.5$ (white as standard)
4. $\varnothing 21/\varnothing 10.5$ galvanized washer
5. White protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Element of the building's structure

Version III of fastening consists in joining wall panels with the transom back member for buildings with temperatures $t \geq 0^{\circ}\text{C}$ with the help of self-drilling and self-tapping eyelet fasteners made of stainless steel characterized by 5 times lower heat conductivity than fasteners made of carbon steel.

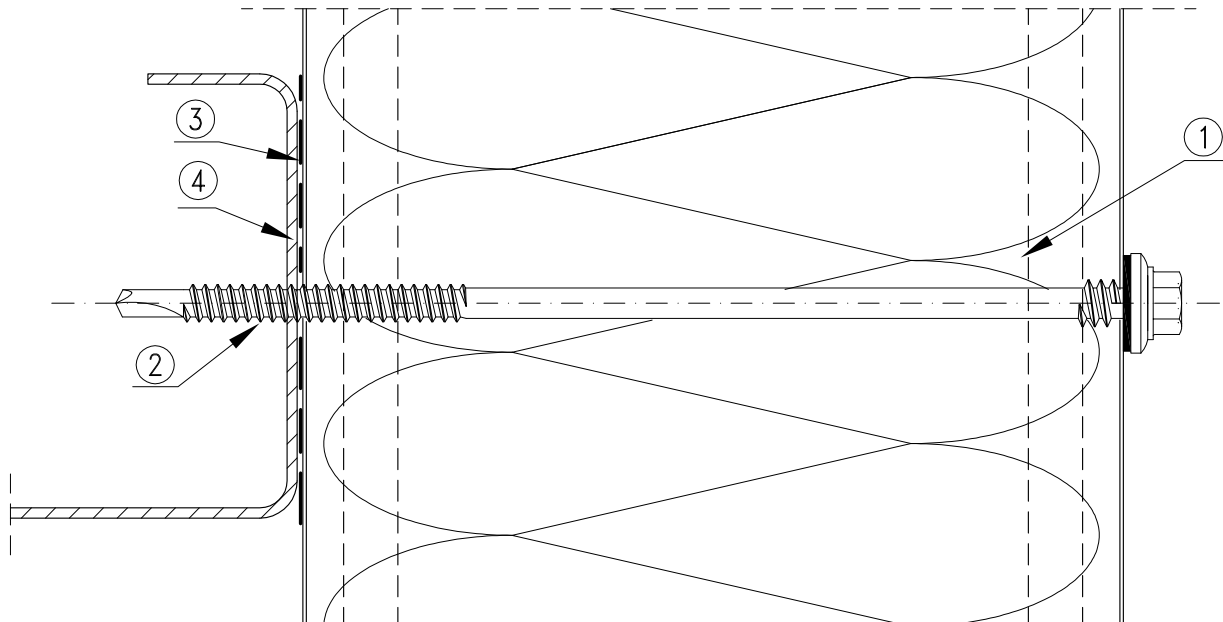


Fig. 6. The fastening system of PIR FROST sandwich panels with the use of self-drilling screws.

1. PIR FROST sandwich panel
2. Stainless steel fastener for fastening panels
3. Self-adhesive polyethylene tape (recommended)
4. Element of the building's structure

Fastening system should be decided by the designer, taking into account appropriate building regulations.

10. THERMAL INSULATION PROPERTIES

PIR FROST sandwich panels are distinguished by very good thermal performance parameters. Tests and calculations carried out in the Building Research Institute in the Department of Thermal Physics in Warsaw aimed at determining the heat conductivity coefficient of polyurethane foam forming the panel's insulating core and the partition's heat-transfer coefficient proved high quality as well as high repeatability of PIR FROST sandwich panels' parameters achieved due to the application of top class materials and continuous control of all production stages on one of the most modern assembly lines in Europe. The design thermal conductivity coefficient (used for designing purposes and corresponding to the conditions of material application) reaches the following values depending on the partition's temperature:

Table 2. Thermal conductivity coefficients

Average temperature of a partition t_{av} [°C]	Thermal conductivity coefficient λ_D [W/mK]
10	0,023
5	0,022
0	0,022
-5	0,021

The values of heat-transfer coefficients U_c of partitions made of PIR FROST sandwich panels taking linear thermal bridges occurring in the panels' contact area into consideration are available in Table 4. Due to the application of special insulating fasteners for fastening PIR FROST sandwich panels the zero value of the point heat-transfer coefficient was assumed in relation to these panels.

Table 3. Internal wall's heat-transfer coefficients

Panel type	Panel's thickness [mm]	Internal wall's heat-transfer coefficient U_c [W/m ² K]
PIR FROST sandwich panel	120	0,18
	160	0,14
	180	0,12
	200	0,11

Table 4. Heat flux density

Lp.	Temperature difference Δt	Panel type						
		PIR STANDARD 60(*)	PIR STANDARD 80(*)	PIR STANDARD 100(*)	PIR FROST 120	PIR FROST 160	PIR FROST 180	PIR FROST 200
		Heat-transfer coefficient						
		0,36	0,27	0,22	0,18	0,14	0,12	0,11
[°C]	[W / m ² K]							
1	10	3,60	2,70	2,20	1,80	1,40	1,20	1,10
2	15	5,40	4,05	3,30	2,70	2,10	1,80	1,65
3	20	7,20	5,40	4,40	3,60	2,80	2,40	2,20
4	25	9,00	6,75	5,50	4,50	3,50	3,00	2,75
5	30	10,80	8,10	6,60	5,40	4,20	3,60	3,30
6	35	12,60	9,45	7,70	6,30	4,90	4,20	3,85
7	40	14,40	10,80	8,80	7,20	5,60	4,80	4,40
8	45	16,20	12,15	9,90	8,10	6,30	5,40	4,95
9	50	18,00	13,50	11,00	9,00	7,00	6,00	5,50
10	55	19,80	14,85	12,10	9,90	7,70	6,60	6,05
11	60	21,60	16,20	13,20	10,80	8,40	7,20	6,60
12	65	23,40	17,55	14,30	11,70	9,10	7,80	7,15
13	70	25,20	18,90	15,40	12,60	9,80	8,40	7,70
14	75	27,00	20,25	16,50	13,50	10,50	9,00	8,25
15	80	28,80	21,60	17,60	14,40	11,20	9,60	8,80
16	85	30,60	22,95	18,70	15,30	11,90	10,20	9,35
17	90	32,40	24,30	19,80	16,20	12,60	10,80	9,90
18	95	34,20	25,65	20,90	17,10	13,30	11,40	10,45
19	100	36,00	27,00	22,00	18,00	14,00	12,00	11,00
With colour		is marked suggested range of appliance.						

(*) ATTENTION: PIR STANDARD panels are presented in the PIR STANDARD, PIR PLUS, PIR LIGHT wall & PIR STANDARD roof sandwich panels catalogue

The above table specifies the partition's thermal performance in W/m² depending on the panel's thickness and temperature difference Δt [K] between the temperature inside the chamber t_w and the analytical outdoor temperature $t_{z.obl}$ for the building's location area. The outdoor analytical temperature is calculated on the basis of the following formula:

$$t_D = 0,40 t_{av.m} + 0,60 t_{max}$$

where:

$t_{av.m}$ - is the average temperature of the hottest month of the year
 t_{max} - is the average maximum temperature of outdoor year in the building's location area.

To make things easier it can be assumed that outdoor temperature equals $t_D = +35^\circ\text{C}$.

A designer adjusts required partition's thermal performance whereas the recommended thermal performance should be lower than 10 W/m².

An example of adjusting panel's thickness:

Temperature inside the chamber -30°C

Outdoor temperature +35°C

$$\Delta t = 65^\circ\text{C}$$

We check in a column with Δt 65 for what panel's thickness the density of the heat flux does not exceed 10 W/m².

This condition is met by PIR FROST sandwich panels that are at least 160 mm thick and their heat flux value is 9,10 W/m².

11. STRENGTH

These tables have been compiled according to the methodology of PN-EN 14509:2013 Annex E, Design Procedures and apply to the maintenance of safety of a structure defined in the Technical Requirements referred to below.

1. Given the aforementioned guidelines, the following assumptions have been input to compile the load capacity and rigidity tables for the BALEX METAL composite panels:

- a) Ultimate limit state (ULS): which is deemed exceeded when the actual load exceeds the permissible failure load.
- b) Serviceability limit state (SLS): in the case of the composite panels, this is their rigidity, which is deemed exceeded if the deflection of the wall and roof-installed panels exceeds 1/200 of the span width under a transient load or 1/100 of the span width under a long-term load.

2. The scope of application of the PIR FROST sandwich panels shall meet the appended tables in terms of load capacity and rigidity. The permissible load values in the table include the following:

- a) the effects of the thermal loads caused by the temperature difference between the outer and inner cladding (the assumed temperatures meet PN-EN 14509: $t_{in} = +25^{\circ}\text{C}$ in summer and $t_{in} = +20^{\circ}\text{C}$ in winter, complete with the standard temperatures at the outer cladding). The following temperature differences are assumed for thermal loads:

$\Delta t = 35^{\circ}\text{C}$, Group I

$\Delta t = 45^{\circ}\text{C}$, Group II

$\Delta t = 60^{\circ}\text{C}$, Group III

- b) the least favourable combination of loads

3. The maximum ULS and SLS loads shall be compared to characteristic loads.

4. The maximum loads listed in the tables have been determined for the following panel colour groups: Group I – very light colours; Group II – light colours; and Group III – dark colours.

5. It is recommended to install the panels at ambient temperatures equal to or higher than $+10^{\circ}\text{C}$. Installing panels with dark colour cladding at low temperatures will increase the effects of thermal loads in summer. Balex recommends installing dark colour panels in single-span systems. Consult the Balex Design Office for the scope and requirements of application of dark colour panels.

6. Interpolation is permitted to determine the permissible loads for all spans not listed in the tables.

7. The tables specify the support width values for pressure; the wording “support” denotes the support width in millimetres (mm). The minimum width of edge support is 40 mm, for inner support is 60 mm.

Table 5. 1-span system: maximum characteristic loads of PIR FROST sandwich panels in 0.50/0.50 mm thick cladding with microprofiling/lining; outer support width [mm] is specified under the load values
Direction of force: TOWARDS SUPPORT – PRESSURE

Core thickness		PIR FROST sandwich panel																																
		Maximum characteristic load [kN/m ²] at given span [m]																																
Colour group		2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	8,00	8,25	8,50	8,75	9,00	9,25	9,50		
120	I	4,33	3,85	3,46	3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,23	1,14	1,06	0,99	0,93	0,87								
	support	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	68	65	63	60	60								
	II	4,33	3,85	3,46	3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,23	1,14	1,06	0,99	0,93	0,87								
	support	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	68	65	63	60	60								
	III	4,33	3,85	3,46	3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,23	1,14	1,06	0,99	0,93	0,87								
	support	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	68	65	63	60	60								
160	I	4,33	3,85	3,46	3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,09	1,02								
	support	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	69	66								
	II	4,33	3,85	3,46	3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,09	1,02								
	support	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	69	66							
	III	4,33	3,85	3,46	3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,09	1,02								
	support	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	69	66							
180	I				3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,11	1,07	1,00	0,95	0,89	0,84				
	support				70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	67	66	63	62				
	II				3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,11	1,07	1,00	0,95	0,89	0,84				
	support				70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	67	66	63	62				
	III				3,15	2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,11	1,07	1,00	0,95	0,89	0,84				
	support				70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	67	66	63	62				
200	I					2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,11	1,08	1,03	0,97	0,92	0,87	0,82	0,78		
	support					70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	69	67	66	64	62	60		
	II					2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,11	1,08	1,03	0,97	0,92	0,87	0,82	0,78		
	support					70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	69	67	66	64	62	60		
	III					2,88	2,66	2,47	2,31	2,16	2,03	1,92	1,82	1,73	1,65	1,57	1,50	1,44	1,38	1,33	1,28	1,23	1,19	1,15	1,11	1,08	1,03	0,97	0,92	0,87	0,82	0,78		
	support					70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	69	67	66	64	62	60		

**Table 6. 2-span system: maximum characteristic loads of PIR FROST sandwich panels in 0.50/0.50 mm thick cladding with microprofiling/lining; inner support width [mm] is specified under the load values; 40 mm outer support
Direction of force: TOWARDS SUPPORT – PRESSURE**

Core thickness		Colour group		PIR FROST sandwich panel																															
				Maximum characteristic load [kN/m ²] at given span [m]																															
		2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	8,00	8,25	8,50	8,75	9,00	9,25	9,50			
120	I support	2,16	1,92	1,73	1,57	1,44	1,27	0,88	0,63	0,45	0,33	0,24	0,17	0,12	0,09	0,06	0,04	0,02	0,02	0,02	0,02														
		70	70	70	70	70	67	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60			
		2,16	1,92	1,73	1,57	1,44	1,27	0,88	0,63	0,45	0,33	0,24	0,17	0,12	0,09	0,06	0,04	0,02	0,02	0,02	0,02														
	II support	2,16	1,92	1,73	1,57	1,44	1,27	0,88	0,63	0,45	0,33	0,24	0,17	0,12	0,09	0,06	0,04	0,02	0,02	0,02	0,02														
		70	70	70	70	70	67	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60			
		2,16	1,92	1,73	1,57	1,44	1,27	0,88	0,63	0,45	0,33	0,24	0,17	0,12	0,09	0,06	0,04	0,02	0,02	0,02	0,02														
160	I support	2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,81	0,62	0,49	0,38	0,30	0,24	0,19	0,15	0,11	0,09	0,07	0,05	0,04	0,03	0,02									
		70	70	70	70	70	70	70	70	70	70	70	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60			
		2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,81	0,62	0,49	0,38	0,30	0,24	0,19	0,15	0,11	0,09	0,07	0,05	0,04	0,03	0,02									
	II support	2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,81	0,62	0,49	0,38	0,30	0,24	0,19	0,15	0,11	0,09	0,07	0,05	0,04	0,03	0,02									
		70	70	70	70	70	70	70	70	70	70	70	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60		
		2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,81	0,62	0,49	0,38	0,30	0,24	0,19	0,15	0,11	0,09	0,07	0,05	0,04	0,03	0,02									
180	I support	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,83	0,65	0,51	0,40	0,32	0,26	0,21	0,16	0,13	0,10	0,08	0,06	0,05	0,04	0,03	0,02	0,02									
		70	70	70	70	70	70	70	70	70	64	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60		
		1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,83	0,65	0,51	0,40	0,32	0,26	0,21	0,16	0,13	0,10	0,08	0,06	0,05	0,04	0,03	0,02	0,02									
	II support	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,83	0,65	0,51	0,40	0,32	0,26	0,21	0,16	0,13	0,10	0,08	0,06	0,05	0,04	0,03	0,02	0,02									
		70	70	70	70	70	70	70	70	70	64	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
		1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,83	0,65	0,51	0,40	0,32	0,26	0,21	0,16	0,13	0,10	0,08	0,06	0,05	0,04	0,03	0,02	0,02									
200	I support	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,83	0,66	0,53	0,42	0,34	0,27	0,22	0,18	0,14	0,12	0,09	0,07	0,06	0,05	0,04	0,03	0,02	0,02								
		70	70	70	70	70	70	70	70	70	70	68	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
		1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,83	0,66	0,53	0,42	0,34	0,27	0,22	0,18	0,14	0,12	0,09	0,07	0,06	0,05	0,04	0,03	0,02	0,02								
	II support	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,83	0,66	0,53	0,42	0,34	0,27	0,22	0,18	0,14	0,12	0,09	0,07	0,06	0,05	0,04	0,03	0,02	0,02								
		70	70	70	70	70	70	70	70	70	70	68	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
		1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,83	0,66	0,53	0,42	0,34	0,27	0,22	0,18	0,14	0,12	0,09	0,07	0,06	0,05	0,04	0,03	0,02	0,02								

Table 7. 3-span system: maximum characteristic loads of PIR FROST sandwich panels in 0.50/0.50 mm thick cladding with microprofiling/lining; inner support width [mm] is specified under the load values; 40 mm outer support
Direction of force: TOWARDS SUPPORT - PRESSURE

Core thickness	Colour group	PIR FROST sandwich panel																																		
		Maximum characteristic load [kN/m ²] at given span [m]																																		
		2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	8,00	8,25	8,50	8,75	9,00	9,25	9,50				
120	I support	2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,01	0,84	0,71	0,60	0,52	0,45	0,40	0,35	0,32	0,28	0,26	0,23	0,21	0,20	0,18	0,17	0,16	0,14										
		70	70	70	70	70	70	70	62	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60										
		2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,01	0,84	0,71	0,60	0,52	0,45	0,40	0,35	0,32	0,28	0,26	0,23	0,21	0,20	0,18	0,17	0,16	0,14										
	II support	2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,01	0,84	0,71	0,60	0,52	0,45	0,40	0,35	0,32	0,28	0,26	0,23	0,21	0,20	0,18	0,17	0,16	0,14										
		70	70	70	70	70	70	70	62	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60									
		2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,01	0,84	0,71	0,60	0,52	0,45	0,40	0,35	0,32	0,28	0,26	0,23	0,21	0,20	0,18	0,17	0,16	0,14										
160	I support	2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,89	0,76	0,66	0,58	0,51	0,46	0,41	0,37	0,33	0,30	0,28	0,25	0,23	0,22										
		70	70	70	70	70	70	70	70	70	70	70	69	62	60	60	60	60	60	60	60	60	60	60	60	60	60									
		2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,89	0,76	0,66	0,58	0,51	0,46	0,41	0,37	0,33	0,30	0,28	0,25	0,23	0,22										
	II support	2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,89	0,76	0,66	0,58	0,51	0,46	0,41	0,37	0,33	0,30	0,28	0,25	0,23	0,22										
		70	70	70	70	70	70	70	70	70	70	70	69	62	60	60	60	60	60	60	60	60	60	60	60	60	60	60								
		2,16	1,92	1,73	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,89	0,76	0,66	0,58	0,51	0,46	0,41	0,37	0,33	0,30	0,28	0,25	0,23	0,22										
180	I support	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,79	0,69	0,61	0,54	0,48	0,43	0,39	0,35	0,32	0,29	0,27	0,25	0,23	0,21	0,20	0,19									
		70	70	70	70	70	70	70	70	70	70	70	67	62	60	60	60	60	60	60	60	60	60	60	60	60	60	60								
		1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,79	0,69	0,61	0,54	0,48	0,43	0,39	0,35	0,32	0,29	0,27	0,25	0,23	0,21	0,20	0,19									
	II support	1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,79	0,69	0,61	0,54	0,48	0,43	0,39	0,35	0,32	0,29	0,27	0,25	0,23	0,21	0,20	0,19									
		70	70	70	70	70	70	70	70	70	70	70	67	62	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60							
		1,57	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,79	0,69	0,61	0,54	0,48	0,43	0,39	0,35	0,32	0,29	0,27	0,25	0,23	0,21	0,20	0,19									
200	I support	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,82	0,78	0,70	0,62	0,55	0,50	0,45	0,41	0,37	0,34	0,31	0,29	0,27	0,25	0,23	0,21	0,20	0,19								
		70	70	70	70	70	70	70	70	70	70	70	66	61	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60							
		1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,82	0,78	0,70	0,62	0,55	0,50	0,45	0,41	0,37	0,34	0,31	0,29	0,27	0,25	0,23	0,21	0,20	0,19								
	II support	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,82	0,78	0,70	0,62	0,55	0,50	0,45	0,41	0,37	0,34	0,31	0,29	0,27	0,25	0,23	0,21	0,20	0,19								
		70	70	70	70	70	70	70	70	70	70	70	66	61	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60						
		1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,82	0,78	0,70	0,62	0,55	0,50	0,45	0,41	0,37	0,34	0,31	0,29	0,27	0,25	0,23	0,21	0,20	0,19								
III support	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,82	0,78	0,70	0,62	0,55	0,50	0,45	0,41	0,37	0,34	0,31	0,29	0,27	0,25	0,23	0,21	0,20	0,19									
	70	70	70	70	70	70	70	70	70	70	70	66	61	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60							
	1,44	1,33	1,23	1,15	1,08	1,01	0,96	0,91	0,86	0,82	0,78	0,70	0,62	0,55	0,50	0,45	0,41	0,37	0,34	0,31	0,29	0,27	0,25	0,23	0,21	0,20	0,19									

Table 8. 1-span system: maximum characteristic loads of PIR FROST sandwich panels in 0.50/0.50 mm thick cladding with microprofiling/lining
Direction of force: FROM SUPPORT – SUCTION

Core thickness		Colour group		PIR FROST sandwich panel																														
				Maximum characteristic load [kN/m ²] at given span [m]																														
		1,50	1,75	2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	8,00	8,25	8,50	8,75	9,00	9,25	9,50
120	I	-9,68	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45								
	II	-9,68	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45								
	III	-9,68	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45								
160	I			-7,27	-6,47	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53						
	II			-7,27	-6,47	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53						
	III			-7,27	-6,47	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53						
180	I					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53				
	II					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53				
	III					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53				
200	I							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47
	II							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47
	III							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47

Table 9. 2-span system: maximum characteristic loads of PIR FROST sandwich panels in 0.50/0.50 mm thick cladding with microprofiling/lining
Direction of force: FROM SUPPORT – SUCTION

Core thickness		PIR FROST sandwich panel																																
		Maximum characteristic load [kN/m ²] at given span [m]																																
Colour group		1,50	1,75	2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	8,00	8,25	8,50	8,75	9,00	9,25	9,50
120	I	-9,67	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45								
	II	-9,67	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45								
	III	-9,67	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45								
160	I			-7,27	-6,46	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53						
	II			-7,27	-6,46	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53						
	III			-7,27	-6,46	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53						
180	I					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53				
	II					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53				
	III					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,58	-0,53	-0,49				
200	I							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47
	II							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47
	III							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47

Table 10. 3-span system: maximum characteristic loads of PIR FROST sandwich panels in 0.50/0.50 mm thick cladding with microprofiling/lining
Direction of force: FROM SUPPORT – SUCTION

		PIR FROST sandwich panel																																		
Core thickness	Colour group	Maximum characteristic load [kN/m ²] at given span [m]																																		
		1,50	1,75	2,00	2,25	2,50	2,75	3,00	3,25	3,50	3,75	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	8,00	8,25	8,50	8,75	9,00	9,25	9,50		
120	I	-9,67	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45										
	II	-9,67	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45										
	III	-9,67	-8,25	-6,32	-4,99	-4,04	-3,34	-2,81	-2,39	-2,06	-1,79	-1,58	-1,40	-1,24	-1,12	-1,01	-0,91	-0,83	-0,76	-0,70	-0,65	-0,60	-0,55	-0,52	-0,48	-0,45										
160	I			-7,27	-6,46	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53								
	II			-7,27	-6,46	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53								
	III			-7,27	-6,46	-5,40	-4,47	-3,75	-3,20	-2,75	-2,40	-2,11	-1,87	-1,66	-1,49	-1,35	-1,22	-1,11	-1,02	-0,93	-0,86	-0,80	-0,74	-0,69	-0,64	-0,60	-0,56	-0,53								
180	I					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53						
	II					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53						
	III					-6,08	-5,03	-4,22	-3,60	-3,10	-2,70	-2,37	-2,10	-1,87	-1,68	-1,52	-1,38	-1,25	-1,15	-1,05	-0,97	-0,90	-0,83	-0,77	-0,72	-0,67	-0,63	-0,59	-0,56	-0,53						
200	I							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47		
	II							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47		
	III							-4,70	-4,00	-3,45	-3,00	-2,64	-2,34	-2,08	-1,87	-1,69	-1,53	-1,39	-1,27	-1,17	-1,08	-1,00	-0,92	-0,86	-0,80	-0,75	-0,70	-0,66	-0,62	-0,58	-0,55	-0,52	-0,49	-0,47		

Table 11. Permissible span of PIR FROST sandwich panels under tropical coat

panels arrangement	single-span				double-span			
core thickness [mm]	120	160	180	200	120	160	180	200
temperature inside the room [°C]	maximum span [m]							
+ 5	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
0	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
- 5	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
- 10	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
- 15	6,00	6,00	6,60	7,00	5,70	6,00	6,60	7,00
- 20	-	6,00	6,60	7,00	-	5,30	5,60	5,90
- 25	-	6,00	6,60	7,00	-	4,50	4,80	5,00
- 30	-	6,00	6,60	7,00	-	4,00	4,20	4,50
- 40	-	-	6,60	7,00	-	-	3,50	3,70
- 50	-	-	-	7,00	-	-	-	3,30

Important: When analysing the pull-off-load, take into account the permissible load on a single fastener.

12. FIRE SAFETY

PIR FROST sandwich panels are the building elements of a certain fire resistance class and so they should meet the requirements of fire resistance and fire dispersion specified in the local law.

The B-s1,d0 classification enables application of PIR FROST sandwich panels both for ceilings and screening walls according to technical requirements that should be met by buildings and their location as well as for non-flammable, not dripping and not dropping off when exposed to fire products and not spreading fire construction elements.

Classification of fire resistance of non-carrying walls made of PIR FROST sandwich panels prepared on the basis of tests led in accordance with EN 13501-2 norm is presented in table 12.

Table 12. Fire resistance classification of walls built of PIR FROST sandwich panels.

PIR FROST sandwich panel					
Core thickness [mm]	Fire resistance	Distance between supports [mm]	Arrangement	Reaction to fire	External fire performance
120	up to EI 30	3000	vertical	B-s1,d0*	Not Spreading Fire
120	up to EI 15	7500	horizontal/vertical		
160	up to EI 30	7500	horizontal/vertical		
180	up to EI 30	7500	horizontal/vertical		
200	up to EI 45	7500	horizontal/vertical		
200	up to EI 60	4000	horizontal		
200	up to EI 45	3000	as a ceiling		

**Panel with EPDM gasket: B-s2,d0*

13. SOUND INSULATION PROPERTIES

PIR FROST sandwich panels are characterized by the following sound parameters regardless of the thickness of steel claddings and the thickness of the polyurethane core.

Table 13. Noise reduction performance

Weighted index of the R_w specific sound insulation	Weighted assessment index of the specific sound insulation determined in relation to noise in R_{A1} 'flat' spectrum.	Weighted assessment index of the specific sound insulation determined in relation to noise in R_{A2} low-frequency spectrum.
[dB]	[dB]	[dB]
25	23	21

PIR FROST sandwich panels with a polyurethane core can be applied in industrial and commercial facilities and facilities similar to cold stores in case determined individual sound requirements do not exceed appropriate sound parameters of panels specified above.

14. CORROSION RESISTANCE

Corrosion categories and examples of typical environments acc. to PN-EN ISO 12944-2.

C1 corrosion category

- interiors – heated buildings with clean ambience, e.g. offices, shops, schools, hotels

C2 corrosion category

- exteriors – ambiances of little contamination; mainly rural areas
- interiors – unheated buildings with possible condensation, e.g. warehouses, sports halls

C3 corrosion category

- exteriors – urban and industrial ambiances; average contamination with sulphur oxide (IV); water bank and shore areas of little salinity
- interiors – production interiors of high humidity and certain air pollution, e.g. food production facilities, laundries, breweries, milk production units

C4 corrosion category

- exteriors – industrial areas and water shore areas of moderate salinity
- interiors – chemical plants, swimming pools, ship repair yards for ships and boats.

C5 corrosion category

- exteriors – industrial areas of high humidity and aggressive ambience
- interiors – building structures or areas with virtually constant condensation and high contamination levels

Table 14. Coatings corrosion resistance categories

Coating	SP15	SP25	SP35 Mat	Cesar 55	PVC(F) FoodSafe	INOX
Metallic coating	min Z225 or equal (alloy coating)					
Corrosion resistance category (external) RC	-	RC3	RC4	RC5*	-	RC5* **
Corrosion resistance category (internal) AC	CPI2	AC3	up to AC4*	up to AC5*	up to CPI5*	up to AC5*

(*) Confirmation of the corrosion resistance class RC/AC by the steel supplier after analyzing the environmental questionnaire only (via the Quality Department)

(**) Transport, assembly, cleaning, maintenance in accordance with Balex Metal recommendations

15. MATERIAL AND CLADDING COATINGS

15.1. Material

STAINLESS STEEL (1.4301)

- high-quality specialist steel with increased corrosion resistance
- metal sheet thickness: 0.50 mm
- material for food processing industry, warehousing and transport of food, cold stores, mushroom-growing cellars, agricultural facilities

15.2. Coatings

PREMIUM offer:

CESAR 55 SEMI-MAT®

- polyurethane coating with polyamid of overall thickness 55 µm
- resistance for corrosion – RC5
- resistance to intensive UV radiation – RUV4
- solution for standard, demanding and aggressive environments
- high scratch resistance
- the colour looks good and is stable for the full cycle of use
- for scratches on roof coverings, wall claddings, standard as well as aggressive and demanding environments: cold, damp, high UV radiation, industrial and contaminated environments
- colours are presented on the company's website

Standard offer:

SP POLYESTER GLOSS

- for outdoor applications - coating thickness 25 µm: resistant to changing temperature and weather conditions, good corrosion resistance
- for indoor applications coating thickness 15 µm: indoor layers of walls and roofs
- colors are presented on the company's website

SP POLYESTER MAT

- coating thickness 35 µm,
- for outdoor applications: resistant to changing temperature and weather conditions, good corrosion resistance,
- perfectly suitable for roofs of commercial and industrial facilities
- colors are presented on the company's website

PCV(F) „foodsafef”

- coating thickness 120 µm
- white foil
- special coating with increased hardness
- it can be applied in food processing facilities and cold stores, easily washable and resistant to the majority of cleaning agents.

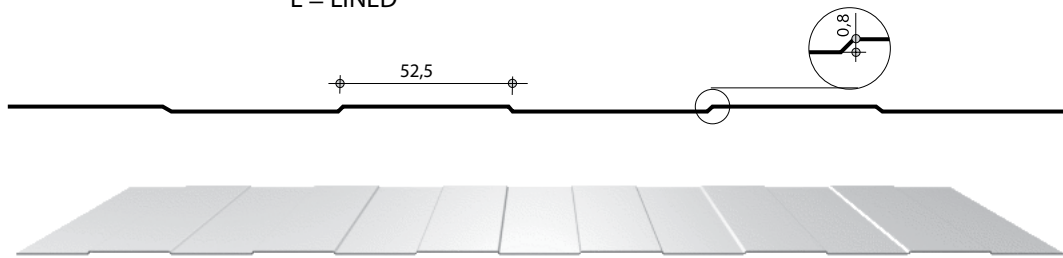
16. PROFILE TYPE COMBINATIONS

Tabela 15. Profile type combinations

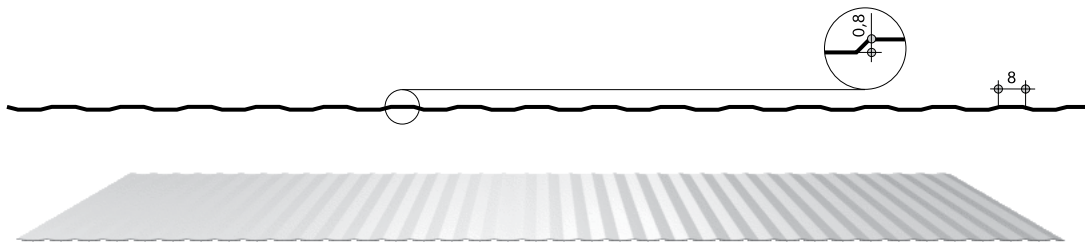
Panel type	External cladding					Internal cladding	
	L	M	G	1L	2L	L	G
PIR FROST Cold Storage	●	●	●*	●	●	●	●*

* profiling available only for minimum 0.50 mm thickness

L = LINED



M = MICROPROFILED



G = FLAT*

** profiling available only for minimum 0.50 mm thickness*



1L = CLEARLINE*



2L = Double CLEARLINE*



** 0.5 mm thickness for G/1L/2L profiling of outside cladding is available after signing the statement, which contains the acceptance of possibility of appearing visible deflection (within standard tolerance up to 0,6 mm/200 mm acc. to EN 14509). Stainless steel cladding not available.*

17. GENERAL GUIDELINES ON ASSEMBLY

Before starting assembly it is recommended that one should verify the load-bearing structure in terms of precision of performance and its accordance with the design. Special attention should be paid to the quality of anti-corrosion and varnish coating of the load-bearing structure and additional elements like transoms and purlins as well as the quality of joints.

PIR FROST sandwich panels are secured against dirt and damage with a protective film applied to claddings in the production process.

It is recommended to remove the protective film from claddings which are to form the internal side in a building before fastening them to the structure. In the case of external claddings the protective film should be removed within 2 months from the date of panels' production. It will prevent both the foil from binding permanently with protective varnish of claddings and varnish from getting dirty while removing the foil.

In the case of PIR FROST sandwich panels which are symmetrical in shape, in order to avoid mistakes in identifying the external and internal side in the production process, a special label is placed under foil. The label indicates the external side of a panel along with the recommended date of removing the protective foil.

For PIR FROST sandwich panels with both claddings in the same colour, it is possible to fix panels depending on the assembler's preference.

In order to prevent varnish coating from being damaged it is recommended to cut panels and flashings on stands covered with soft material e.g. felt.

Panels should be cut with the use of a cutting saw with small tooth blades and flashings with the use of hand scissors.

It is forbidden to use angle grinders and other tools heating up claddings in the process of cutting – it can lead to damaging anti-corrosion coating.

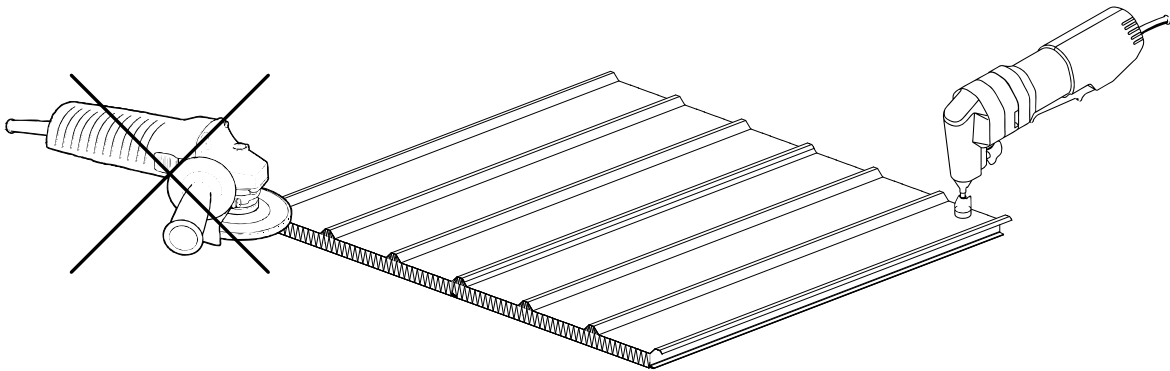


Fig. 7. Tools for cutting sandwich panels

It is recommended to fix sandwich panels with the use of fastening systems described in this catalogue and the types of fastening elements and their indexes, depending on the thickness of panels are specified in the catalogue of accessories.

For screwing in self-drilling and self-tapping fasteners (application of stainless steel fasteners is recommended) the application of electrical tools is recommended. Screwdrivers should be equipped with an appropriate head for driving long fasteners and a depth limiter fig.7 That guarantees appropriate assembly i.e. maintaining perpendicular location of a particular fastener in relation to a panel, minimised risk of damaging panels' surface and tightness of the fastening.

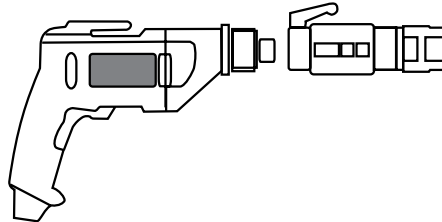


Fig. 8. Screwdriver with a driving head for long bolts.

Optimal parameters of electrical tools for assembling sandwich panels are provided by the information below:

power	600 - 750	W
rotation	1500 - 200	rpm
torque	600 - 700	Ncm

After finishing each work cycle you should carefully remove all steel waste and filings that can cause discolouration of the surface of a cladding. The whole enclosure should be sealed with the use of polyurethane foam and appropriate permanently plastic sealers (see figures of construction details). All damages to varnish on cladding sheets caused during assembly should be secured with touch up varnish.

18. INSTRUCTIONS ON MAKING HOLES IN PIR SANDWICH PANELS

While planing the cuts of sandwich panels on facades and the roof, proper arrangement of window and door openings should be taken into account, as making openings obviously makes the load bearing capacity of the product weaker. Despite an opening, the sandwich panel must still bear the loads affecting it. If this is impossible, e.g. due to the size of the opening, it is recommended that an additional sub-structure is made to re-distribute the loads to load bearing profiles. In such cases, the final decision should be made by a duly licensed designer.

Small openings in sandwich panels (e.g. for cable passages) may be made without any reservations. It is permissible to make openings in wall and roof panels for passages of round and rectangular pipes and cables, of maximum diameter $d = 300$ mm; however, at least 200 mm of space must be maintained between the panel edge and passage opening. The opening should be sealed with flexible pipe sealing compound.

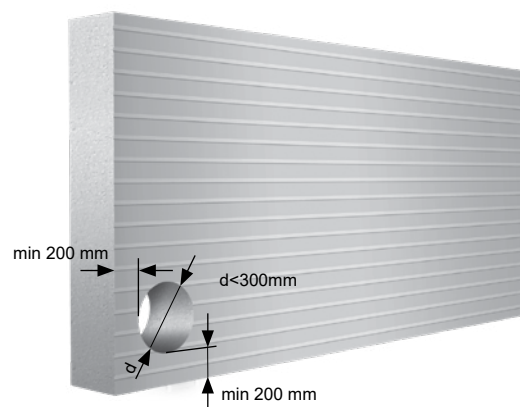


Fig. 9. Guidelines on making small openings in PIR sandwich panels

It is also permissible to make openings for PCV and aluminium windows in single panels, of maximum window dimensions: 700 mm width. x 800 mm height, mounted to the wall panel. Framing of the opening should be made of C-bars of (A-10)x30x3mm (where A – size of the cut opening) and mounted between the claddings. The wall space of 200 mm width between the panel edge and the opening should be maintained. The designer is responsible for arranging the location of the opening in relation to the supports (transoms) and selecting their span in such a way that the deflection of panels does not exceed $L/100$ value.

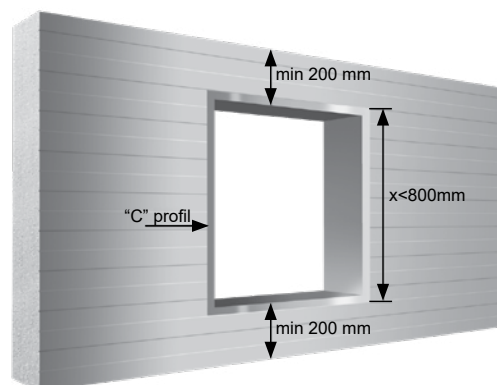


Fig. 10. Guidelines on making openings in PIR sandwich panels

Proceed with great care while making the opening. In order to avoid damaging the colour of the claddings, the panels should be cut on stands covered with soft material (felt, polyester). You may use a special opening maker mounted to the drill to make cuts. Using angle grinders or any other tools generating high cutting temperature is forbidden.

19. GUIDELINES

Recommended means of transport and its technical conditions:

Lorries with an open load-carrying body or an open trailer enabling loading long panels (up to 13.60 running metres) from both sides of a car constitute the basic means of transport for sandwich panels.

The following technical conditions are recommended for vehicles for transporting sandwich panels:

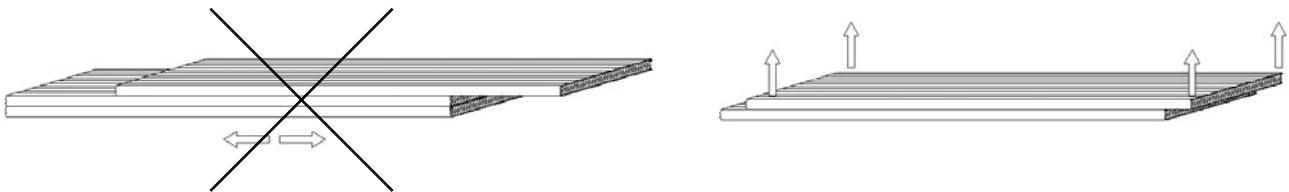
- load-carrying body with canvas cover ("CURTAIN" type)
- load-carrying body longer than transported panels (a package of panels should be placed on the platform in its entire length)
- transport belts holding the load should be placed on a package of panels on each support (belt tension can deform panels)

Unloading, transport:

Check if the package is complete and specify any possible inconsistencies immediately upon delivery.

For packages up to 6m it is permissible to use forklift trucks of adjustable fork width, min. fork span 2 m at min. width 150 mm. While unloading the products with forklift trucks, pay particular attention to fork length and thickness, so as not to damage the second row of products in the vehicle and the upper cladding of lower packages.

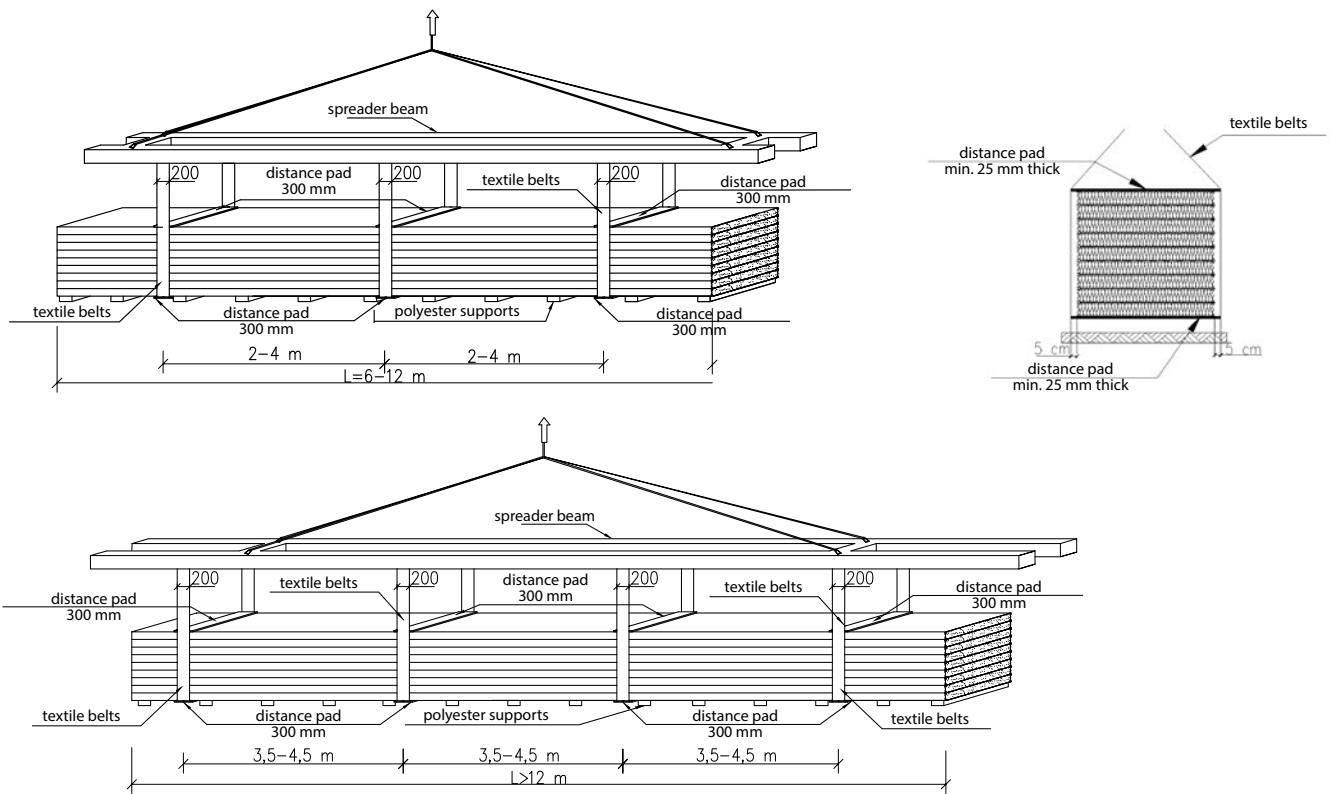
Manual unloading is permissible for products of up to 6 m length, when taken down one by one, and with special caution. **Dragging the products on the floor and on one another is forbidden.**



Packages of products longer than 6m must be lifted on transport belts by means of a spreader beam. Recommended belt span for packages from 6 m to 12 m is 2-4 m at their min. width 200 mm. For packages of over 12 m length, transport belt span is 3,5-4,5 m, at their min. width 200 mm. It is recommended that the belts are placed on distance pads of min. 300 mm width and min. 25 mm thickness, on the upper and lower package panel.

Using suspensions from steel lines or chains is forbidden. It is inadmissible to lift the packages on clamping or crossing belts, or using any other methods that might damage the product.

Unloading sandwich panels with a spreader beam:



Panel storage:

Packages should be stored on flat ground with a slight inclination, to make sure all the pads lie on the surface precisely and rainwater is drained from the areas in between the packages. **It is allowed to store two packages placed one on another at the most.**

Storing in closed, airy spaces is recommended, at normal temperatures, away from acids, lye, and other corrosive substances. When stored in the open air, the packages must be secured against rain and dirt by means of tarpaulins that give access to air flow. Remove the protective film from the product **no later than after 2 months of the date of production.**

Small repairs and maintenance:

All damage to coating caused during transport or assembly should be covered with touch up paint. Maintenance of sandwich panels consists in performing regular inspections and securing potential damages. During inspection close attention should be paid to uncovered edges and joints.

20. CERTIFICATION DOCUMENTS

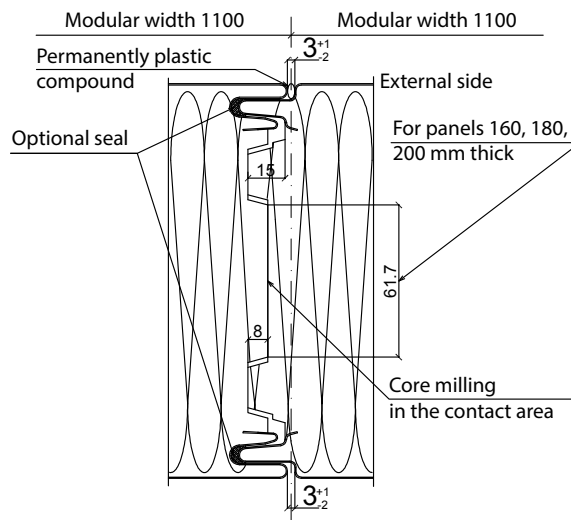
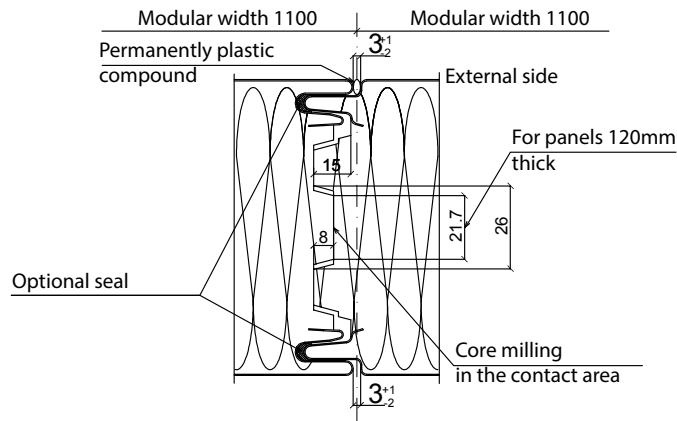
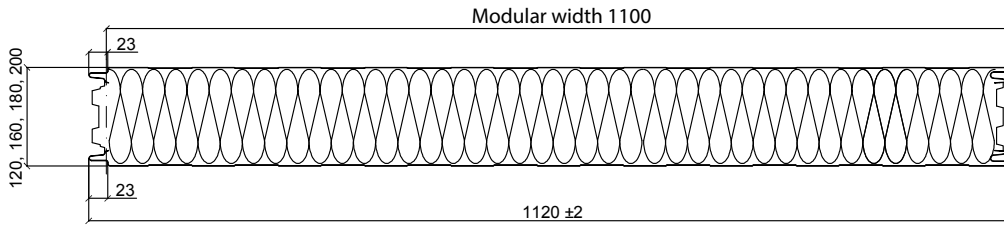
The current certification documents are available at www.balex.eu

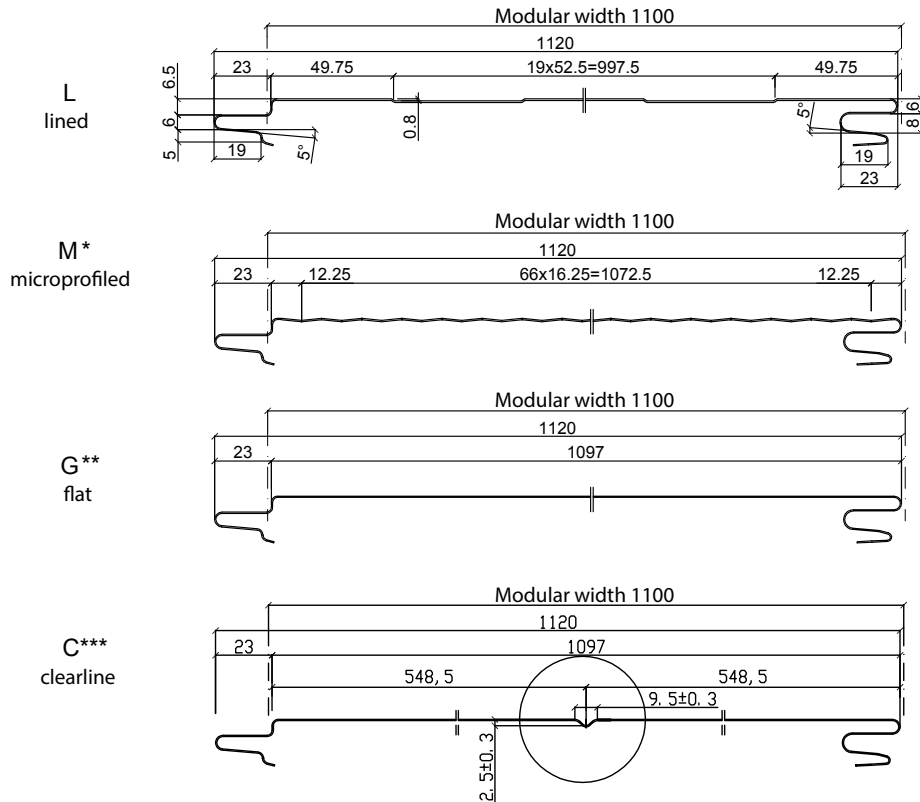
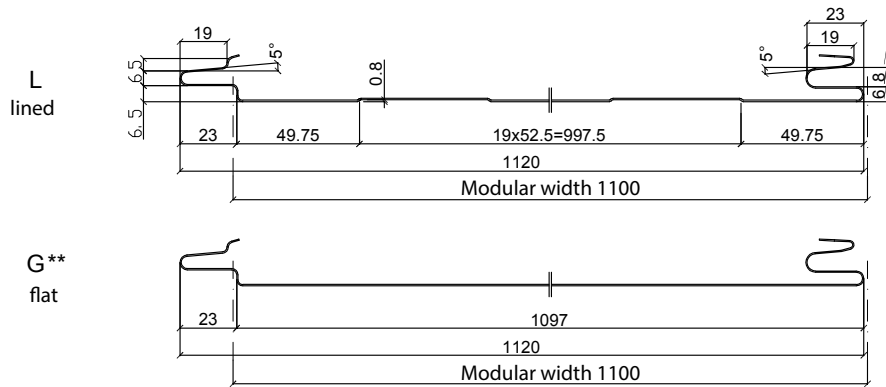
II. DETAILS OF CONSTRUCTION AND ARCHITECTURE ELEMENTS

1. BASIC DRAWINGS

1.1. F01

PIR FROST sandwich panel - panel joint, profile types



EXTERNAL CLADDINGS:

INTERNAL CLADDINGS:


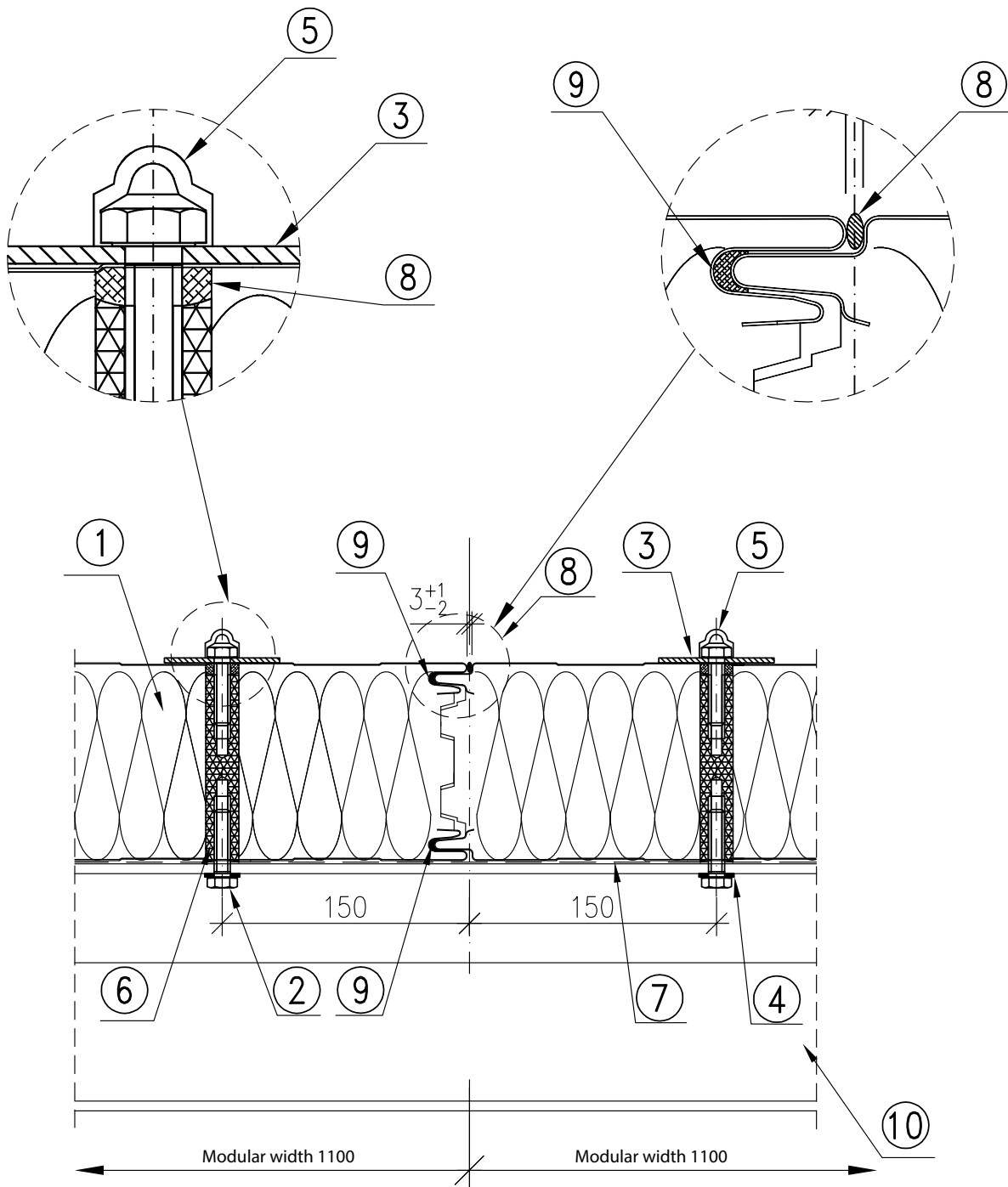
* On special order, after agreeing with the customer

** profiling available only for minimum 0.50 mm panel thickness

*** profiling available for 0.50 mm and 0.60 mm panel thickness (production only at the production plant in Bolszewo)

1.2. F02

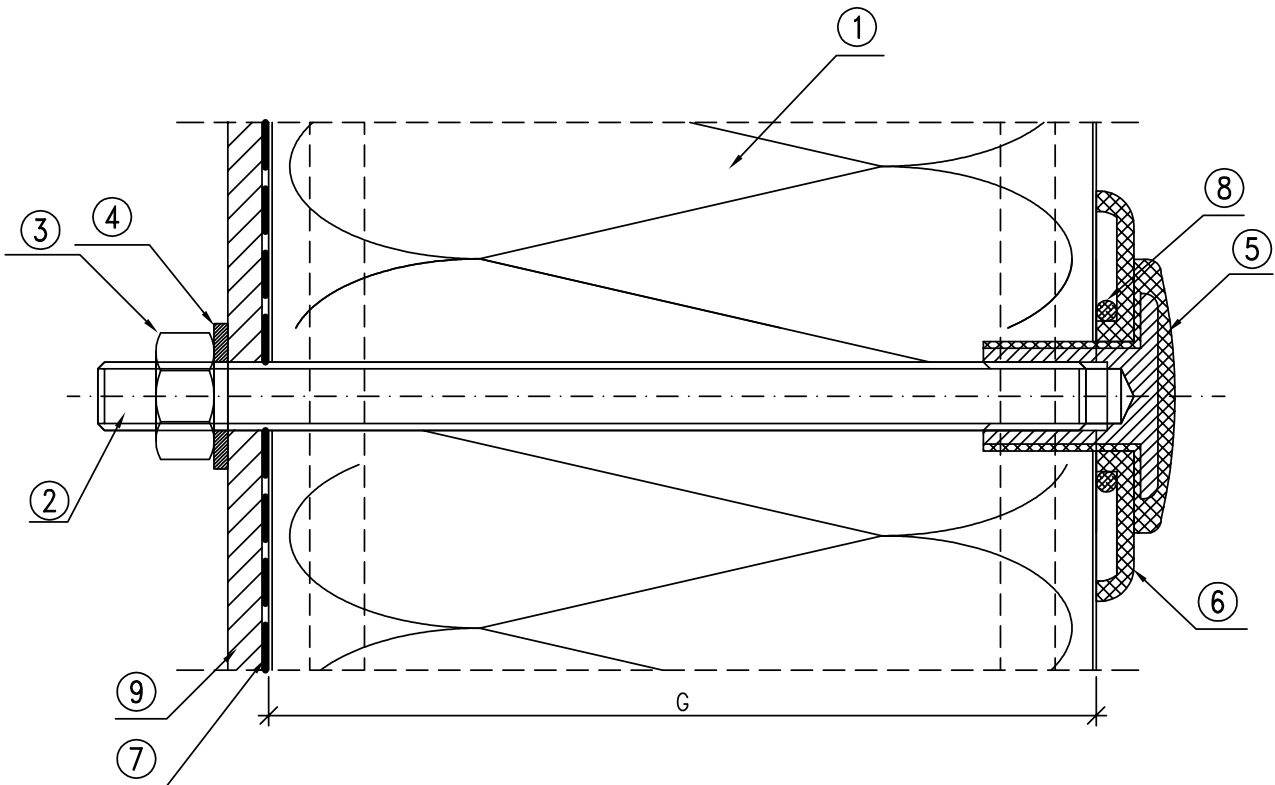
Fastening panels in the joint to the transom



2. FASTENING SYSTEM BY MEANS OF INSULATING NUTS WITH STEEL INSERT

2.1. F03

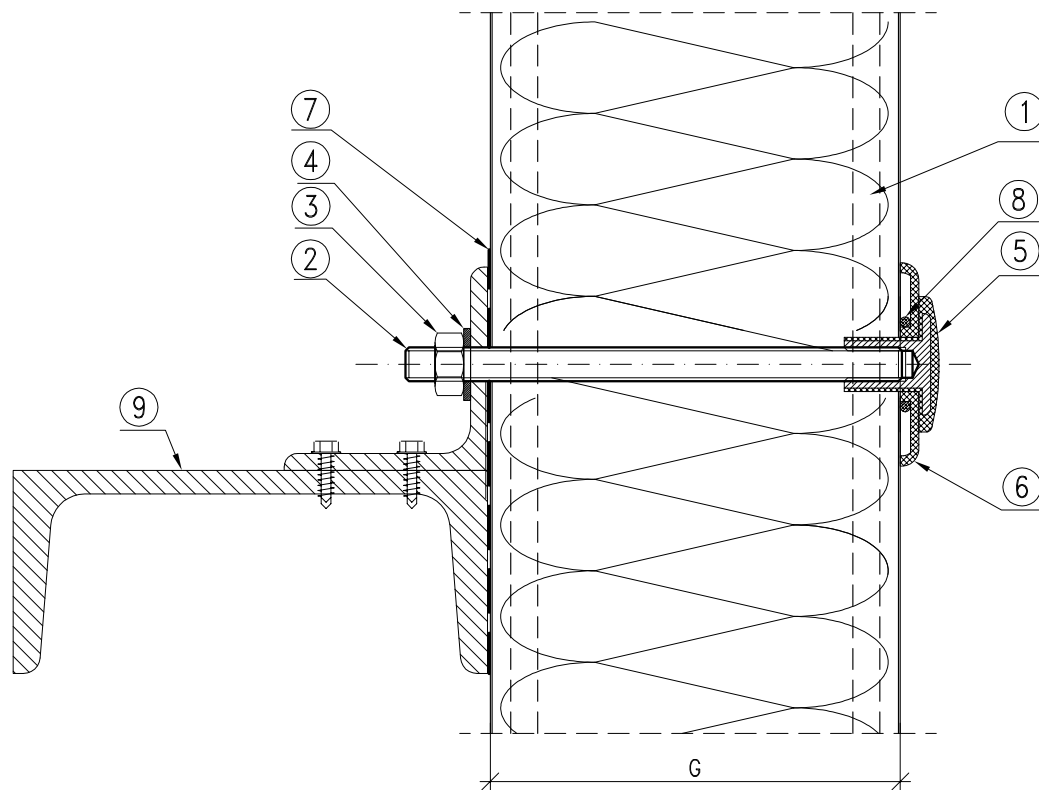
System of fastening cold storage panels by means of insulating nuts with steel insert



1. PIR FROST sandwich panel
2. Galvanized screwed bar M 10 x L bar where $L = G + 25$ mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Element of the building's structure

2.2. F04

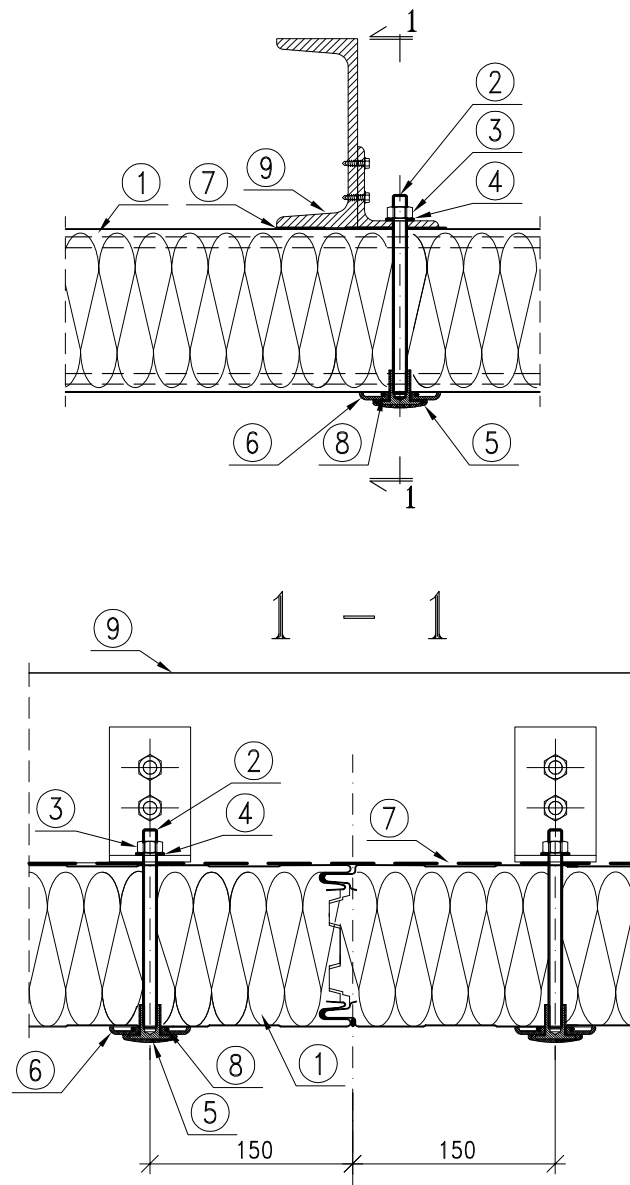
Fastening panels to hot-rolled transom by means of insulating nuts with steel insert



1. PIR FROST sandwich panel
2. Galvanized screwed bar M 10 x L bar where $L = G + 25$ mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Wall transom acc to the construction design

2.3. F05

Suspending panels under the ceiling by means of insulating nuts with steel insert

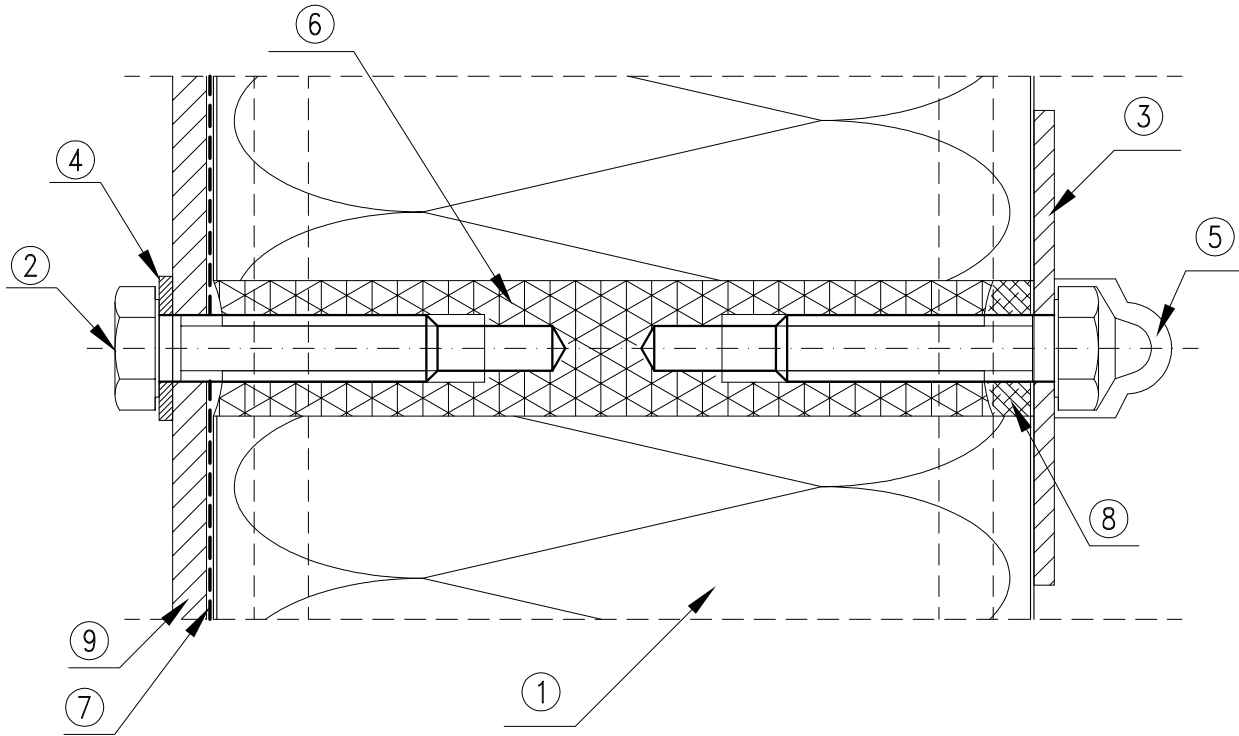


1. PIR FROST sandwich panel
2. Galvanized screwed bar M 10 x L bar where $L = G + 25$ mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Steel binder acc. to the construction design

3. SYSTEM OF FASTENING PIR FROST PANELS BY MEANS OF INSULATING POLYAMIDE SLEEVES

3.1. F06

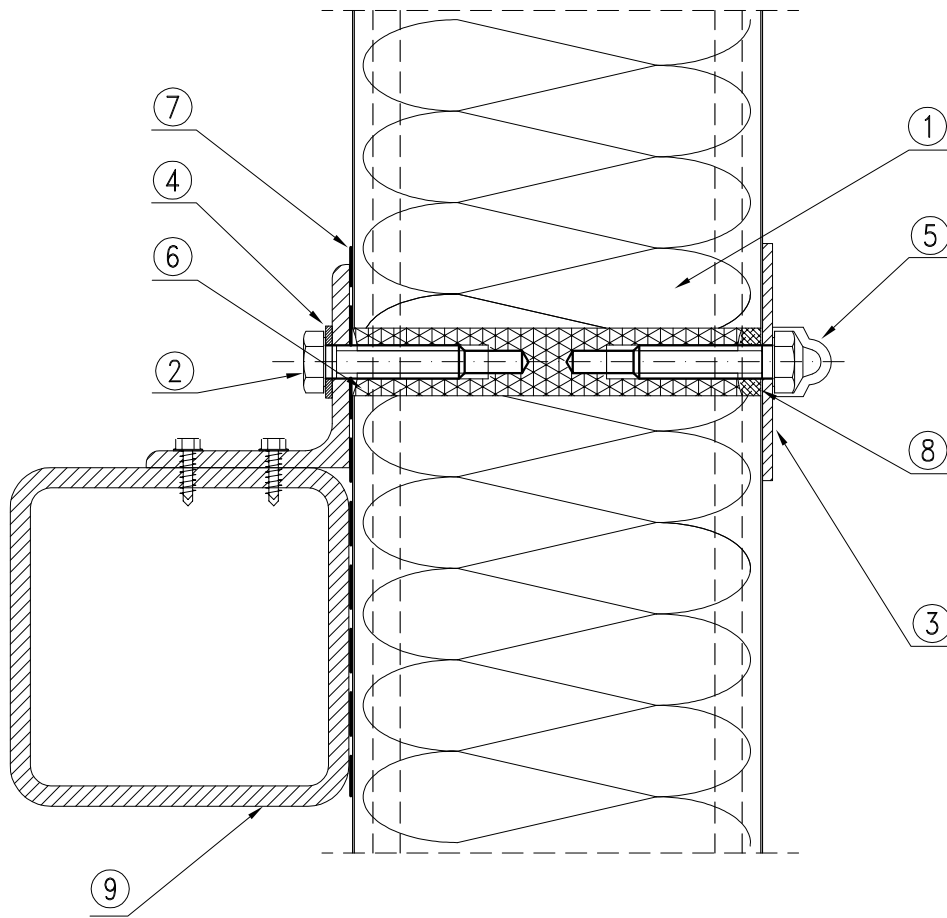
System of fastening cold storage panels by means of insulating polyamide sleeves



1. PIR FROST sandwich panel
2. M 10x40 galvanized screw
3. Galvanized varnished load carrying washer $\text{Ø}70/\text{Ø}10.5$ (white)
4. $\text{Ø}21/\text{Ø}10.5$ galvanized washer
5. Protective cap
6. Polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Element of the building's structure

3.2. F07

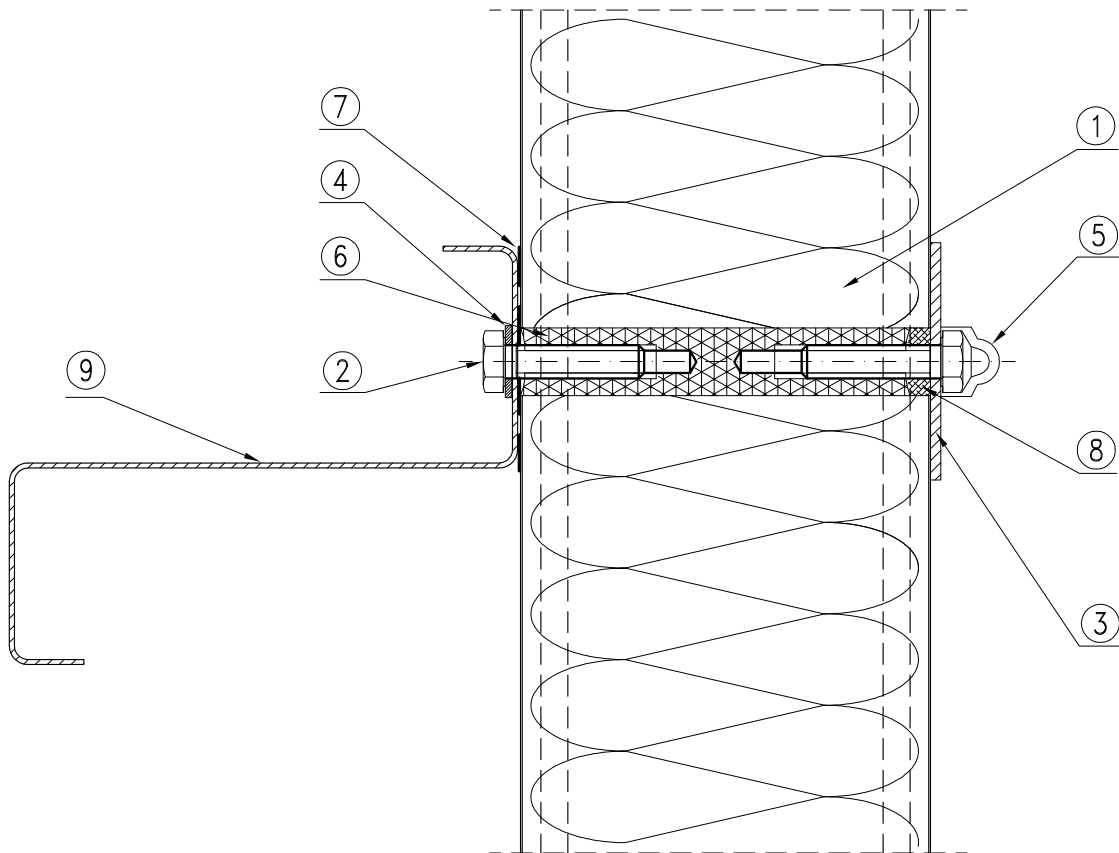
Fastening panels to hot-rolled transom by means of insulating polyamide sleeves



1. PIR FROST sandwich panel
2. Galvanized M 10x40 screw
3. Galvanized varnished load carrying washer Ø70/Ø10.5 (white)
4. Ø21/Ø10.5 galvanized washer
5. Protective cap
6. Polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Wall transom acc. to the structural design

3.3. F08

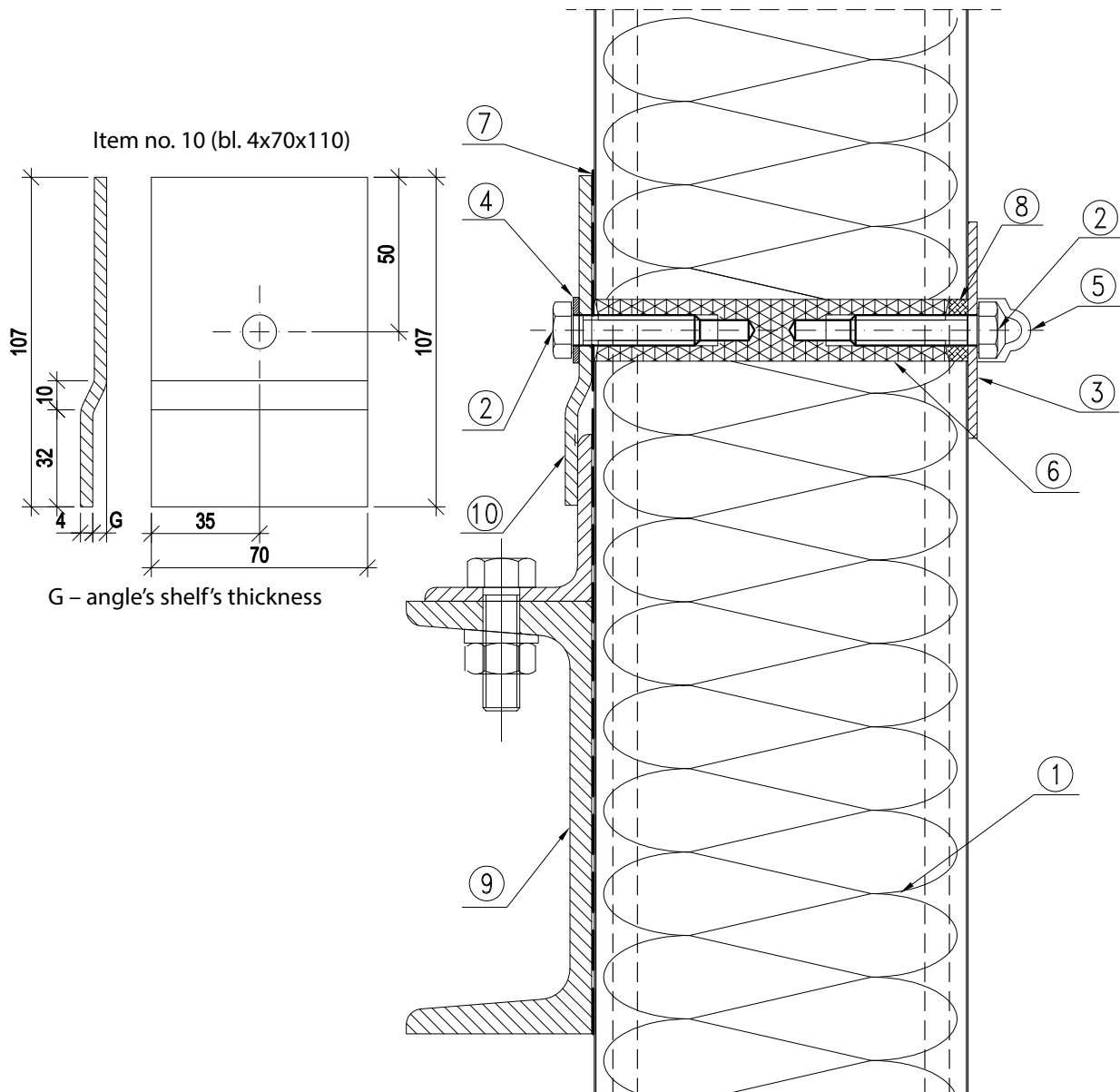
Fastening panels to thin-walled transom by means of insulating polyamide sleeves



1. PIR FROST sandwich panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB71 load carrying washer $\varnothing 70/\varnothing 10.5$ (white)
4. $\varnothing 21/\varnothing 10.5$ galvanized washer
5. Protective cap
6. Polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Wall transom acc. to the construction design

3.4. F09

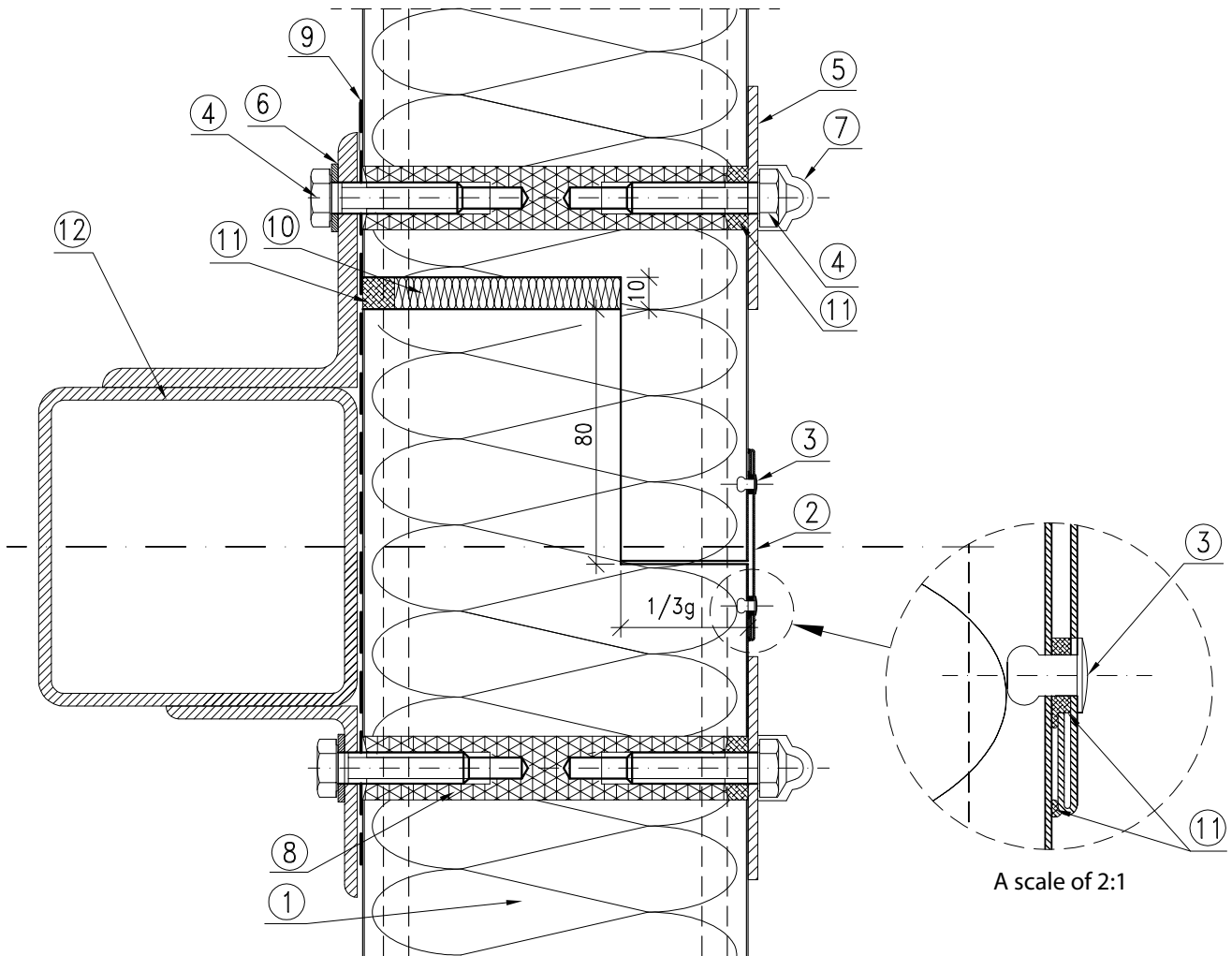
Sliding panel joint on a wall transom



1. PIR FROST sandwich panel
2. Galvanized M 10x40 screw
3. Galvanized varnished load carrying washer $\varnothing 70/\varnothing 10.5$ (white)
4. $\varnothing 21/\varnothing 10.5$ galvanized washer
5. Protective cap
6. Polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Wall transom acc. to the construction design
10. Thrust washer (individual)

3.5. F10/1

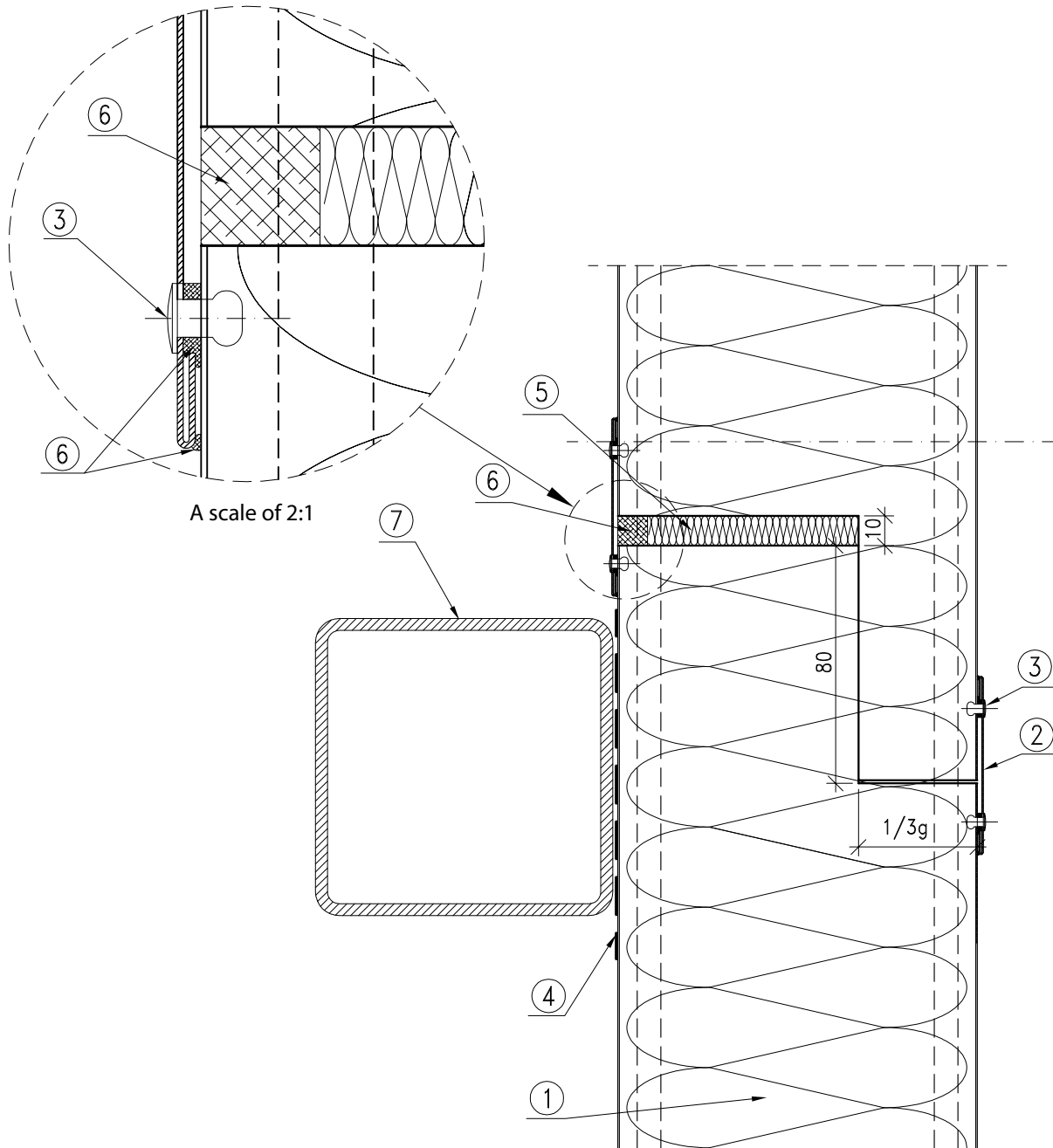
Joining wall panels lengthwise. Cross section of the area of fastening to the wall transom



1. PIR FROST sandwich panel
2. OBR 106
3. Ø4x10 Al/Fe tight blind rivet
4. Galvanized M10x40 screw
5. Galvanized varnished load carrying washer Ø70/Ø10.5 (white)
6. Ø21/Ø10.5 galvanized washer
7. Protective cap
8. Polyamide sleeve
9. Self-adhesive polyethylene tape (recommended)
10. Polyurethane foam
11. Permanently plastic sealant
12. Wall transom acc. to the construction design

3.6. F10/2

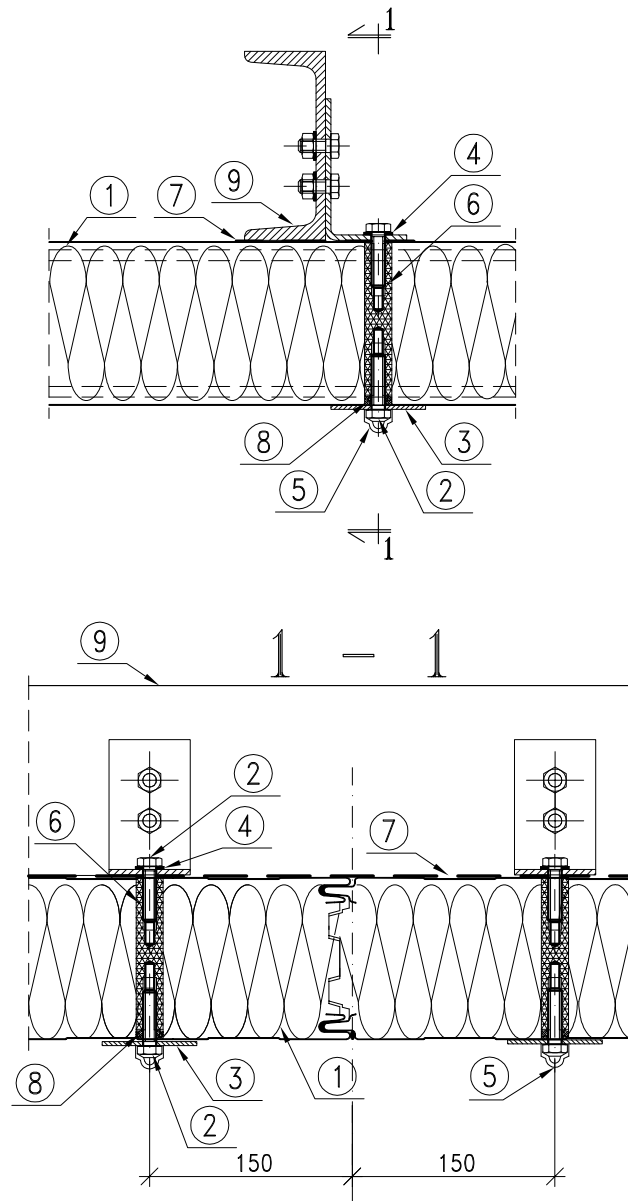
Joining wall panels lengthwise. Cross section outside the area of fastening to the wall transom



1. PIR FROST sandwich panel
2. OBR 106
3. Ø4x10 Al/Fe tight blind rivet
4. Self-adhesive polyethylene tape (recommended)
5. Polyurethane foam
6. Permanently plastic sealant
7. Wall transom acc. to the construction design

3.7. F11

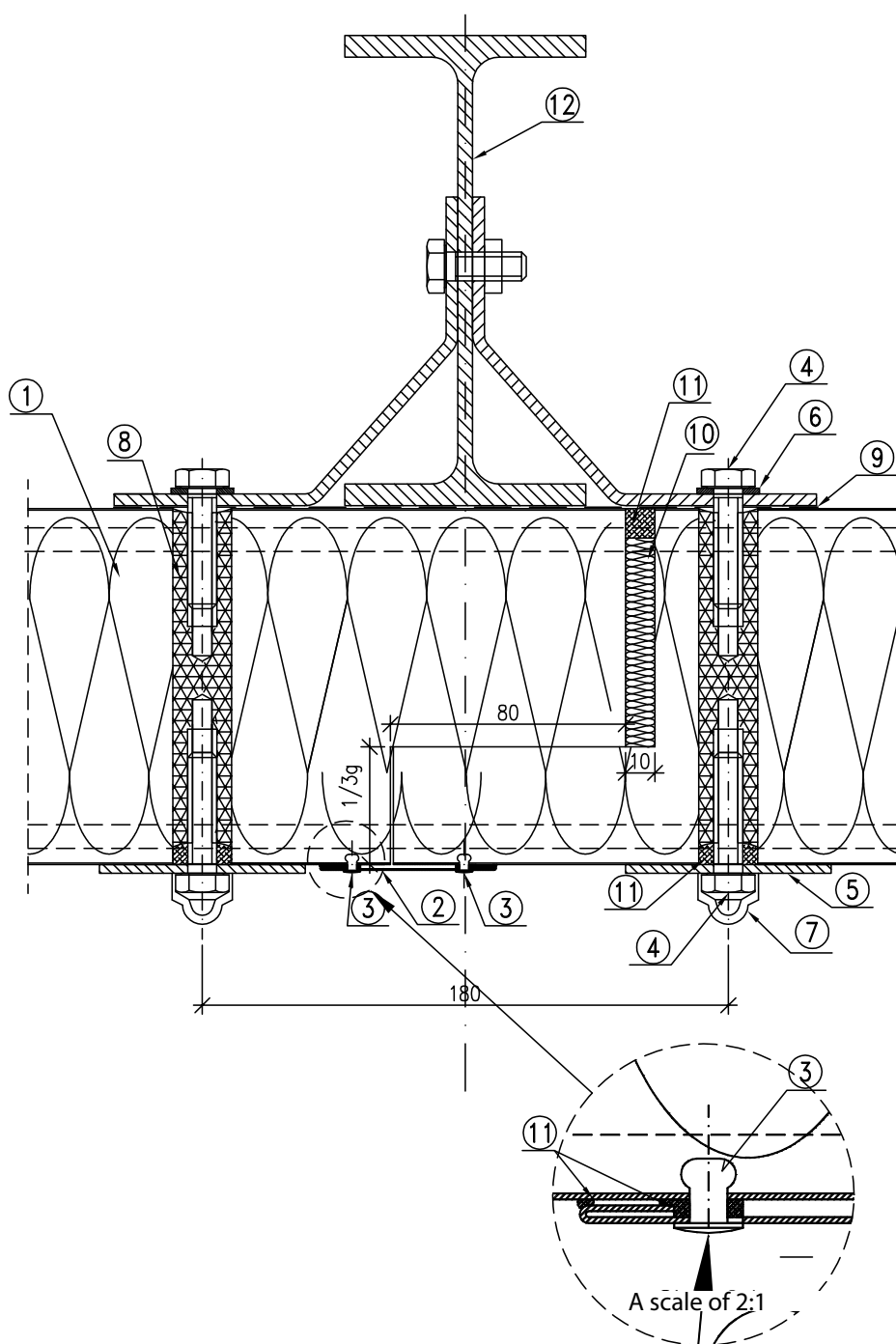
Suspending panels under the ceiling by means of insulating polyamide sleeves



1. PIR FROST sandwich panel
2. Galvanized M 10x40 screw
3. Galvanized varnished load carrying washer $\text{Ø}70/\text{Ø}10.5$ (white)
4. $\text{Ø}21/\text{Ø}10.5$ galvanized washer
5. Protective cap
6. Polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant
9. Steel structure acc. to the design

3.8. F12

Fastening panels in the ceiling and joining them lengthwise

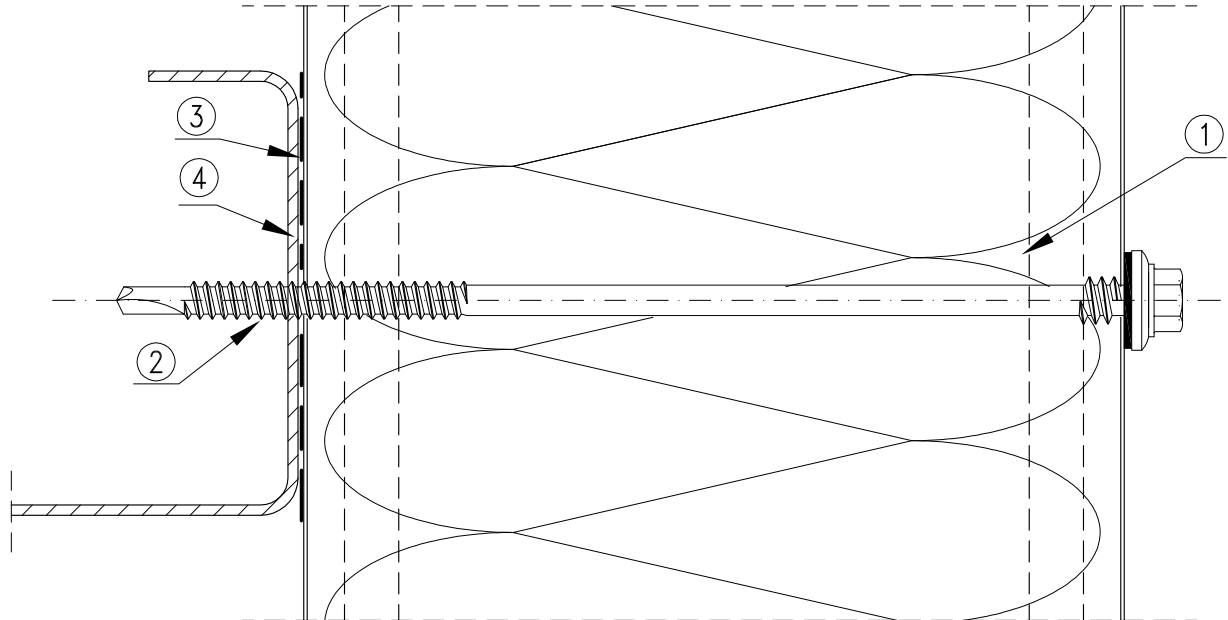


1. PIR FROST sandwich panel
2. OBR 106
3. Ø4x10 Al/Fe tight blind rivet
4. Galvanized M 10x40 screw
5. Galvanized varnished load carrying washer Ø70/Ø10.5 (white)
6. Ø21/Ø10.5 galvanized washer
7. Protective cap
8. Polyamide sleeve
9. Self-adhesive polyethylene tape (recommended)
10. Polyurethane assembly foam
11. Permanently plastic sealant
12. Load carrying structure acc. to the design

4. SYSTEM OF FASTENING PIR FROST PANELS BY MEANS OF STAINLESS STEEL FASTENERS

4.1. F13

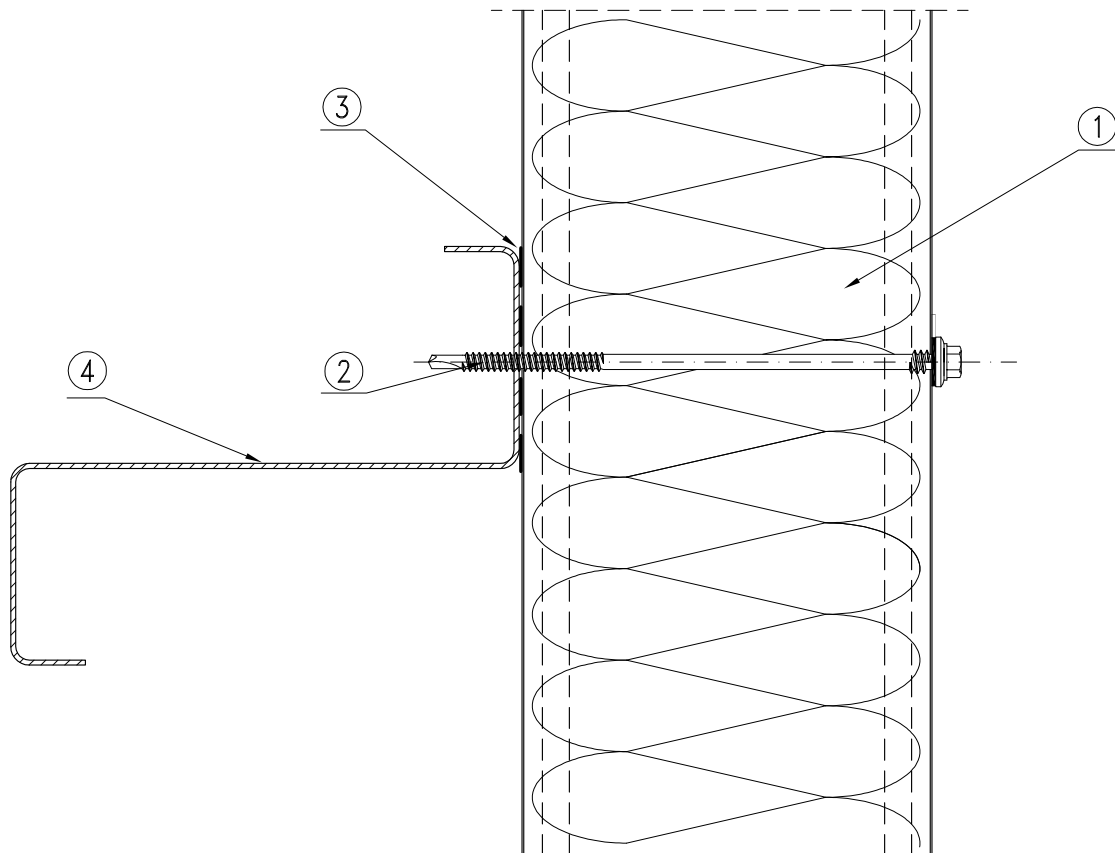
System of fastening cold storage panels by means of stainless steel fasteners



1. PIR FROST sandwich panel
2. Stainless steel fastener for fastening panels
3. Self-adhesive polyethylene tape (recommended)
4. Element of the building's structure

4.2. F14

Fastening panels to thin-walled transom by means of stainless steel fasteners

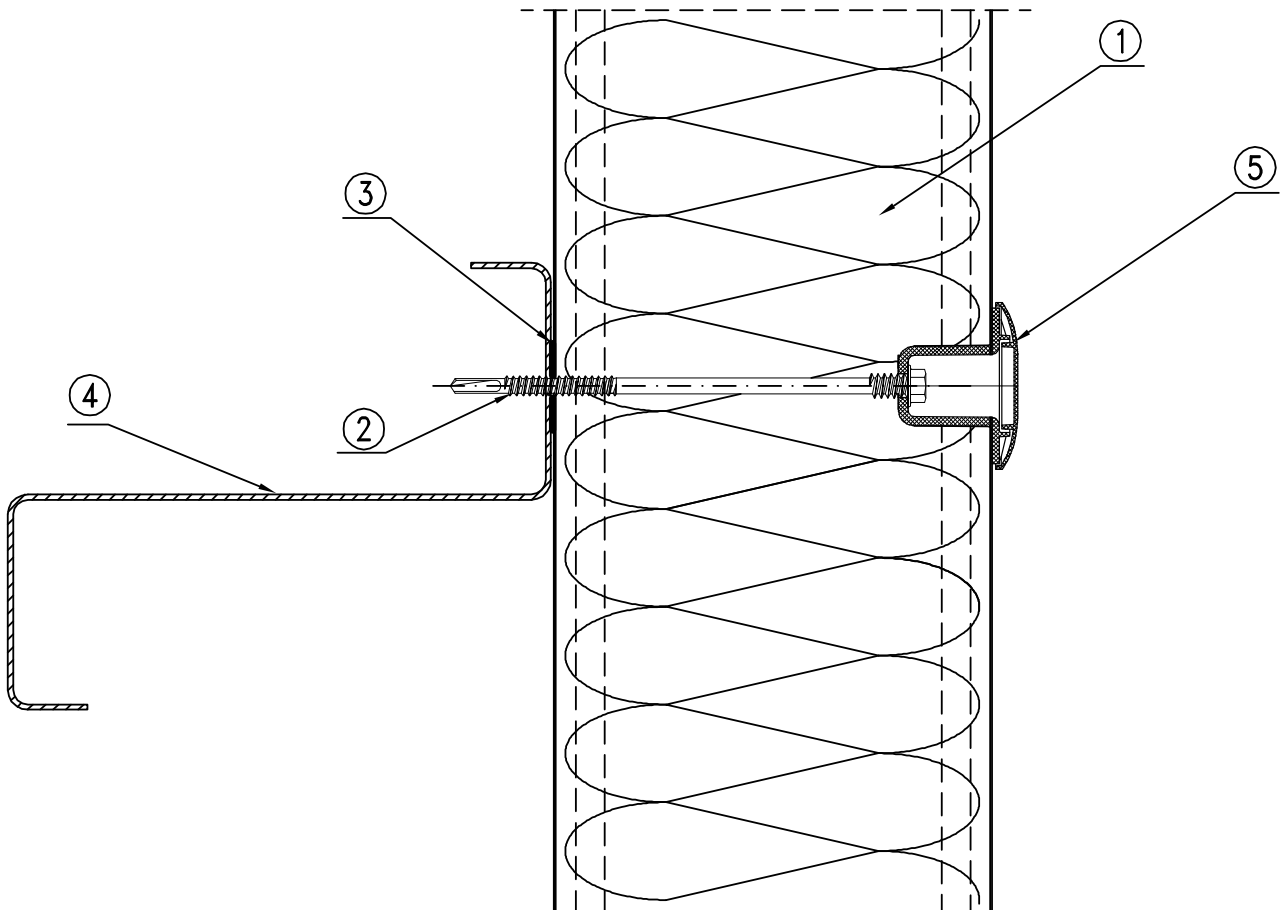


1. PIR FROST sandwich panel
2. Stainless steel fastener for fastening panels
3. Self-adhesive polyethylene tape (recommended)
4. Wall transom acc. to the construction design

5. SYSTEM OF FASTENING PIR FROST PANELS WITH THE USE OF LAX FASTENERS

5.1. F25

System of fastening PIR FROST Cold Storage sandwich panels with the use of LAX fasteners

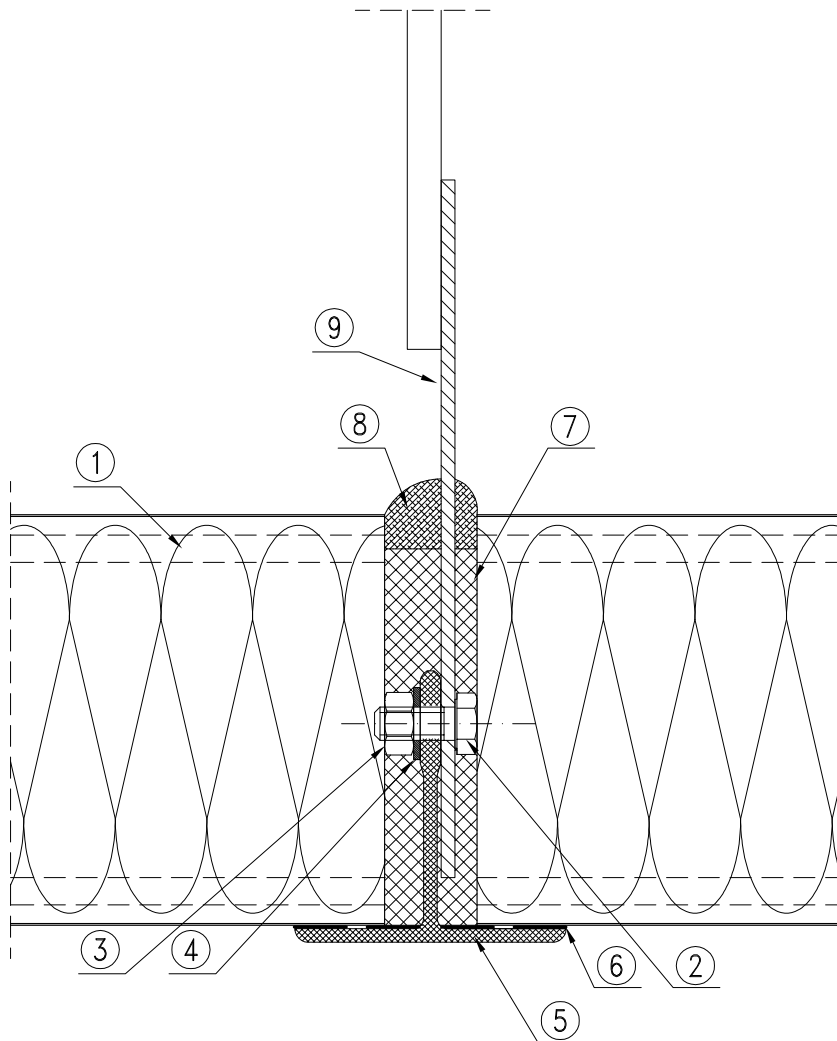


1. PIR FROST sandwich panel
2. Sandwich panel fastener
3. PES 3x20 polyethylene adhesive tape (recommended)
4. Wall spandrel beam according to structure design
5. LAX bushing and cap

6. SUSPENDING PANELS UNDER THE CEILING BY MEANS OF PCV PROFILES

6.1. F15

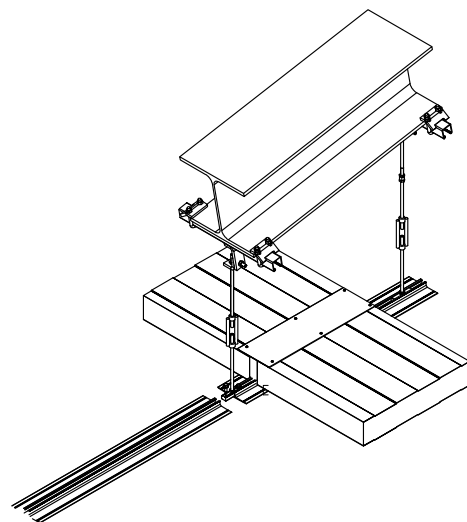
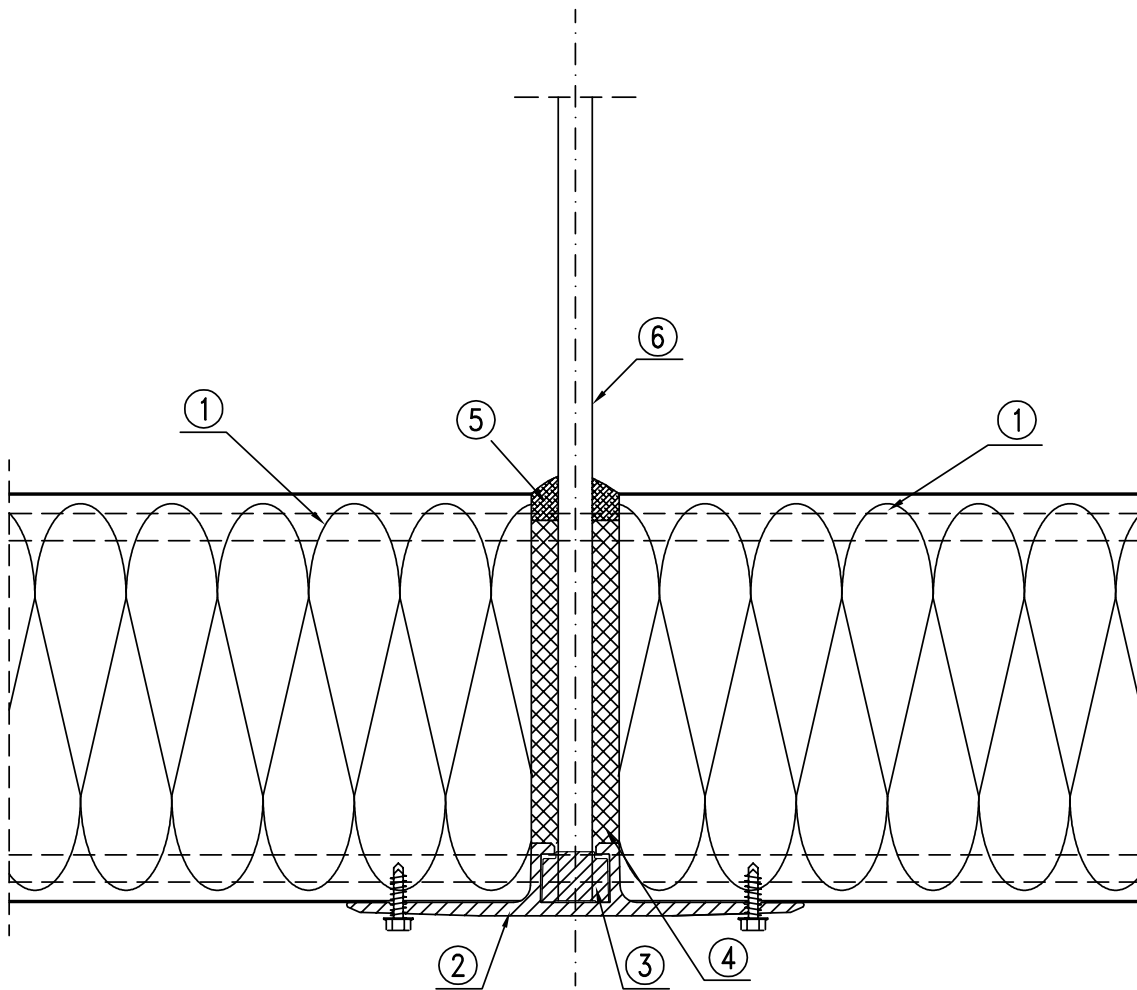
Suspending panels under the ceiling by means of a T profile



1. PIR FROST sandwich panell
2. Galvanized M 10x40 screw
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. T profile (aluminium TALU 01 or Polyester)
6. Self-adhesive polyethylene tape (recommended)
7. Polyurethane assembly foam
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Hanger – tension member

6.2. F16/1

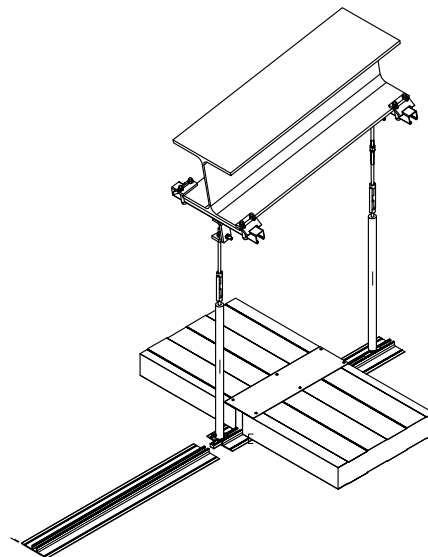
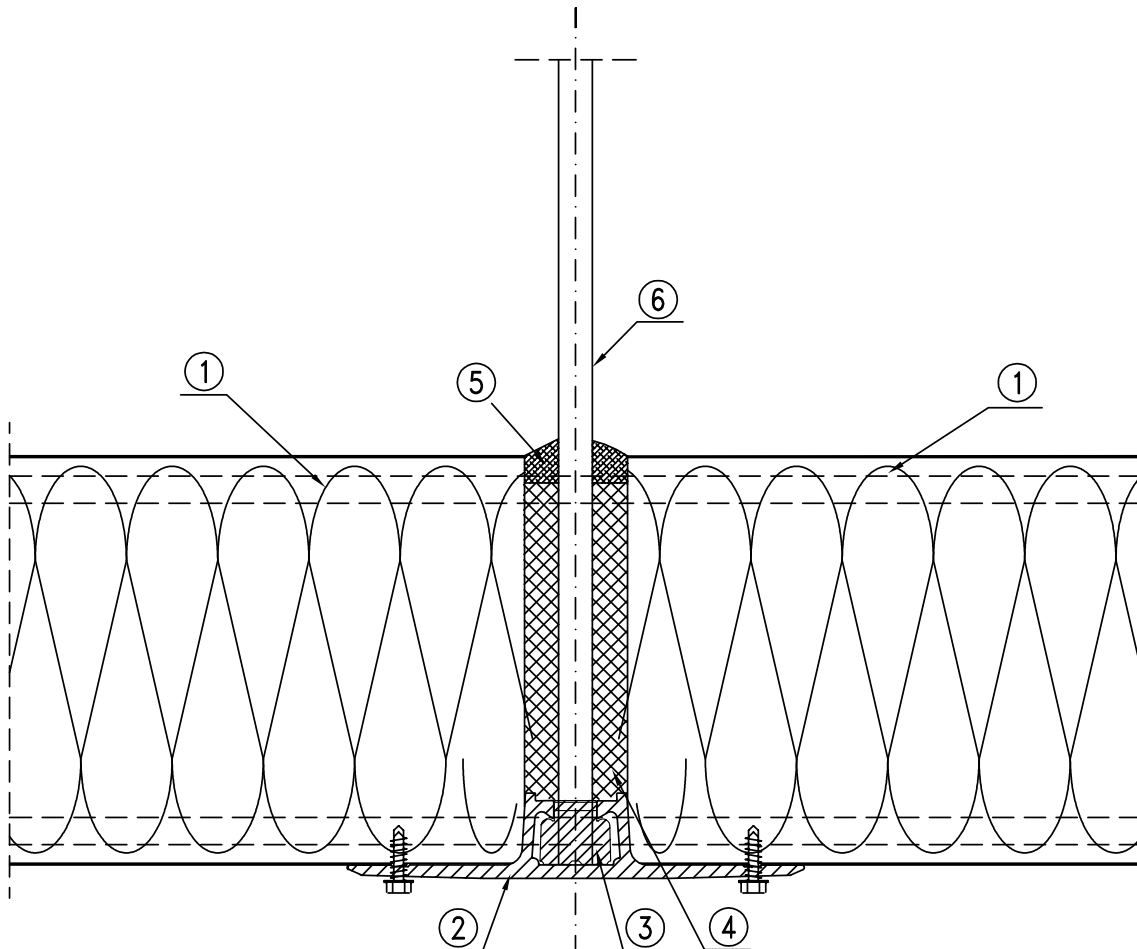
Suspended ceiling with TO.ALU.02 profile – recommended for cold rooms



1. PIR FROST sandwich panel
2. TO.ALU.02 profile - recommended for cold rooms suspended ceilings
3. M10 nut, fixing A.315 profile
4. PU installation foam
5. Permanently elastic sealing compound
6. Hanger and linkage according to design

6.3. F16/2

Suspended ceiling with TH.ALU.02 – recommended for freeze rooms

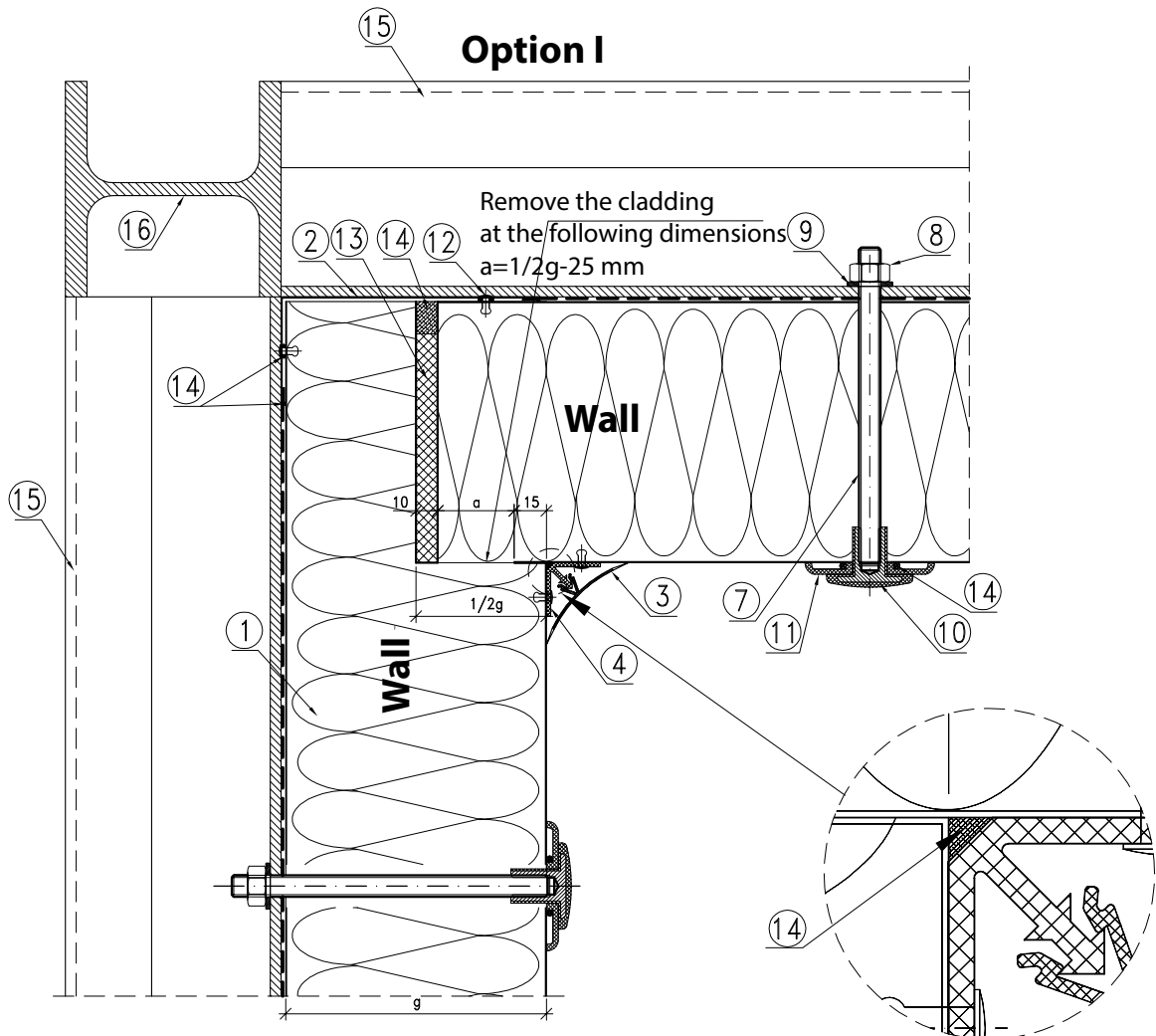


1. PIR FROST sandwich panel
2. TH.ALU.02 profile - recommended for freeze rooms suspended ceilings
3. M 10 nut, fixing A.325 profile
4. PU installation foam
5. Permanently elastic sealing compound
6. Hanger and linkage according to design

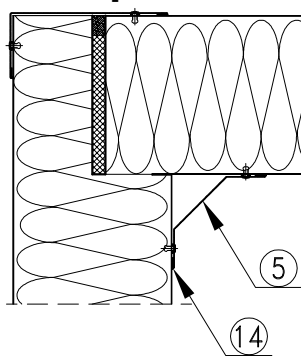
7. SOLUTIONS FOR PIR FROST PANEL CORNERS

7.1. F17

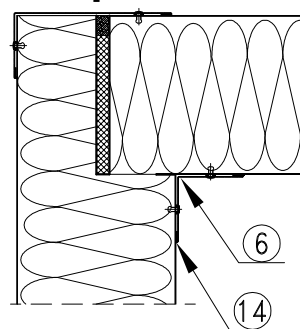
Fastening wall panels in the corner



Option II



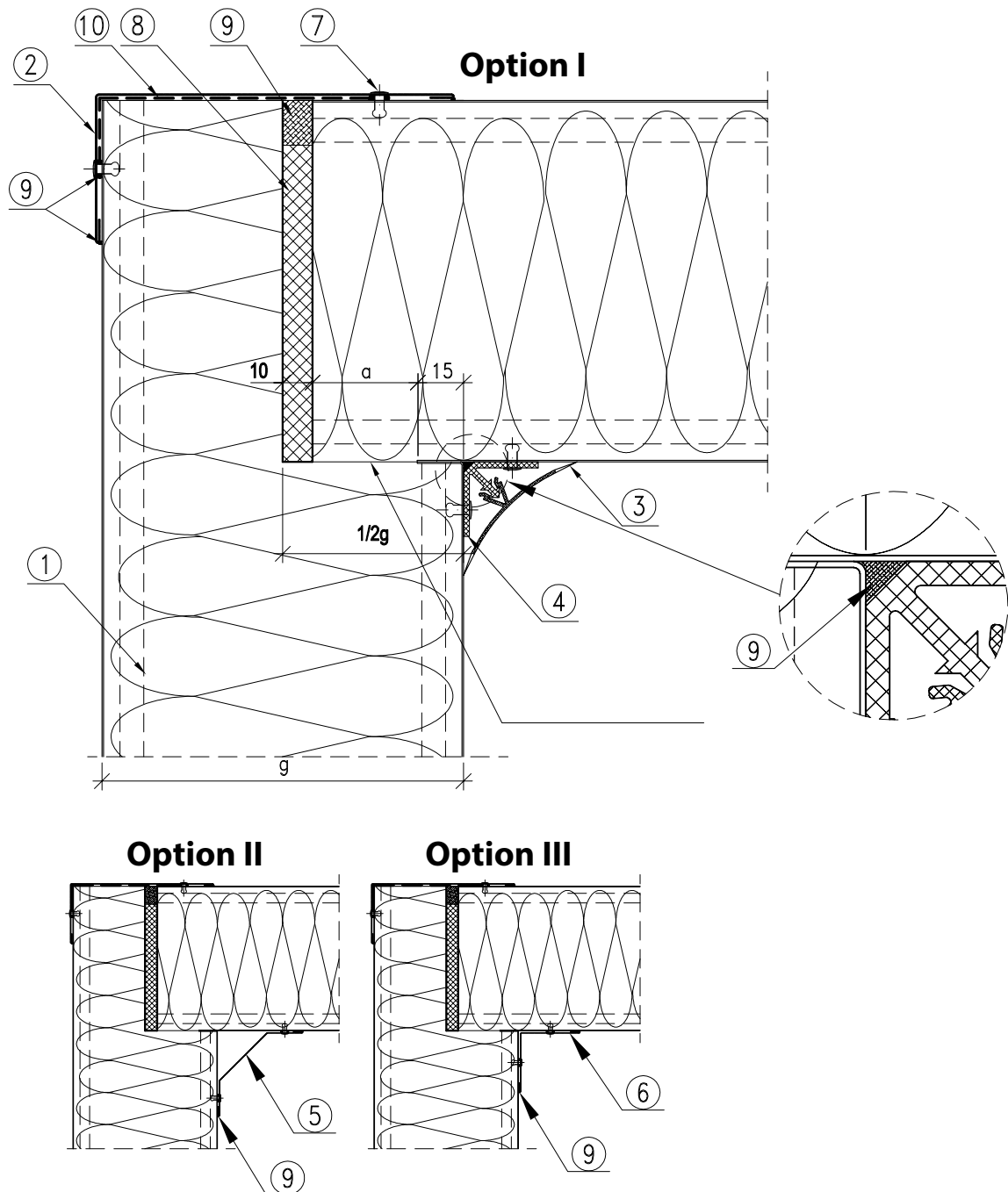
Option III



1. PIR FROST sandwich panel
2. OBR 301
3. PVC corner profile
4. PVC mounting profile
5. OBR 302
6. OBR303
7. Screwed galvanized bar M10 x L where $L = G + 25 \text{ mm}$
8. M10 galvanized nut
9. $\text{Ø}21/\text{Ø}10.5$ galvanized washer
10. PVC insulating nut with a steel INJ.235 insert
11. PVC INJ.24 washer
12. $\text{Ø}4 \times 10$ Al/Fe tight blind rivet
13. Polyurethane assembly foam
14. Permanently plastic sealant
15. Wall transom acc. to the construction design
16. Post acc. to the construction design

7.2. F18

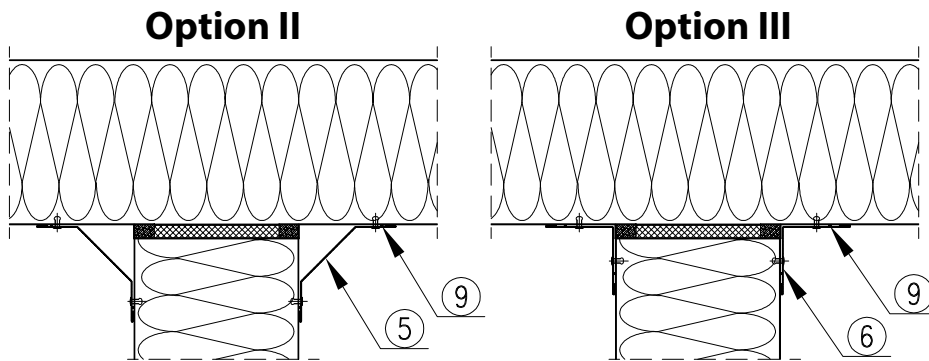
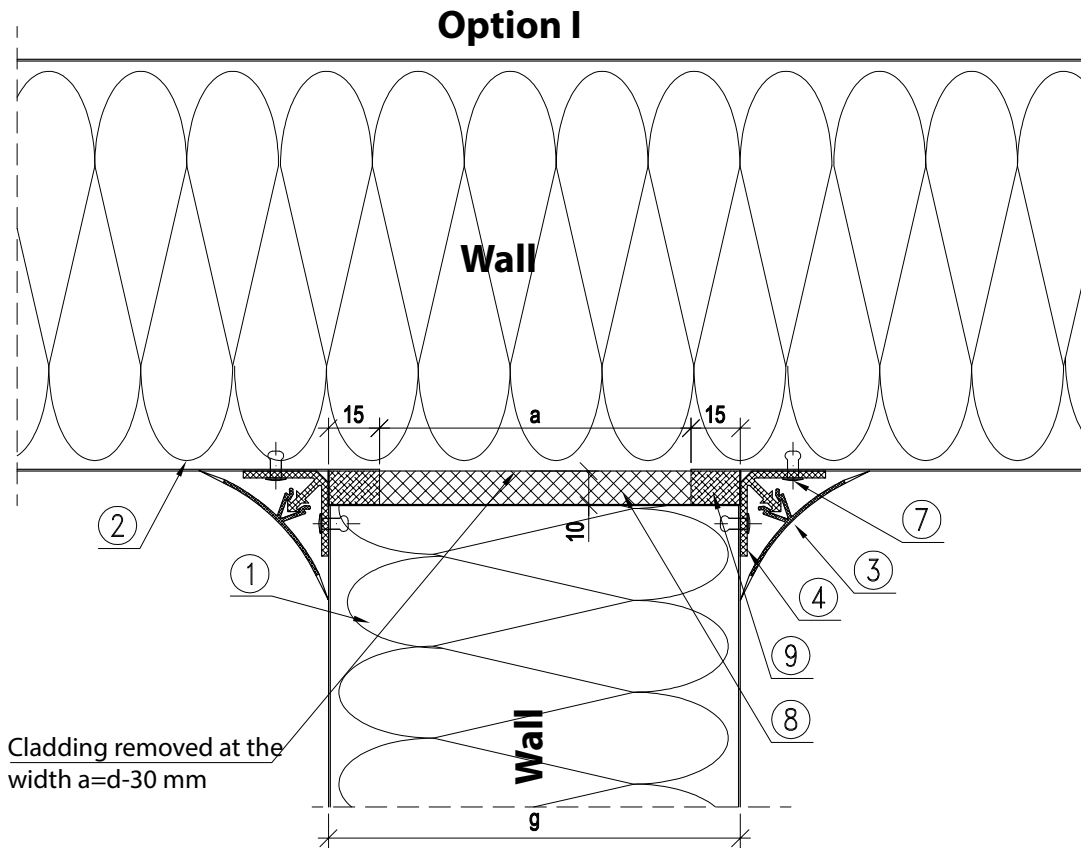
Joint of wall and ceiling panels in the corner



1. PIR FROST sandwich panel
2. OBR 301
3. PVC Corner profile
4. PVC Mounting profile
5. OBR 302
6. OBR 303
7. Ø4x10 Al/Fe tight blind rivet
8. Polyurethane assembly foam
9. Permanently plastic sealant
10. Polyethylene foil

7.3. F19

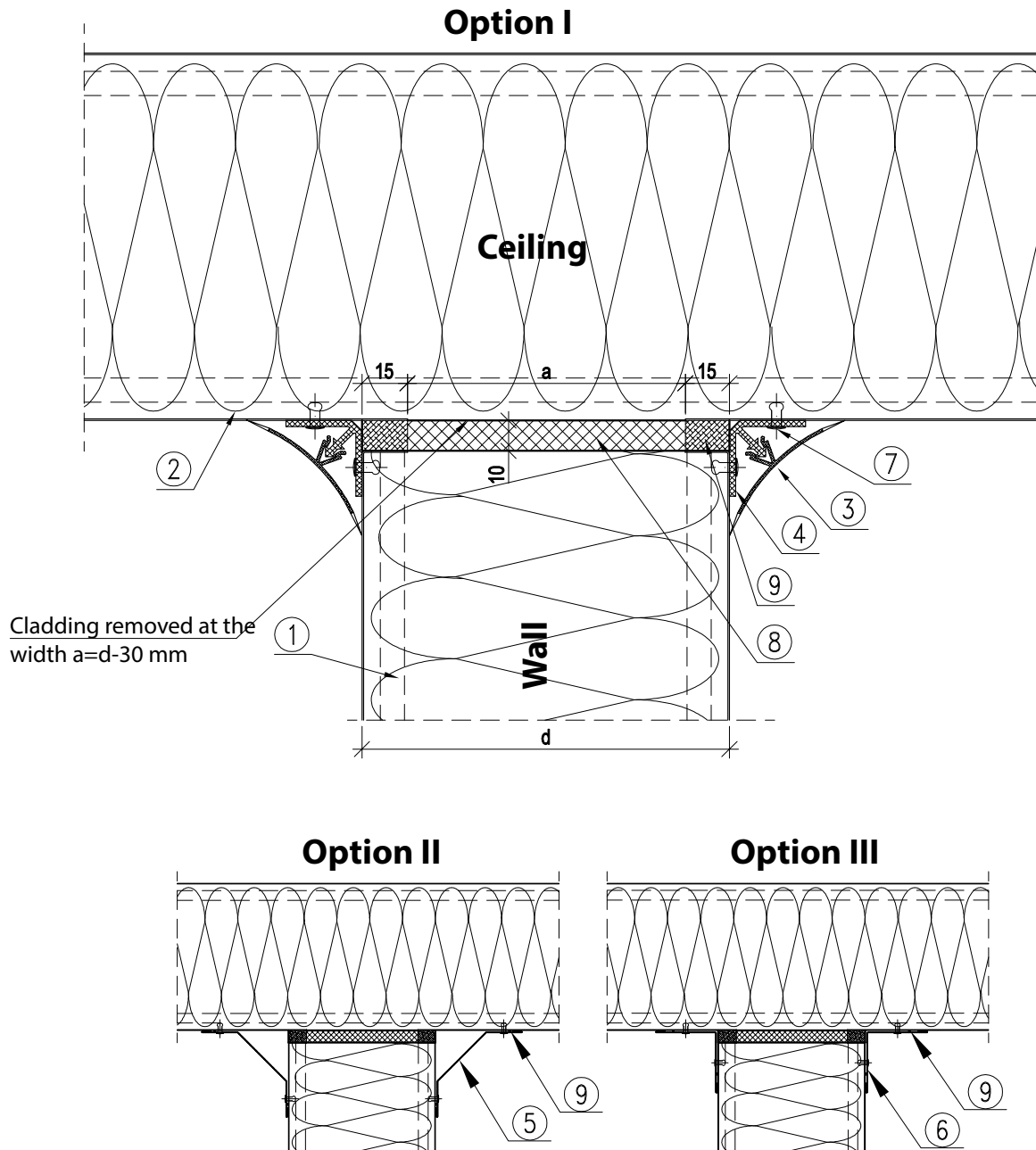
Joint of partition walls with external walls



- 1. PIR FROST sandwich panel
- 2. PIR FROST sandwich panel
- 3. PVC Corner profile
- 4. PVC Mounting profile
- 5. OBR 302
- 6. OBR 303
- 7. $\varnothing 4 \times 10$ Al/Fe tight blind rivet
- 8. Polyurethane assembly foam
- 9. Permanently plastic sealant

7.4. F20/1

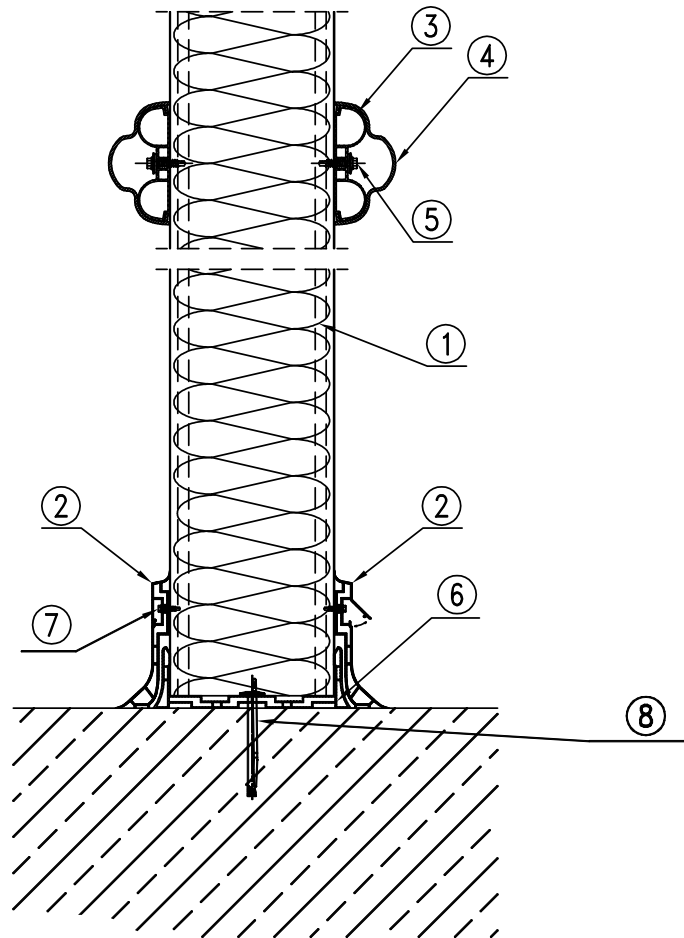
Joint of partition walls with the ceiling



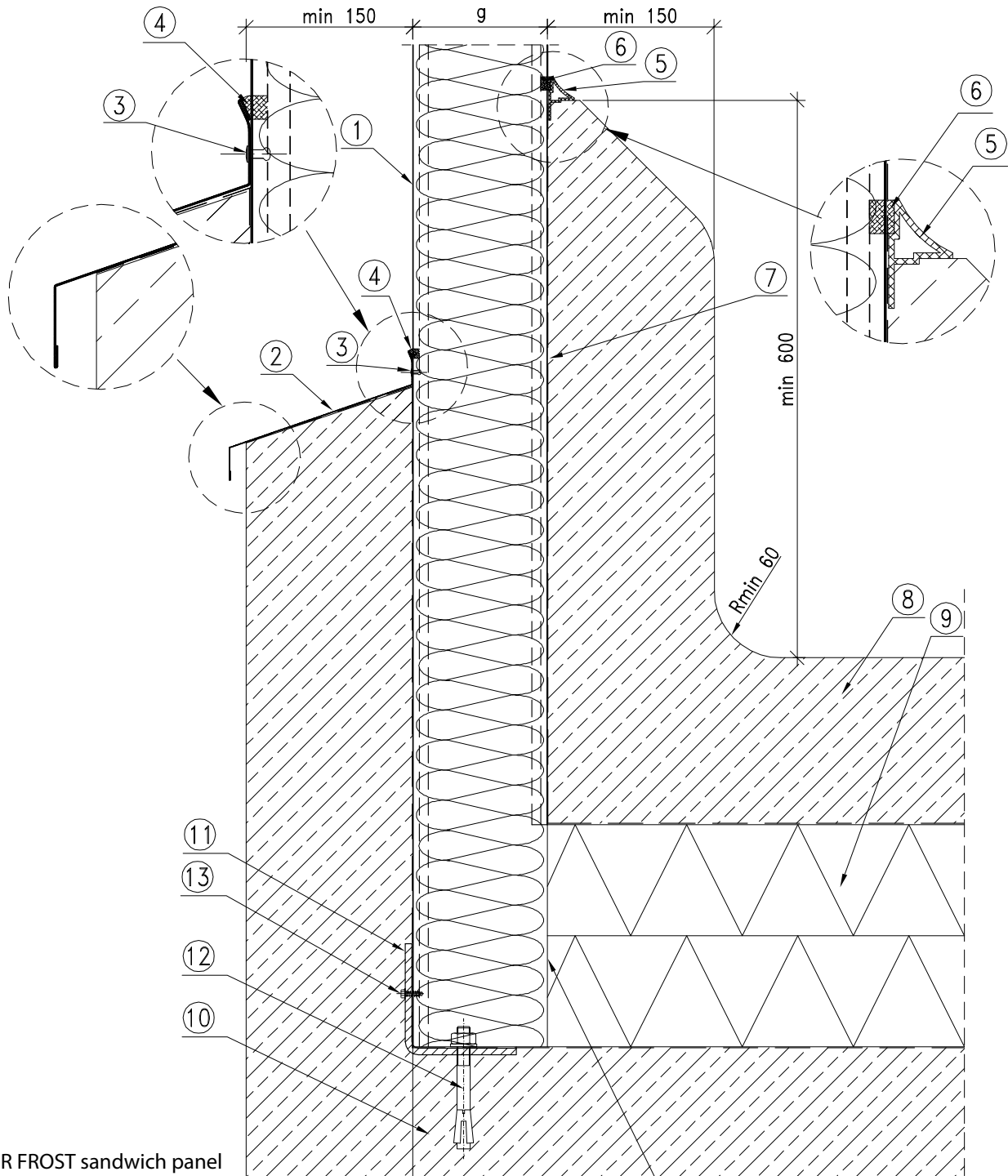
1. PIR FROST sandwich panel
2. PIR FROST sandwich panel
3. EX 14 v EX 40 PVC Corner profile
4. EX 28 v EX 41 PVC Mounting profile
5. OBR 302
6. OBR 303
7. Ø4x10 Al/Fe tight blind rivet
8. Polyurethane assembly foam
9. Permanently plastic sealant

7.5. F20/2

Fastening of a partition wall on a groove profile



1. PIR FROST sandwich panel
2. Base
3. Wall support of the fender
4. Fender cover
5. Self-drilling screw for fastening of PVC/PE
6. Groove profile
7. Self-drilling screw
8. Anchor bolt

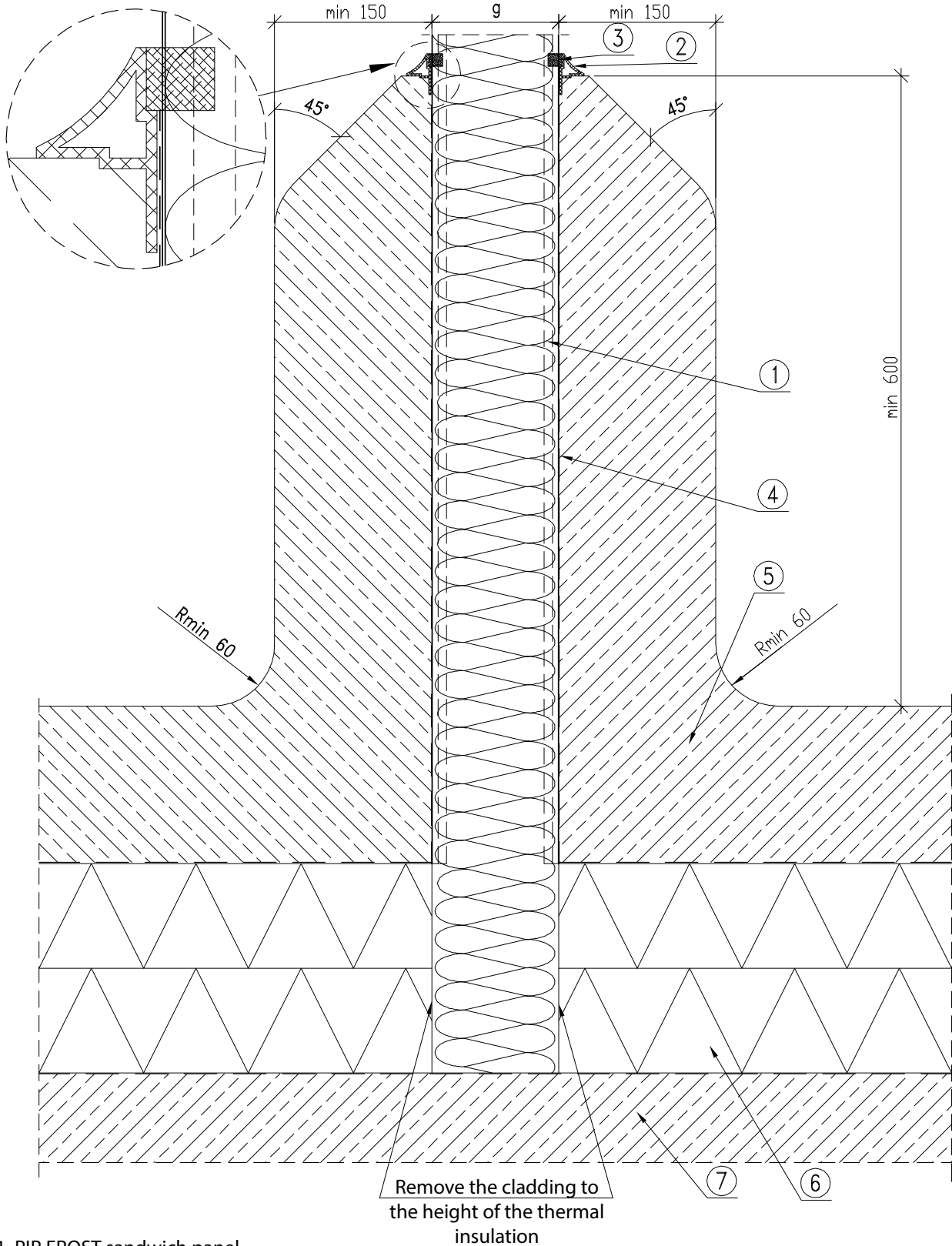
7.6. F21
Joint of external wall with the floor and a concrete base


1. PIR FROST sandwich panel
2. OBR 304
3. Ø4x10 Al/Fe tight blind rivet
4. Butyl mass
5. PVC corner profile
6. Permanently plastic sealant
7. Vertical and horizontal dampproof course (e.g. PE)
8. Concrete floor acc. to the design
9. Thermal insulation
10. Concrete slab acc. to the construction design
11. Cold-bent angle
12. Concrete anchor bolt
13. Self-drilling fastener

Remove the cladding to
the height of the thermal
insulation

7.7. F22

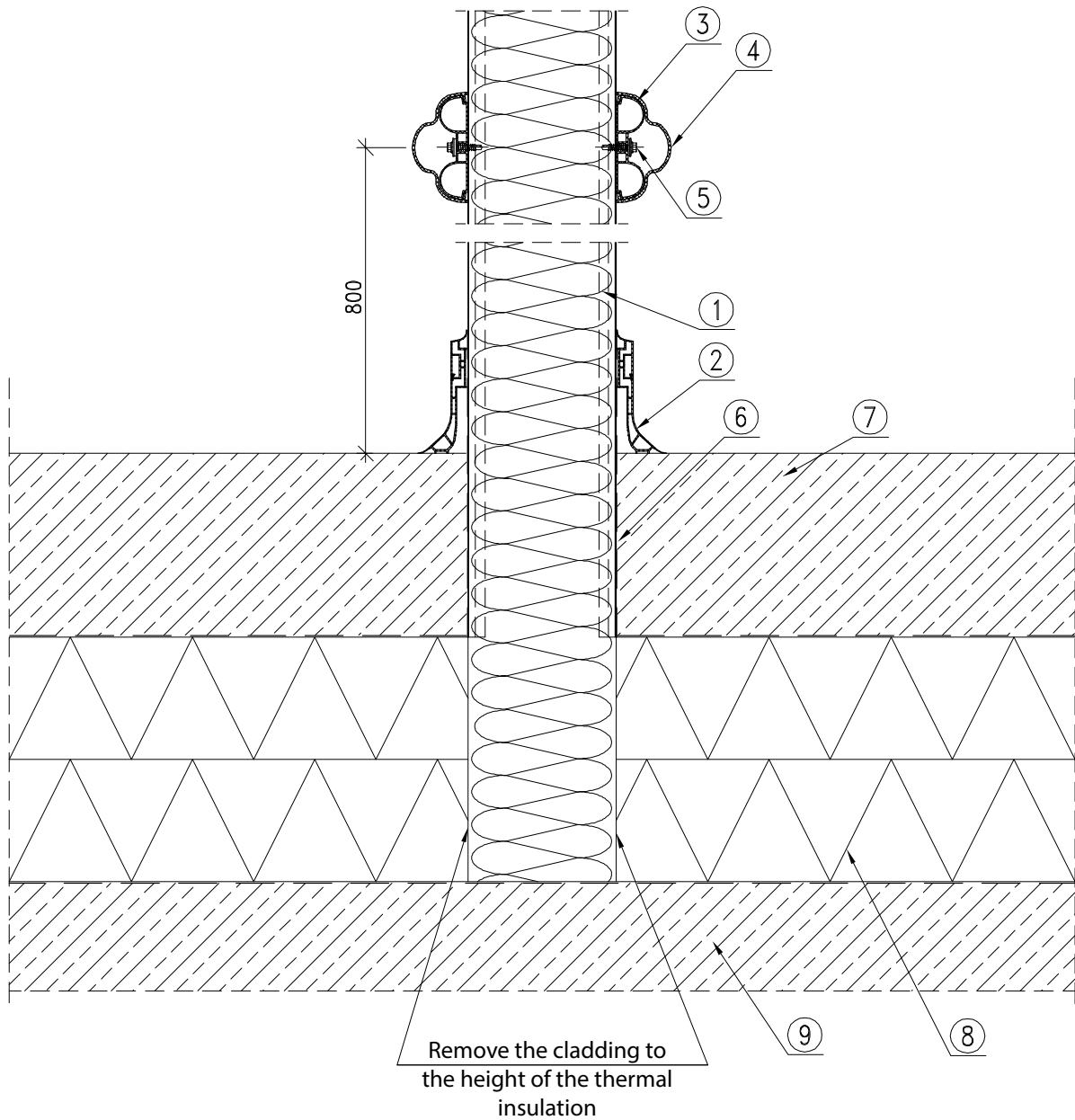
Joint of internal wall with a concrete base



1. PIR FROST sandwich panel
2. PVC corner profile
3. Permanently plastic sealant
4. Vertical and horizontal dampproof course (e.g. PE)
5. Concrete floor acc. to the design
6. Thermal insulation
7. Concrete slab acc. to the construction design

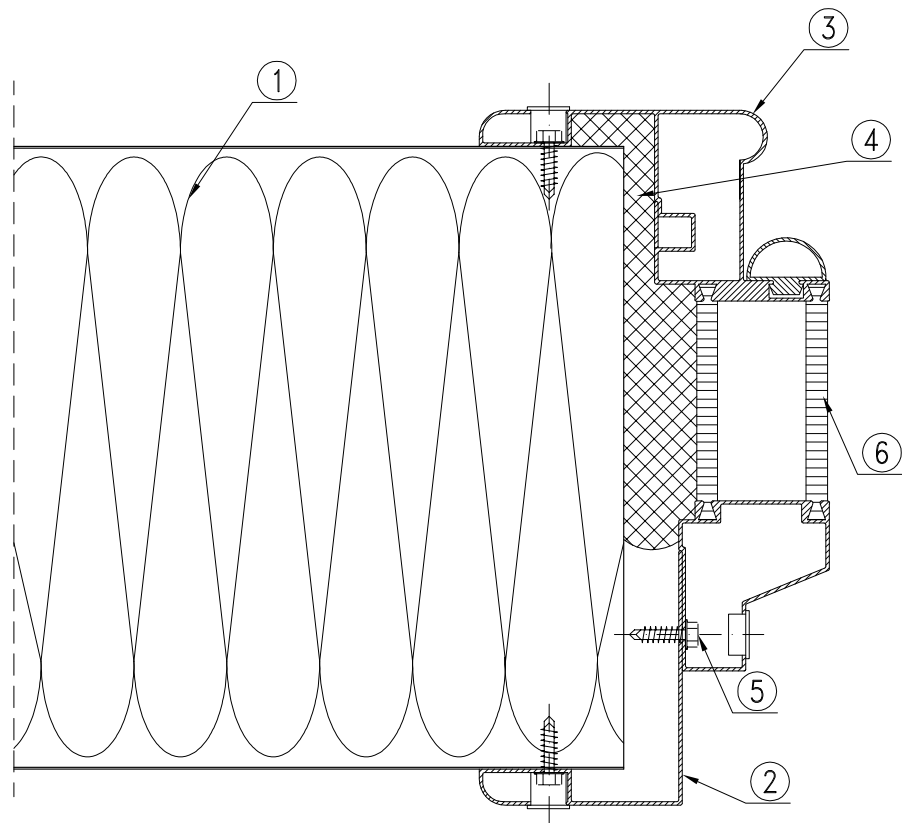
7.8. F23

Joint of internal wall with a PVC base



1. PIR FROST sandwich panel
2. PVC base
3. Wall support of the fender
4. Dender cover
5. Assembly screw
6. Vertical and horizontal dampproof course (e.g. PE)
7. Concrete floor acc. to the design
8. Thermal insulation
9. Concrete slab acc. to the construction design

7.9. F24 Cold storage door installation



1. PIR FROST sandwich panel
2. External door frame
3. Internal door frame
4. Polyurethane assembly foam
5. Assembly screw
6. Insulating insert

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EN-2023-12-20

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