

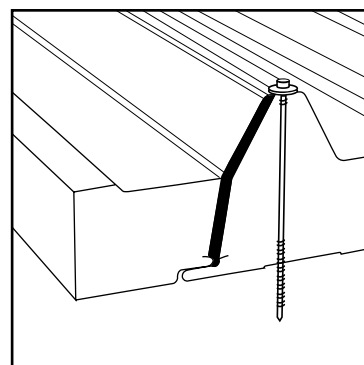
BALEXTHERM ST, PLUS, D

SANDWICH PANELS WITH POLYURETHANE CORE



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TECHNICAL CATALOGUE



BALEXTHERM PLUS, ST, D

Sandwich panels with polyurethane core

April 2009

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I. TECHNICAL INFORMATION CONCERNING ENCLOSURES MADE OF BALEXTHERM SANDWICH PANELS WITH A POLYURETHANE CORE

1. GENERAL INFORMATION - SANDWICH PANEL CONSTRUCTION

BALEXMETAL company provides wide range of modern wall and roof panels with polyurethane core marked with BALEX THERM trade name.

BALEX THERM sandwich panels consist of two stainless steel facings and a construction and insulation core. The core is made of non-freon polyurethane foam, with density of $40\pm 3 \text{ kg/m}^3$ (environmentally friendly due to the applied foaming agent) with the highest heat insulation value among all known insulation materials and it is responsible for transmitting shear stress, maintaining fixed distance between facing panels and ensuring high heat insulation values.

BALEX THERM sandwich panel's facings are made of S220GD, S250GD and S280GD steel metal sheet with thickness range from 0,40mm to 0,63mm and galvanized on both sides with coating weight $\geq 275 \text{ g/m}^2$ according to the EN 10326:2005 standard. Facing panels are responsible for transmitting normal stress and securing a particular facility against weather conditions. Stainless steel (1.4301) is also used for facings. Such construction of the panel makes it very light retaining its high capacity and rigidity at the same time and enables increasing the span of supports (purlins and girders).

The variety of facing profiles along with their wide colour scheme allows architects and users to shape the elevation of particular buildings retaining proportions between their aesthetic and functional values.

2. PRODUCTION TECHNOLOGY

The production of BALEX THERM sandwich panels is continuous and performed of 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. As a result the technological process of producing sandwich panels with polyurethane core consists in injection of mixed components forming rigid polyurethane foam between two continuously moving steel panels (with previously profiled longitudinal contacts and the main profile) and applying sealing strip and aluminium foil into the longitudinal panel contact at the same time. High quality and fixed repeatability of technical parameters has been achieved due to the application of top class materials and continuous control of production.

3. PANEL TYPES

We provide four types of BALEX THERM panels:

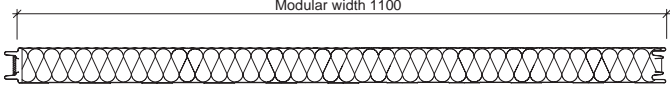
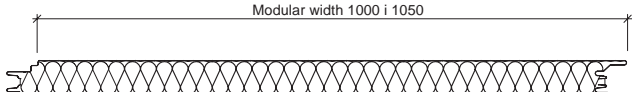
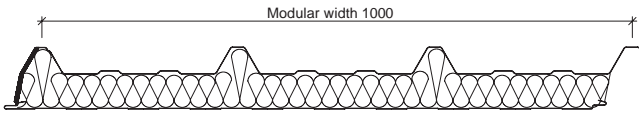
BALEX THERM ST – standard wall panel with modular width (so called ,covering width') 1100mm enables quick assembly and better usage of transport surface area for vehicles with the load width of 2.4m. Standard wall panel is fastened to the construction with the use of eyelet fasteners.

BALEX THERM PLUS – wall panel with concealed fastening, not visible from the elevation side with modular widths of 1050mm and 1000mm. The fastening concealed from the elevation side as well as other types of profiles: ,softline'(new), grooved and microprofiled make the panels attractive in terms of both architecture and functionality.

BALEX THERM D – roof panel (which can be applied as a wall panel) with the modular width of 1000mm and trapezoidal profile of the external surface guarantees high load-bearing capacity while transferring operational loads as well as during assembly.

BALEX THERM CH – innovative thermoinsulated sandwich panel for cold storage applications with the modular width of 1100 mm. Detailed information on this product is available in a separate technical catalogue.

Table 1. Types of BALEX THERM sandwich panels

Panel type	Panel thickness [mm]	Panel shape
1	2	3
BALEX THERM ST Standard wall panel with visible fasteners	40 50 60 80 100	
BALEX THERM PLUS 1000, 1050 wall panels with a concealed fasteners	60 80 100	
BALEX THERM D Roof panel	40/85 60/105 80/125 100/145	

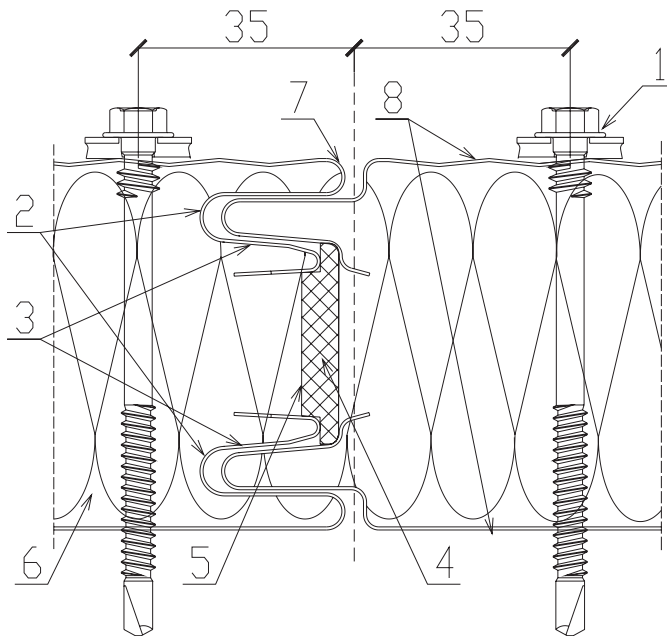
4. THE SCOPE OF PANEL APPLICATION

Sandwich panels are commonly used building material for light constructions of industrial halls, warehouses, sports and production halls, pavilions and commercial facilities, offices, social buildings, garages, workshops, administrative and public buildings, storehouses, freezers and cold stores (including food industry facilities). Wide colour palette and variety of profile shapes make it possible to realize many construction projects. The panel's construction enables fast and easy assembly regardless of weather conditions in both vertical and horizontal arrangement. BALEX THERM ST and PLUS wall panels can also be applied on self-supporting suspended ceilings. The designer guided by the destination of a particular facility, operating conditions, possible influence of the internal environment as well as weather conditions decides on the kind and the arrangement of sandwich panels. Taking low heat-transfer coefficient into account BALEX THERM sandwich panels seem to be a perfect choice for heated buildings' elevations offering a possibility of complex and quick completion of the construction project. BALEX THERM panels are designed for low and normal temperatures. Fixed temperature on the panel's surface should not exceed + 60°C.

5. BALEX THERM PANELS CONTACT TYPES

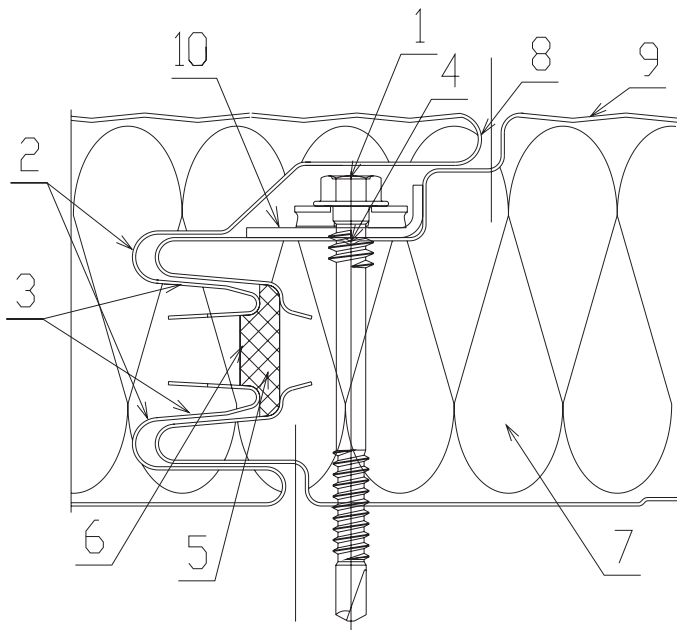
A new structural solution has been implemented in BALEX THERM sandwich panels. Unique shape of longitudinal joints with optimal proportion between the thickness of feather and the depth of the groove on both claddings on the internal and external side had considerable effect on increasing the fire resistance parameters of wall panels. This solution has been applied in both BALEX THERM PLUS AND BALEX THERM ST panels. The application of sealing strip laminated with high fire resistance material is an innovation in this field. The appropriate joint shape guarantees good thermal performance and leaktightness to rain waters, air and water vapour penetration. In the case of BALEX THERM D roof panel the lower cladding is factory-removed at one end of the panel together with the core as standard in order to facilitate joining panels lengthwise and the assembly of gutters.

6. BALEX THERM ST SANDWICH PANEL



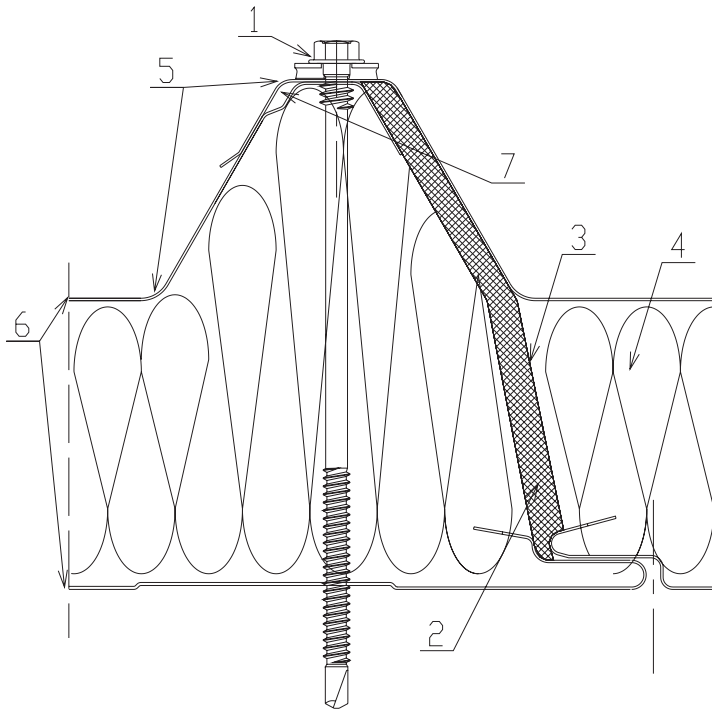
- 1) joint fasteners
- 2) Unique both sided form of the panel joint in the shape of a double lock increasing fire resistance to the level obtained by panels with a core made of mineral wool.
- 3) Conical inclination of the panel's internal joint surface facilitating assembly.
- 4) Continuous polyurethane sealing strip or polyurethane sealing strip laminated with aluminium foil and additionally covered with carbon fibre cloth (NOVELTY) applied in the production process, preventing water vapour penetration and retaining good thermal performance and increasing fire resistance.
- 5) Aluminium foil or aluminium foil laminated with high fire resistance material (NEW) preventing water vapour penetration and gas diffusion in order to maintain a fixed heat-transfer coefficient and increasing fire resistance.
- 6) A core made of rigid polyurethane foam produced on the basis of environmentally and ozone layer friendly technology with the lowest heat-transfer coefficient in comparison with other thermal insulation materials.
- 7) A technology of profiling the shape of metal claddings retaining the integrity and durability of protection coatings.
- 8) Wide range of external cladding profiles meeting stiff architectural requirements.

7. BALEXTHERM PLUS 1000, BALEXTHERM PLUS 1050 SANDWICH PANEL



- 1) Concealed fasteners masked with especially shaped tongue of the external panel's cladding.
- 2) Unique both sided form of the panel joint in the shape of a double lock increasing fire resistance to the level obtained by panels with a core made of mineral wool.
- 3) Conical inclination of the panel's internal joint surface facilitating assembly.
- 4) Longitudinal groove that facilitates the process of positioning joint fasteners.
- 5) Continuous polyurethane sealing strip or polyurethane sealing strip laminated with aluminium foil and additionally covered with carbon fibre cloth (NEW) applied in the production process, preventing water vapour penetration and retaining good thermal performance and increasing fire resistance.
- 6) Aluminium foil or aluminium foil laminated with high fire resistance material (NEW) preventing water vapour penetration and gas diffusion in order to maintain a fixed heat-transfer coefficient and increasing fire resistance.
- 7) A core made of rigid polyurethane foam produced on the basis of environmentally and ozone layer friendly technology with the lowest heat-transfer coefficient in comparison with other thermal insulation materials.
- 8) A technology of profiling the shape of metal claddings retaining the integrity and durability of protection coatings.
- 9) Wide range of external cladding profiles meeting stiff architectural requirements.
- 10) Steel LB 25, LB 30 washers in the panel lock increasing the joint's load-bearing capacity.

8. BALEX THERM D SANDWICH PANEL



- 1) joint fasteners .
- 2) Continuous polyurethane sealing strip additionally coated with aluminium foil, applied in the production process, preventing water vapour penetration and retaining good thermal performance..
- 3) Aluminium foil preventing water vapour penetration and gas diffusion in order to maintain a fixed heat-transfer coefficient.
- 4) A core made of rigid polyurethane foam produced on the basis of environmentally and ozone layer friendly technology with the lowest heat-transfer coefficient in comparison with other thermal insulation materials.
- 5) A technology of profiling the shape of metal claddings retaining the integrity and durability of protection coatings.
- 6) Trapezoidal profile of the external cladding increasing the load-bearing capacity of the roof panel.
- 7) chamber, capillary groove draining water.

9. BASIC TECHNICAL INFORMATION

Table 2. Technical information

Panel type	Cladding thickness [mm]				Panel thickness [mm]	Panel length L [mm]		Panel weight [kg/m ²]
	Standard		on request			min	max	
	EXT	INT	EXT	INT				
1	2	3	4		5	6	7	8
BALEXTHERM ST								
40					40			10,26
50	0,50	0,50	0,40 – 0,70		50	2,50	18,00	10,58
60					60			11,08
80					80			11,79
100					100			12,60
BALEXTHERM PLUS 1000								
60	0,50	0,50	0,40 – 0,70		60	2,50	18,00	11,38
80					80			12,11
100					100			12,91
BALEXTHERM PLUS 1050								
60	0,50	0,50	0,40 – 0,70		60	2,50	18,00	11,41
80					80			12,11
100					100			12,87
BALEXTHERM D								
40/85	0,50	0,50	0,50	0,40	40/85	2,50	18,00	10,84
60/105			- 0,70	- 0,70	60/105			11,65
80/125					80/125			12,45
100/145					100/145			13,26

Note: In the case of BALEXTHERM D roof panel thickness marking the first digit refers to the core's thickness and the second one to the total thickness of the panel

10. MATERIAL AND CLADDING COATINGS

10.1. Material

S220GD+Z275, S250GD+Z275, S280GD+Z275 STEEL (acc. to PN-EN 10326:2005)

- steel with increased parameters, galvanized on both sides and permanently secured with anti-corrosion coating
- metal sheet thickness: 0.40 – 0.63mm
- coated with organic and metallic coatings

STAINLESS STEEL (1.4301) (acc PN-EN10088-1:1998)

- 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.

10.2. Coatings

Standard offer

POLYESTER

- 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
- colour scheme according to the Balex Metal colour palette

POLYESTER MATT PEARL

- 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
- colour scheme according to the Balex Metal colour palette

Special orders offer:

PVDF

- coating thickness 25µm
- good resistance to corrosion and mechanical damage, exceptionally high colour endurance and resistance to fading (at a temperature of up to 110°C), can be formed easily and shows high hardness of surface that prevents dirt accumulation and loss of gloss
- especially recommended for outdoor applications (building's external wall claddings)
- colour scheme according to the Balex Metal colour palette

PCV(F) „food safe“

- coating thickness 120µm
- 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.

GALVANIZED STEEL

- coating thickness 20 µm
- metallic coating with basis weight of 275 g/m² on one side, (self-galvanization process, i.e. any scratches and edges are independently covered with zinc)
- double-sided coating, hot-applied on the metal sheet
- high resistance to corrosion and mechanical damage

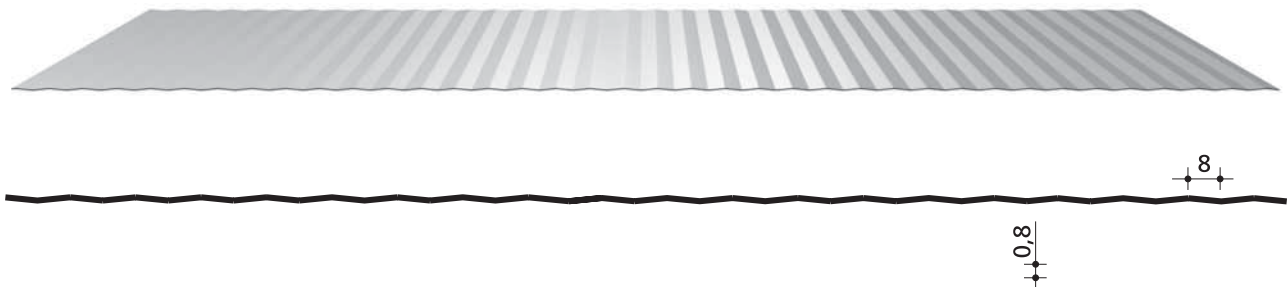
ALUCYNK + Easyfilm®

- metallic coating : 150 and 185 g/m² basis weight for each side of the sheet
- thickness of the coating - 20 µm (for 150 g/m²), 25 µm (for 185 g/m²)
- double-sided thermally applied coating in a continuous process, additionally protected with a thin organic coating SPT (Special Protection Treatment), Easyfilm® (environmentally friendly, thin organic layer which protects aluzinc coating against discoloration)
- resistance to higher temperatures, high corrosive resistance, excellent heat and light reflection, good abrasive resistance.

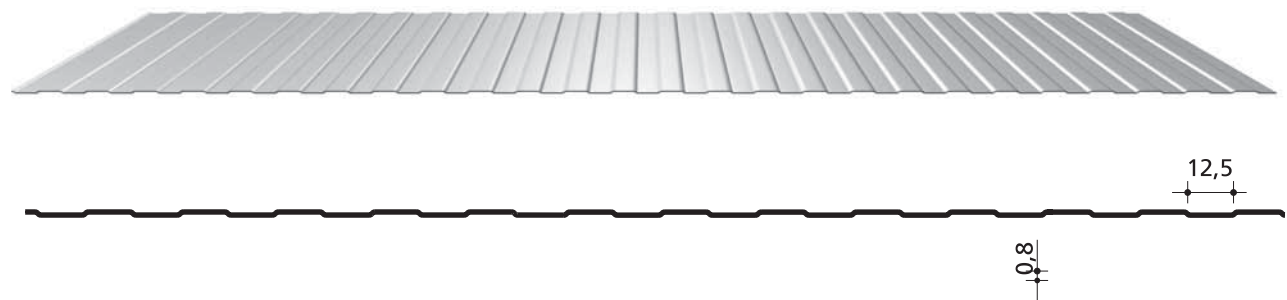
11. FACINGS PROFILING SCHEME

Sandwich panels with BALEX THERM polyurethane core are distinguished by wide variety of available profiles, especially in the case of external elevation facing. The ,softline' profile which is characterized by high aesthetic values of elevation is an innovation in this field. Profile types:

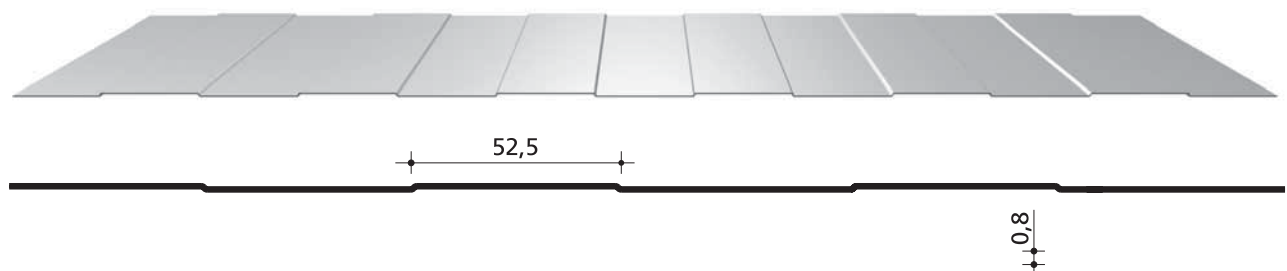
M = MICROPROFILED



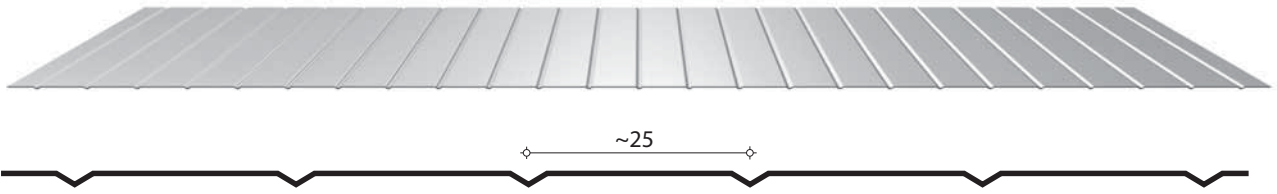
S = SOFTLINE



L = LINED



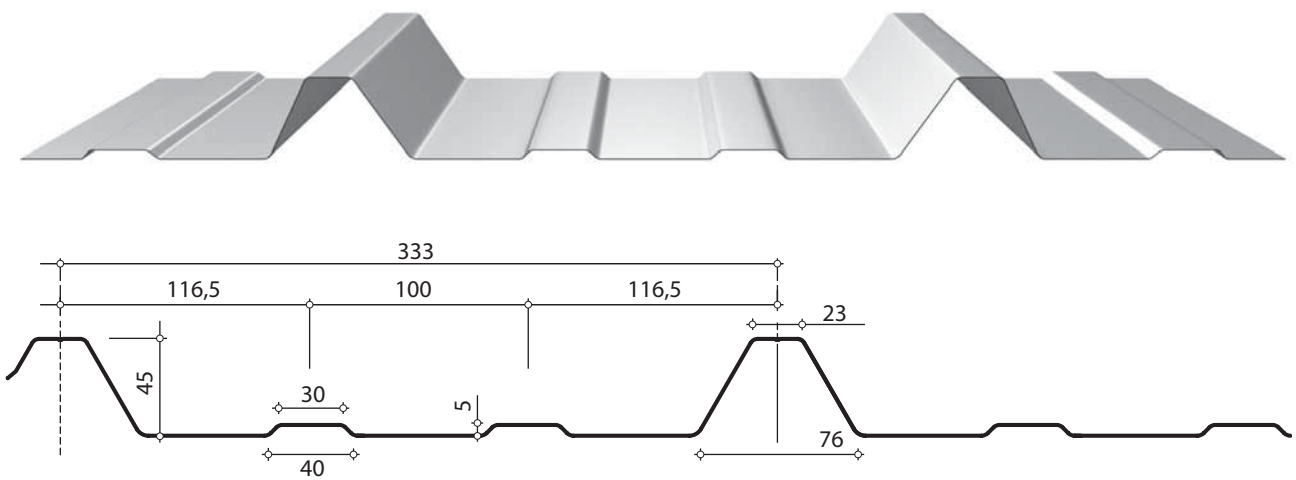
R = GROOVED



G = FLAT



T = TRAPEZOIDAL



12. PROFILE TYPE COMBINATIONS

The table below includes possible combinations of profile types of external and internal facings for individual panel types.

Table 3. Profile type combinations

Panel type	External facing						Internal facing	
	M	S	L	R	G	T	L	G
BALEXTHERM ST	●		●		●		●	●
BALEXTHERM PLUS 1000	●	●	●		●		●	●
BALEXTHERM PLUS 1050	●	●		●	●		●	●
BALEXTHERM D						●	●	●

13. SAMPLE MARKING OF BALEXTHERM PANELS

BALEXTHERM PLUS wall sandwich panel with a concealed joint:

BALEXTHERM PLUS 100.1050

zew. 0,50 SP 25 µm 9006 - M / wew. 0,50 SP 25 µm 9010 - L

BALEXTHERM | **PLUS** | **100** | **1050**
 Panel name | Type | Thickness | Modular width

Zew. **0,50** | **SP 25 µm** | **9006** - **M** / Wew. **0,50** | **SP 25 µm** | **9010** - **L**
 External facing | Metal sheet thickness | Coating type | Colour | Profile type | Internal facing | Metal sheet thickness | Coating type | Colour | Profile type

BALEXTHERM D wall sandwich panel:

BALEXTHERM D 40/85.1000 P/200

zew. 0,50 SP 25 µm 3016 - T / wew. 0,50 SP 25 µm 9010 - L

BALEXTHERM | **D** | **40/85** | **1000** | **P/200**
 Panel name | Panel type | Thickness | Modular width | Overlap length

Zew. **0,50** | **SP 25 µm** | **3016** - **T** / Wew. **0,50** | **SP 25 µm** | **9010** - **L**
 External facing | Metal sheet thickness | Coating type | Colour | Profile type | Internal facing | Metal sheet thickness | Coating type | Colour | Profile type

14. FACING COLOUR SCHEME

Colour scheme according to the Balex Metal colour palette

Organic coatings:

Polyester 25 µm :	9010,	9002,	9005,	9006,	9007,	3011,	3016,	5012,	8004,	8017,
	8012,	7024,	7035,	6005,	6011,	6020,	5010,	1015,	1017,	1003
Polyester MATT Pearl 35 µm	8637M,	8620M,	3301M,	7591M,	6490M,					

PVC(F) food safe 9010 – applied in BALEXTHERM ST panels

PVDF: colours to be set

Metallic coatings

Alucynk + easyfilm®	AZ 185 (25 µm)
STAINLESS STEEL	1.4301 of 2B surface finishing

15. STRENGTH ISSUES

According to the Directive of the Minister of Infrastructure of 12th April 2002 concerning technical conditions to be met by buildings and their location, the process of designing and making buildings' constructions and their elements must take the construction safety criterion into account. Chapter V entitled 'Construction safety § 204' includes a definition of safety of a building construction and its elements:

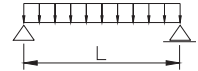
Building construction should meet conditions ensuring that capacity limits and usability limits in the case of all elements as well as the whole construction are not exceeded.

Capacity limits are considered exceeded if a construction constitutes a hazard to safety of the people in the building and in its surroundings as well as damages the equipment or stored property.

Usability limits are considered exceeded if the functional requirements concerning the construction are not satisfied.

1. Taking the above guidelines into consideration, the following assumptions were made in the process of designing the load-bearing capacity and rigidity tables for BALEXTHERM sandwich panel application:
 - a) the load-bearing capacity limit is considered exceeded if real load exceeds the acceptable breaking load whose value has been calculated by means of dividing the breaking load obtained in the carried out strength tests by 2.
 - b) the usability limit which means rigidity in the case of sandwich panels is considered exceeded if the deflection of wall and roof panels under short-term load exceeds 1/200 of the span spread and 1/100 of the span spread taking long-term load into consideration.
2. The scope of application of BALEXTHERM panels regarding load-bearing capacity and rigidity should be in accordance with the attached tables. The values of acceptable loads indicated in the tables take the following into account:
 - a) the influence of heat load caused by the difference of temperatures between the external and internal cladding ($t_{int} = 25^{\circ}\text{C}$ in summer and $t_{int} = 20^{\circ}\text{C}$ in winter). For calculating heat loads was made an assumption of temperature's difference $\Delta t = 50^{\circ}\text{C}$.
 - b) the influence of long-term loads (in the case of roof panels)
 - c) the most unfavourable load combination
 - d) the increase in deflection in case of load acting towards the support, in the case of fastening panels with the use of two fasteners widthways.
3. Maximum load values provided in the table should be compared with the following:
 - a) in the case of rigidity related loads (SGU) with characteristic loads
 - b) in the case of load-bearing capacity related loads (SGN) with design loads.
4. Maximum loads provided in the tables have been specified for panels in **light and very light colours**. In the case of dark colours acceptable load should be reduced.
5. The tables cover all types and combinations of profiles of both metal sheet claddings.
6. In order to establish acceptable loads for span spreads not included in the tables you can use interpolation.
7. The minimum in-between support width is 60mm and end supports width is 40mm.
8. In order to fasten sandwich panels you should use fasteners in accordance with the list in table 16.
9. The panel support span in edge zones should be reduced appropriately in relation to the value provided in the tables.
10. Given values in the field of loads going from the support can be applied if the element to which a panel is fastened is not less than 1.50mm thick.

Table 4. Single span system – maximum load of BALEXTERM ST panels in claddings 0.50 / 0.50 mm thick* in light and very light colours.



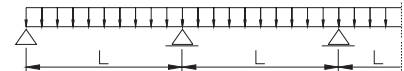
BALEXTERM ST	Core thickness	Load action direction	Condition	Maximum loads [kN/m ²] with span spread [m]															
				2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0	6,3	6,6
40	Towards the support	SGN (Q _s)	1,98	1,51	1,2														
		SGU (Q _s)	1,10	0,80	0,58														
		SGU (Q _s)	1,10	0,80	0,58														
50	Towards the support	SGN (Q _s)	2,50	1,91	1,51	1,22	1,01												
		SGU (Q _s)	1,66	1,24	0,93	0,71	0,55												
		SGU (Q _s)	1,66	1,24	0,93	0,71	0,55												
60	Towards the support	SGN (Q _s)	2,31	1,82	1,48	1,22	1,02	0,87	0,75										
		SGU (Q _s)	1,72	1,33	1,03	0,81	0,64	0,51	0,41										
		SGU (Q _s)	1,72	1,33	1,03	0,81	0,64	0,51	0,41										
80	Towards the support	SGN (Q _s)				1,98	1,64	1,38	1,18	1,02	0,88	0,78	0,69	0,62					
		SGU (Q _s)				1,76	1,42	1,16	0,95	0,78	0,65	0,54	0,45	0,38					
		SGU (Q _s)				1,76	1,42	1,16	0,95	0,78	0,65	0,54	0,45	0,38					
100	Towards the support	SGN (Q _s)				2,32	1,91	1,61	1,37	1,18	1,03	0,90	0,80	0,71	0,64	0,58	0,53	0,48	
		SGU (Q _s)				2,22	1,84	1,54	1,30	1,10	0,93	0,79	0,68	0,58	0,50	0,43	0,37	0,33	
		SGU (Q _s)				1,90	1,73	1,54	1,30	1,10	0,93	0,79	0,68	0,58	0,50	0,43	0,37	0,33	

Table 4.1. Single span system – maximum load of BALEXTERM ST panels in claddings 0.50 / 0.50 mm thick* in light and very light colours, Δt = 40°C.

BALEXTERM ST	Core thickness	Load with regard to	Maximum loads [kN/m ²] with span spread [m]															
			2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0		
80	80	load-bearing capacity	4,056	3,104	2,456	1,984	1,64	1,384	1,176	1,016	0,88	0,776	0,688	0,616	0,552	0,496		
		rigidity (L/100)	7,64	6,07	4,88	3,97	3,25	2,69	2,24	1,88	1,59	1,35	1,16	1,00	0,86	0,75		
		rigidity (L/200)	3,56	2,80	2,22	1,79	1,45	1,18	0,97	0,81	0,67	0,56	0,47	0,40	0,34	0,29		

max. force influencing the fastener at a pull-off-load (wind suction):
 90 daN – eyelet fastener with an aluminium washer of 19 mm in diameter
 100 daN – eyelet fastener with an aluminium washer of 19 mm in diameter

Table 5. Multi span system - maximum load of panels in claddings 0.50 / 0.50 mm thick in light and very light colours



BALEXTERM ST	Core thickness	Load action direction	Condition	Maximum loads [kN/m ²] with span spread [m]															
				2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0	6,3	6,6
40	Towards the support	SGN (Q _s)	2,22	1,52	1,10	0,84													
		SGU (Q _s)	1,69	1,37	1,12	0,93													
		SGU (Q _s)	1,36	1,19	1,06	0,93													
50	Towards the support	SGN (Q _s)	3,13	2,11	1,52	1,14	0,89												
		SGU (Q _s)	2,29	1,87	1,55	1,30	1,10												
		SGU (Q _s)	1,36	1,19	1,06	0,95	0,86												
60	Towards the support	SGN (Q _s)			2,08	1,55	1,20	0,96	0,78	0,65									
		SGU (Q _s)			2,00	1,69	1,44	1,23	1,06	0,92									
		SGU (Q _s)			1,06	0,95	0,86	0,79	0,73	0,68									
80	Towards the support	SGN (Q _s)				2,32	1,77	1,40	1,13	0,93	0,78	0,66	0,57						
		SGU (Q _s)				2,51	2,16	1,87	1,64	1,43	1,26	1,12	0,99						
		SGU (Q _s)				0,95	0,86	0,79	0,73	0,68	0,63	0,59	0,56						
100	Towards the support	SGN (Q _s)				3,62	2,70	2,09	1,66	1,35	1,12	0,94	0,80	0,69	0,60	0,53			
		SGU (Q _s)				2,80	2,44	2,14	1,89	1,68	1,50	1,35	1,21	1,09	0,99	0,90			
		SGU (Q _s)				0,95	0,86	0,79	0,73	0,68	0,63	0,59	0,56	0,53	0,50	0,48			

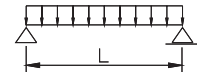
* Acceptable loads in the direction of load action from the support take fastening with the use of 3 fasteners (three eyelet fasteners with an aluminium or steel washer) on the panel width into consideration.
 In case of applying two fasteners (2 eyelet fasteners with an aluminium or steel washer) on the panel width, deflections are 30% higher than deflections in linear support (3 fasteners)

Table 5.1. Multi span system - maximum load of panels in claddings 0.50 / 0.50 mm thick in light and very light colours, $\Delta t = 40^{\circ}\text{C}$.

BALEXTHERM ST	Core thickness	Load with regard to	Maximum loads [kN/m ²] with span spread [m]													
			2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0
80		load-bearing capacity	5,30	4,57	3,38	2,53	1,96	1,56	1,27	1,06	0,90	0,77	0,67	0,58	0,52	0,46
		rigidity (L/100)	8,77	7,29	6,14	5,24	4,51	3,91	3,41	2,99	2,63	2,33	2,06	1,84	1,64	1,47
		rigidity (L/200)	4,21	3,50	2,94	2,50	2,15	1,86	1,62	1,42	1,24	1,10	0,97	0,86	0,77	0,69

max. force influencing the fastener at a pull-off-load (wind suction):
 90 daN – eyelet fastener with an aluminium washer of 19 mm in diameter
 100 daN – eyelet fastener with an aluminium washer of 19 mm in diameter

Table 6. Single span system - maximum load of panels in claddings 0.50 / 0.50 mm thick in light and very light colours



BALEXTHERM PLUS	Core thickness	Load action direction	Condition	Maximum loads [kN/m ²] with span spread [m]																		
				2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0	6,3	6,6			
60	towards the support	SGN (Q _s)				2,31	1,82	1,48	1,22	1,02	0,87	0,75	0,65	0,57	0,51	0,45	0,41	0,37				
		SGU (Q _s)				1,72	1,33	1,03	0,81	0,64	0,51	0,41	0,33	0,27	0,23	0,19	0,16	0,14				
		SGU (Q _d)				1,72	1,33	1,03	0,81	0,64	0,51	0,41	0,33	0,27	0,23	0,19	0,16	0,14				
80	towards the support	SGN (Q _s)						1,98	1,64	1,38	1,18	1,02	0,88	0,78	0,69	0,62	0,56	0,50	0,46	0,42		
	SGU (Q _s)							1,76	1,42	1,16	0,95	0,78	0,65	0,54	0,45	0,38	0,32	0,28	0,24	0,21		
	SGU (Q _d)							1,76	1,42	1,16	0,95	0,78	0,65	0,54	0,45	0,38	0,32	0,28	0,24	0,21		
100	towards the support	SGN (Q _s)								2,32	1,91	1,61	1,37	1,18	1,03	0,90	0,80	0,71	0,64	0,58	0,53	0,48
	SGU (Q _s)									2,22	1,84	1,54	1,30	1,10	0,93	0,79	0,68	0,58	0,50	0,43	0,37	0,33
	SGU (Q _d)									2,00	1,82	1,54	1,30	1,10	0,93	0,79	0,68	0,58	0,50	0,43	0,37	0,33

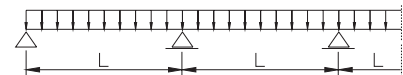
Fastening panels with the use of the eyelet fastener with a longitudinal steel washer

Table 6.1. Single span system – maximum load of BALEXTHERM PLUS panels in claddings 0.50 / 0.50 mm thick* in light and very light colours, $\Delta t = 40^{\circ}\text{C}$.

BALEXTHERM PLUS	Core thickness	Load with regard to	Maximum loads [kN/m ²] with span spread [m]													
			2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0
80		load-bearing capacity	4,056	3,104	2,456	1,984	1,64	1,384	1,176	1,016	0,88	0,776	0,688	0,616	0,552	0,496
		rigidity (L/100)	7,64	6,07	4,88	3,97	3,25	2,69	2,24	1,88	1,59	1,35	1,16	1,00	0,86	0,75
		rigidity (L/200)	3,56	2,80	2,22	1,79	1,45	1,18	0,97	0,81	0,67	0,56	0,47	0,40	0,34	0,29

max. force influencing the fastener at a pull-off-load (wind suction):
 90 daN – eyelet fastener with an aluminium washer of 19 mm in diameter
 100 daN – eyelet fastener with an aluminium washer of 19 mm in diameter

Table 7. Multi span system - maximum load of BALEXTHERM PLUS panels in claddings 0.50 / 0.50 mm thick* in light and very light colours.



BALEXTHERM PLUS	Core thickness	Load action direction	Condition	Maximum loads [kN/m ²] with span spread [m]																			
				2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0	6,3	6,6				
60	towards the support	SGN (Q _s)																					
		SGU (Q _s)																					
		SGU (Q _d)																					
80	towards the support	SGN (Q _s)																					
	SGU (Q _s)																						
	SGU (Q _d)																						
100	towards the support	SGN (Q _s)																					
	SGU (Q _s)																						
	SGU (Q _d)																						

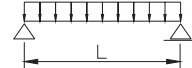
Fastening panels with the use of the eyelet fastener with a longitudinal steel washer

Table 7.1. Multi span system - maximum load of panels in claddings 0.50 / 0.50 thick in light and very light colours, $\Delta t = 40^{\circ}\text{C}$.

BALEXTHERM PLUS	Core thickness	Load with regard to	Maximum loads [kN/m ²] with span spread [m]													
			2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0
80		load-bearing capacity	5,30	4,57	3,38	2,53	1,96	1,56	1,27	1,06	0,90	0,77	0,67	0,58	0,52	0,46
		rigidity (L/100)	8,77	7,29	6,14	5,24	4,51	3,91	3,41	2,99	2,63	2,33	2,06	1,84	1,64	1,47
		rigidity (L/200)	4,21	3,50	2,94	2,50	2,15	1,86	1,62	1,42	1,24	1,10	0,97	0,86	0,77	0,69

*max. force influencing the fastening at a pull-off-load (wind suction):
300 daN – 2 fasteners and the aluminium washer 1.5 mm thick which distributes the load*

Table 8. Single span system - maximum load of BALEXTHERM D panels in claddings with external thickness of 0.50 mm and internal 0.40 mm, in light and very light colours

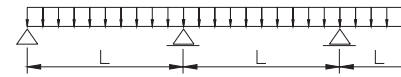


BALEXTHERM D	Core thickness	Load action direction	Condition	Maximum loads [kN/m ²] with span spread [m]															
				2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0	6,3	6,6
40/85		Towards the support	SGN (Q _s)	2,02	1,77	1,57	1,42	1,29	1,18	1,01									
		Towards the support	SGU (Q _s)	1,74	1,40	1,15	0,95	0,80	0,66	0,56									
		upwards the support	SGU (Q _s) 2 al.	0,95	0,83	0,74	0,67	0,61	0,56	0,51									
			SGU (Q _s) 2 st.	1,43	1,25	1,11	0,95	0,80	0,66	0,56									
60/105		Towards the support	SGN (Q _s)		2,49	2,21	1,99	1,81	1,66	1,53	1,40	1,22	1,07						
		Towards the support	SGU (Q _s)		2,40	1,99	1,66	1,40	1,19	1,01	0,88	0,75	0,65						
		upwards the support	SGU (Q _s) 2 al.		0,83	0,74	0,67	0,61	0,56	0,51	0,48	0,44	0,42						
			SGU (Q _s) 2 st.		1,25	1,11	1,00	0,91	0,83	0,77	0,71	0,67	0,63						
80/125		Towards the support	SGN (Q _s)			2,85	2,57	2,34	2,14	1,98	1,86	1,70	1,50	1,33	1,18	1,06			
		Towards the support	SGU (Q _s)			2,93	2,46	2,10	1,80	1,54	1,34	1,16	1,01	0,89	0,79	0,70			
		upwards the support	SGU (Q _s) 2 al.			0,74	0,67	0,61	0,56	0,51	0,48	0,44	0,42	0,39	0,37	0,35			
			SGU (Q _s) 2 st.			1,11	1,00	0,91	0,83	0,77	0,71	0,67	0,63	0,59	0,56	0,53			
100/145		Towards the support	SGN (Q _s)				3,14	2,86	2,62	2,42	2,25	2,10	1,94	1,72	1,54	1,38	1,24	1,13	1,02
		Towards the support	SGU (Q _s)				2,85	2,46	2,14	1,86	1,64	1,44	1,28	1,13	1,00	0,90	0,80	0,73	0,65
		upwards the support	SGU (Q _s) 2 al.				0,67	0,61	0,56	0,51	0,48	0,44	0,42	0,39	0,37	0,35	0,33	0,32	0,30
			SGU (Q _s) 2 st.				1,00	0,91	0,83	0,77	0,71	0,67	0,63	0,59	0,56	0,53	0,50	0,48	0,45

2 al. – 2 eyelet fasteners with an aluminium washer

2 st. – 2 eyelet fasteners with a steel washer

Table 9. Multi span system - maximum load of BALEX THERM D panels in claddings with external thickness of 0.50 mm and internal 0.40 mm, in light and very light colours



BALEX THERM D	Core thickness	Load action direction	Condition	Maximum loads [kN/m ²] with span spread [m]															
				2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	4,5	4,8	5,1	5,4	5,7	6,0	6,3	6,6
40/85	Towards the support	upwards the support	SGN (Q)	2,20	1,64	1,20	0,92	0,73	0,59	0,49	0,41	0,35	0,30						
			SGU (Q)	1,80	1,50	1,26	1,08	0,93	0,80	0,70	0,61	0,54	0,48						
	Towards the support	upwards the support	SGU (Q) 2 al.	0,48	0,42	0,37	0,33	0,30	0,28	0,26	0,24	0,22	0,21						
			SGU (Q) 2 st.	0,71	0,63	0,56	0,50	0,45	0,42	0,38	0,36	0,33	0,31						
60/105	Towards the support	upwards the support	SGN (Q)		2,70	2,07	1,57	1,23	0,99	0,82	0,68	0,58	0,50	0,44	0,38	0,34	0,30		
			SGU (Q)		2,51	2,13	1,83	1,58	1,38	1,21	1,06	0,95	0,84	0,75	0,68	0,60	0,55		
	Towards the support	upwards the support	SGU (Q) 2 al.		0,42	0,37	0,33	0,30	0,28	0,26	0,24	0,22	0,21	0,20	0,19	0,18	0,17		
			SGU (Q) 2 st.		0,63	0,56	0,50	0,45	0,42	0,38	0,36	0,33	0,31	0,29	0,28	0,26	0,25		
80/125	Towards the support	upwards the support	SGN (Q)			3,08	2,32	1,81	1,45	1,18	0,99	0,84	0,72	0,63	0,55	0,49	0,43	0,39	0,35
			SGU (Q)			3,09	2,66	2,31	2,03	1,78	1,59	1,41	1,26	1,13	1,01	0,91	0,84	0,75	0,69
	Towards the support	upwards the support	SGU (Q) 2 al.			0,37	0,33	0,30	0,28	0,26	0,24	0,22	0,21	0,20	0,19	0,18	0,17	0,16	0,15
			SGU (Q) 2 st.			0,56	0,50	0,45	0,42	0,38	0,36	0,33	0,31	0,29	0,28	0,26	0,25	0,24	0,23
100/145	Towards the support	upwards the support	SGN (Q)				3,20	2,46	1,94	1,57	1,30	1,09	0,93	0,80	0,70	0,62	0,55	0,49	0,44
			SGU (Q)				2,96	2,60	2,29	2,04	1,83	1,64	1,48	1,34	1,21	1,11	1,01	0,93	0,85
	Towards the support	upwards the support	SGU (Q) 2 al.				0,33	0,30	0,28	0,26	0,24	0,22	0,21	0,20	0,19	0,18	0,17	0,16	0,15
			SGU (Q) 2 st.				0,50	0,45	0,42	0,38	0,36	0,33	0,31	0,29	0,28	0,26	0,25	0,24	0,23

2 al. - 2 eyelet joints with aluminium washers

2 st. - 2 eyelet joints with steel washers

* Acceptable loads in the direction of load action from the support take fastening with the use of 3 fasteners (three eyelet fasteners with an aluminium or steel washer) on the panel width into consideration.

In case of applying two fasteners (2 eyelet fasteners with an aluminium or steel washer) on the panel width, deflections are 30% higher than deflections in linear support (3 fasteners)

The tables also include acceptable values of loads and sandwich panel spread in the case of loads acting from the support (wind suction, heat load in summer). In such a case panels are only supported on fasteners and panel load-bearing capacity depends on the load-bearing capacity of applied type of fastening (fastener washer size and material, cladding thickness). In order to make it easier for designers to perform calculations e.g. adjusting the number of fasteners, especially in edge zones acceptable single fastener loads depending on the size and type of the eyelet fastener washer as well as sandwich panel type have been provided.

Table 10. Acceptable loads of a single fastener

Panel type	Fastener washer dimensions and material type	Single fastener load-bearing capacity (kN)
BALEX THERM ST	Ø19 mm / aluminium	0,95
BALEX THERM ST	Ø19 mm / steel	1,00
BALEX THERM PLUS	LB 25 or LB 30 system steel washer	3,00
BALEX THERM D	Ø19mm / aluminium	1,00
BALEX THERM D	Ø19 mm / steel	1,50

16. THERMAL PERFORMANCE

BALEXTHERM ST and BALEXTHERM PLUS wall sandwich panels and BALEXTHERM D roof 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 thermal conductivity coefficient of polyurethane foam forming the panel's insulating core and the partition heat-transfer coefficient proved high the quality as well as high replicability of BALEXTHERM panel parameters achieved due to the application of top class materials and continuous control of all production stages.

The design thermal conductivity coefficient (used for designing purposes and corresponding to the conditions of material application) reaches $\lambda_{obl} = 0.023$ W/mK in relation to the average partition's temperature of 10°C and the same value of $\lambda_{obl} = 0.023$ W/mK has been assumed as a declared value of heat-transfer coefficient (used for controlling the production quality and corresponding to laboratory conditions) at the temperature of 10°C.

Calculation of values of heat-transfer coefficients U_c was carried out taking linear thermal bridges occurring in the panels' joints as well as spot thermal bridges occurring in the place of fastening panels to the load-bearing structure with the use of fasteners into consideration.

The values of heat-transfer coefficients U_c of a partition made of BALEXTHERM wall and roof panels are provided in the table below.

Table 11. The values of U_c partition's heat-transfer coefficient

Panel type	Core thickness [mm]	U_c [W/m ² K]
BALEXTHERM ST	40	0,55
	50	0,44
	60	0,37
	80	0,28
	100	0,22
BALEXTHERM PLUS 1000	60	0,38
	80	0,28
	100	0,23
BALEXTHERM PLUS 1050	60	0,38
	80	0,28
	100	0,23
BALEXTHERM D	40/85	0,50
	60/105	0,35
	80/125	0,27
	100/145	0,22

The scope of application of BALEXTHERM wall and roof sandwich panels has been settled on the basis of tests and calculations as well as the requirements included in the Directive of the Minister of Infrastructure of 12th April 2002 concerning technical conditions to be met by buildings and their location (J. of L. No 75/2002, item 690).

BALEXTHERM wall panels with core thickness of 50, 60, 80 and 100mm are distinguished by thermal performance enabling their application as solid external walls and walls with openings in public and industrial buildings with rooms with design temperature of $t_i > 16^\circ\text{C}$

BALEXTHERM wall panels with core thickness of 40mm is distinguished by thermal performance enabling its application as an external wall panel with openings in public and industrial buildings with rooms with design temperature of $8^{\circ}\text{C} < t_i < 16^{\circ}\text{C}$.

BALEXTHERM PLUS wall panels with core thickness of 60, 80 and 100mm are distinguished by thermal performance enabling their application as solid external walls and walls with openings in public and industrial buildings with rooms with design temperature of $t_i > 16^{\circ}\text{C}$.

BALEXTHERM D roof panels with core thickness of 80/125 mm, 100/145 mm are distinguished by thermal performance enabling their application as roof panels in public and industrial buildings with rooms with design temperature of $t_i > 16^{\circ}\text{C}$.

BALEXTHERM D roof panels with core thickness of 40/85 mm, 60/105 mm are distinguished by thermal performance enabling their application as roof panels in public, industrial and farm buildings with rooms with design temperature of $8^{\circ}\text{C} < t_i < 16^{\circ}\text{C}$.

17. FIRE SAFETY

As building components of determined fire resistance class, BALEXTHERM sandwich panels with polyurethane core must meet the fire safety and suppression requirements set out in the Resolution of the Minister of Infrastructure of 12 April 2002 on required technical conditions of buildings and their location (J. of L. No 75 item 690, 2002, with further amendments).

In accordance with § 216 and §272 external walls and roofs of buildings are subject to fire safety classifications in the following fields:

- fire resistance
- fire spreading level.

On the basis of reports from tests Department of Fire Research of Building Research Institute in Warsaw has prepared the above mentioned classifications for the following products:

- fire resistance of non-carrying walls made of BALEXTHERM ST and BALEXTHERM PLUS sandwich panels with polyurethane core
- fire resistance of roofs made of BALEXTHERM D panels with rigid polyurethane foam core
- fire spreading through walls with fire operating from the outside and inside (BALEXTHERM ST and PLUS),
- roof fire resistance to outside fire (BALEXTHERM D).

On the next pages we present a fire resistance classification prepared by Building Research Institute in Warsaw.

Table 12. Fire resistance classification of BALEX THERM ST and BALEX THERM PLUS sandwich panels

SCREENING WALL PANEL TYPE	FIRE RESISTANCE According to PN 13501-2:2003 PN-EN 1364-2:2002 PN-B-02851-1:1997		FIRE SPREADING THROUGH WALLS WITH FIRE OPERATING FROM THE OUTSIDE AND INSIDE According to PN-90/B-02867 and PN-EN 02872:1996	HEAT RADIATION INTENSITY According to EN 13501-2:2003	
	A joint with a soft polyurethane gasket	A joint with a soft polyurethane gasket covered with carbon fibre cloth	Joints with two kinds of gaskets	A joint with a soft polyurethane gasket	A joint with a soft polyurethane gasket covered with carbon fibre cloth
BALEX THERM ST WALL PANEL Thickness [mm]					
40	Not tested	Not tested	Not spreading fire - NRO	Not tested	Not tested
50	Not tested	Not tested	Not spreading fire - NRO	Not tested	Not tested
60	Not tested	E 60	Not spreading fire - NRO	Not tested	W 30
80	E 60	E 60	Not spreading fire - NRO	W 30	W 30
	EI 15 ^{a)}	EI 15 ^{a)}	Not spreading fire - NRO	W 30	W 30
100	E 60	E 60	Not spreading fire - NRO	W 30	W 30
	EI 15 ^{a)}	EI 15 ^{a)}	Not spreading fire - NRO	W 30	W 30
BALEX THERM PLUS WALL PANEL Thickness [mm]					
60	Not tested	E 30	Not spreading fire - NRO	Not tested	W 30
80	E 30	E 30	Not spreading fire - NRO	W 30	W 30
	EI 15 ^{b)}	EI 15 ^{b)}	Not spreading fire - NRO	W 30	W 30
100	E 30	E 30	Not spreading fire - NRO	W 30	W 30
	EI 15 ^{b)}	EI 15 ^{b)}	Not spreading fire - NRO	W 30	W 30

^{a)} on condition that Ø5.5x25 screws are applied every 300mm on the panel joint on both sides

^{b)} on condition that Ø5.50x25 screws are applied every 300mm on the inner side of the panel joint.

REMARKS:

- '1 E60 fire resistance class means that the fire integrity criteria of covering made of BALEX THERM ST panels with soft polyurethane gasket in the joint, covered with carbon fibre cloth (in the case of thickness of 60, 80 and 100mm) is kept for a minimum 60 minutes.*
- '2 E30 fire resistance class means, that the fire integrity criteria of covering made of BALEX THERM PLUS panels with soft polyurethane gasket in the joint, covered with carbon fibre cloth (in the case of thickness of 60, 80 and 100mm) is kept for a minimum 30 minutes.*
- '3 EI15 fire resistance class means, that the fire integrity criteria of covering made of BALEX THERM ST panels (in the case of thickness of 80 and 100mm) is kept for a minimum 15 minutes.*
- '4 Fire resistance of the BALEX THERM ST panel load-bearing structure should correspond to the R60 fire resistance class, the maximum span of transoms of load-bearing structure – 300mm.*
- '5 Fire resistance of the BALEX THERM PLUS panel load-bearing structure should correspond to the R30 fire resistance class, the maximum span of transoms of load-bearing structure – 400mm.*
- '6 The classification covers panels with all protective coatings including: SP, HDP, HPS200, PVC(F), PVD(F).*
- '7 W30 fire resistance class means that on the not heated panel side the heat radiation intensity did not exceed the value of 15 kW/m² in 30 minutes.*

It is possible to draw the following conclusions from the tables:

- BALEX THERM ST wall panels classifies as not spreading fire and included in the E60 fire resistance class according to §216 and §272 of the Decree mentioned at the beginning meet requirements concerning external walls in buildings with ,B', ,C', ,D' and ,E' fire resistance classes (excluding the inter-storey zone)

- BALEX THERM PLUS wall panels classifies as not spreading fire and included in the E30 fire resistance class according to §216 and §272 of the Decree mentioned at the beginning meet requirements concerning external walls in buildings with ,C', ,D' and ,E' fire resistance classes (excluding the inter-storey zone)

Table 13. BALEX THERM D sandwich panel fire resistance class

ROOF PANEL TYPE	FIRE RESISTANCE CLASS according to EN 13501-2:2003 PN-EN 1365-2:2002 PN-B-02851-1:1997	FIRE RESISTANCE CLASS according to PN-EN 13501-2:2005	ROOF RESISTANCE TO EXTERNAL FIRE according to PN-B-02872:1996
BALEX THERM D 40/85	Not spreading fire - NRO	-	B _{ROOF} (T _f)
BALEX THERM D 60/105	Not spreading fire - NRO	-	B _{ROOF} (T _f)
BALEX THERM D 80/125	Not spreading fire - NRO	REI 20 / RE 60	B _{ROOF} (T _f)
BALEX THERM D 100/145	Not spreading fire - NRO	REI 20 / RE 60	B _{ROOF} (T _f)

¹ REI 20 classification means that the bearing, the fire integrity and insulation criteria of roof covering made of BALEX THERM D panels (in the case of thickness of 80 and 100mm) is kept in 20 minutes when the fire resistance class of the load-bearing structure is not less than R20, the spacing of bearing elements (purlins) is not bigger than 240 cm, with evenly distributed load not bigger than 0.24kN/m² (the load from snow was taken as 0.2 Sk where characteristic load has been assumed as 1.2kN/m² as for snow zone III according to PN-EN 1991-1-1:2005).

² RE 60 classification means that the bearing and the fire integrity criteria of roof covering made of BALEX THERM D panels (in the case of thickness of 80 and 100mm) is kept in 60 minutes when the fire resistance class of the load-bearing structure is not less than R60, the spacing of bearing elements (purlins) is not bigger than 240 cm, with evenly distributed load not bigger than 0.24kN/m² (where the load from snow was taken as 0.2 Sk where characteristic load has been assumed as 1.2kN/m² as for snow zone III according to PN-EN 1991-1-1:2005).

BALEX THERM D panels classifies as fire resistant, not spreading fire and included in the RE 60 fire resistance class according to §216, passage 1 of the Decree, with all currently planned amendments, mentioned at the beginning, meet fire resistance requirements concerning roof coverings supported by a load-bearing structure of appropriate fire resistance class for all building fire resistance classes.

Building's fire resistance class	Building elements' fire resistance class	
	Roof construction	Roof covering
„A”	R 30	RE 30
„B”	R 30	RE 30
„C”	R 15	RE 15
„D”	-	-
„E”	-	-

18. CORROSION RESISTANCE

On the basis of tests carried out in the Building Research Institute in Warsaw in the Department of Durability and Protection of Building Coatings it has been stated that BALEX THERM sandwich panels with a polyurethane core meet the requirements of PN-EN ISO 12944-2 in the range of C1 to C3 class.

BALEX THERM panels with claddings covered with a zinc layer (Z275) and SP 25 or SP 35 organic coats or PDF 25 or HPS 200 or PCV (F) 120 on the front face side can be applied in environments with C1, C2 and C3 corrosion class, in the case of SP 15 coating on the face side in C1 and C2 environment according to the PN-EN ISO 12944-2 standard.

BALEXTHERM panels with claddings protected with AZ185 aluminium and zinc coating can be used in C1, C2 and C3 corrosion class environments according to the PN-EN ISO 12944-2 standard.

BALEXTHERM panels with claddings protected with a zinc coating on the face side $137,5 \text{ g/m}^2$ + one of the SP25, SP35, PVDF 25 or PCV(F)120 coatings on the opposite side 50 g/m^2 + an organic coating $\geq 6\mu\text{m}$ thick can be used in environments with C1, C2 and C3 corrosion class, in the case of SP 15 coating on the face side in C1 and C2 corrosion class environments according to the EN ISO 12944-2 standard.

BALEXTHERM panels with facings made of stainless steel can be used in C1, C2 and C3 corrosion class environments according to the EN ISO 12944-2 standard.

Corrosion classes and examples of typical environments according to the EN ISO 12944-2 standard.

C1 corrosion class

- indoors – heated buildings with a clean atmosphere e.g. offices, shops, schools and hotels.

C2 corrosion class

- outdoors – slightly polluted atmosphere, mainly countryside

- indoors – not heated buildings with a possibility of condensation e.g. warehouses, sports halls.

C3 corrosion class

- outdoors – urban and industrial atmospheres, medium pollution with sulphur oxide (IV), coastal area with low salinity

- indoors – production rooms with high humidity and certain level of air pollution e.g. food industrial facilities, laundries, breweries, dairies.

19. NOISE REDUCTION PERFORMANCE

BALEXTHERM sandwich panels regardless of their type (wall and roof) as well as the core thickness range from 40 to 100mm are distinguished by the following sound reduction indexes:

$$R_w \geq 25 \text{ dB} \quad R_{A1} \geq 23 \text{ dB} \quad R_{A2} \geq 21 \text{ dB}$$

R_w - weighted specific sound reduction / insulation index,

R_{A1} - specific sound insulation rating index (specified in relation to noise with 'flat' spectrum),

R_{A2} - specific sound insulation rating index (specified in relation to noise with 'low-frequency' spectrum).

Requirements concerning noise reduction performance of partitions in construction industry are determined by the PN-B-02151-3:1999 standard. For cases not covered by the standard and especially in industrial buildings the requirements regarding enclosures and internal partitions should be settled individually.

Taking the acoustic properties of BALEXTHERM sandwich panels (specified above with the mentioned indexes) into consideration it can be assumed that BALEXTHERM sandwich panels from the acoustic point of view can be applied in the following kinds of buildings:

- walls and roofs of industrial and sports halls, production and warehousing facilities, for constructing commercial, service and gastronomic pavilions, construction site back-up facilities, administration and social buildings if the requirements concerning sound insulation appropriate for a specific partition do not exceed the ones specified above or meet individually settled acoustic requirements.

- for construction of buildings that do not have to meet any acoustic requirements

20. FASTENERS

BALEXTHERM sandwich panels are fastened to a steel construction with the use of self-drilling fasteners. Due to that it is possible to avoid initial drilling of holes in the panel and the construction. Moreover self-drilling fasteners increase the quality of the fastening and limit the number of used tools. In the case of self-drilling fasteners a new drilling bit is used as the fastener is used for use once only, which influences the fastening durability.

Self-drilling fasteners are used for fastening sandwich panels to a steel structure with maximum side thickness of 12mm. Fasteners are made of hardened carbon steel with anti-corrosion protective coating. All fasteners are equipped with washers with cured EPDM. The application of EPDM increases the rigidity and tightness of the joint.

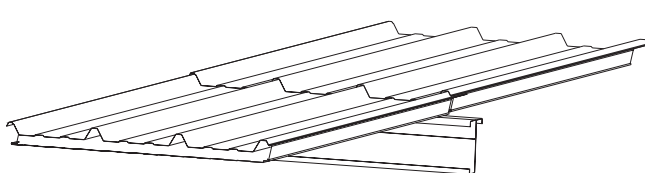
Table 14. BALEX THERM ST, PLUS and D sandwich panel fasteners

Panel type and thickness in mm		BALEX THERM ST					BALEX THERM PLUS 1000 & 1050		
Fastener type	Support side thickness (mm)	40	50	60	80	100	60	80	100
LB 1	1,50-5,00	LB 1A	LB 1B	LB 1C	LB 1D	LB 1E	LB 1F	LB 1G	LB 1H
LB 2	3,00-12,00	LB 2A	LB 2B	LB 2C	LB 2D	LB 2E	LB 2F	LB 2G	LB 2H
LB 3	> 12	Individually adjusted to a particular order							
LB 4	Concrete	LB 4A	LB 4B	LB 4C	LB 4D	LB 4E	LB 4F	LB 4G	LB 4H
LB 5	timber	Individually adjusted to a particular order							
LB 6		A fastener for fastening flashings							
Stainless steel LB 7	1,50-5,00	Individually adjusted to a particular order							
Stainless steel LB 8	3,00-12,00	Individually adjusted to a particular order							
Stainless steel LB 9	> 12,00	Individually adjusted to a particular order							
Stainless steel LB 10	Concrete brick base	Individually adjusted to a particular order							
LB 25		A steel washer under BALEX THERM PLUS panel fastener with 25mm hole span							
LB 30		A steel washer under BALEX THERM PLUS panel fastener with 30mm hole span							

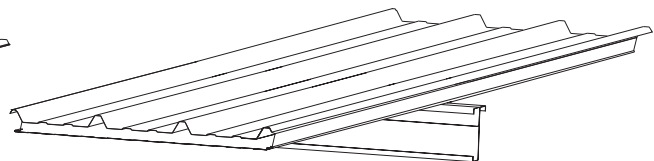
Panel type and thickness in mm		BALEX THERM D							
Fastener type	Support side thickness (mm)	40/85		60/105		80/125		100/145	
		top of the sinusoid	bottom of the sinusoid	top of the sinusoid	bottom of the sinusoid	top of the sinusoid	bottom of the sinusoid	top of the sinusoid	bottom of the sinusoid
LB 1	1,50-5,00	LB 1J	LB 1K	LB 1L	LB 1M	LB 1N	LB 1O	LB 1P	LB 1R
LB 2	3,00-12,00	LB 2J	LB 2K	LB 2L	LB 2M	LB 2N	LB 2O	LB 2P	LB 2R
LB 3	> 12	Individually adjusted to a particular order							
LB 4	Concrete base	LB 4J	LB 4K	LB 4L	LB 4M	LB 4N	LB 4O	LB 4P	LB 4R
LB 5	Wooden base	Individually adjusted to a particular order							
LB 6		A fastener for fastening flashings							
Stainless steel LB 7	1,50-5,00	Individually adjusted to a particular order							
Stainless steel LB 8	3,00-12,00	Individually adjusted to a particular order							
Stainless steel LB 9	> 12,00	Individually adjusted to a particular order							
Stainless steel LB 10	Concrete brick base	Individually adjusted to a particular order							

21. FASTENING ROOF PANELS LENGTHWISE

Recommended roof pitch for BALEX THERM D roof panels is:

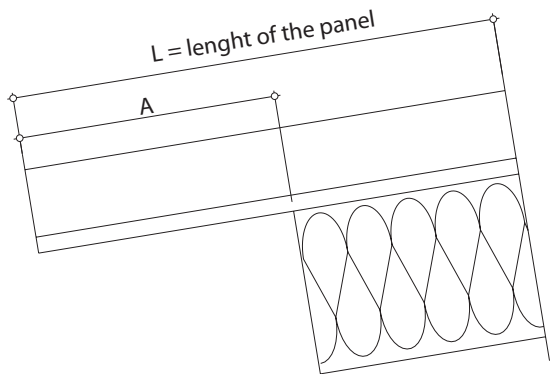


>7 % - for panels joined lengthwise or with roof skylights



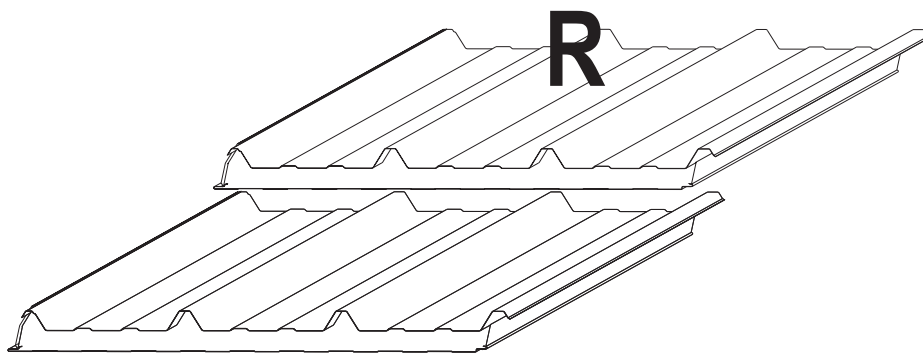
> 5% - for continuous panels without roof skylights

BALEXTHERM D panels have endings formed at the production stage that facilitate gutter assembly next to the eaves or joining panels lengthwise.



- A
- standard 50mm next to the eaves
 - standard 150mm next to the overlap
 - max. 200mm next to the overlap
 - min. 10mm without any overlap

BALEXTHERM D roof panel is produced as a Right option only:



22. ROOFLIGHTS

'LEXAN Thermorooft' polycarbonate rooflight is a unique thermoplastic engineering solution combining high mechanical, aesthetic and thermal qualities.

Multi-chamber extruded sheet, including the overlap and in-between sinusoid tops is visually adjusted as a rooflight for BALEXTHERM D insulated polyurethane sandwich panels. "LEXAN Thermorooft" rooflight is an impact-resistant insulating material adjusted to the specification and shape of roof panels.

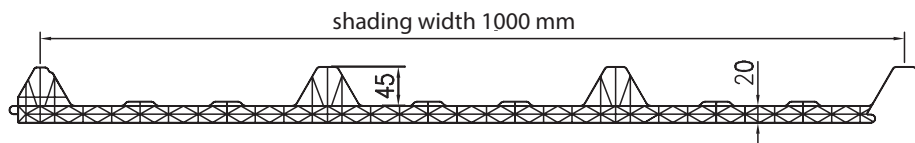


Table 15. Properties of 'LEXAN Thermorooft' polycarbonate rooflight

Parameter	Value
Material	Plastically shaped multi-wall polycarbonate with a UV-protection layer
Width	1000 (± 3 mm)
Length	2.60 – 13.60 m (every 0.50 m)
Thickness	20 mm + top of sinusoid 45mm
Weight	3,30 kg/m ² ±5%
Resistance to temperatures	between - 40°C and +100°C
Heat transfer coefficient	U = 1.90 W/m ² K ISO 12567-1
Noise reduction performance	22 dB DIN 52210-75
Coefficient of linear thermal expansion	7 x 10 ⁻⁵ 1/C
Light transmittance	55% ±5% ASTM D1003
Sunlight transmittance	76% ±5% DIN 67507, shading width: 1000 mm

Table 16. Dew point in °C in relation to air temperature

Temperature at which there is a risk of water vapour condensation on the inner side of the rooflight

Air temperature in °C	Dew point in °C in relation to air humidity													
	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
30	10,5	12,9	14,9	16,8	18,4	20,0	21,4	22,7	23,9	25,1	26,2	27,2	28,2	29,1
29	9,7	12,0	14,0	15,9	17,5	19,0	20,3	21,7	23,0	24,1	25,2	26,2	27,2	28,1
28	8,8	11,1	13,1	15,0	16,6	18,1	19,5	20,8	22,0	23,2	24,2	25,2	26,2	27,1
27	8,0	10,1	12,2	24,1	15,7	17,2	18,6	19,9	21,1	22,2	23,3	24,3	25,2	26,1
26	7,1	9,4	11,4	13,2	14,8	16,3	17,6	18,9	20,1	21,2	22,3	23,3	24,2	25,1
25	6,2	8,5	10,5	12,2	13,9	15,3	16,7	18,0	19,1	20,3	21,3	22,2	23,2	24,1
24	5,4	7,6	9,6	11,3	12,9	14,4	15,8	17,0	18,2	19,3	20,3	21,3	22,2	23,1
23	4,5	6,7	8,7	10,4	12,0	13,5	14,8	16,1	17,2	18,3	19,4	20,3	21,3	22,2
22	3,6	5,9	7,8	9,5	11,1	12,5	13,9	15,1	16,3	17,4	18,4	19,4	20,3	21,2
21	2,8	5,0	6,9	8,6	10,2	11,6	12,9	14,2	15,3	16,4	17,4	18,4	19,3	20,2
20	1,9	4,1	6,0	7,7	9,3	10,7	12,0	13,2	14,4	15,4	16,4	17,4	18,3	19,2
19	1,0	3,2	5,1	6,8	8,3	9,8	11,1	12,3	13,4	14,5	15,5	16,4	17,3	18,2
18	0,2	2,3	4,2	5,9	7,4	8,0	10,1	11,3	12,5	13,5	14,5	15,4	16,3	17,2
17	-0,6	1,4	3,3	5,0	6,5	7,9	9,2	10,4	11,5	12,5	13,5	14,5	15,3	16,2
16	-1,4	0,5	2,4	4,1	5,6	7,0	8,2	9,4	10,5	11,6	12,6	13,5	14,4	15,2
15	-2,2	-0,3	1,5	3,2	4,7	6,1	7,3	8,5	9,6	10,6	11,6	12,5	13,4	14,2
14	-2,9	-1,0	0,6	2,3	3,7	5,1	6,4	7,5	8,6	9,6	10,6	11,5	12,4	13,2
13	-3,7	-1,9	-0,1	1,3	2,8	4,2	5,5	6,6	7,7	8,7	9,6	10,5	11,4	12,2
12	-4,5	-2,6	-0,1	0,4	1,9	3,2	4,5	5,7	6,7	7,7	8,7	9,6	10,4	11,2
11	-5,2	-3,4	-1,8	-0,4	1,0	2,3	3,5	4,7	5,8	6,7	7,7	8,6	9,4	10,2
10	-6,0	-4,2	-2,6	-1,2	0,1	1,4	2,6	3,7	4,8	5,8	6,7	7,6	8,4	9,2

Cleaning

Balex Metal suggests that rooflights should be periodically cleaned with appropriate cleansers, which enables rooflights to retain their original parameters. Steam or water jet cleaning appliances can be used for cleaning of

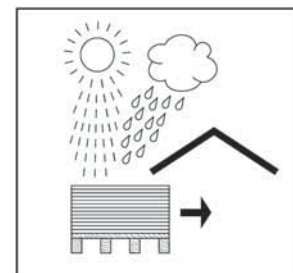
Attention !

- Never use abrasive or basic cleaning agents
- Never use brushes, steel wool or other abrasive materials
- Do not clean your skylight in full sunlight or at high temperatures – it can cause discoloration of its surface



Storage

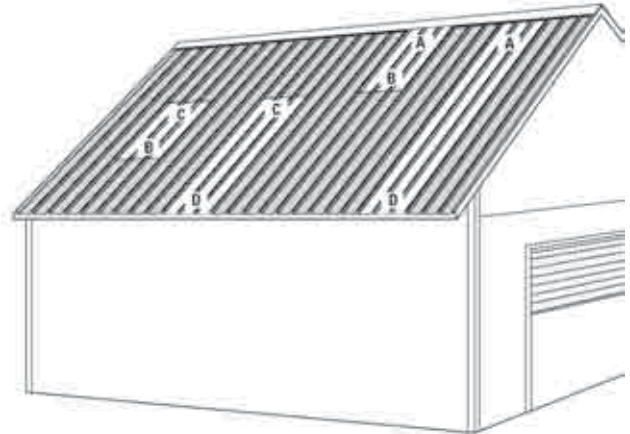
LEXAN rooflight should be stored and protected against exposure to weather conditions, such as rain, sunlight or hail. Protective film should be removed before installation.



Installation

LEXAN rooflights are efficient solutions that enable letting more daylight to the interior of a building. Even with the roof surface coverage between 5 and 15%, a rooflight can fully replace electric light. Chamber structure of rooflights reduces excessive heat caused by sunlight and minimises building's heat losses.

LEXAN rooflight can be installed from the roof ridge to the eaves, in the middle of the roof surface, near the roof ridge or from the middle of the roof surface and the eaves.

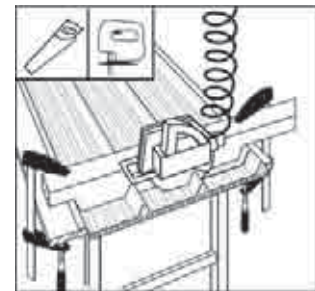


Cutting and drilling

LEXAN rooflight sheet can be easily and precisely cut using standard tools, including popular circular saws. In order to ensure appropriate smoothness of cut edges, use circular blades with many teeth.

A rooflight sheet to be cut should be fixed to the work table so that it cannot be moved by accident during cutting.

Holes in the overlap should be drilled during the installation on the roof, with the rooflight properly positioned at the sandwich panel.



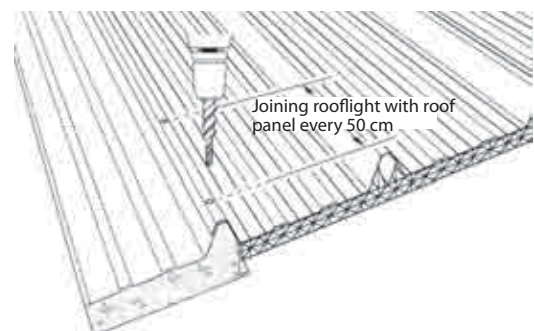
Reaction to fire classification*

B-s1-D0, test methods: EN-ISO 11925-2, EN 13823

Fire resistance classification of construction materials: EN 13501-1

Table 17. Maximum deflection of LEXAN rooflight

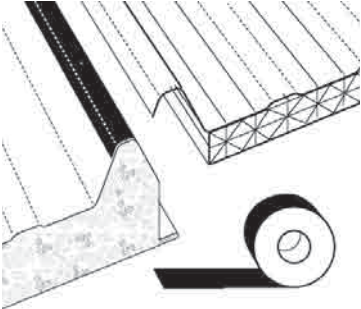
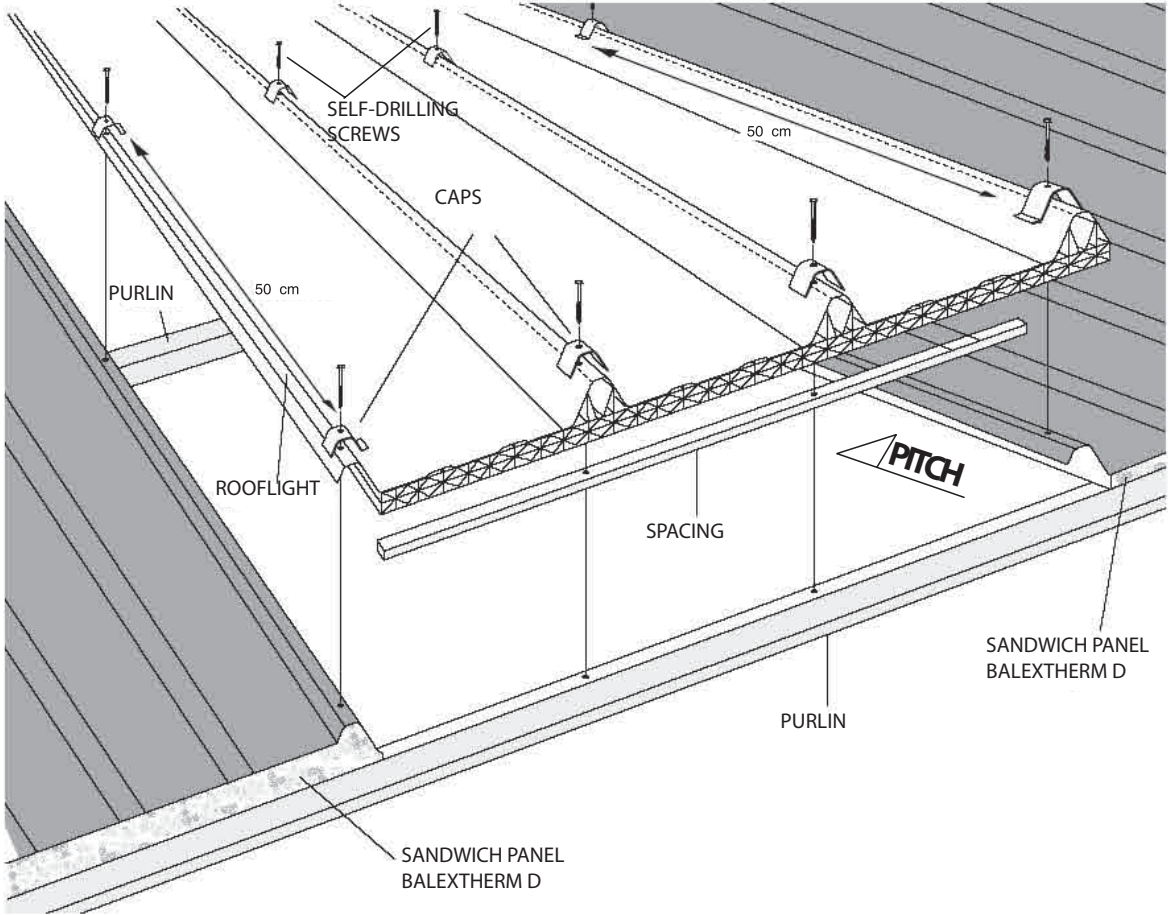
Load kN/m ²	Spacing between purlins			
	1,00 m	1,50 m	2,00 m	2,50 m
	Rooflight deflection [mm]			
0,50	1,20	7	16	20
1,00	2,60	15	30	38
1,50	4,50	22	44	52
2,00	6,60	29	56	62



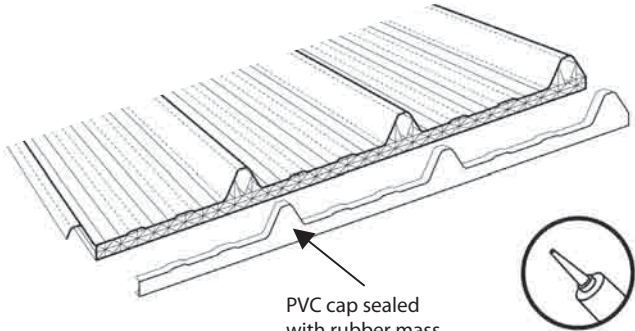
The values indicated herein assume that the LEXAN rooflight is mounted in each of the four sinusoid tops to every purlin (support). Fastening the rooflight to the sandwich panels on both sides must be made by self-drilling screws for metal sheet joining.

* Research performed by: Warrington Fire Research Centre, Holmesfield Road, Warrington, WA1 2DS, England

LEXAN rooflight installation – reference drawings



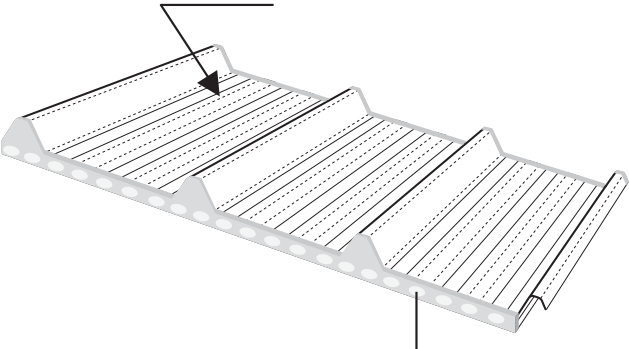
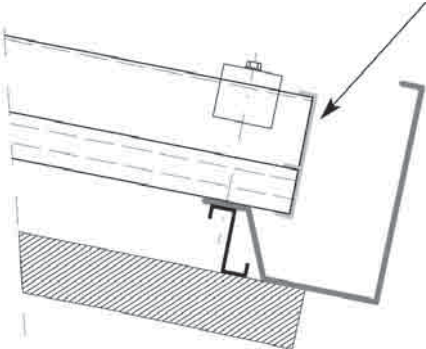
Butyl tape or EPDM insulation



PVC cap sealed with rubber mass

Channels of the rooflight should be closed by a PVC cap or tape

Closing with a cap from the top or sealing with a leak-proof tape



Ventilated ridge roll closed from the bottom

23. GENERAL GUIDELINES ON ASSEMBLY

Before starting assembly it is recommended that one should verify the carrying construction in terms of precision of performance and its accordance with the design.

BALEXTHERM sandwich panels are protected against contamination and damaging by protective film, with which the cladding is covered during the production process. After unpacking the set of panels, the protective film must be removed to avoid its permanent binding with protective varnish of lining sheets.

In the case of symmetrical sandwich panels in order to avoid mistakes during assembly aluminium foil placed in the longitudinal panel joint in the production process is additionally marked, apart from the BALEX METAL company's logo, with an arrow with the inscription 'external side' – fig. 1

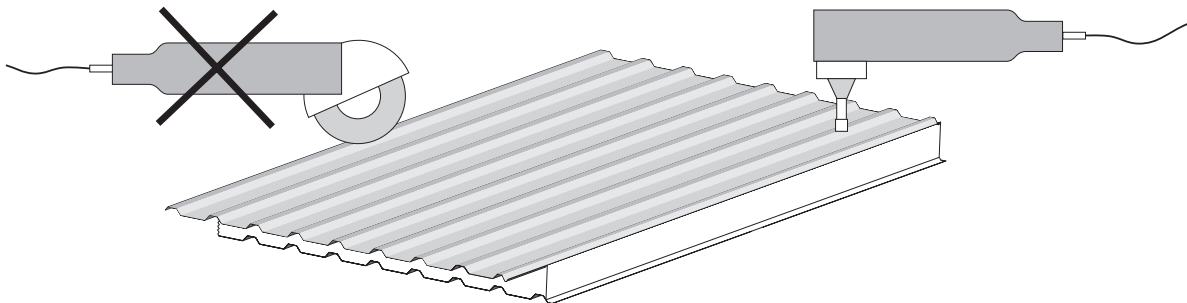
Fig. 1



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

Use circular saws with fine-toothed blades for cutting the panels, and manual scissors for sheet cutting. 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. 2.

Fig. 2



It is recommended to fasten sandwich panels with the use of appropriate fasteners depending on the type of supporting structure and the panel core thickness. The types of fastening elements and all markings are provided in the FASTENER chapter.

It is recommended to use hardened galvanized carbon steel self-drilling fasteners for fastening sandwich panels to a steel construction that is less than 12mm thick. All fasteners are equipped with a washer with a cured EPDM which ensures many years of operation retaining the flexibility of the sealing element.

In the case of steel base (thickness > 12 mm) or wooden base the application of special self-tapping fasteners with appropriately formed screw thread profile is recommended.

In the case of concrete base the application of special fasteners with universal sleeve anchor element or self-tapping fasteners with appropriately formed screw thread.

For screwing fasteners the application of electrical tools is recommended. Screwdrivers should be equipped with an appropriate head for driving long fasteners and a depth limiter fig.3 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. 4. It is possible to use universal screwdrivers with standard short heads. However tools of this type should be equipped with a fastener depth limiter. Optimal parameters of electric tools for sandwich panel assembly are provided in the list below.

- power 600 - 750 W
- rotation 1500 - 2000 rpm
- torque 600 - 700 Ncm

Fig. 3

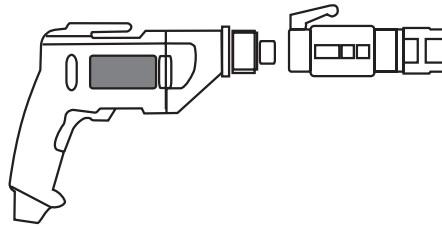
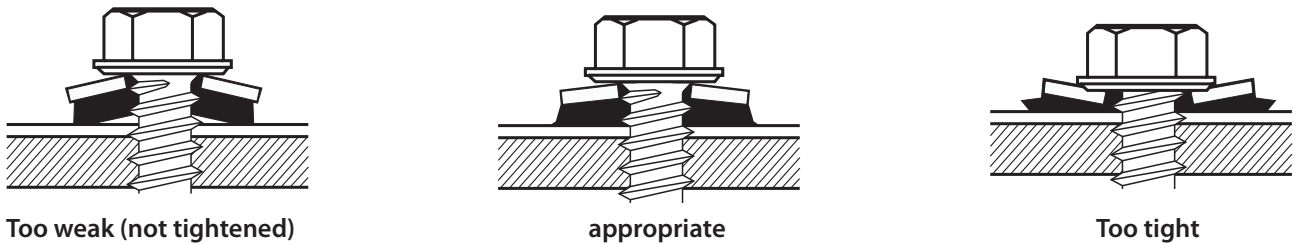


Fig. 4



Sample assembly of BALEX THERM D panel:

PHASE I - free positioning of a panel, pay attention to the lock (it is important that the locks be locked and the gasket not squeezed)

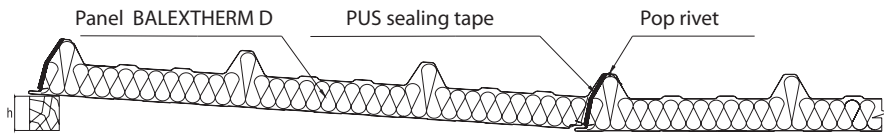
PHASE II - raising a panel to a certain height:

- $h = 4$ cm for panels 40 mm and 60 mm thick
- $h = 6$ cm for panels 80 mm and 100 mm thick

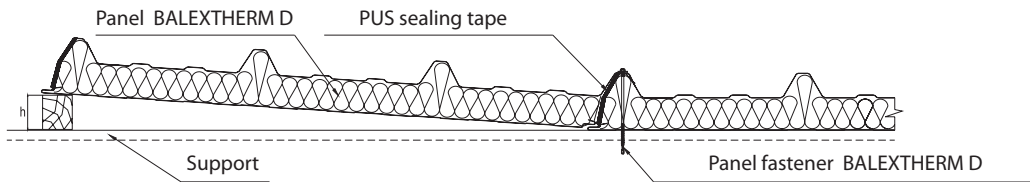
PHASE III - screwing panels down with the use of fasteners (pay attention to the axle and the order fastener – rivet)

PHASE IV - lowering panels and tightening the remaining fasteners.

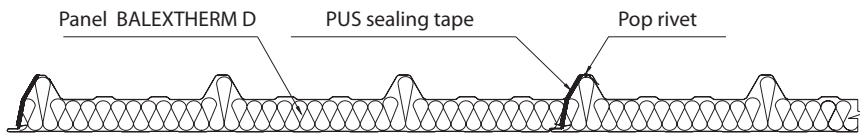
Section in the middle of the panel span phase II - III



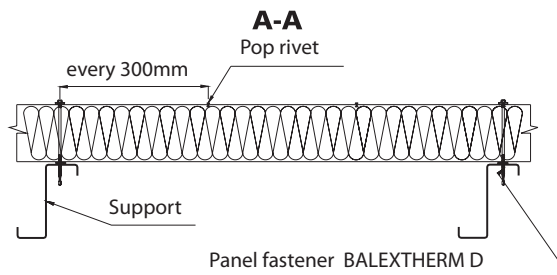
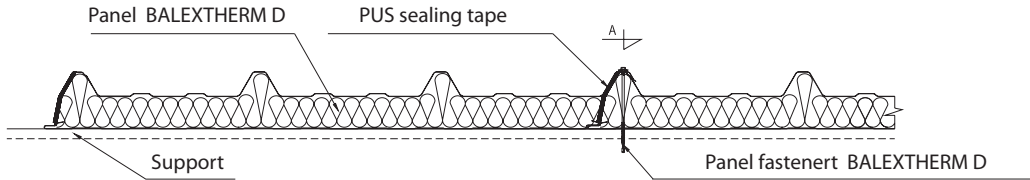
Support section phase II - III



Section in the middle of the panel span phase IV



Support section phase IV



After finishing cutting and drilling 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 appropriate tapes and sealing foams. All damages to varnish of screening metal sheet panels caused during assembly should be secured with touch up varnish.

24. GUIDELINES ON TRANSPORT

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 13.5 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)

Way of packing sandwich panels:

The number of sandwich panels in a package depends on the type and the thickness of a single panel:

Panel thickness	Quantity of sandwich panels in a package		
	BALEXTHERM ST	BALEXTHERM PLUS	BALEXTHERM D
40	25	-	16
50	20	-	-
60	17	17	12
80	13	13	10
100	10	10	8

36pcs of BALEXTHERM ST 100.1100 panels 12m long 475.2 m² constitute a sample load.

The number of packages for the whole load is:

the number of panels/the number of panels of particular thickness in a package = $36/10 = 3$ packages x 10 pcs and 1 package 6 pcs

Total load weight is: total panel surface x weight of 1m² 475.2 x 12.60 ≈ 6000 kg

Transport requirements regarding load:

- Load carrying body length min. 12.5m
- Load capacity min. 6.5 t

A truck-tractor with a covered trailer min 2.4m wide is an optimal means of transport for the load specified above. The load is placed in two piles, two panel packages each.

Unloading, transport:

During loading and unloading extreme caution should be kept, one should avoid point supports as it may lead to damaging the facing of the lowest panel. In order to avoid this problem you should distribute the load over a greater surface area. You should also pay attention not to drag one panel along another one not to scratch it.

Panel storage:

Sandwich panels should be stored on ground beams, not less than 250mm over the ground. It is allowed to store two packages placed one on another at the most. It is recommended to store panels in airy rooms, at normal temperature, far away from acids, lye, salts and other corrosive substances. Storing uncovered panels is unacceptable. In case of storing panels under canvas cover for a short period of time (a fortnight at the most) you should ensure free air flow. If storing period is longer than 2 weeks panels should be placed in a well ventilated room and left uncovered as well as provided with free access to air in order for all layers to be ventilated. Not observing these recommendations can lead to coating decolouration, so called 'white rust', permanent core damage as well as loss of guarantee.

Slight 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.

Remarks concerning usage:

Wall sandwich panels with dark claddings are characterized by high heat absorption capacity which can cause local deformation of claddings' surface in the period of high air temperatures. As a result allow for panels' thermal motion and apply panels of limited length. This effect does not have any influence on the properties of sandwich panels but the producer warns that clients purchase wall panels in those colours on their own responsibility and do not have rights to claim against the producer due to this fact. The appearance of local deformations in roof panels practically does not appear.

Pursuant to the EN 14509 standard, it is assumed that sheets in dark colours heat to the temperature of 90°C. Therefore, Balex Metal shall not be responsible for any damages caused by high temperature, which may result in changing the position of the cladding in some places. Dark colours are defined in Item E.33 of the EN14509 standard.

25. CERTIFICATION DOCUMENTS

Technical Approval

Steel faced sandwich panels with a core made of rigid polyurethane foam under the BALEX THERM trade name have received AT-15-6550/2005 Technical Approval valid thru 31st December 2010 issued by Building Research Institute in Warsaw.

The ITB-15-6550/2005 Technical Approval is a document stating the suitability of BALEX THERM sandwich panels for application in the construction industry in the scope resulting from the Approval's resolutions.

Conformity assessment and introduction to sales and application

On the basis of art. 4 and 5 par. 1 item 3 and art. 8 of the act of 16th April 2004 on construction products (J. of L. No 92/2004, item 881) and according to the order The Minister of Infrastructure as of 11th August 2004 on ways of declaring conformity of construction products and ways of marking them with the construction mark (J. of L. No 198/2004, item 2041) BALEX METAL company performed an assessment of sandwich panels' conformity with the approval mentioned above and issued NATIONAL DECLARATION OF CONFORMITY NO 18/15-6550. It was issued on the basis of the following:

- type tests carried out by Building Research Institute in Warsaw,
- company's production control.

According to the aforementioned order the National Declaration of Conformity No. 18/15-6550 with Technical Approval AT-15-6550/2005 issued by BALEX METAL company and way of marking the products with the construction marks meet all requirements concerning introduction to sales and application in construction industry.

Conformity certificates

BALEX THERM sandwich panels have obtained a Sanitary Certificate No. HK/B/0025/01/2009 issued by the National Institute of Hygiene in Warsaw.



NARODOWY INSTYTUT ZDROWIA PUBLICZNEGO
- PAŃSTWOWY ZAKŁAD HIGIENY
NATIONAL INSTITUTE OF PUBLIC HEALTH
- NATIONAL INSTITUTE OF HYGIENE
ZAKŁAD HIGIENY KOMUNALNEJ
DEPARTMENT OF ENVIRONMENTAL HYGIENE

24 Chocimska 00-791 Warsaw • Phone (22) 5421354; (22) 5421349 • Fax (22) 5421287 • e-mail: sek-zhk@pzh.gov.pl

ATEST HIGIENICZNY
HYGIENIC CERTIFICATE

HK/B/0025/01/2009

ORYGINAL

Wyrób / product: **Płyta warstwowa**
- BALEXTHERM
- ECOPANEL

Zawierający / containing: poliuretan, stal ocynkowaną, glin, PVC i inne składniki wg dokumentacji producenta

Przeznaczony do / destined: stosowania w budownictwie na ściany zewnętrzne i wewnętrzne obudowy konstrukcji obiektów: przemysłowych, spożywczych, produkcyjnych, sportowych, biurowych, handlowych, usługowych, administracyjnych, użyteczności publicznej, służby zdrowia

Wymieniony wyżej produkt odpowiada wymaganiom higienicznym przy spełnieniu następujących warunków / is acceptable according to hygienic criteria with the following conditions:
- bez zastrzeżeń

Wytwórca / producer:
BALEX METAL Sp. z o.o.
84-239 Bolszewo
ul. Wejherowska 12c

Niniejszy dokument wydano na wniosek / this certificate issued for:
BALEX METAL Sp. z o.o.
84-239 Bolszewo
ul. Wejherowska 12c

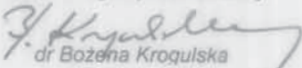
Atest może być zmieniony lub unieważniony po przedstawieniu stosownych dowodów przez którąkolwiek stronę. Niniejszy atest traci ważność po 2014-01-19 lub w przypadku zmian w recepturze albo w technologii wytwarzania wyrobu.

The certificate may be corrected or cancelled after appropriate motivation.
The certificate loses its validity after 2014-01-19
or in the case of changes in composition or in technology of production.

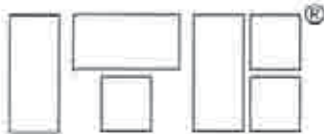
Data wydania atestu higienicznego: 19 stycznia 2009

The date of issue of the certificate: 19th January 2009

p.o. Kierownika
Zakładu Higieny Komunalnej


dr Bożena Kroquińska

www.pzh.gov.pl



INSTYTUT TECHNIKI BUDOWLANEJ

PL 00-611 WARSZAWA, ul. FILTROWA 1

tel.: (48 22) 825 04 71; (48 22) 825 76 55; fax: (48 22) 825 52 86

Członek Europejskiej Unii Akceptacji Technicznej w Budownictwie - DEATE
Członek Europejskiej Organizacji ds. Aprobát Technicznych - EOTA

Seria: APROBATY TECHNICZNE

APROBATA TECHNICZNA ITB AT-15-6550/2005

Na podstawie rozporządzenia Ministra Infrastruktury z dnia 8 listopada 2004 r. w sprawie aprobát technicznych oraz jednostek organizacyjnych upoważnionych do ich wydawania (Dz. U. Nr 249, poz. 2497), w wyniku postępowania akceptacyjnego dokonanego w Instytucie Techniki Budowlanej w Warszawie, na wniosek firmy:

BALEX METAL Spółka z o.o.

84-239 Bolszewo, ul. Wejherowska 12C

stwierdza się przydatność do stosowania w budownictwie wyrobów pod nazwą:

PŁYTY WARSTWOWE BALEX THERM z rdzeniem ze sztywnej pianki poliuretanowej w okładzinach z blachy stalowej

w zakresie i na zasadach określonych w Załączniku, który stanowi integralną część niniejszej Aprobáty Technicznej ITB.

Termin ważności:

31 stycznia 2010 r.

Załącznik:

Postanowienia ogólne i techniczne



DYREKTOR
Instytutu Techniki Budowlanej

doc. dr inż. *Stanisław Wierzbicki*

Warszawa, styczeń 2005 r.

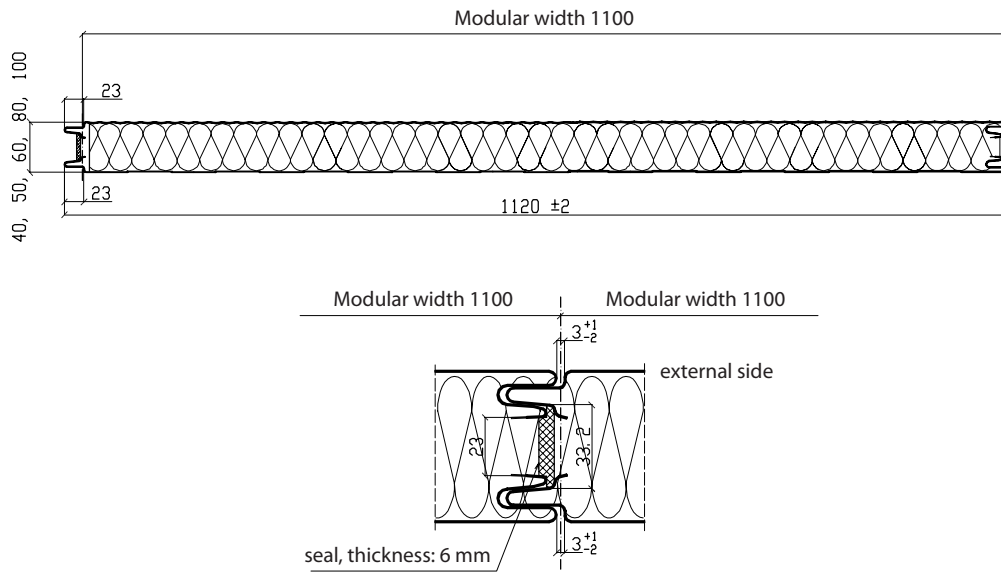
Dokument Aprobáty Technicznej ITB AT-15-6550/2005 zawiera 39 stron. Tekst tego dokumentu kopiować można tylko w całości. Publikowanie lub upowszechnianie w każdej innej formie fragmentów tekstu Aprobáty Technicznej, wymaga pisemnego uzgodnienia z Instytutem Techniki Budowlanej.

**II. DETAILED SOLUTIONS CONCERNING ENCLOSURE MADE
OF BALEX THERM PLUS, ST AND D SANDWICH PANELS WITH
POLYURETHANE CORE**

1. BALEX THERM ST wall panel

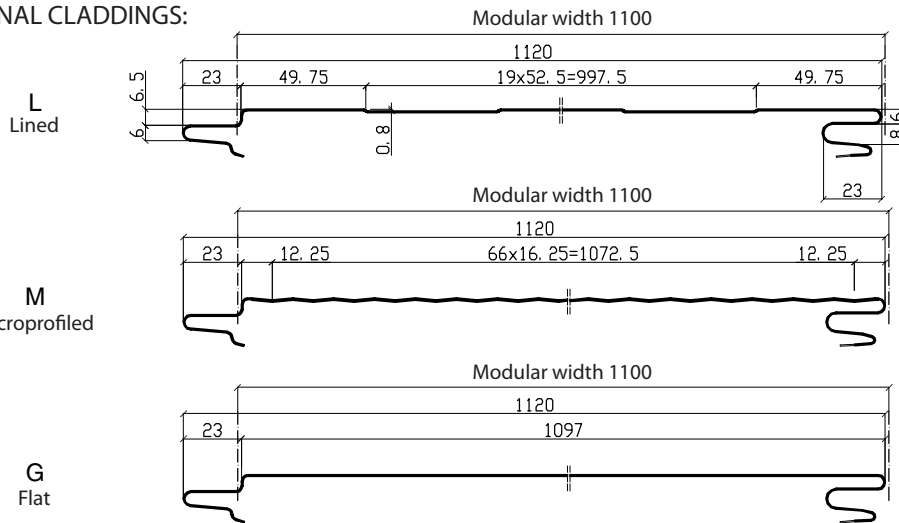
1.1. ST01

BALEX THERM ST wall panel - joint, profile types

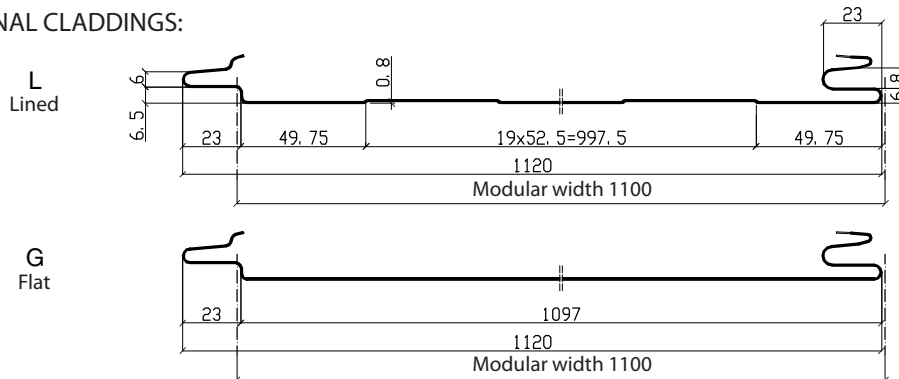


PROFILE TYPE

EXTERNAL CLADDINGS:

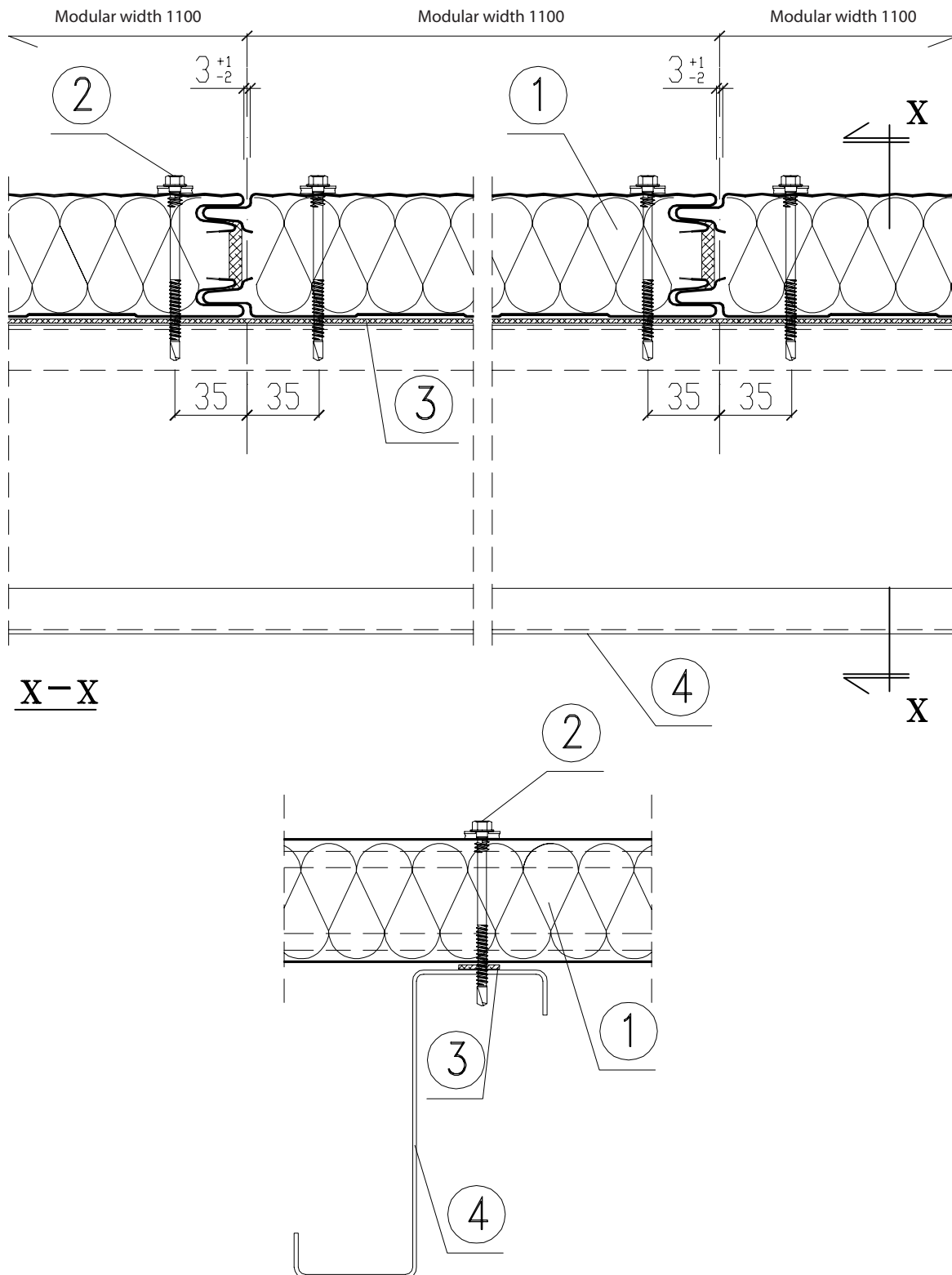


INTERNAL CLADDINGS:



1.2. ST02

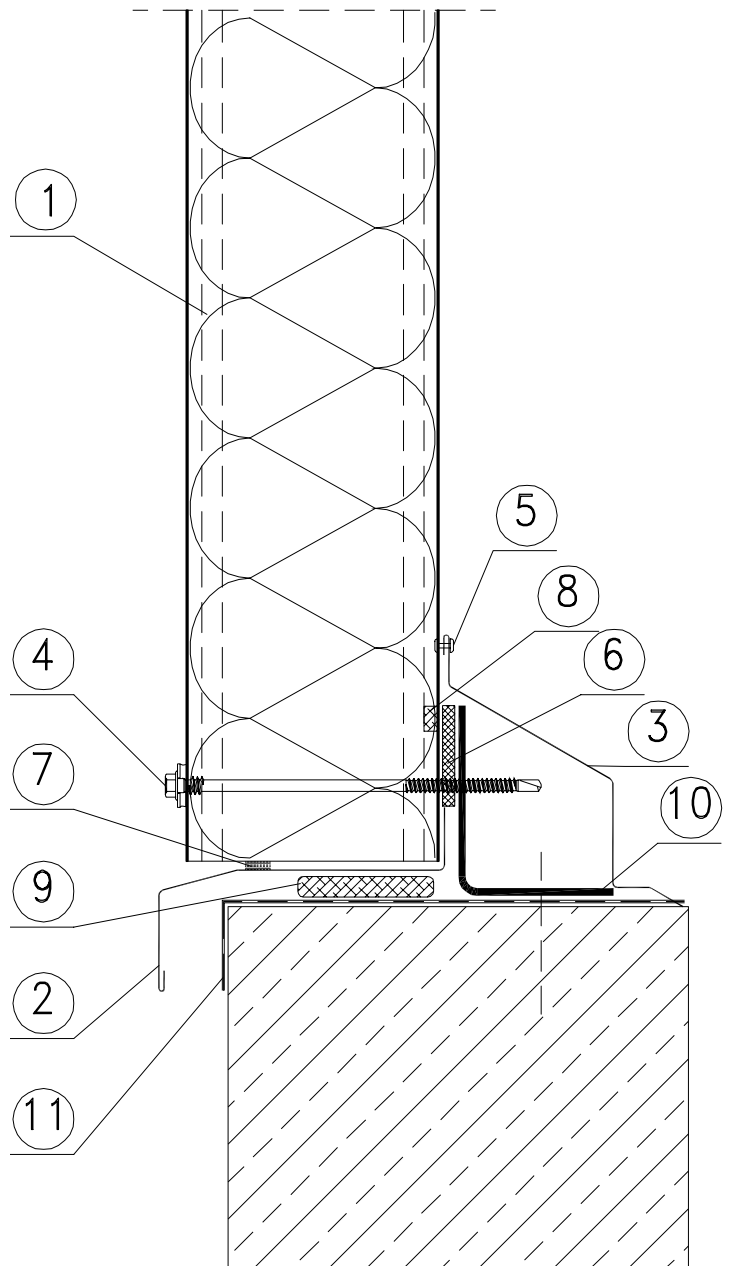
Fastening panel - vertical arrangement of panels



1. BALEX THERM ST wall panel
2. Fastener for fastening LB 1 - LB 5 BALEX THERM panels
3. PES 3x20 self-adhesive sealing tape (recommended)
4. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

1.3. ST03

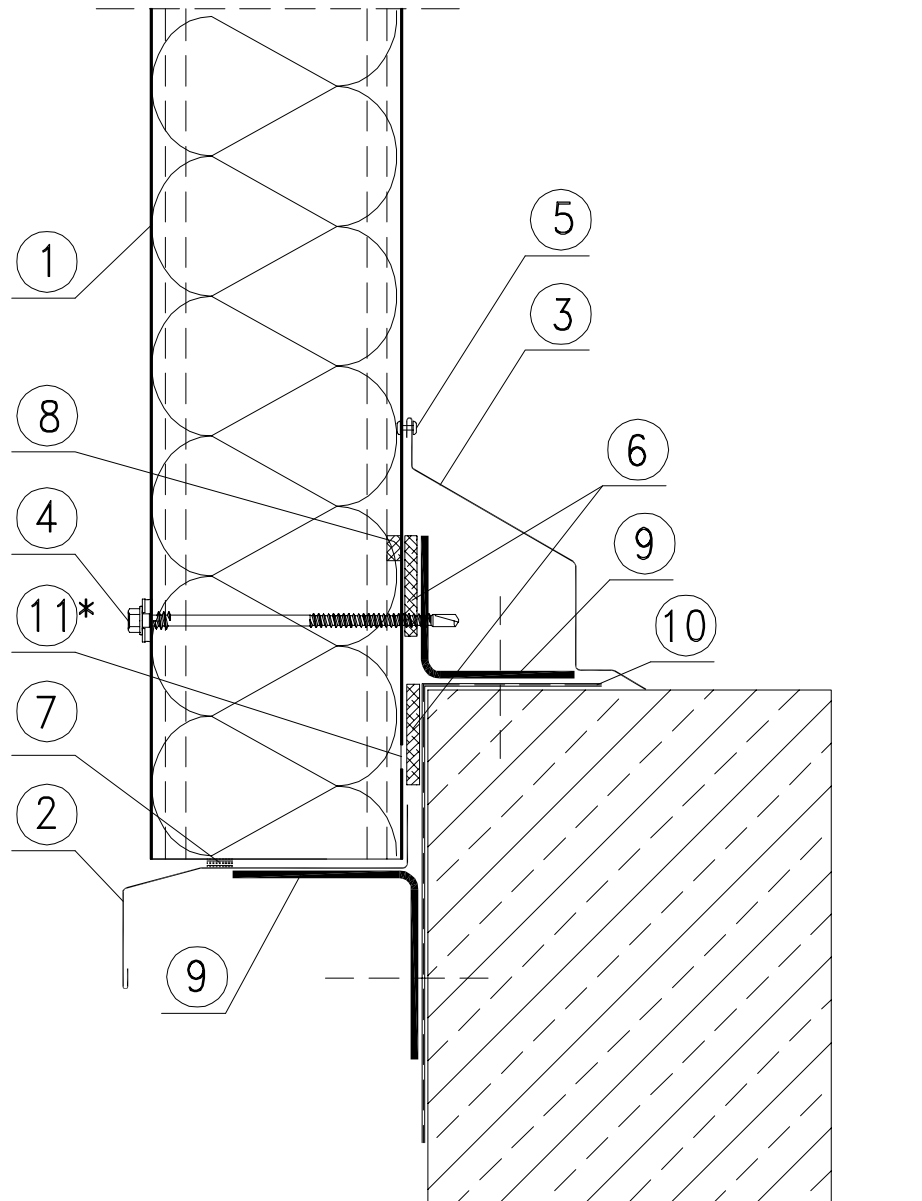
Basing panels on a ground beam or foundation – vertical arrangement of panels



1. BALEXTHERM ST wall panel
2. OBR 100 flashing
3. OBR 101 flashing
4. LB 1 or LB 2 fastener for fastening BALEXTHERM panels
5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
6. PUS 5x40 self-adhesive sealing tape
7. Butyl sealing tape (recommended)
8. Sealing compound in the panel contact area
9. Impregnated polyurethane gasket 20mm thick
10. Angle acc. to the construction design
11. Damp insulation acc. to the architecture design

1.4. ST04

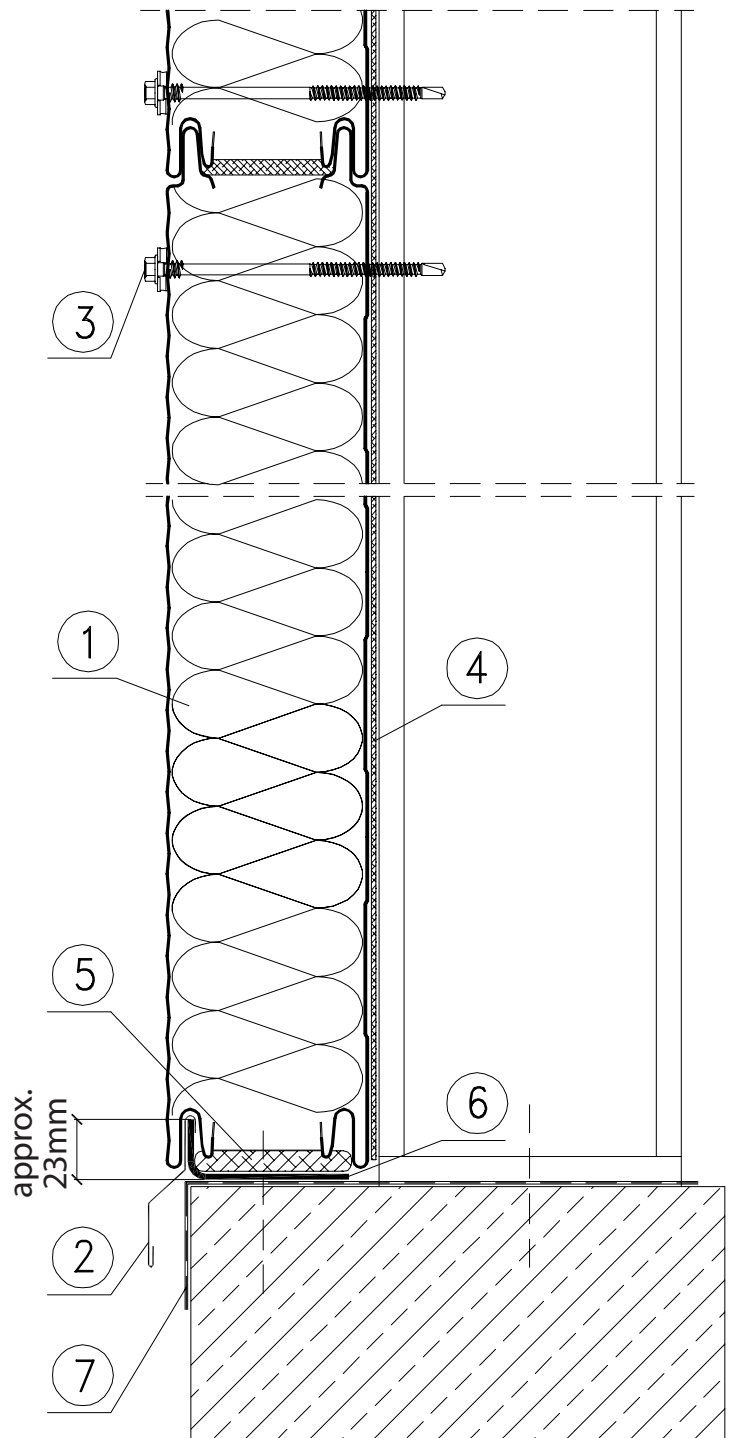
Supporting panels below the upper level of the ground beam or foundation - vertical arrangement of panels



1. BALEX THERM ST wall panel
 2. OBR 100 flashing
 3. OBR 101 flashing
 4. LB 1 or LB 2 fastener for fastening BALEX THERM panels
 5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
 6. PUS 5x40 self-adhesive sealing tape
 7. Butyl sealing tape (recommended)
 8. Sealing compound in the panel joint area
 9. Angle acc. to the construction design
 10. Dampproof insulation acc. to the architecture design
 11. Cladding with a 10mm wide gap (throat distance of the support max 300mm)
- * refers to increased thermal performance requirements

1.5. ST05

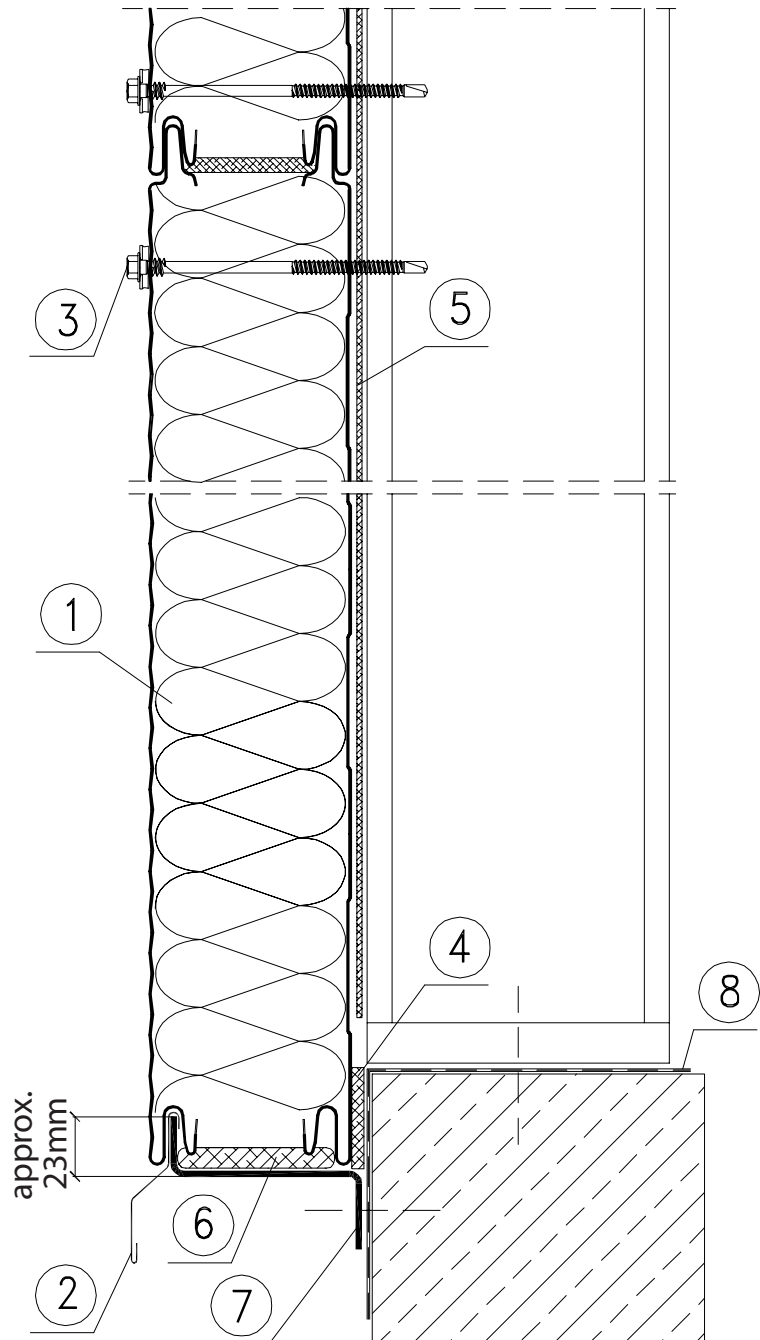
Basing panels on a ground beam or foundation - horizontal arrangement of panels



1. BALEXTHERM ST wall panel
2. OBR 102 flashing
3. Joint fastener
4. PES 3x20 self-adhesive sealing tape (recommended)
5. Impregnated polyurethane gasket 20mm thick
6. Angle acc. to the construction design
7. Dampproof insulation acc. to the architecture design

1.6. ST06

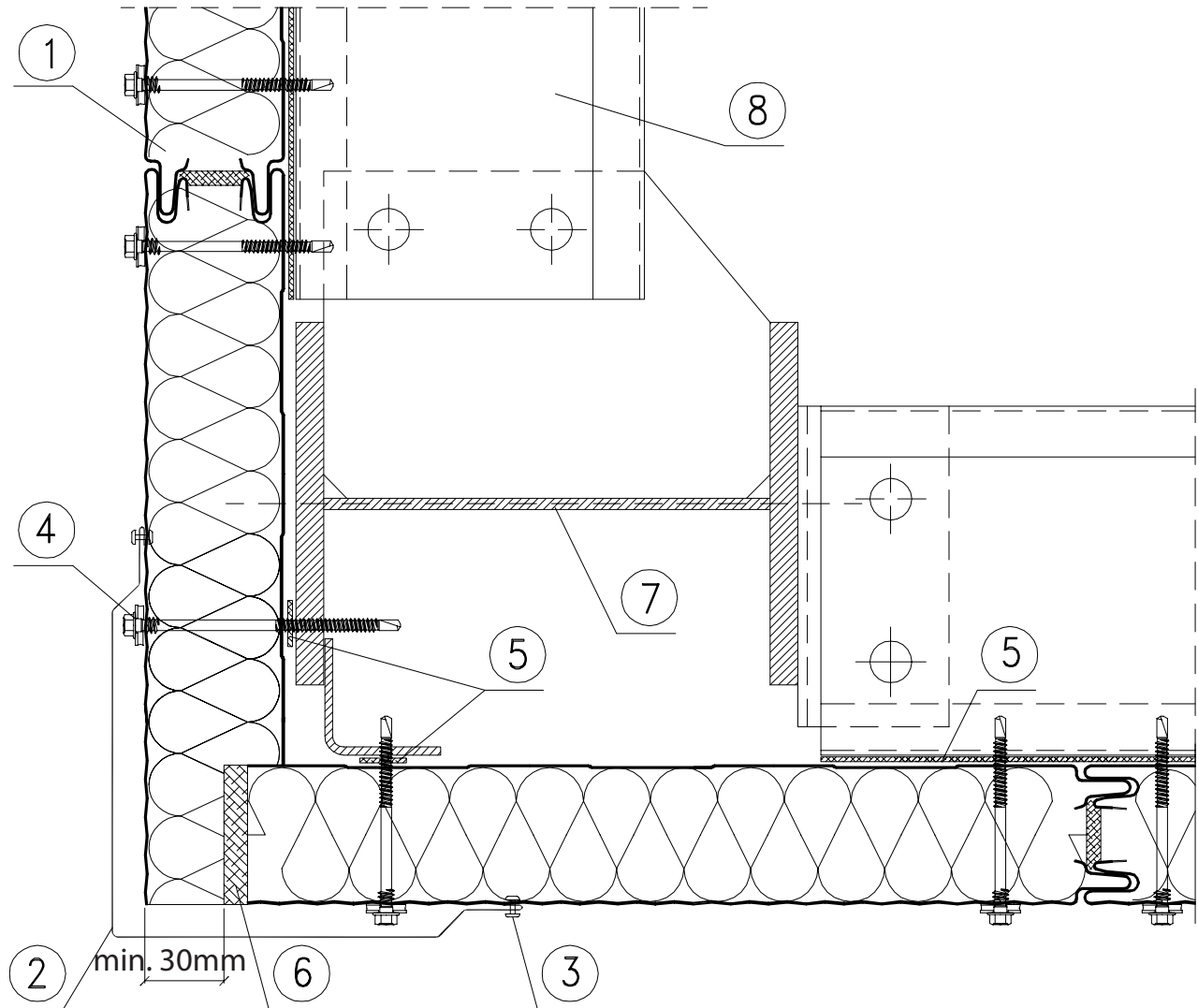
Supporting panels below the upper level of the ground beam or foundation
- horizontal arrangement of panels



1. BALEX THERM ST wall panel
2. OBR 102 flashing
3. LB 1- LB 5 fasteners BALEX THERM panels
4. PUS 5x40 self-adhesive sealing tape
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Impregnated polyurethane gasket 20mm thick
7. Z-bar acc. to the construction design
8. Dampproof insulation acc. to the architecture design

1.7. ST07

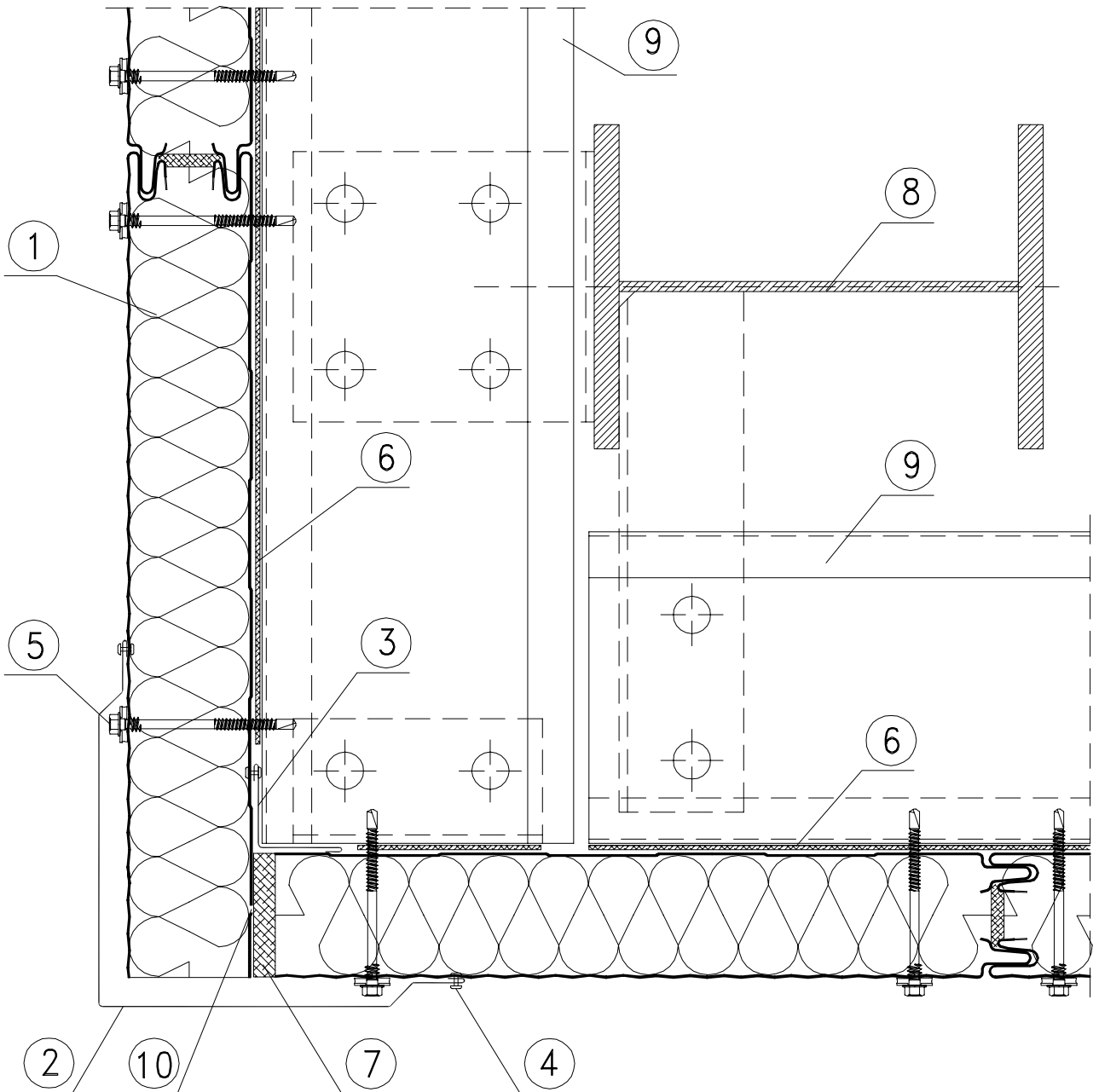
Joining panels in the corner - vertical arrangement of panels – option I



1. BALEXTHERM ST wall panel
2. OBR 103 flashing
3. LB6 self-drilling fastener or AL/Fe blind rivet every 300mm
4. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Assembly foam or polyurethane gasket
7. Steel, reinforced concrete, wooden column + angle acc. to the construction design
8. Transom acc. to the construction design

1.8. ST08

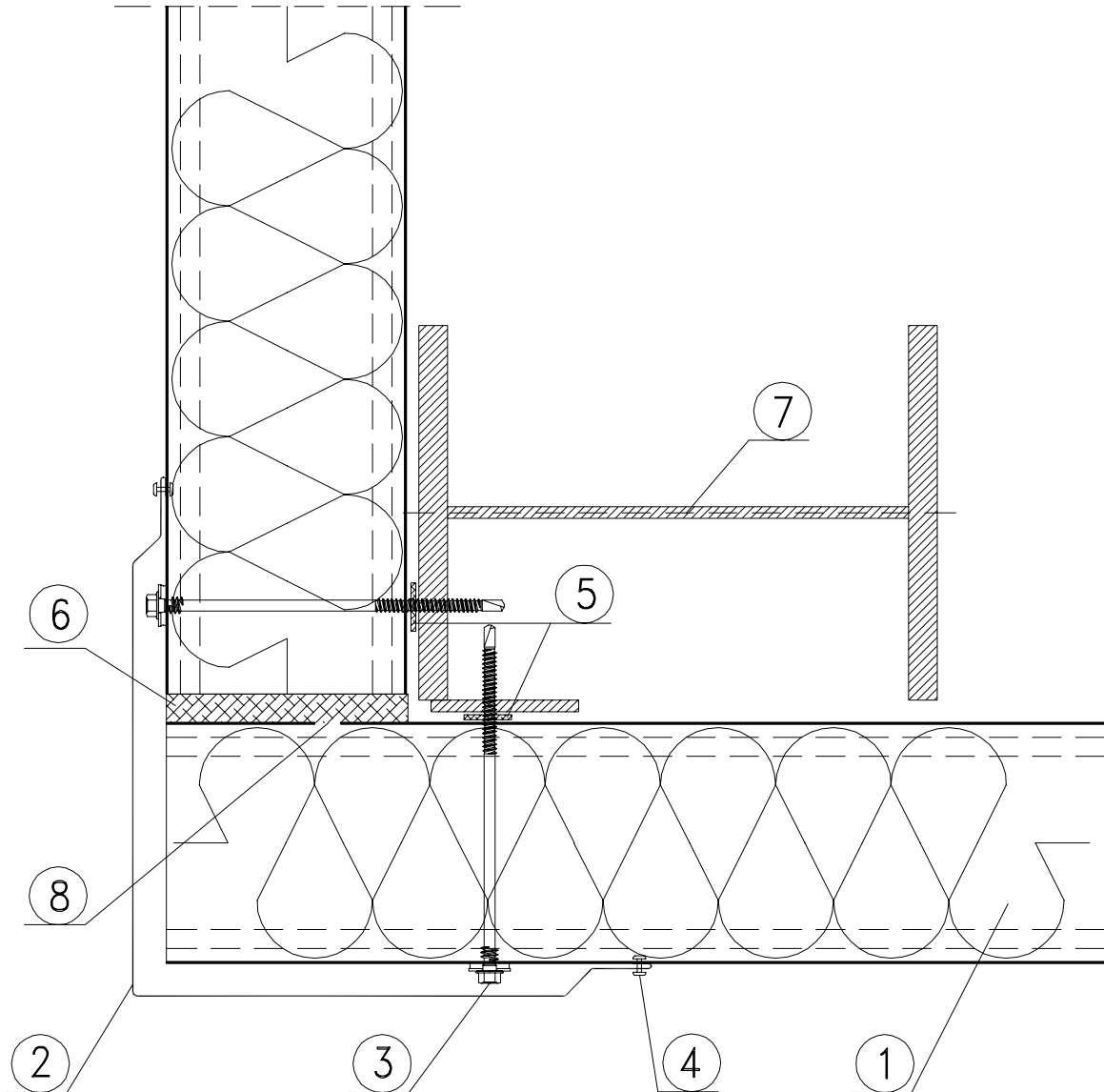
Joining panels in the corner - vertical arrangement of panels – option II



1. BALEX THERM ST wall panel
2. OBR 103 flashing
3. OBR 104 flashing
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. LB 1- LB 5 fasteners for fastening BALEX THERM panels
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Assembly foam or polyurethane gasket
8. Steel, reinforced concrete, wooden column acc. to the construction design
9. Transom acc. to the construction design
10. Cladding with a 10mm wide gap at increased thermal performance requirements

1.9. ST09

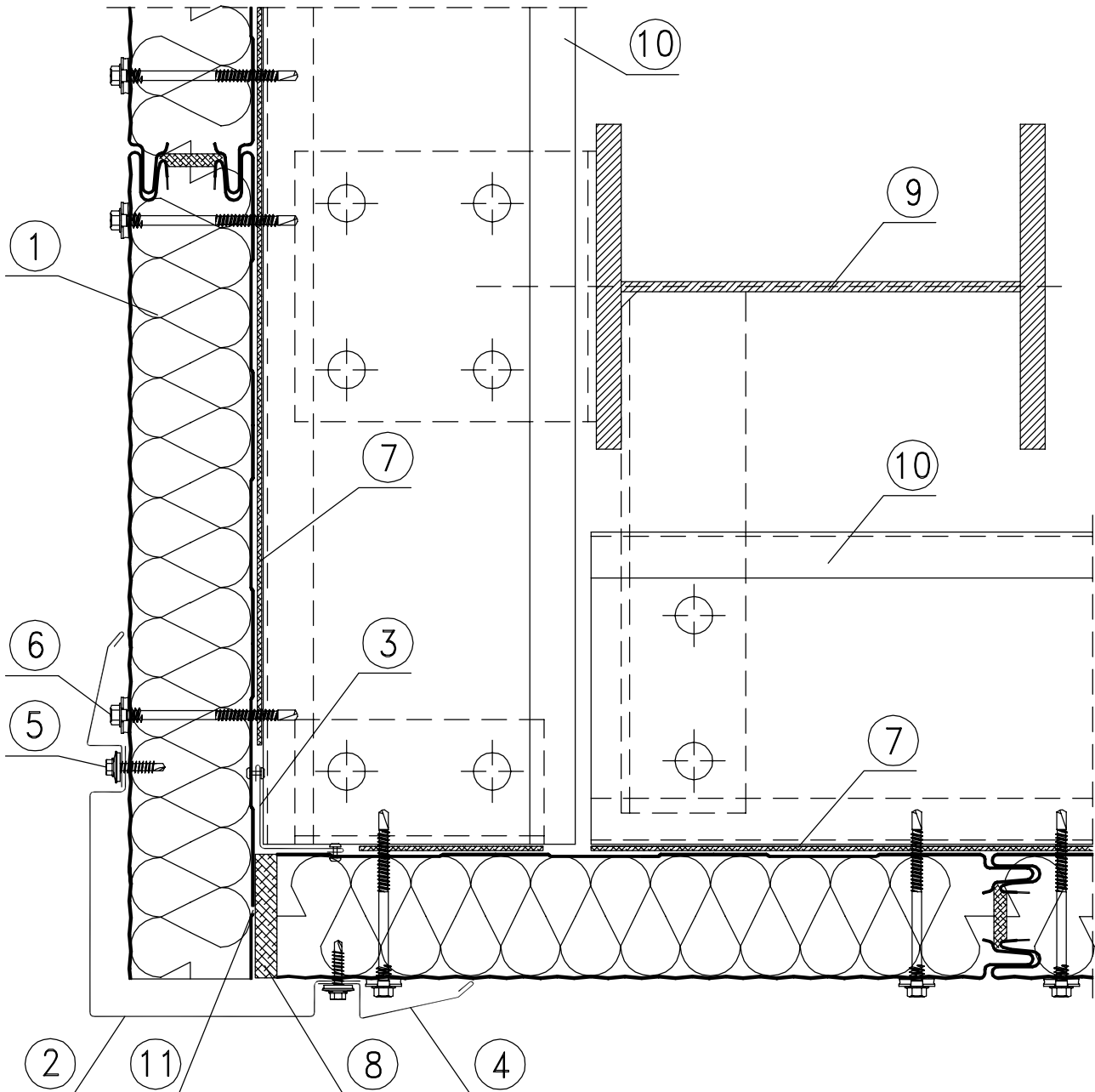
Joining panels in the corner - horizontal arrangement of panels



1. BALEXOTHERM ST wall panel
2. OBR 103 flashing
3. LB 1- LB 5 fasteners for fastening BALEXOTHERM panels
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Steel, reinforced concrete, wooden column + flat bar acc. to the construction design
7. Cladding with a 10mm wide gap at increased thermal performance requirements
8. Assembly foam or gasket

1.10. ST09/1

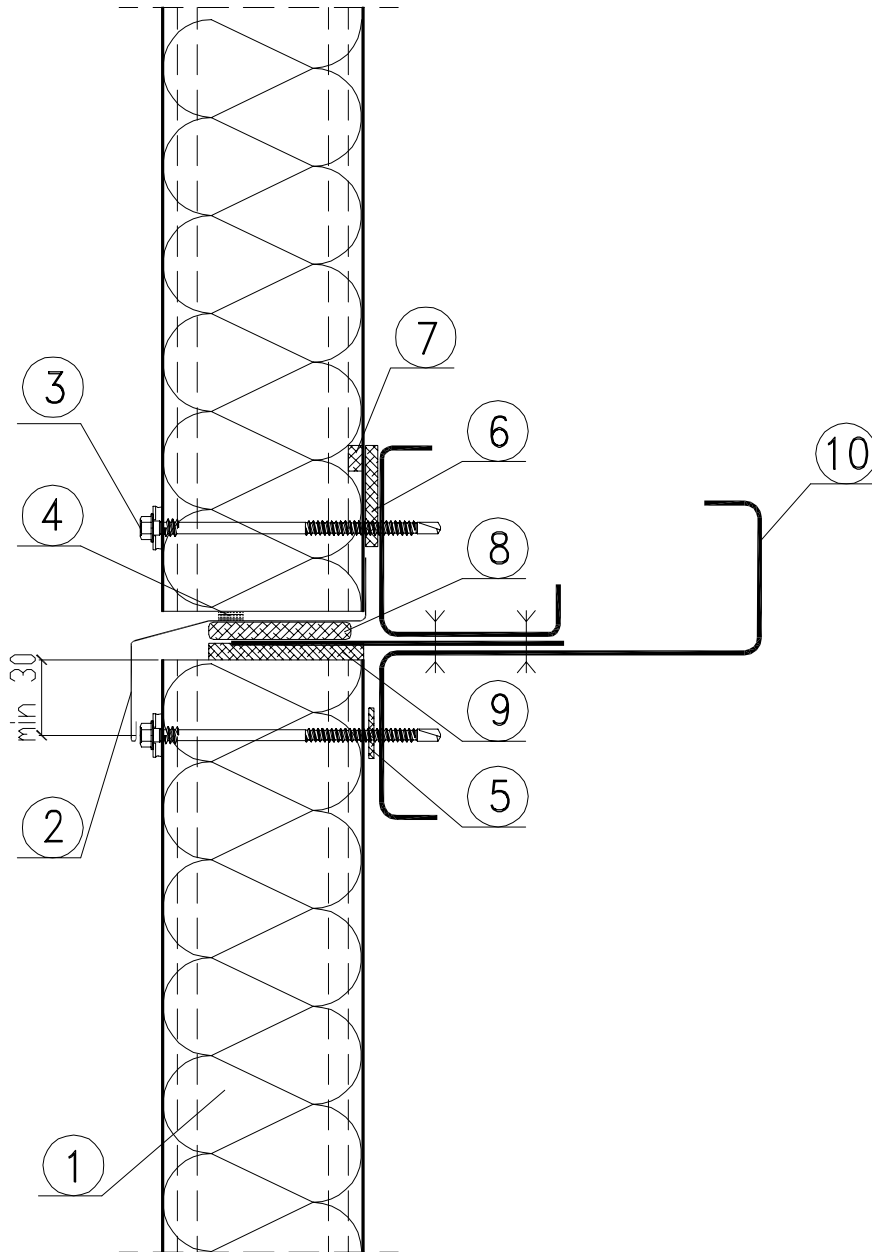
Joining panels in the corner – vertical or horizontal arrangement of panels



1. BALEXTHERM ST wall panel
2. OBR 103 flashing
3. OBR 104 flashing
4. OBR 111 flashing
5. LB 6 self-drilling fastener every 300mm
6. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
7. PES 3x20 self-adhesive sealing tape (recommended)
8. Assembly foam or polyurethane gasket
9. Steel, reinforced concrete, wooden column acc. to the construction design
10. Transom acc. to the construction design
11. Cladding with a 10mm wide gap at increased thermal performance requirements

1.11. ST10

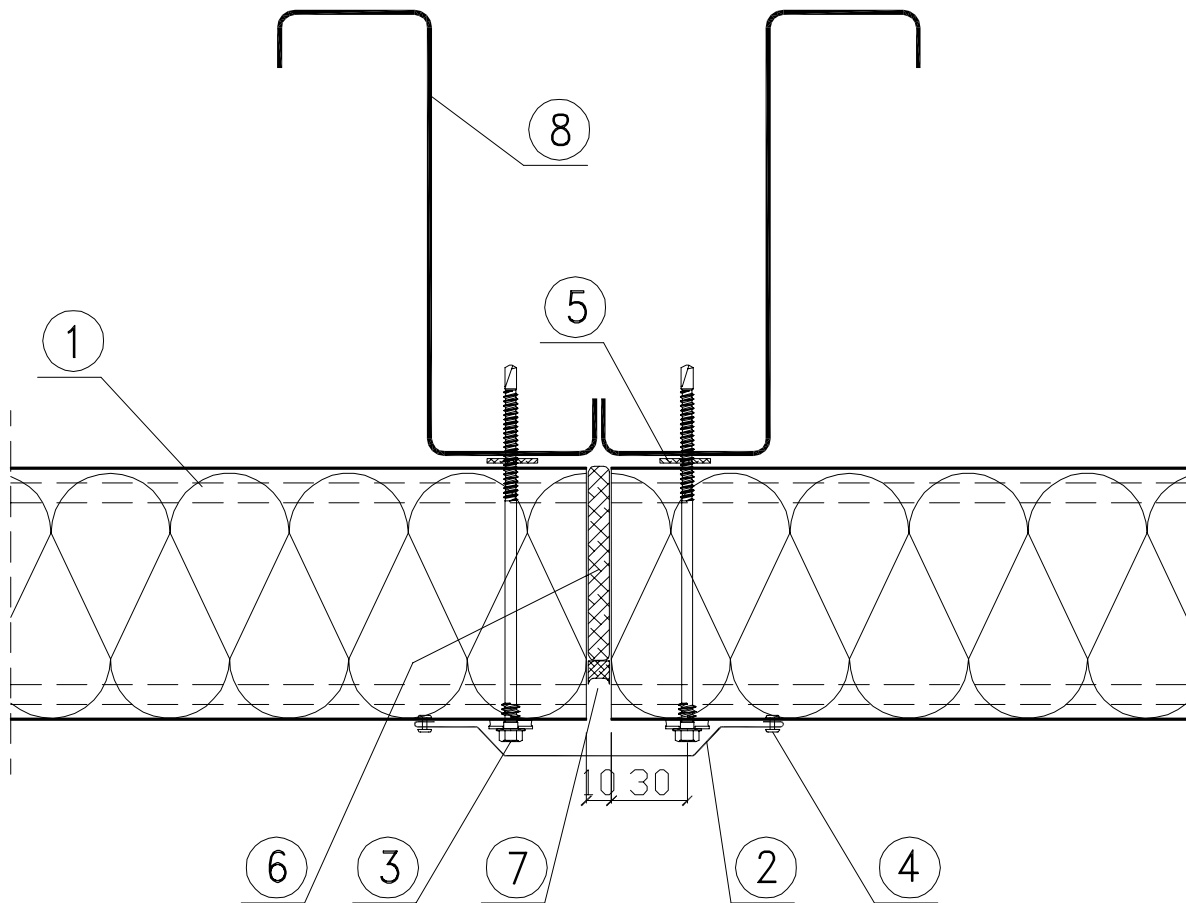
Joining panels lengthwise – vertical arrangement of panels



1. BALEXTHERM ST wall panel
2. OBR 100 flashing
3. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
4. Butyl sealing tape (recommended)
5. PES 3x20 self-adhesive sealing tape (recommended)
6. PUS 5x40 self-adhesive sealing tape
7. Sealing compound in the panel joint area
8. Impregnated polyurethane gasket 20mm thick
9. Assembly foam
10. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

1.12. ST11/1

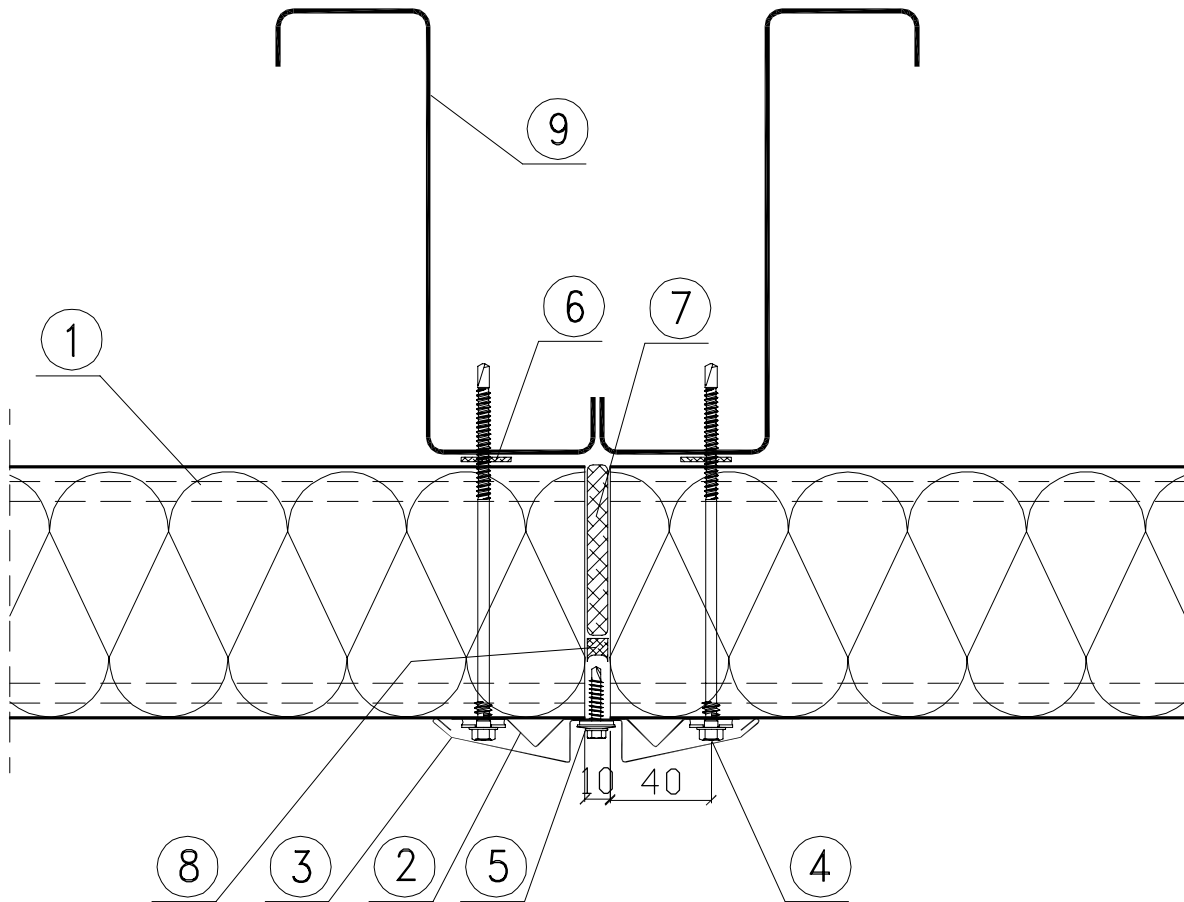
Fastening panel to the end support - vertical arrangement of panels – option I



1. BALEX THERM ST wall panel
2. OBR 105 flashing
3. LB 1- LB 5 fasteners for fastening BALEX THERM panels
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Impregnated polyurethane gasket or assembly foam
7. Illmod expansion gasket (recommended)
8. Steel, reinforced concrete, wooden column acc. to the construction design

1.13. ST11/2

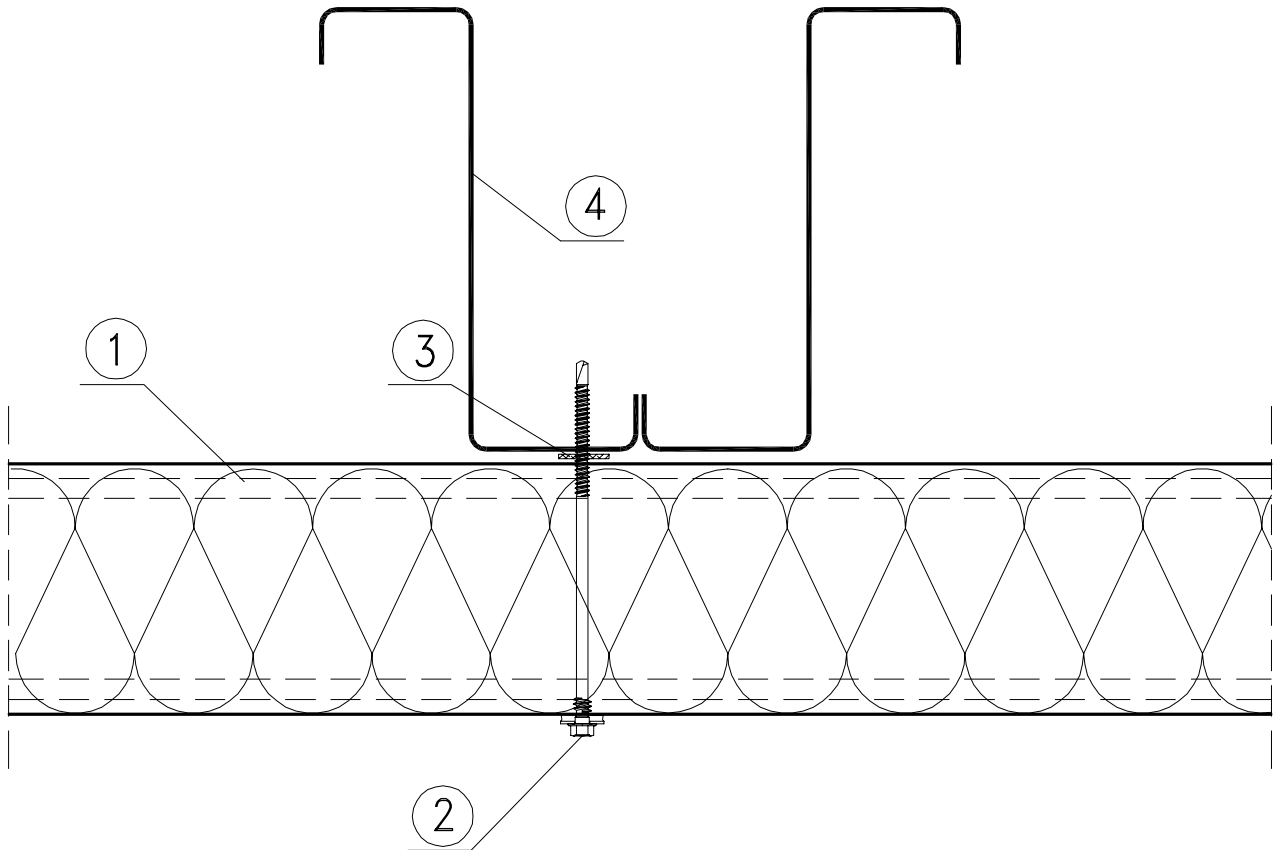
Fastening panel to the end support – horizontal arrangement of panels – option II



1. BALEXTERM ST wall panel
2. OBR 110 flashing (holes for fasteners item 4 should be made during assembly)
3. OBR 111 flashing
4. LB 1- LB 5 fasteners for fastening BALEXTERM panels
5. LB 6 self-drilling fastener every 300mm
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Impregnated polyurethane gasket or assembly foam
8. Illmod expansion gasket (recommended)
9. Steel, reinforced concrete, wooden column acc. to the construction design

1.14. ST12

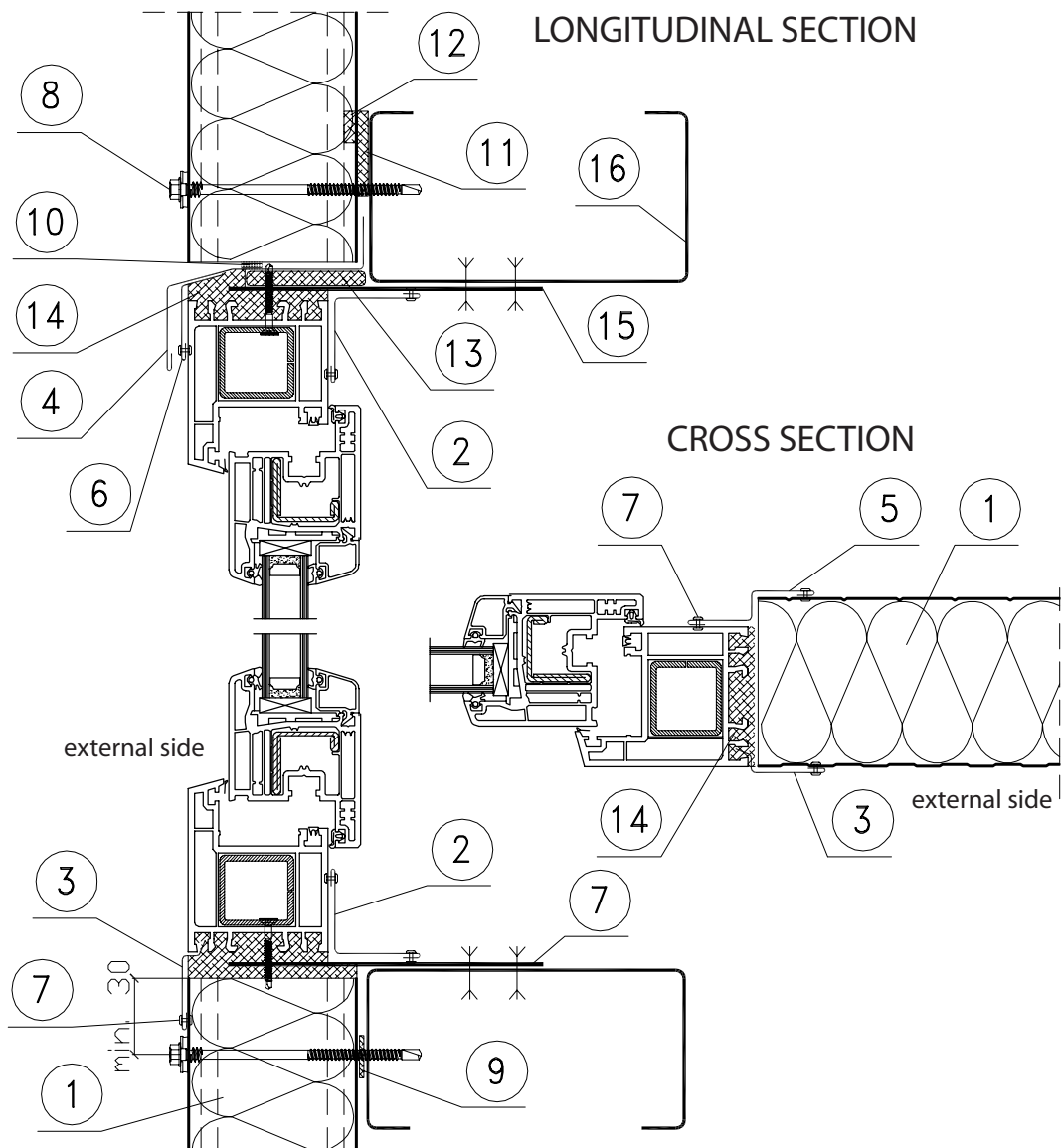
Fastening panel to the in-between support – horizontal arrangement of panels



1. BALEX THERM ST wall panel
2. LB 1- LB 5 fasteners for fastening BALEX THERM panels
3. PES 3x20 self-adhesive sealing tape (recommended)
4. Steel, reinforced concrete, wooden column acc. to the construction design

1.15. ST13

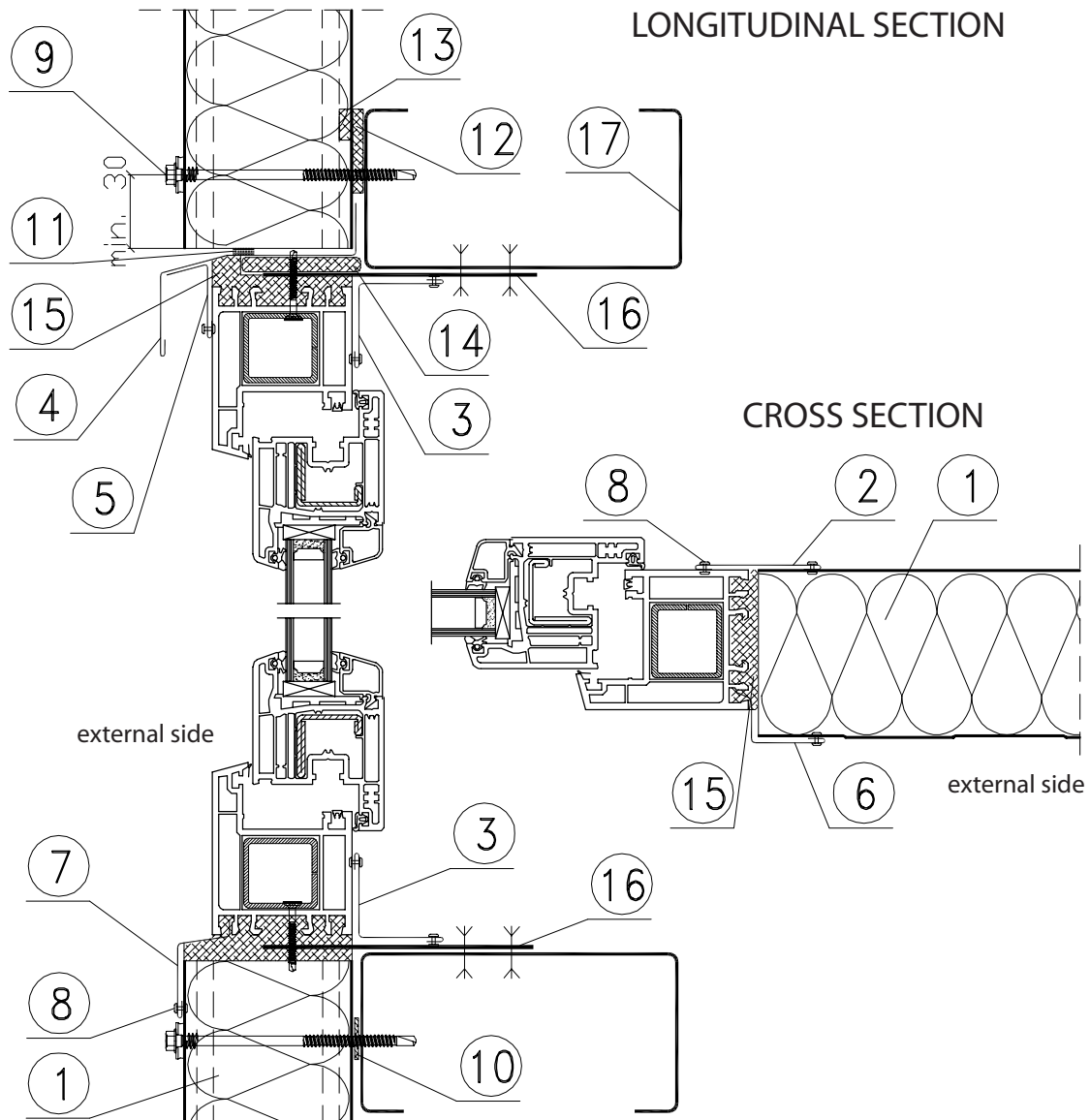
Joining panels with window strip – vertical arrangement of panels – option I



1. BALEXTHERM ST wall panel
2. OBR 104 flashing
3. OBR 06 flashing
4. OBR 100 flashing
5. Individual flashing
6. Individual flashing
7. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
8. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
9. PES 3x20 self-adhesive sealing tape (recommended)
10. Butyl sealing tape (recommended)
11. PUS 5x40 self-adhesive sealing tape
12. Sealing compound in the panel joint area
13. Impregnated polyurethane gasket 10mm thick
14. Assembly foam
15. Flat bar for fastening a window
16. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

1.16. ST14

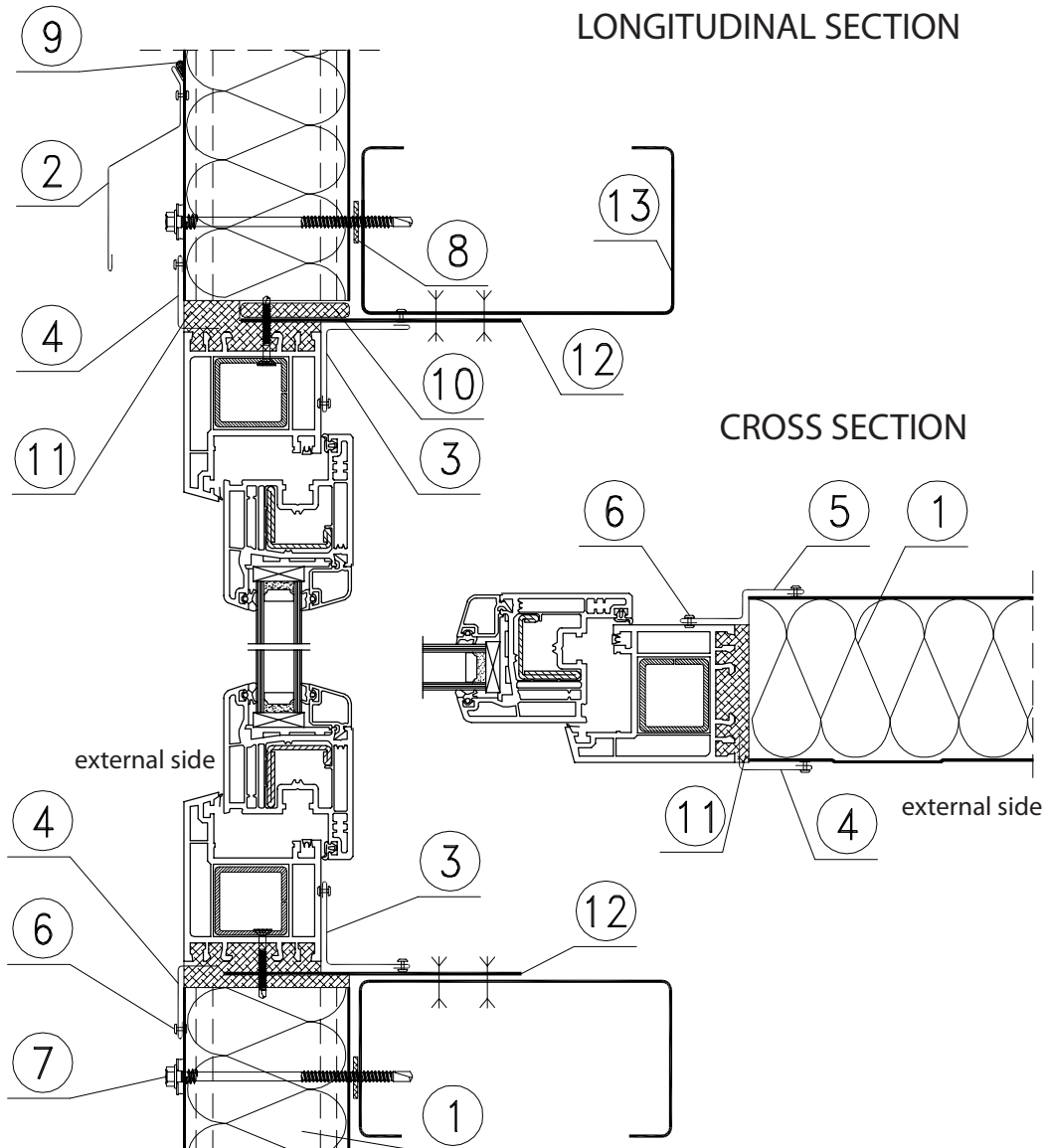
Joining panels with window strip – vertical arrangement of panels – option II



1. BALEXTHERM ST wall panel
2. OBR 106 flashing
3. OBR 104 flashing
4. OBR 100 flashing
5. Individual flashing
6. Individual flashing
7. Individual flashing
8. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
9. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
10. PES 3x20 self-adhesive sealing tape (recommended)
11. Butyl sealing tape (recommended)
12. PUS 5x40 self-adhesive sealing tape
13. Sealing compound in the panel joint area
14. Impregnated polyurethane gasket 10mm thick
15. Assembly foam
16. Flat bar for fastening a window
17. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

1.17. ST15

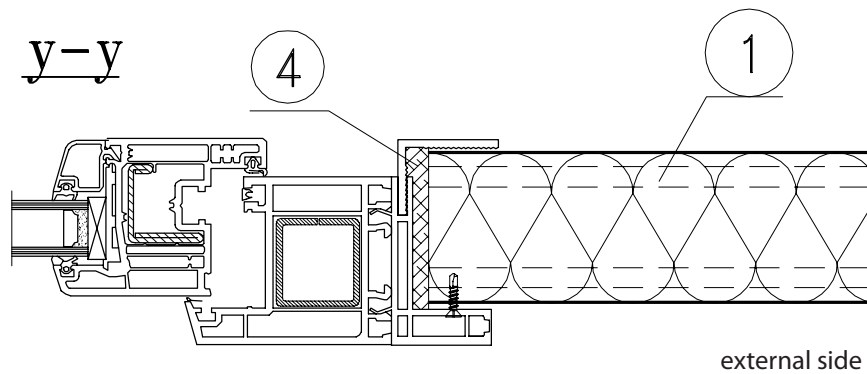
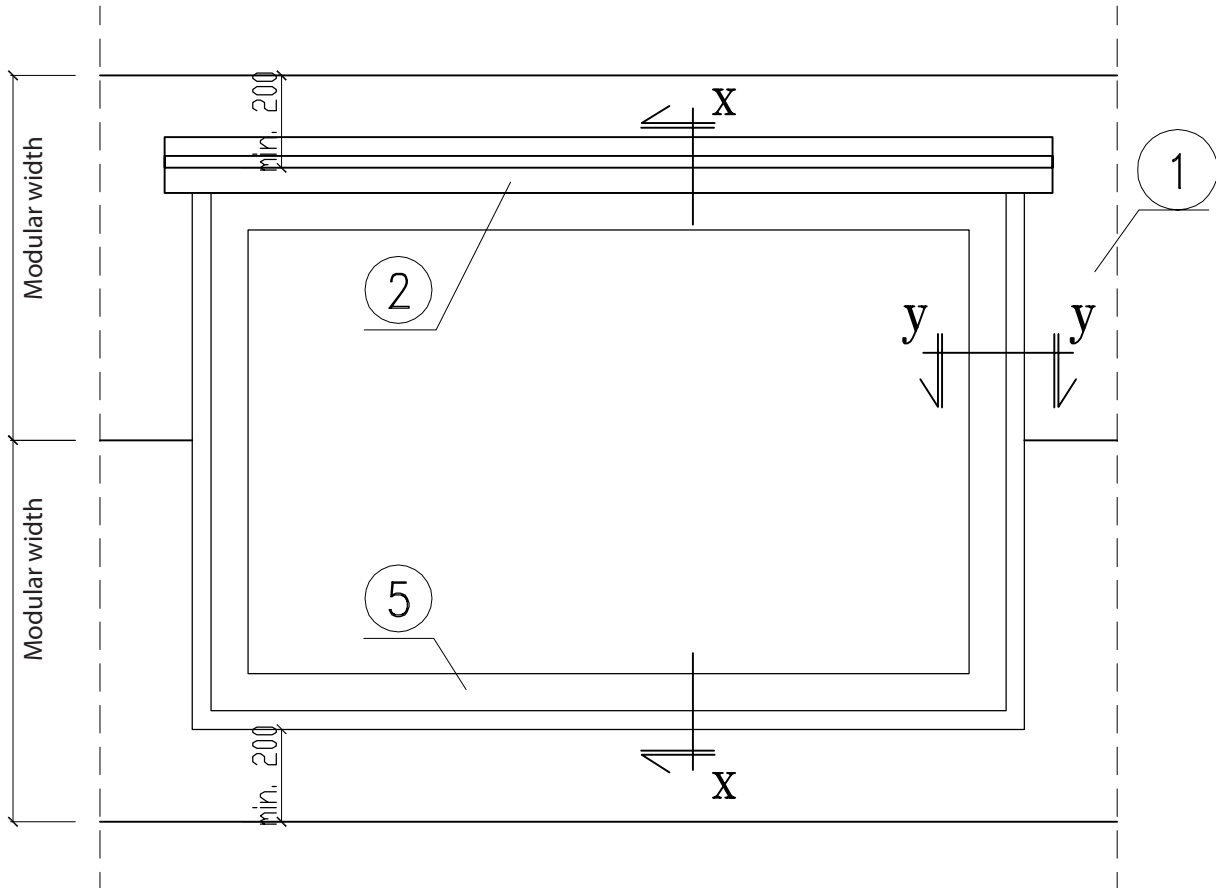
Joining panels with window strip – vertical arrangement of panels – option III



1. BALEXTHERM ST wall panel
2. OBR 107 flashing
3. OBR 104 flashing
4. Individual flashing (cut a groove in foam)
5. Individual flashing
6. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
7. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
8. PES 3x20 self-adhesive sealing tape (recommended)
9. Butyl sealing tape (recommended)
10. Impregnated polyurethane gasket 10mm thick
11. Assembly foam
12. Flat bar for fastening a window
13. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

1.18. ST16/1

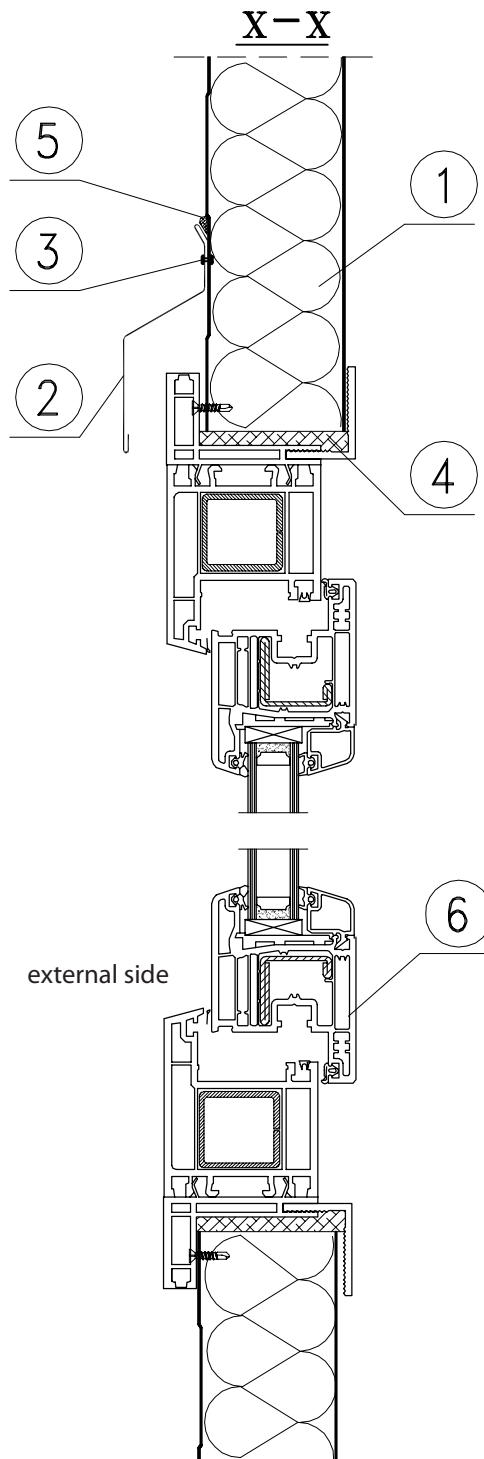
Joining panels with PVC windows – vertical or horizontal arrangement of panels



- 1. BALEXTHERM ST wall panel
- 2. OBR 107 flashing
- 4. Impregnated polyurethane gasket or assembly foam
- 5. PVC window

1.19. ST16/2

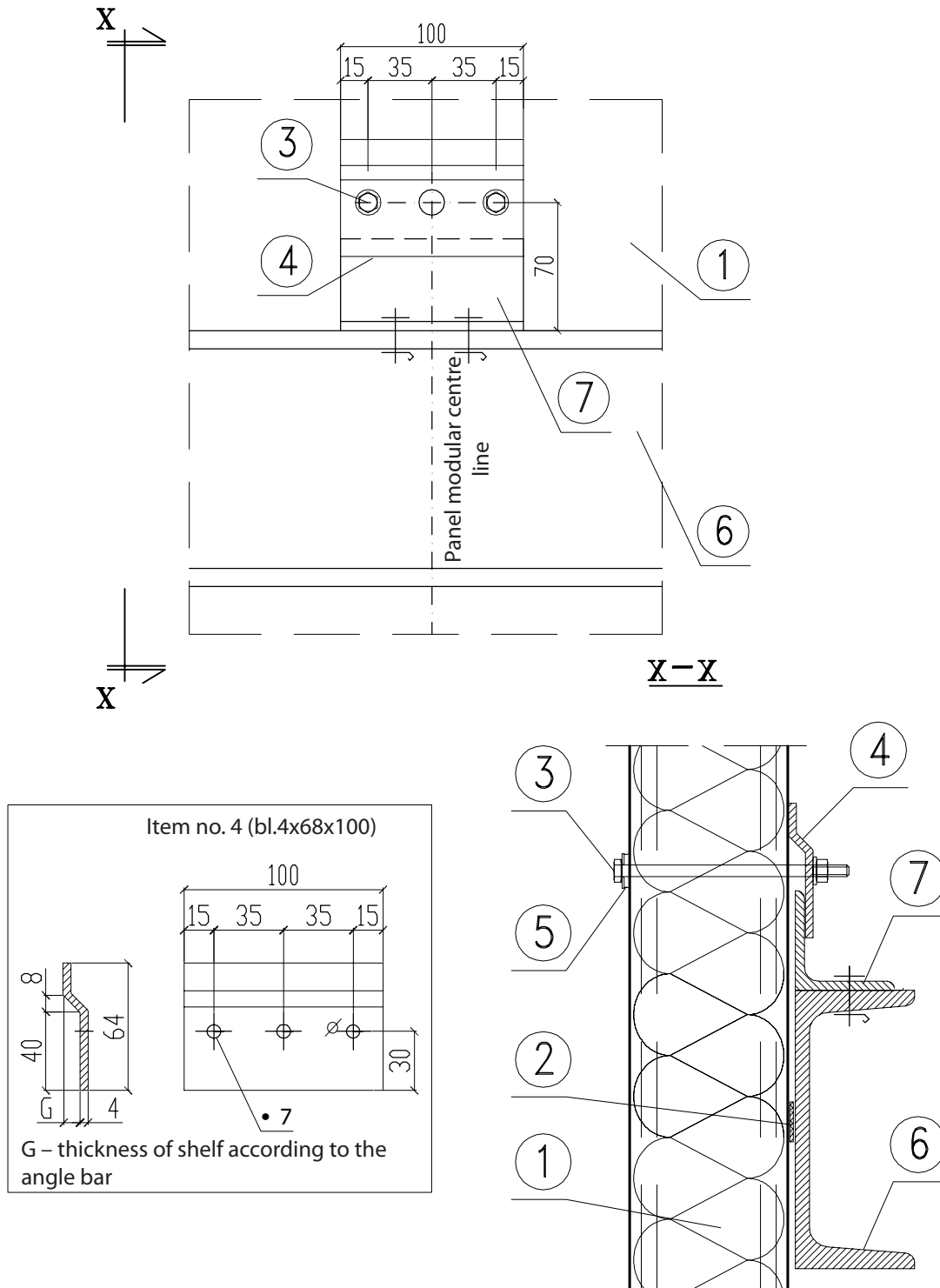
Joining panels with PVC windows – vertical or horizontal arrangement of panels



1. BALEXTHERM ST wall panel
2. OBR 107 flashing
3. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
4. Impregnated polyurethane gasket or assembly foam
5. Sealing compound
6. PVC window

1.20. ST17

Fastening panel – sliding joint – vertical arrangement of panels

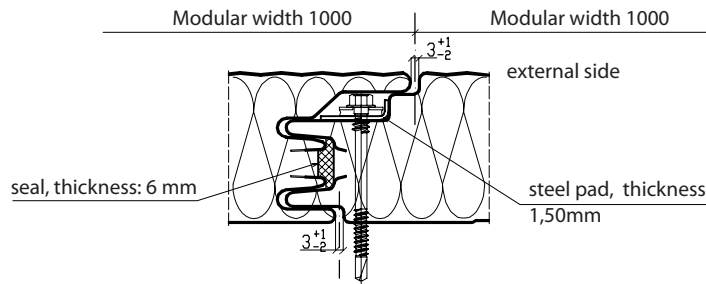
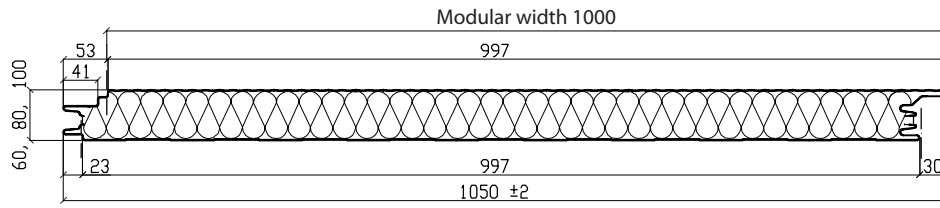


1. BALEX THERM ST wall panel
2. PES 3x20 self-adhesive sealing tape (recommended)
3. M6 screw with a self-locking nut
4. Steel washer (sheet 4x68x100) - individual
5. Washer with cured EPDM (recommended T19/3/6,7 SFS)
6. Transom acc. to the construction design
7. Angle acc. to the construction design

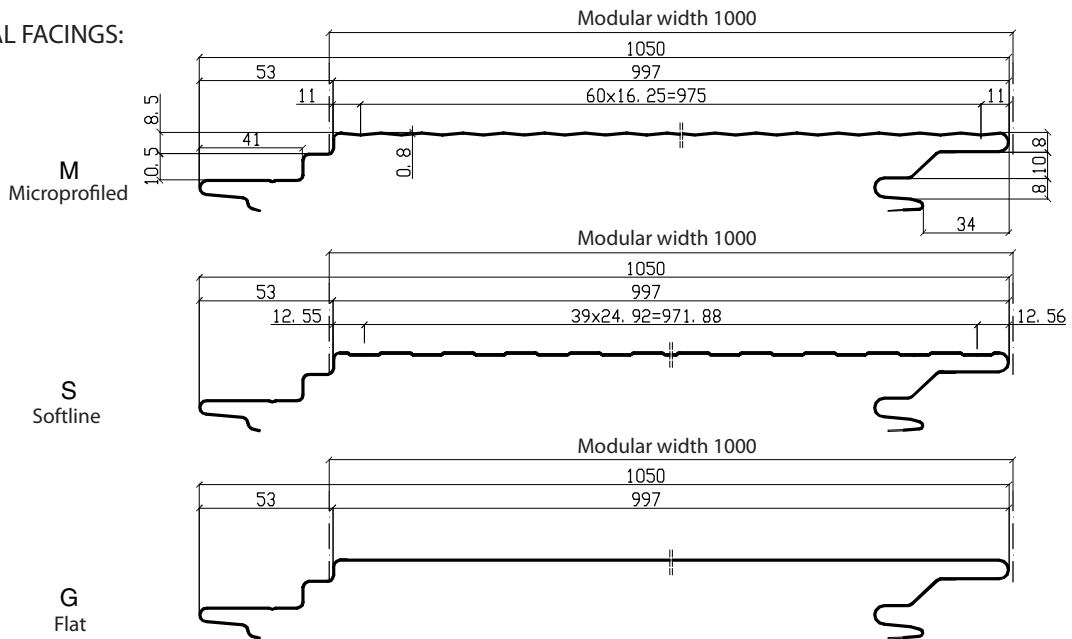
2. BALEX THERM PLUS WALL PANELS

2.1. PL01

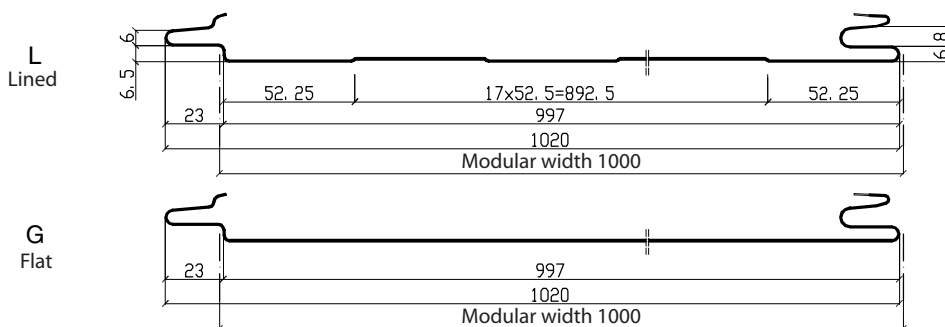
BALEX THERM PLUS 1000 wall panels- joint, profile types



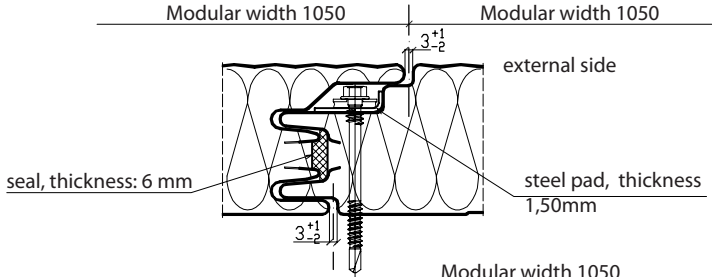
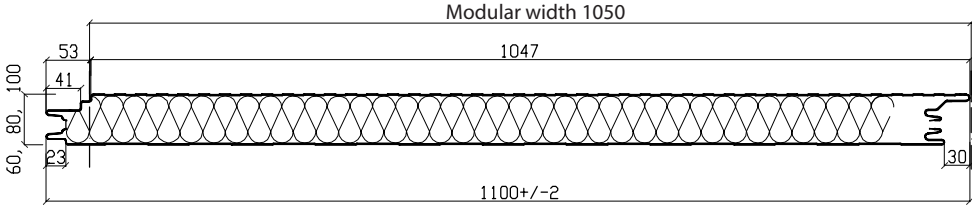
EXTERNAL FACINGS:



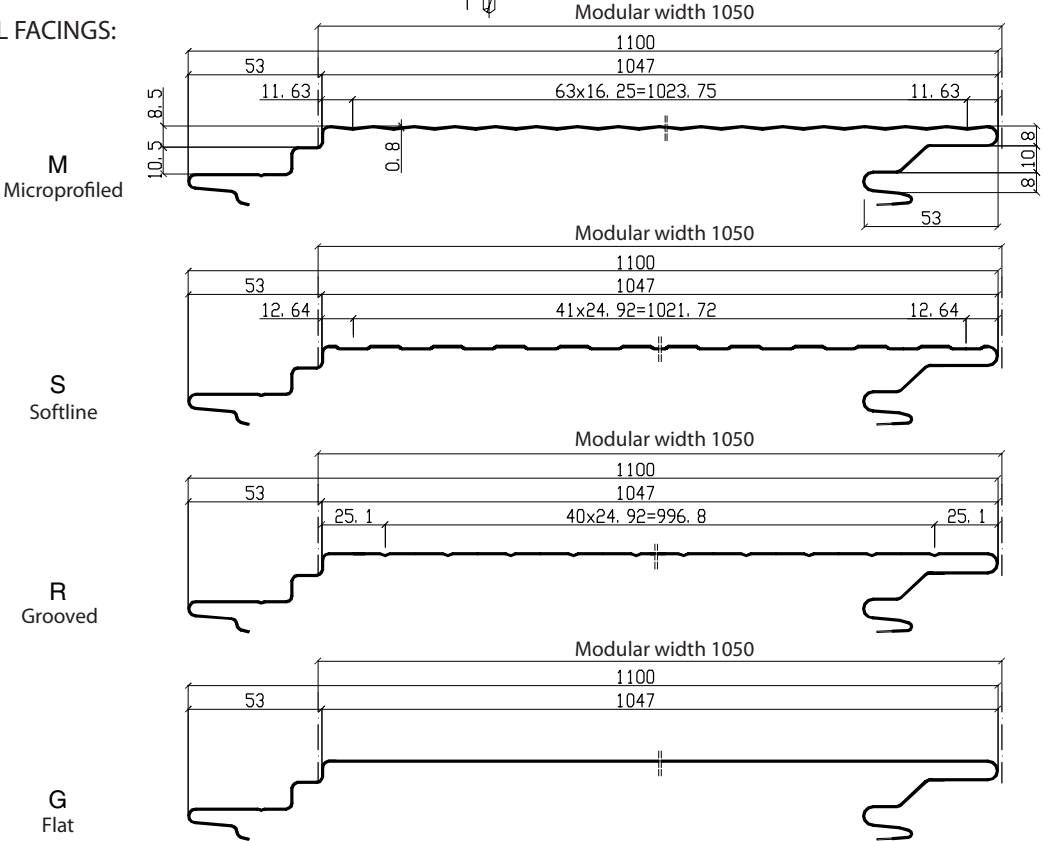
INTERNAL FACINGS:



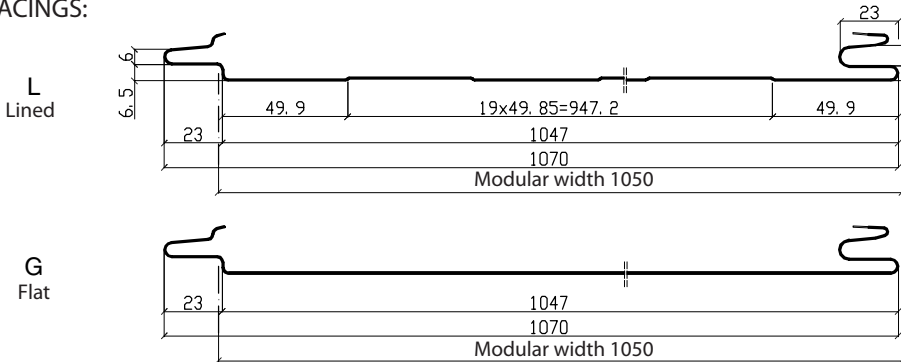
2.2. PL02
BALEXTHERM PLUS 1050 wall panel, - joint, profile types



EXTERNAL FACINGS:

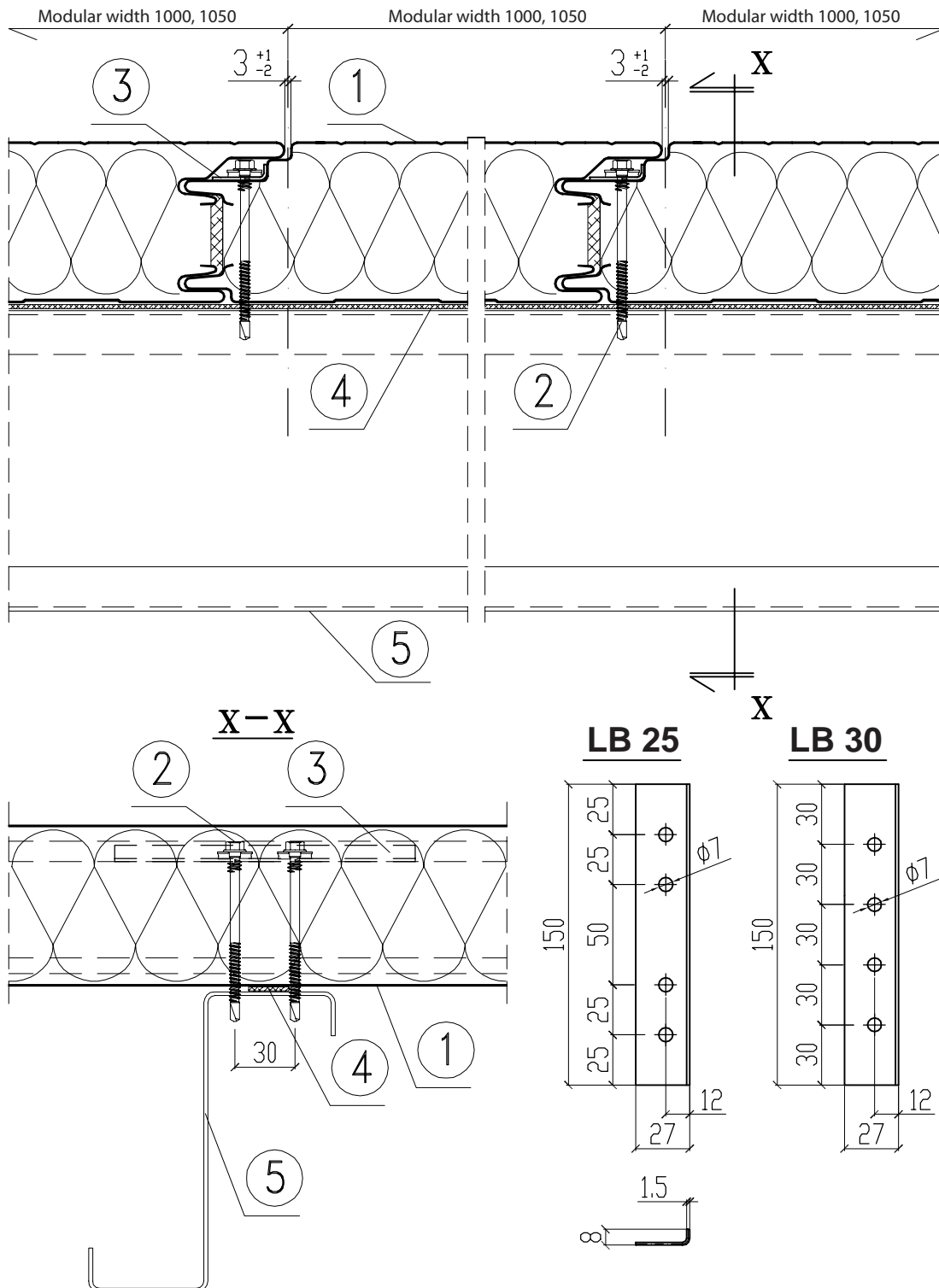


INTERNAL FACINGS:



2.3. PL03

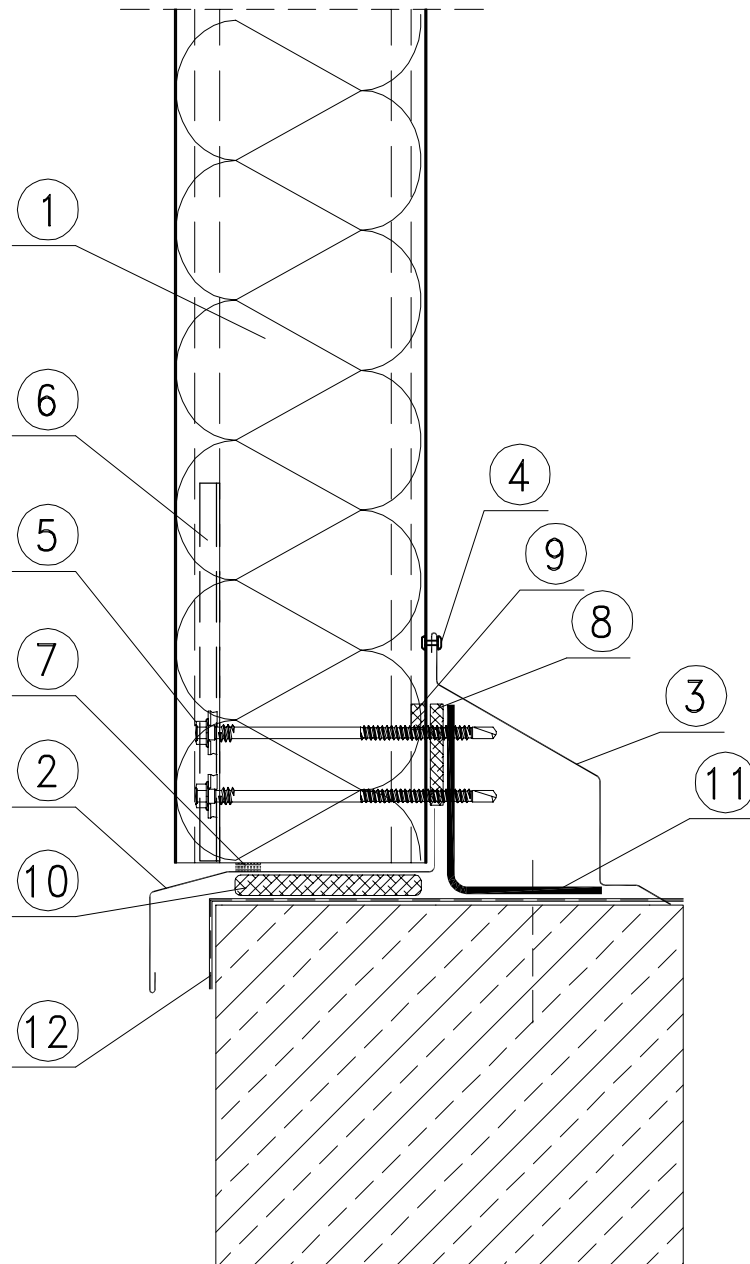
Fastening panels – vertical arrangement of panels



1. BALEXTERM PLUS wall panel
2. LB 1- LB 5 fasteners for fastening BALEXTERM panels
3. LB25 or LB 30 system steel washer
4. PES 3x20 self-adhesive sealing tape (recommended)
5. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

2.4. PL04

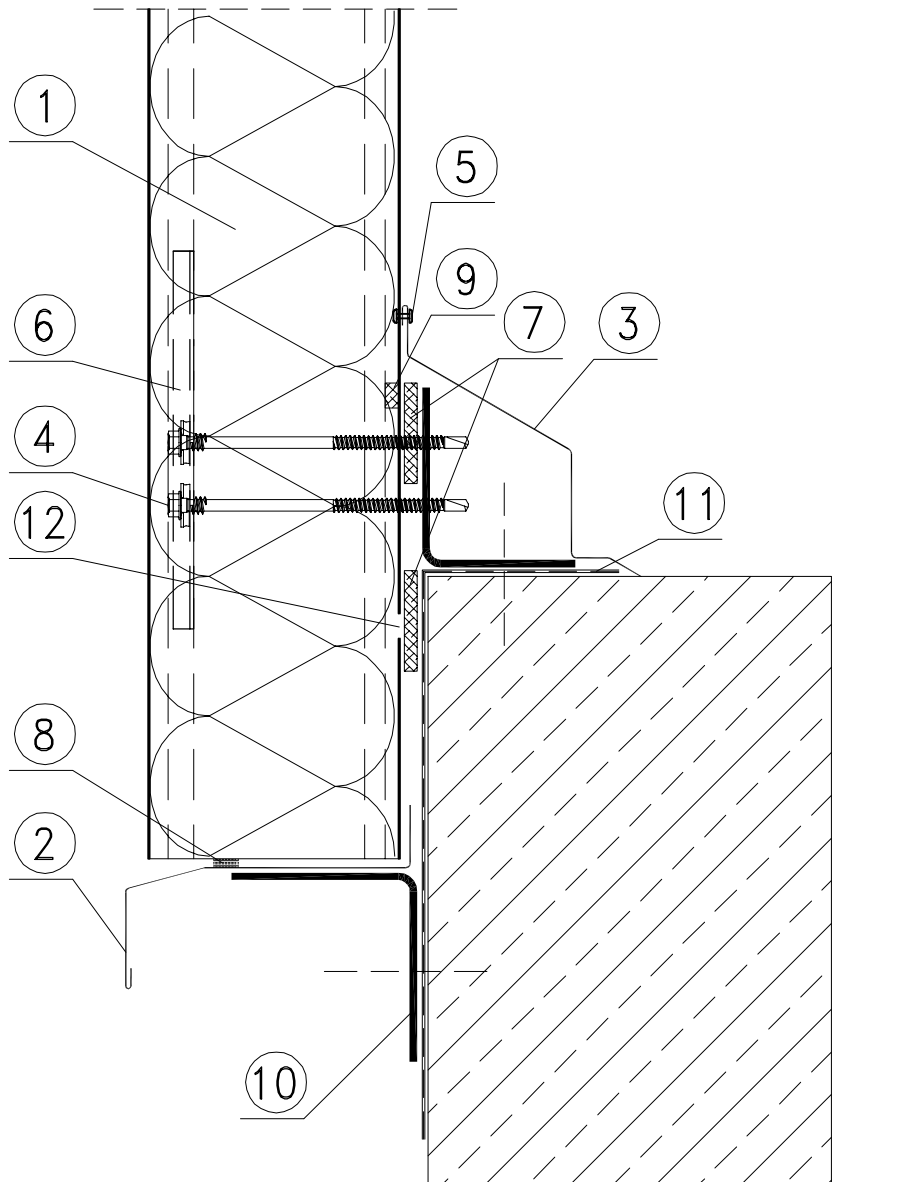
Basing panels on a ground beam or foundation - vertical arrangement of panels



1. BALEX THERM PLUS wall panel
2. OBR 100 flashing
3. OBR 101 flashing
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. LB 1 or LB 2 fastener for fastening BALEX THERM panels
6. LB 25 steel washer under fasteners
7. Butyl sealing tape (recommended)
8. PUS 5x40 self-adhesive sealing tape
9. Sealing compound in the panel joint area
10. Impregnated polyurethane gasket 20mm thick
11. Angle acc. to the construction design
12. Dampproof insulation acc. to the architecture design

2.5. PL05

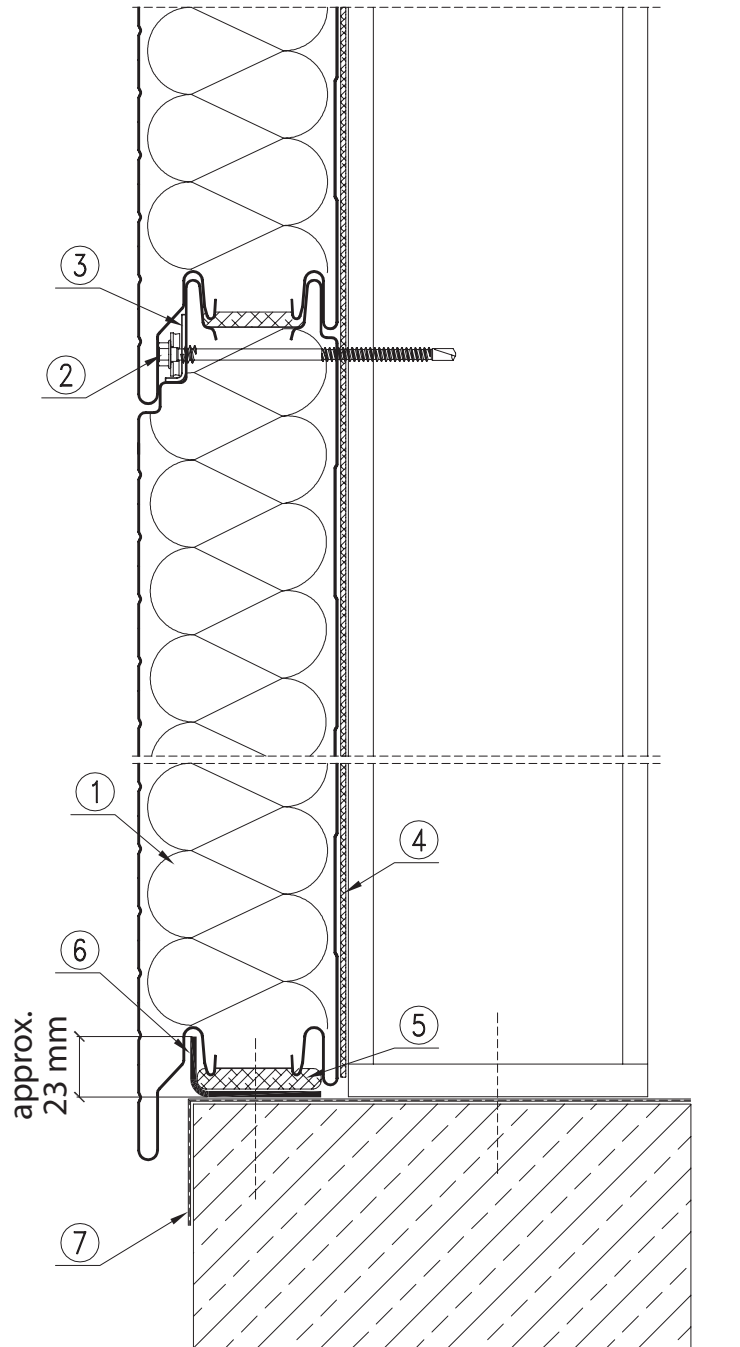
Supporting panels below the upper level of the ground beam or foundation - vertical arrangement of panels



1. BALEXTHERM PLUS wall panel
2. OBR 100 flashing
3. OBR 101 flashing
4. LB 1 or LB 2 fastener for fastening BALEXTHERM panels
5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
6. LB 25 steel washer under fasteners
7. PUS 5x40 self-adhesive sealing tape
8. Butyl sealing tape (recommended)
9. Sealing compound in the panel joint area
10. Angle acc. to the construction design
11. Dampproof insulation acc. to the architecture design
12. Cladding with a 10mm wide gap at increased thermal performance requirements

2.6. PL06

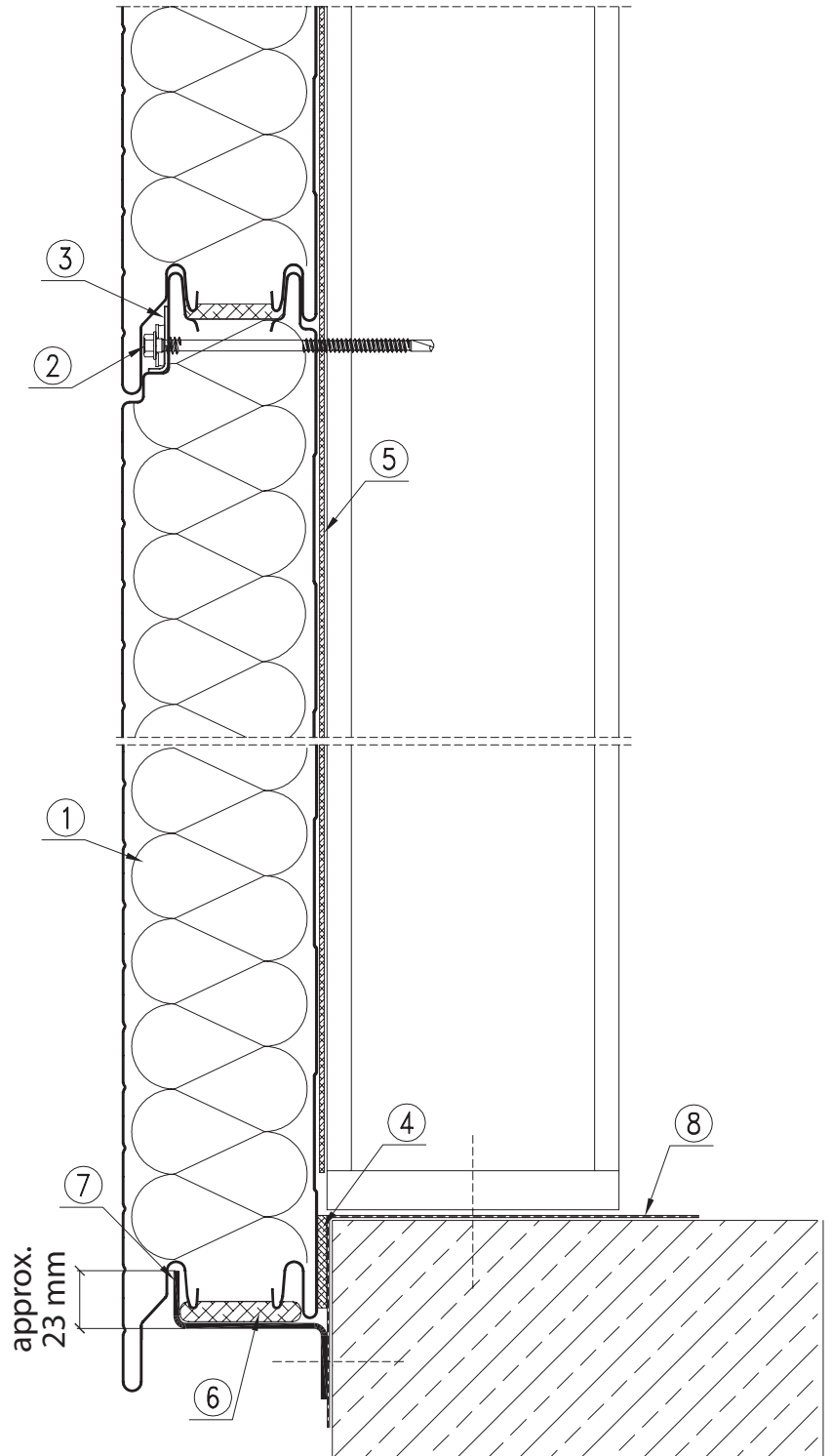
Supporting panels below the upper level of the ground beam or foundation - horizontal arrangement of panels



1. BALEX THERM PLUS wall panel
2. LB 1- LB 5 fasteners for fastening BALEX THERM panels
3. LB 25 or LB 30 steel washer under fasteners
4. PES 3x20 self-adhesive sealing tape (recommended)
5. Impregnated polyurethane gasket 20mm thick
6. Angle acc. to the construction design
7. Dampproof insulation acc. to the architecture design

2.7. PL07

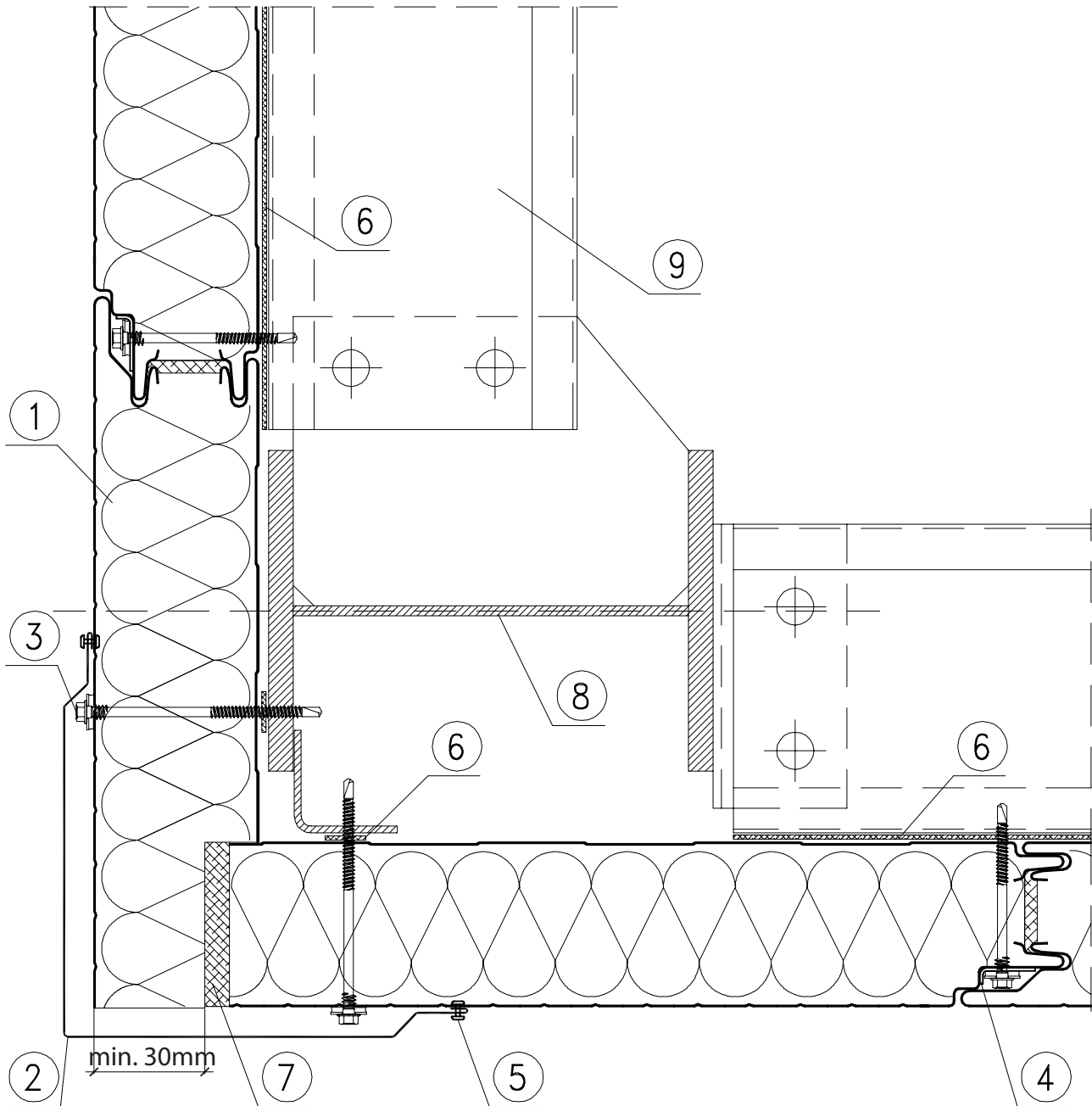
Supporting panels below the upper level of the ground beam or foundation - horizontal arrangement of panels



1. BALEXTHERM PLUS wall panel
2. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
3. LB 25 or LB 30 steel washer under fasteners
4. PUS 5x40 self-adhesive sealing tape
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Impregnated polyurethane gasket 20mm thick
7. Z-bar acc. to the construction design
8. Dampproof insulation acc. to the architecture design

2.8. PL08

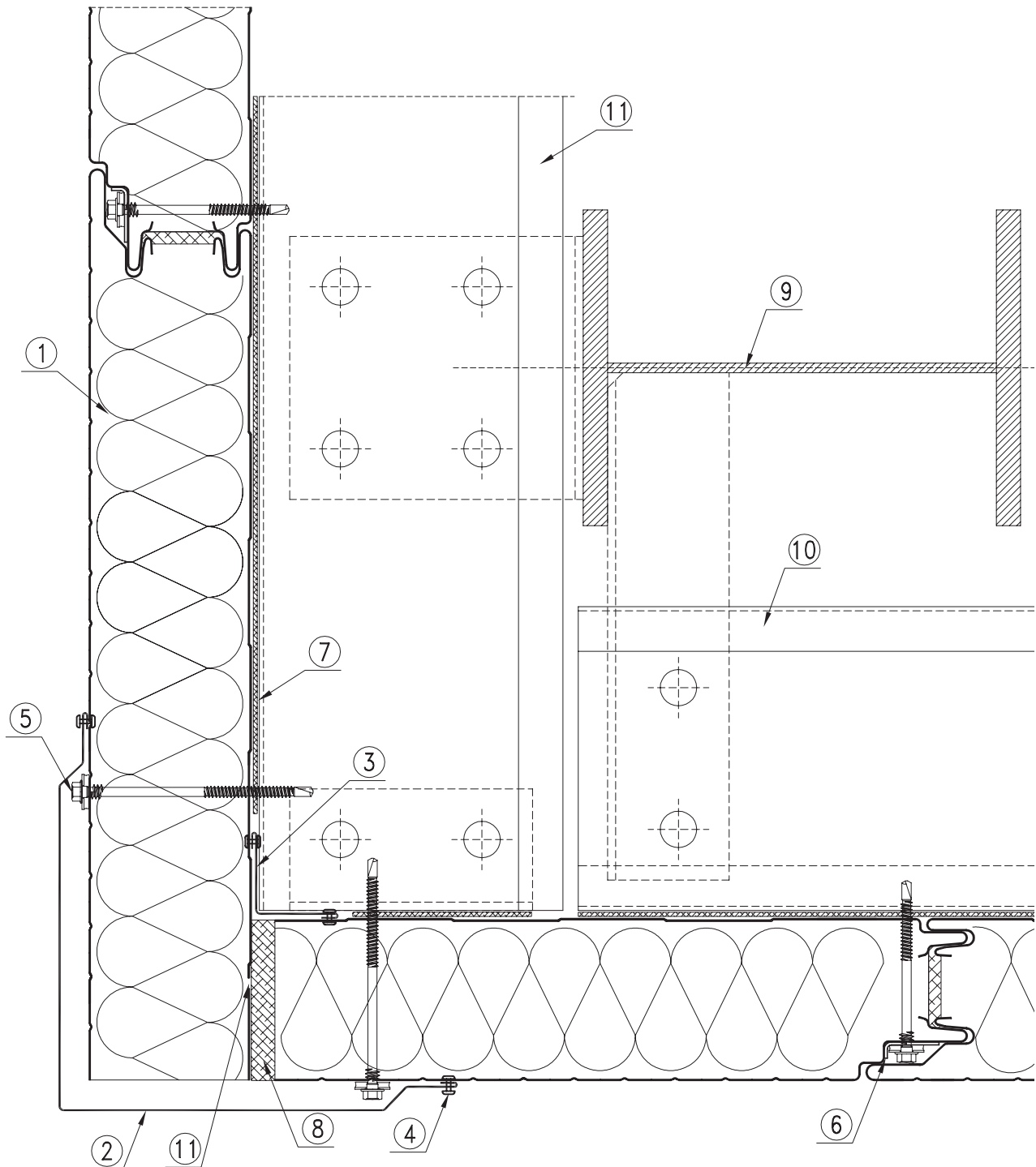
Joining panels in the corner - vertical arrangement of panels – option I



1. BALEX THERM PLUS wall panel
2. OBR 103 flashing
3. LB 1- LB 5 fasteners for fastening BALEX THERM panels
4. LB 25 or LB 30 steel washer under fasteners
5. LB6 self-drilling fastener or AL/Fe blind rivet every 300mm
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Assembly foam or polyurethane gasket
8. Steel, reinforced concrete, wooden column + angle acc. to the construction design
9. Transom acc. to the construction design

2.9. PL09

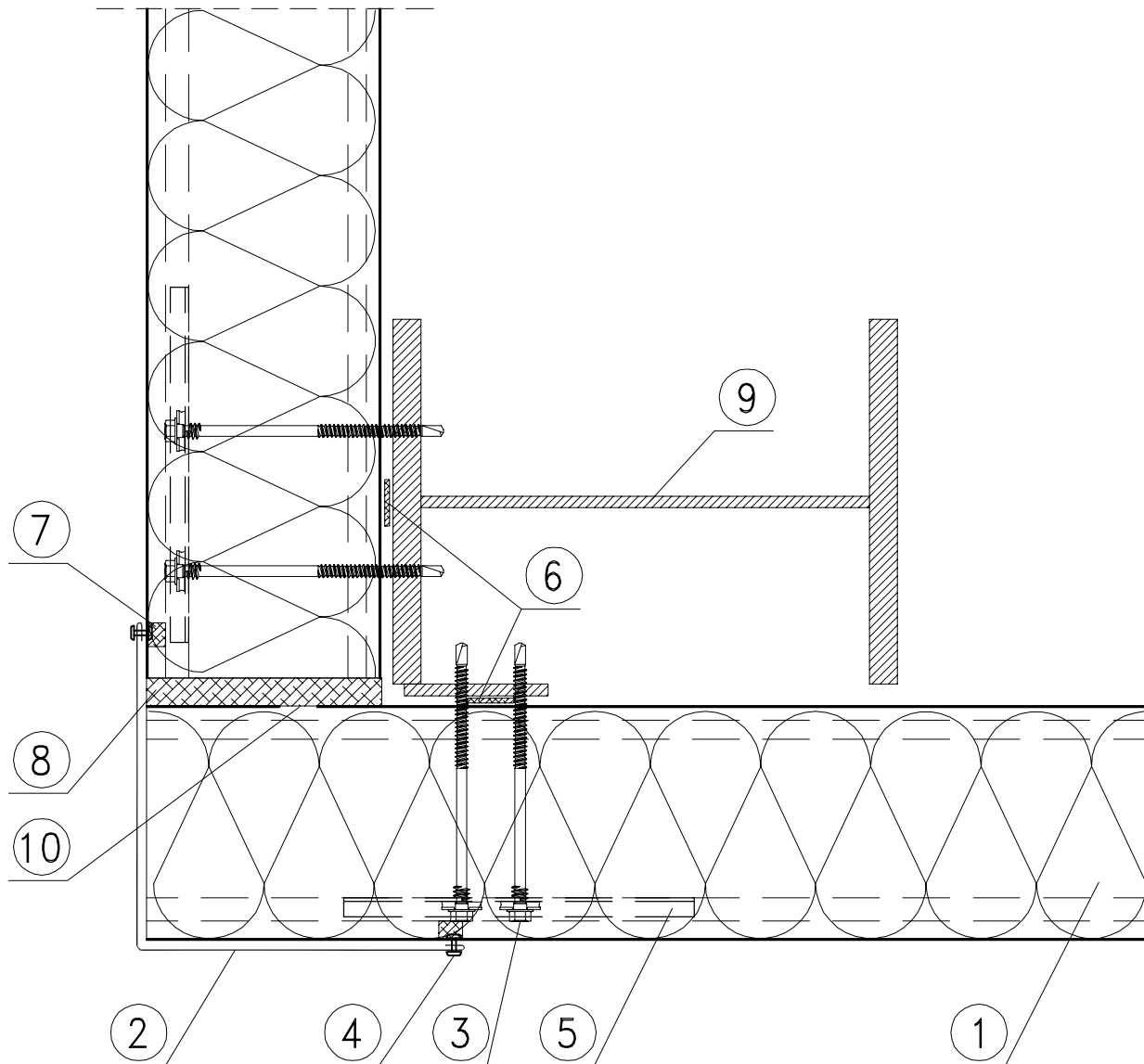
Joining panels in the corner - vertical arrangement of panels – option II



1. BALEXTHERM PLUS wall panel
2. OBR 103 flashing
3. OBR 104 flashing
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
6. LB 25 or LB 30 steel washer under fasteners
7. PES 3x20 self-adhesive sealing tape (recommended)
8. Assembly foam or polyurethane ga
9. Steel, reinforced concrete, wooden column acc. to the construction design
10. Transom acc. to the construction design
11. Cladding with a 10mm wide gap at increased thermal performance requirements

2.10. PL10

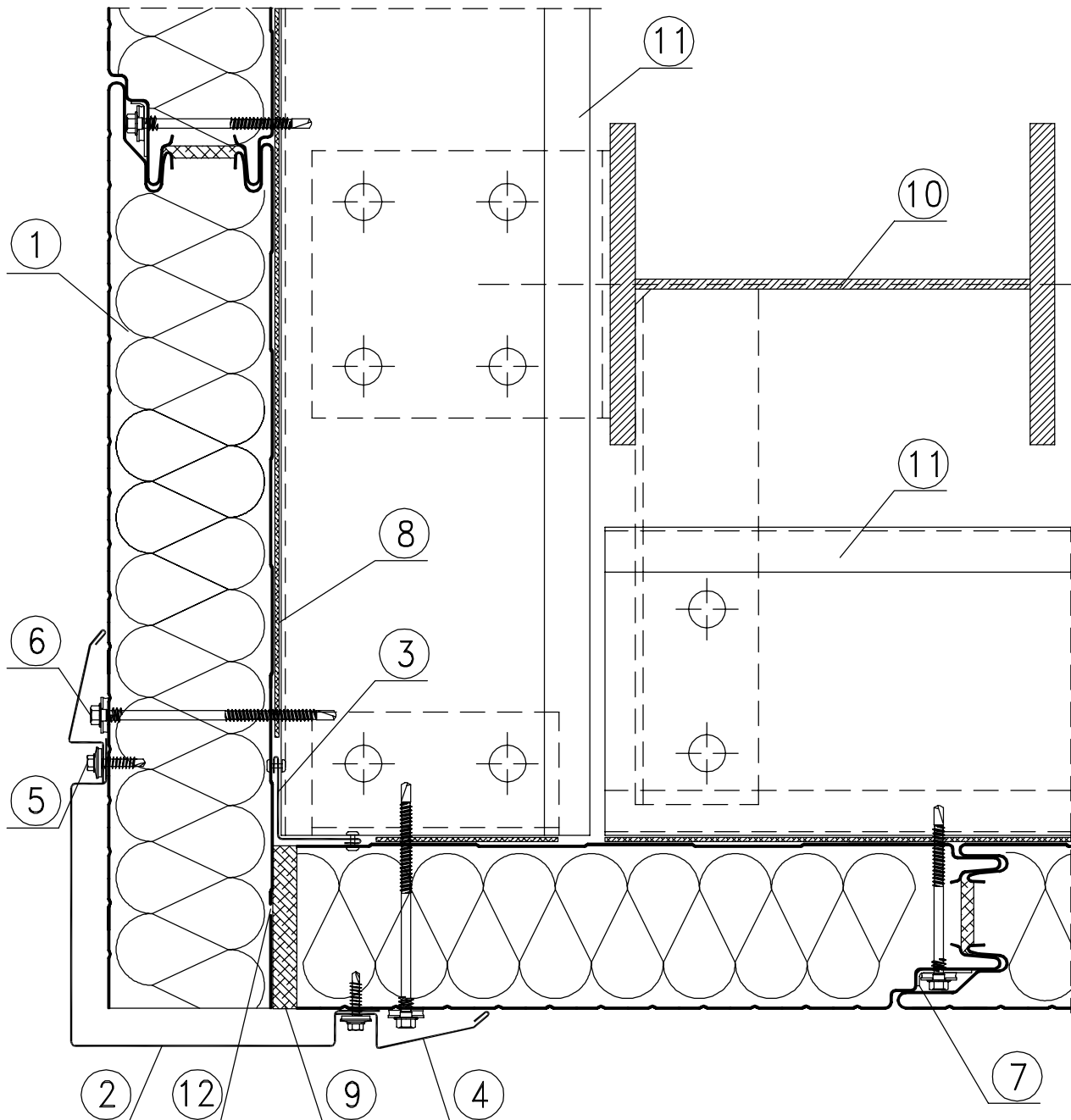
Joining panels in the corner - horizontal arrangement of panels



1. BALEXTHERM PLUS wall panel
2. OBR 105 or OBR109 flashing
3. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. LB 25 or LB 30 steel washer under fasteners
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Sealing compound in the panel joint area
8. Assembly foam or impregnated polyurethane gasket
9. Steel, reinforced concrete, wooden column + flat bar acc. to the construction design
10. Cladding with a 10mm wide gap at increased thermal performance requirements

2.11. PL10/1

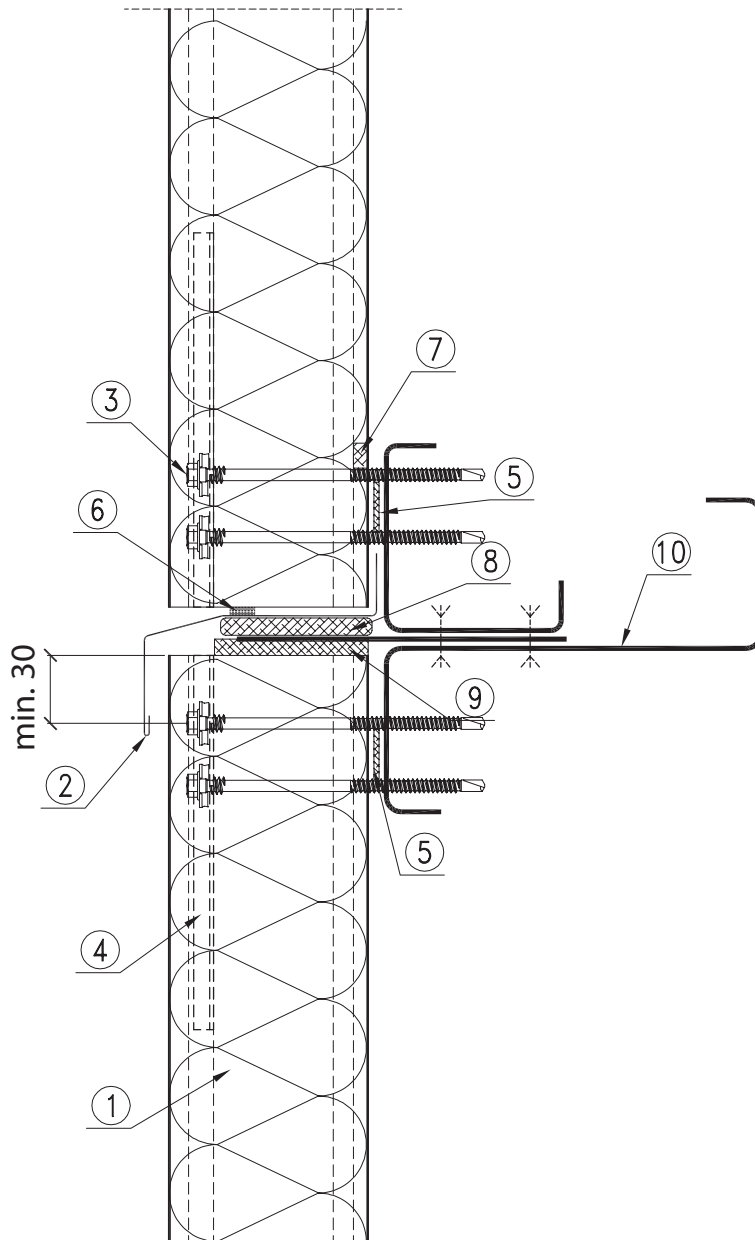
Joining panels in the corner – vertical or horizontal arrangement of panels



1. BALEXTHERM PLUS wall panel
2. OBR 113 flashing
3. OBR 104 flashing
4. OBR 111 flashing
5. LB 6 self-drilling fastener every 300mm
6. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
7. LB 25 or LB 30 steel washer under fasteners
8. PES 3x20 self-adhesive sealing tape (recommended)
9. Assembly foam or polyurethane gasket
10. Steel, reinforced concrete, wooden column acc. to the construction design
11. Transom acc. to the construction design
12. Cladding with a 10mm wide gap at increased thermal performance requirements

2.12. PL11

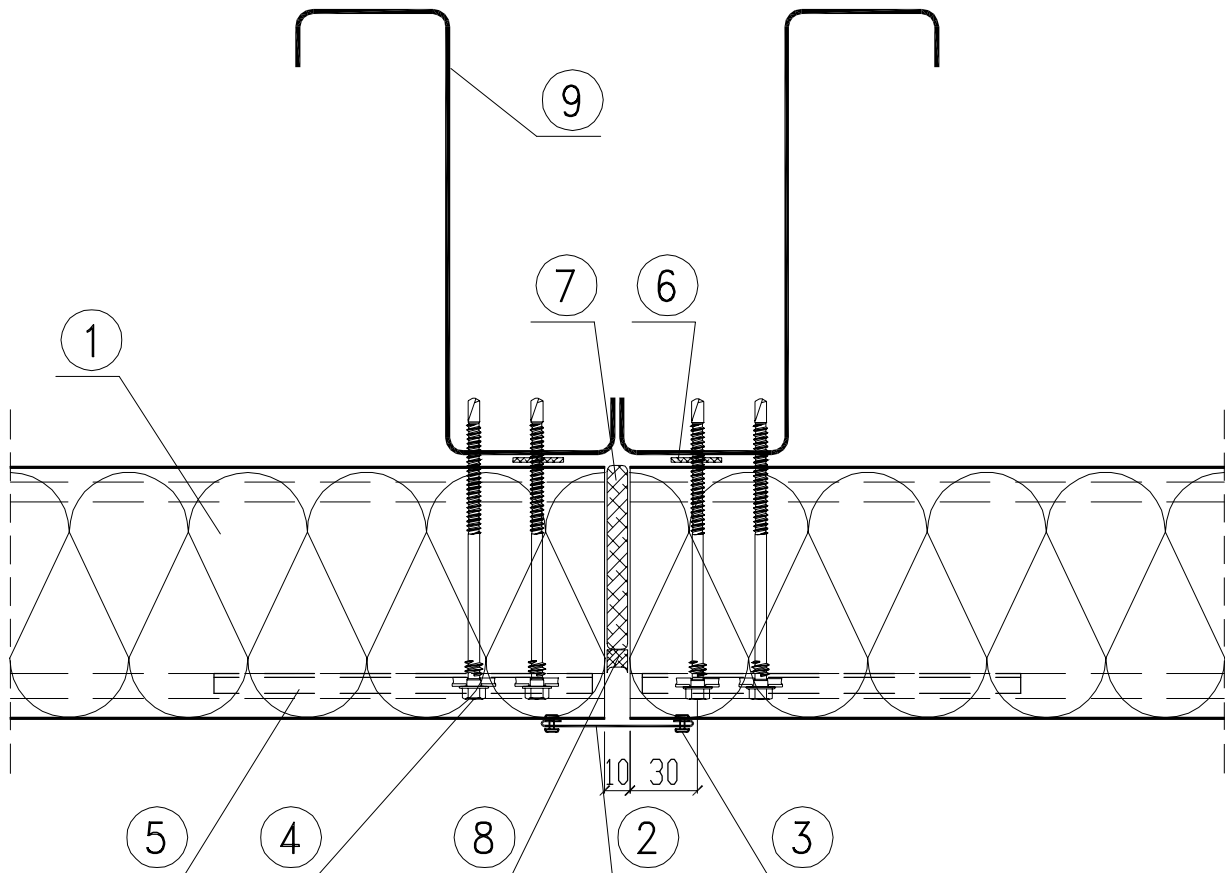
Joining panels lengthwise – vertical arrangement of panels



1. BALEX THERM PLUS wall panel
2. OBR 100 flashing
3. LB 1- LB 5 fasteners for fastening BALEX THERM panels
4. LB 25 or LB 30 steel washer under fasteners
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Butyl sealing tape (recommended)
7. PUS 5x40 self-adhesive sealing tape
8. Sealing compound in the panel joint area
9. Impregnated polyurethane gasket 20mm thick
10. Assembly foam
11. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

2.13. PL12/1

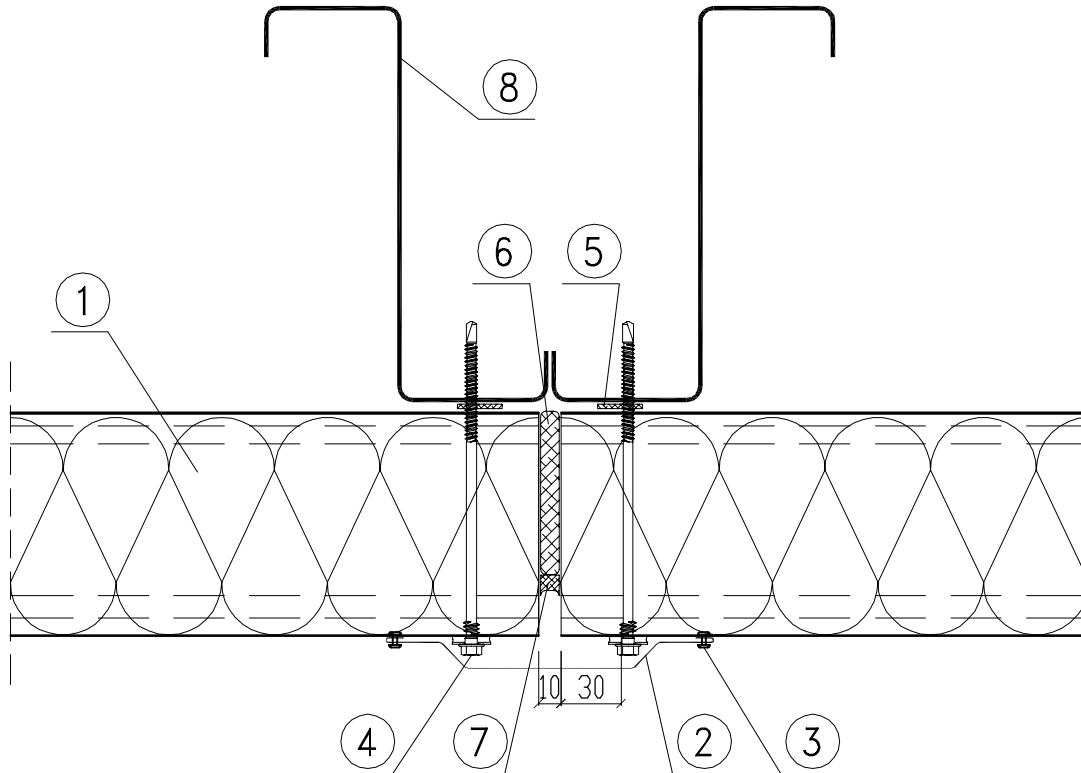
Fastening panel to the end support – horizontal arrangement of panels – option I



1. BALEX THERM PLUS wall panel
2. OBR 106 flashing
3. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
4. LB 1- LB 5 fasteners for fastening BALEX THERM panels
5. LB 25 or LB 30 steel washer under fasteners
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Impregnated polyurethane gasket or assembly foam
8. Illmod expansion gasket (recommended)
9. Steel, reinforced concrete, wooden column acc. to the construction design

2.14. PL12/2

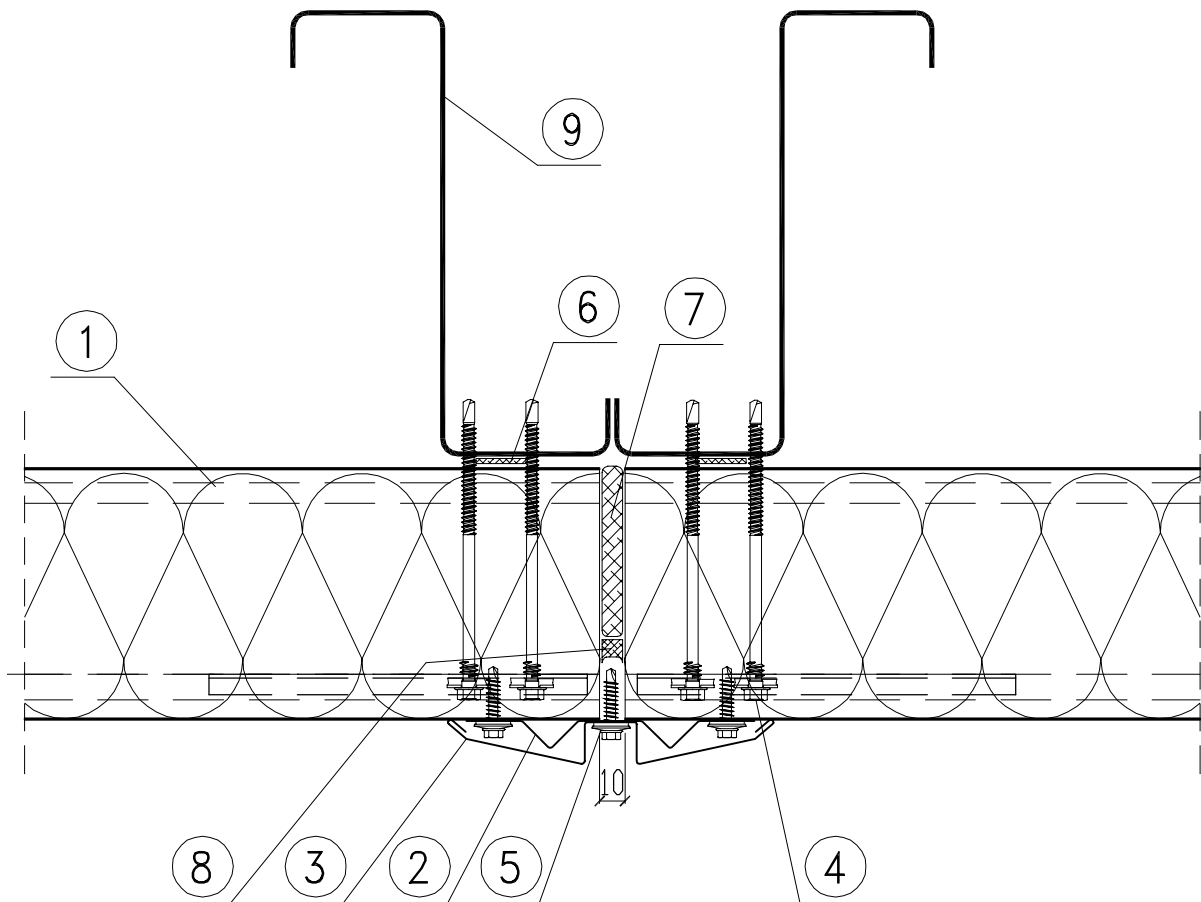
Fastening panel to the end support – horizontal arrangement of panels – option II



1. BALEX THERM PLUS wall panel
2. OBR 105 flashing
3. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
4. LB 1- LB 5 fasteners for fastening BALEX THERM panels
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Impregnated polyurethane gasket or assembly foam
7. Illmod expansion gasket (recommended)
8. Steel, reinforced concrete, wooden column acc. to the construction design

2.15. PL12/3

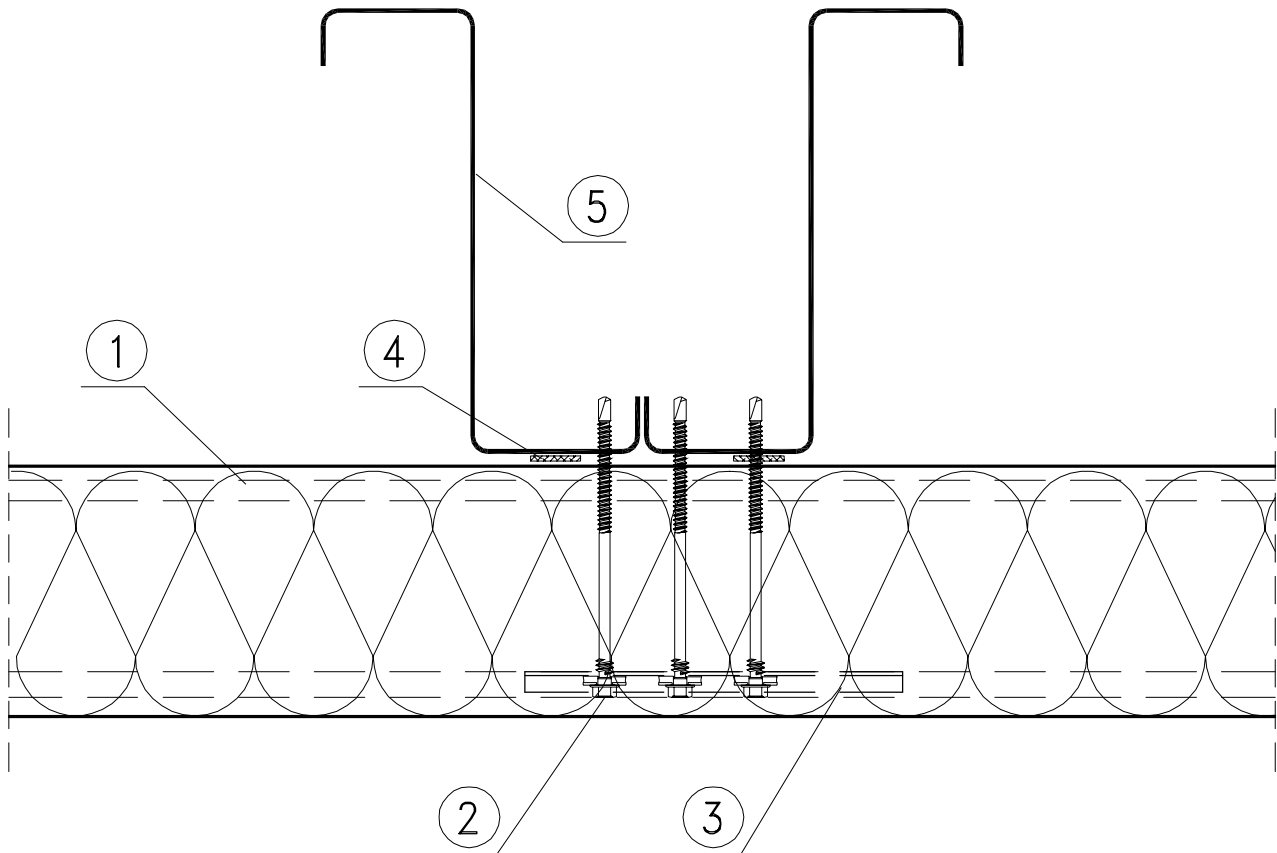
Fastening panel to the end support – horizontal arrangement of panels – option III



1. BALEXTHERM PLUS wall panel
2. OBR 110 flashing
3. OBR 110 flashing
4. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
5. LB 6 self-drilling fastener every 300mm
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Impregnated polyurethane gasket or assembly foam
8. Illmod expansion gasket (recommended)
9. Steel, reinforced concrete, wooden column acc. to the construction design

2.16. PL13

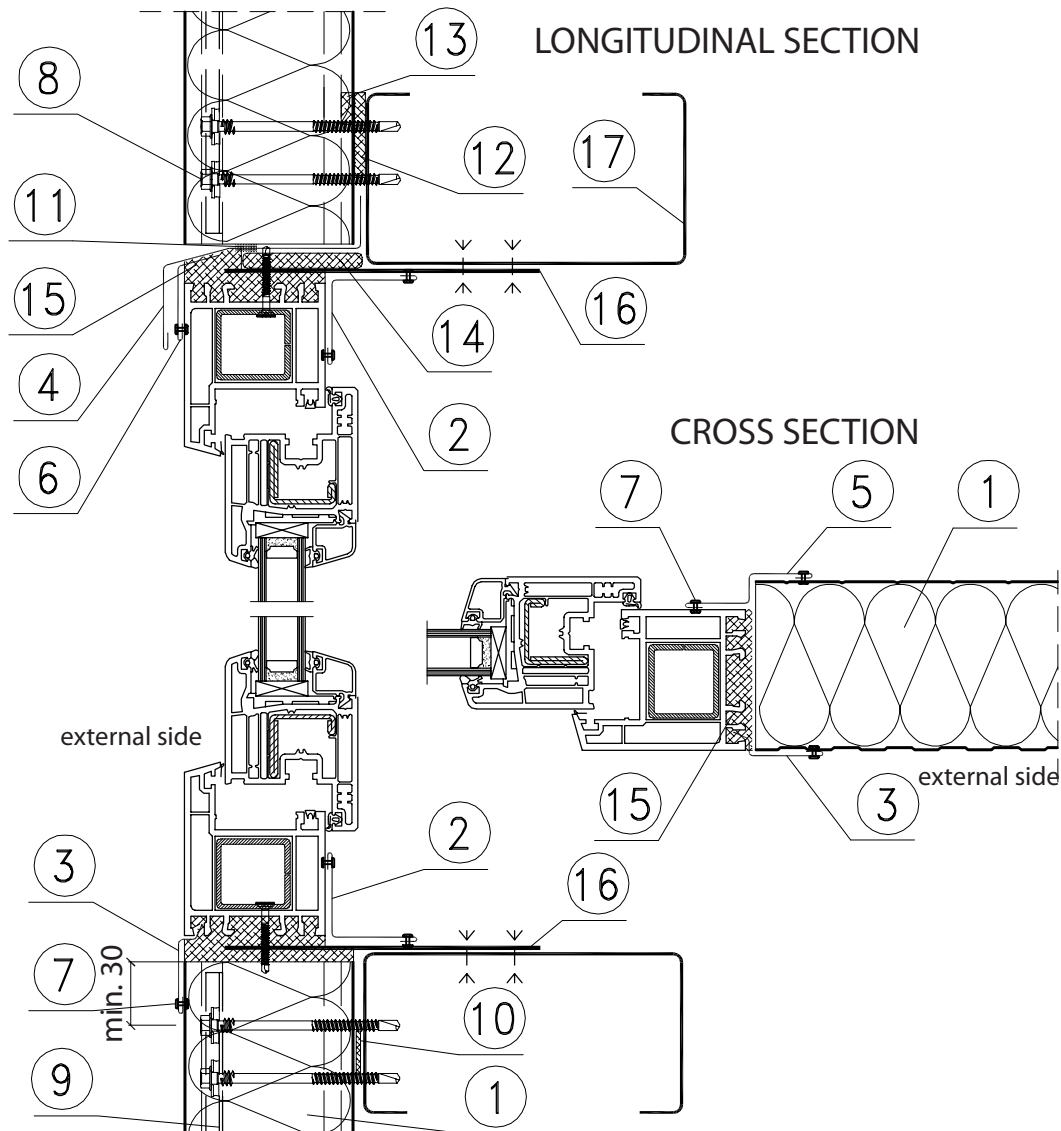
Fastening panel to the in-between support – horizontal arrangement of panels



1. BALEX THERM PLUS wall panel
2. LB 1- LB 5 fasteners for fastening BALEX THERM panels
3. LB 25 or LB 30 steel washer under fasteners
4. PES 3x20 self-adhesive sealing tape (recommended)
5. Steel, reinforced concrete, wooden column acc. to the construction design

2.17. PL14

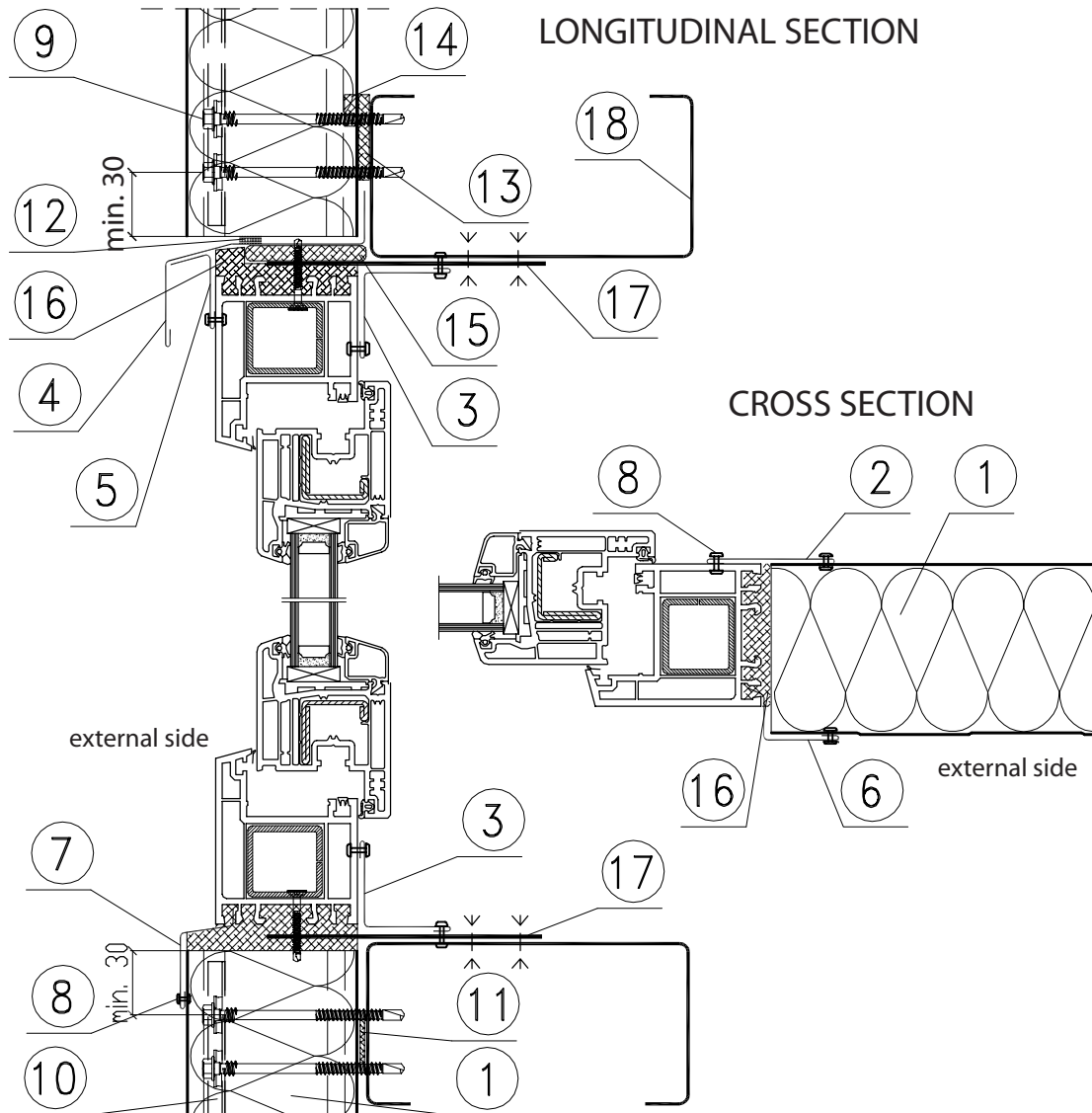
Joining panels with window strip – vertical arrangement of panels – option I



1. BALEXTHERM PLUS wall panel
2. OBR 104 flashing
3. OBR 106 flashing
4. OBR 100 flashing
5. Individual flashing
6. Individual flashing
7. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
8. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
9. LB 25 or LB 30 steel washer under fasteners
10. PES 3x20 self-adhesive sealing tape (recommended)
11. Butyl sealing tape (recommended)
12. PUS 5x40 self-adhesive sealing tape
13. Sealing compound in the panel joint area
14. Impregnated polyurethane gasket 10mm thick
15. Assembly foam
16. Flat bar for fastening a window
17. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

2.18. PL15

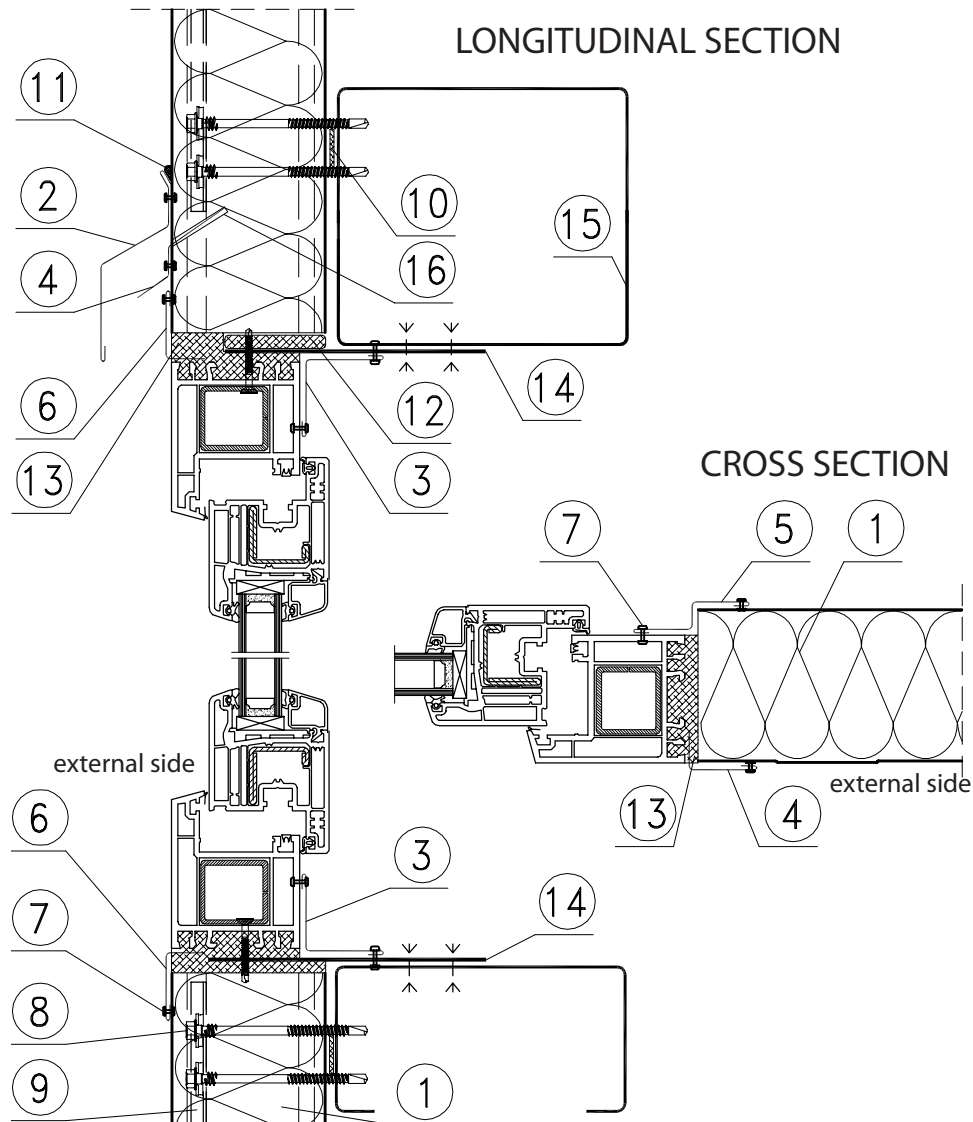
Joining panels with window strip – vertical arrangement of panels – option II



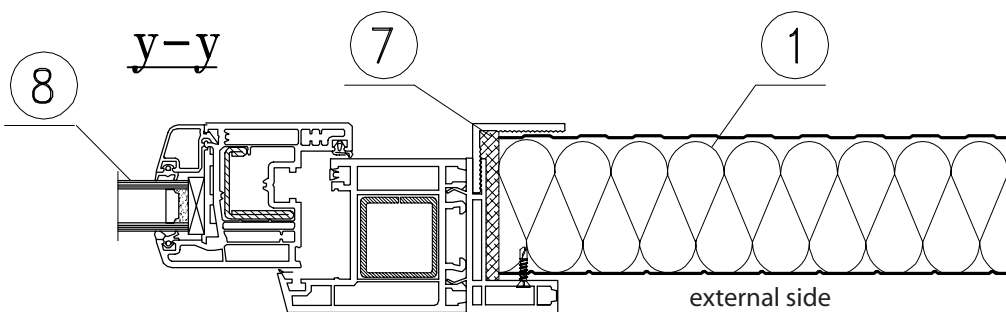
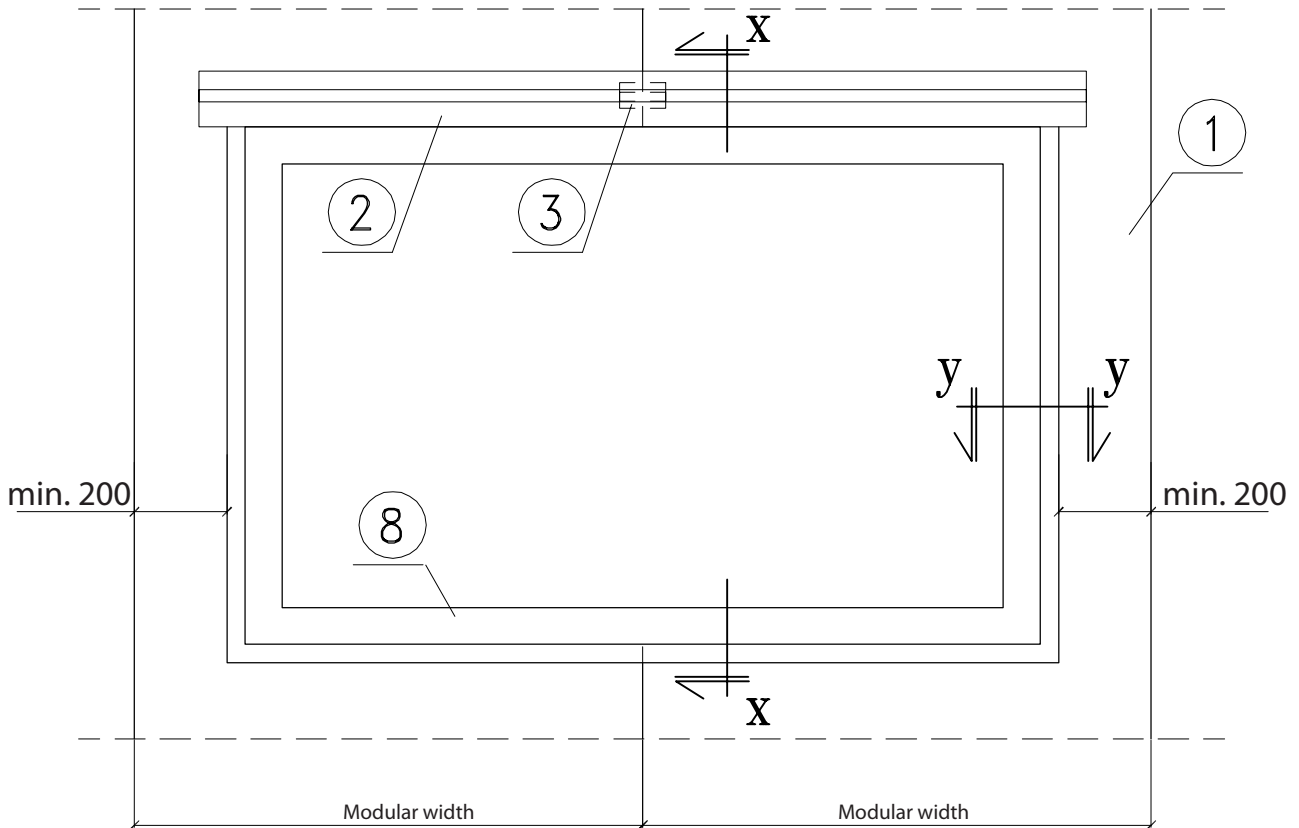
1. BALEXTHERM PLUS wall panel
2. OBR 106 flashing
3. OBR 104 flashing
4. OBR 100 flashing
5. Individual flashing
6. Individual flashing
7. Individual flashing
8. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
9. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
10. LB 25 or LB 30 steel washer under fasteners
11. PES 3x20 self-adhesive sealing tape (recommended)
12. Butyl sealing tape (recommended)
13. PUS 5x40 self-adhesive sealing tape
14. Sealing compound in the panel joint area
15. Impregnated polyurethane gasket 10mm thick or assembly foam
16. Assembly foam
17. Flat bar for fastening a window
18. Steel transom: cold-bent or hot-rolled, wooden etc. acc. to the construction design

2.19. PL16

Joining panels with window strip – vertical arrangement of panels – option III



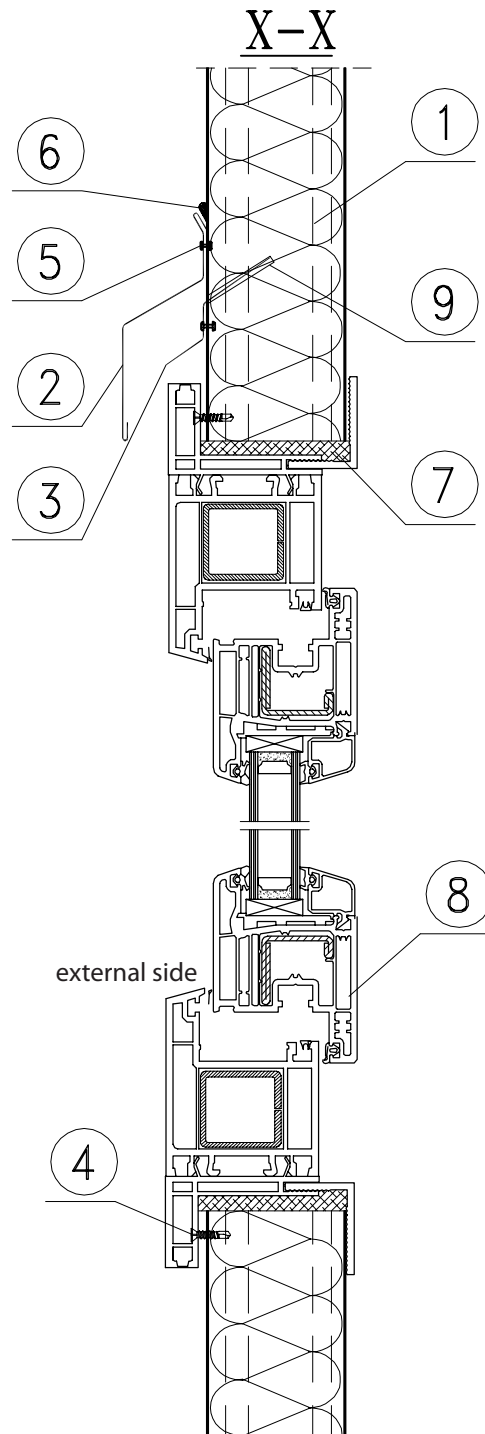
1. BALEXOTHERM PLUS wall panel
2. OBR 100 flashing
3. OBR 100 flashing
4. OBR 100 flashing (in the panel contact area)
5. Individual flashing
6. Individual flashing (cut a groove in foam)
7. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
8. LB 1- LB 5 fasteners for fastening BALEXOTHERM panels
9. LB 25 or LB 30 steel washer under fasteners
10. PES 3x20 self-adhesive sealing tape (recommended)
11. Butyl sealing tape (recommended)
12. Impregnated polyurethane gasket 10mm thick
13. Assembly foam
14. Flat bar for fastening a window
15. Steel transom: cold-bent, hot-rolled, wooden etc. acc. to the construction design
16. Groove in the panel joint area under OBR 110 flashing

2.20. PL17/1
Joining panels with PVC windows – vertical or horizontal arrangement of panels


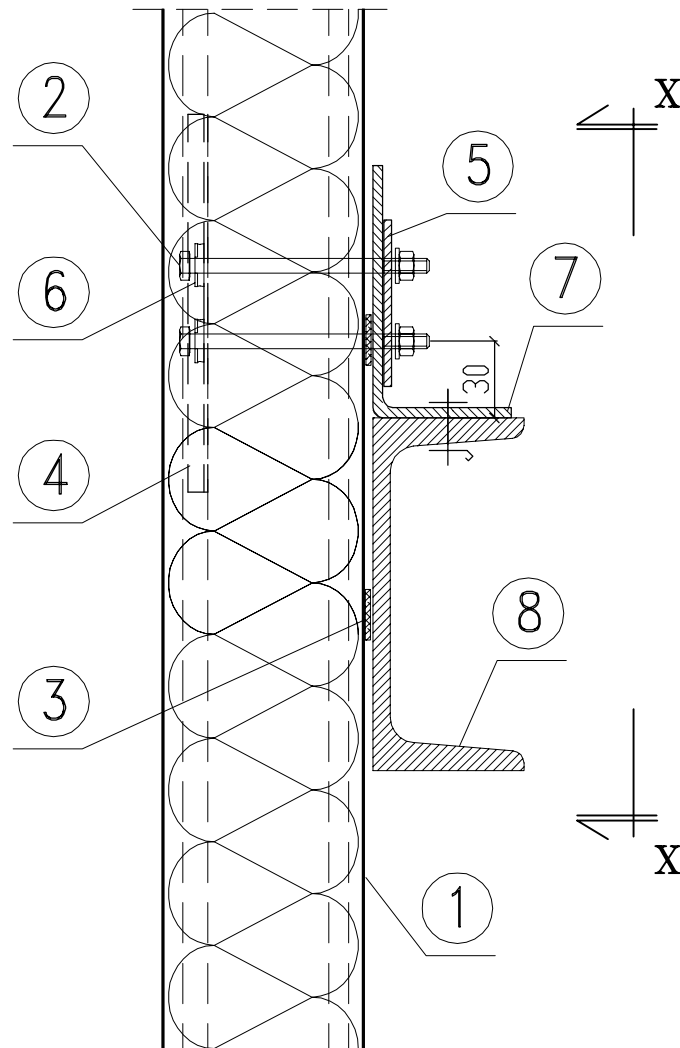
1. BALEX THERM PLUS wall panel
2. OBR 107 flashing
3. OBR 108 flashing (in the panel joint area – for the vertical arrangement of panels only)
4. Assembly foam or polyurethane gasket
5. PVC window

2.21. PL17/2

Joining panels with PVC windows – vertical or horizontal arrangement of panels



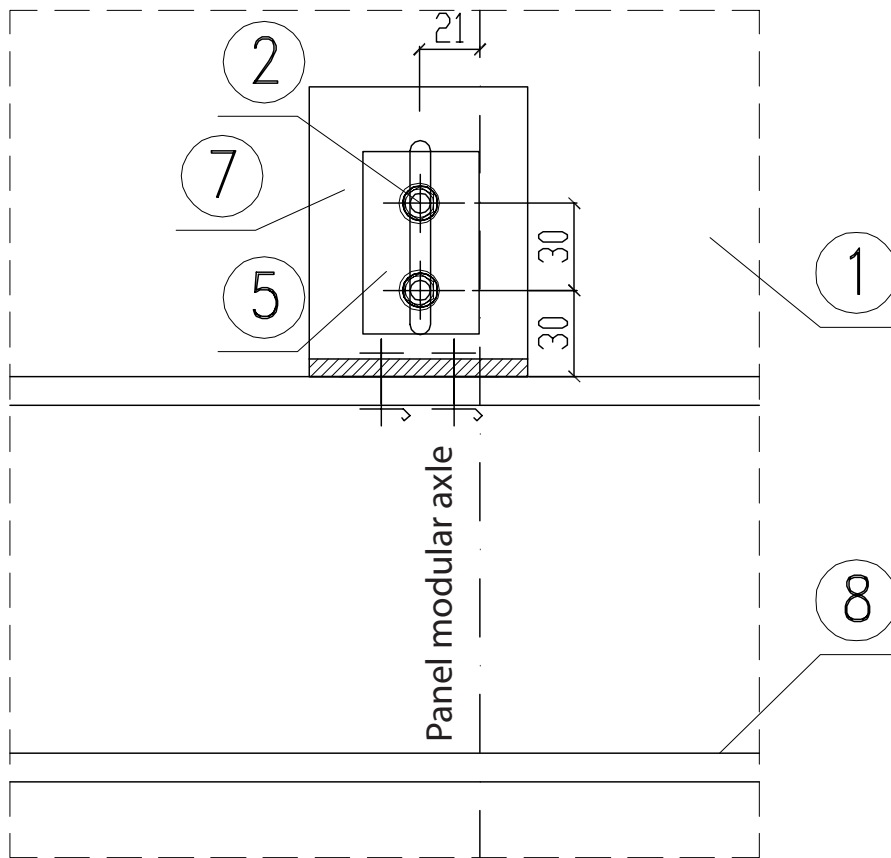
1. BALEXTERM PLUS wall panel
2. OBR 107 flashing
3. OBR 108 flashing (in the panel joint area – for the vertical arrangement of panels only)
4. Self-drilling fastener for fastening a window every 300mm
5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
6. Sealing compound
8. PVC window
9. Groove in the panel joint area under OBR 110 flashing (for the vertical arrangement of panels only)

2.22. PL18/1
Fastening panel – sliding joint – vertical arrangement of panels


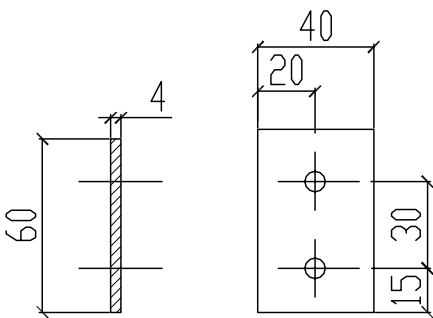
1. BALEX THERM PLUS wall panel
2. M 6 screw with a self-locking nut
3. PES 3x20 self-adhesive sealing tape (recommended) – sound insulation
4. LB 30 system steel washer
5. Steel washer - individual
6. Washer with cured EPDM (recommended T19/3/6,7 by SFS)
7. Angle acc. to the construction design
8. Transom acc. to the construction design

2.23. PL18/2

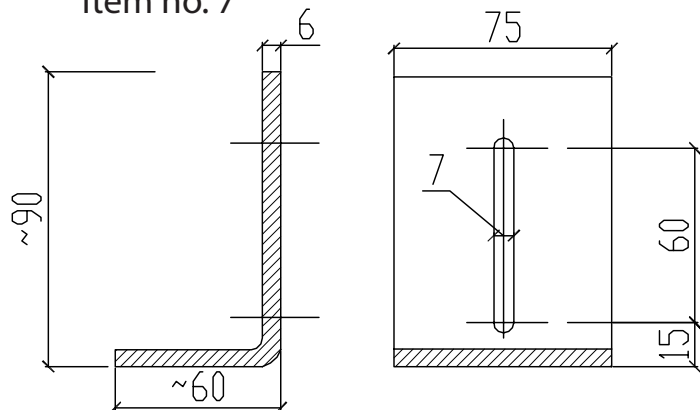
Fastening panel – sliding joint – vertical arrangement of panels – X-X section



Item no. 5



Item no. 7

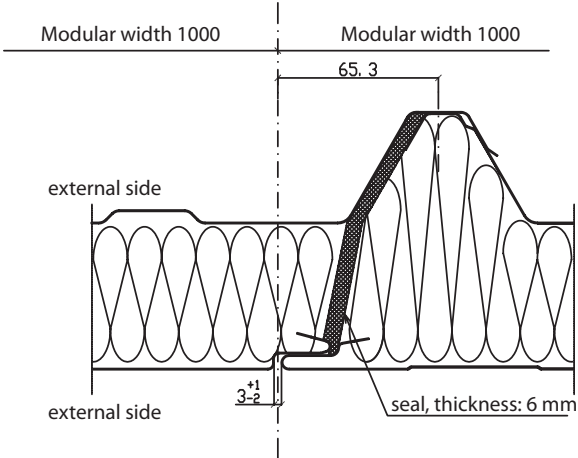
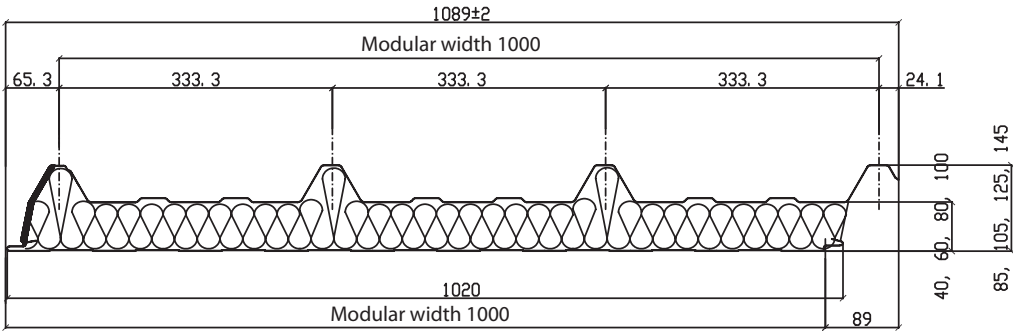


- 1. BALEXTHERM PLUS wall panel
- 2. M 6 screw with a self-locking nut
- 5. Steel washer - individual
- 7. Angle acc. to the construction design
- 8. Girder acc. to the construction design

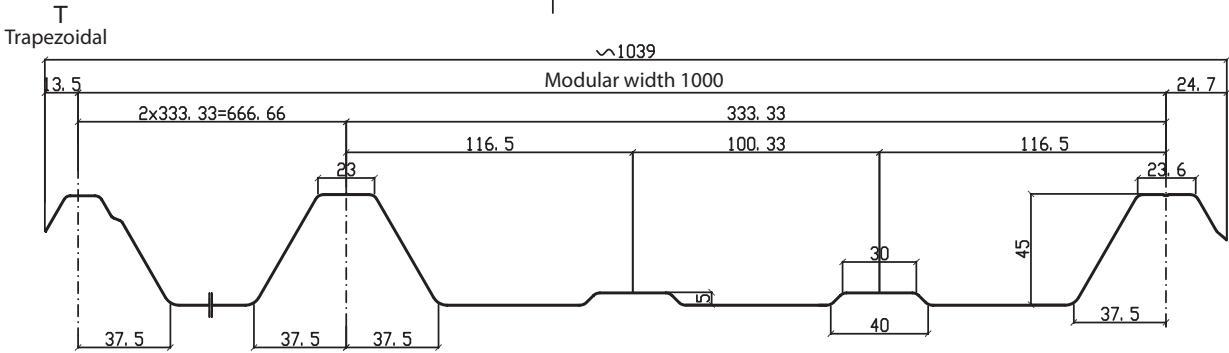
3. BALEX THERM D ROOF PANELS

3.1. D01

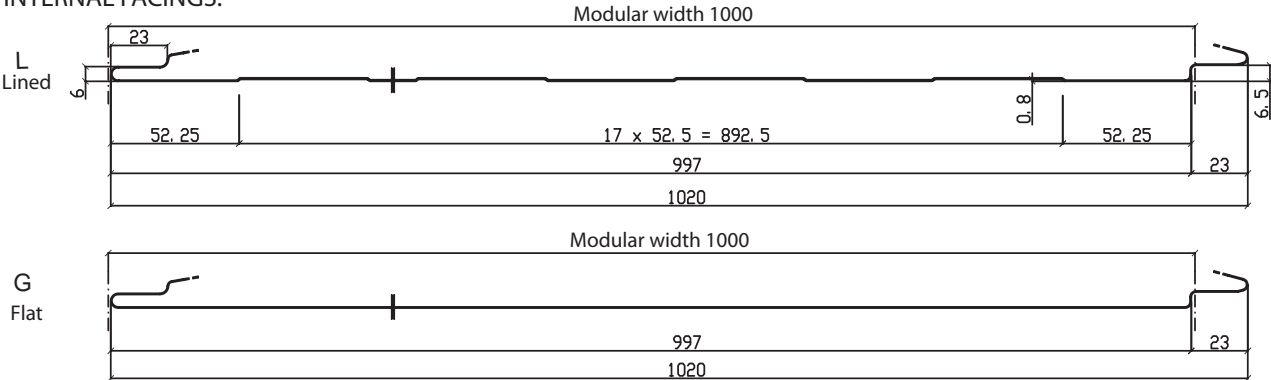
BALEX THERM D roof panels- joint, profile type



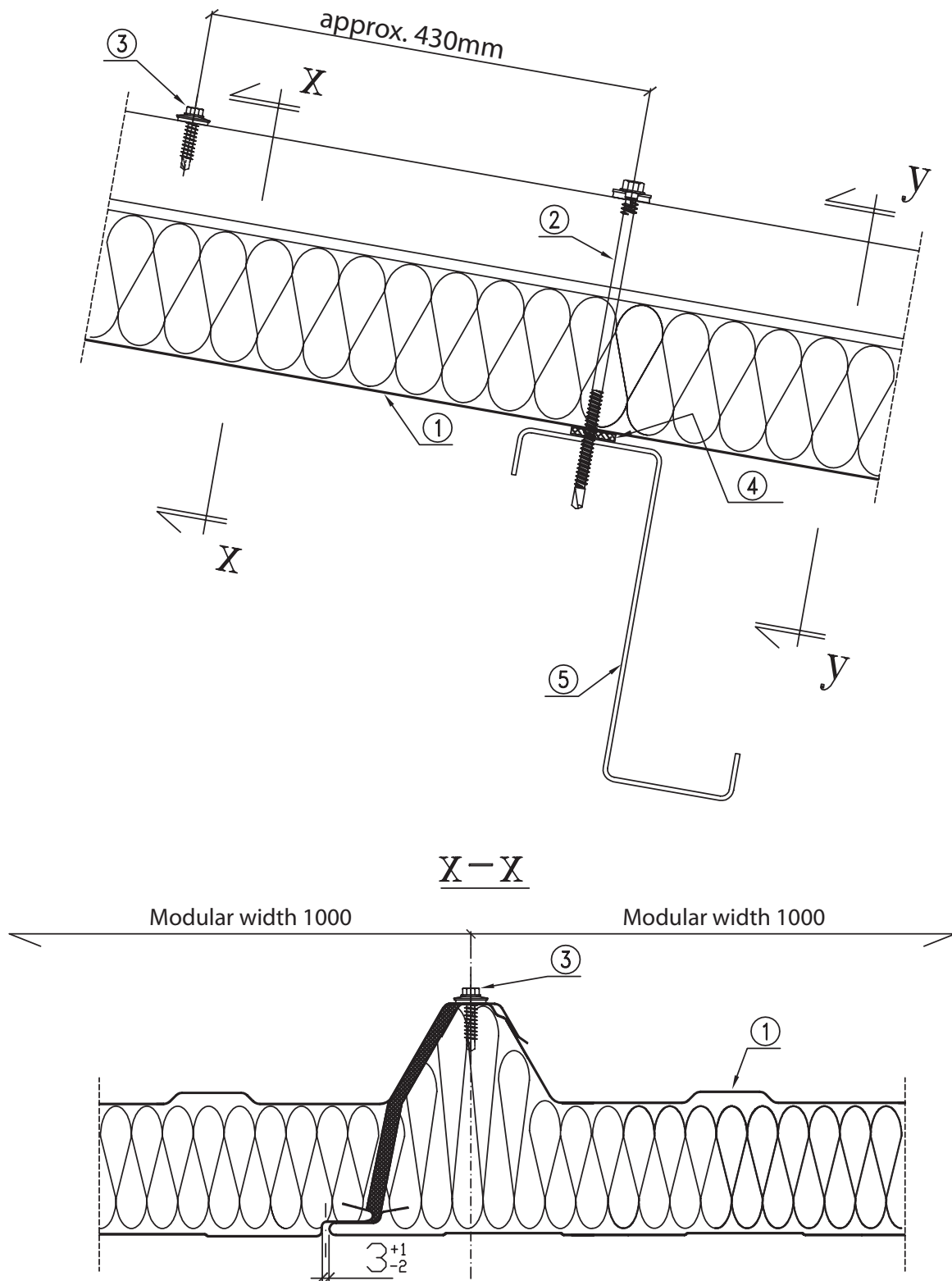
EXTERNAL FACINGS:



INTERNAL FACINGS:

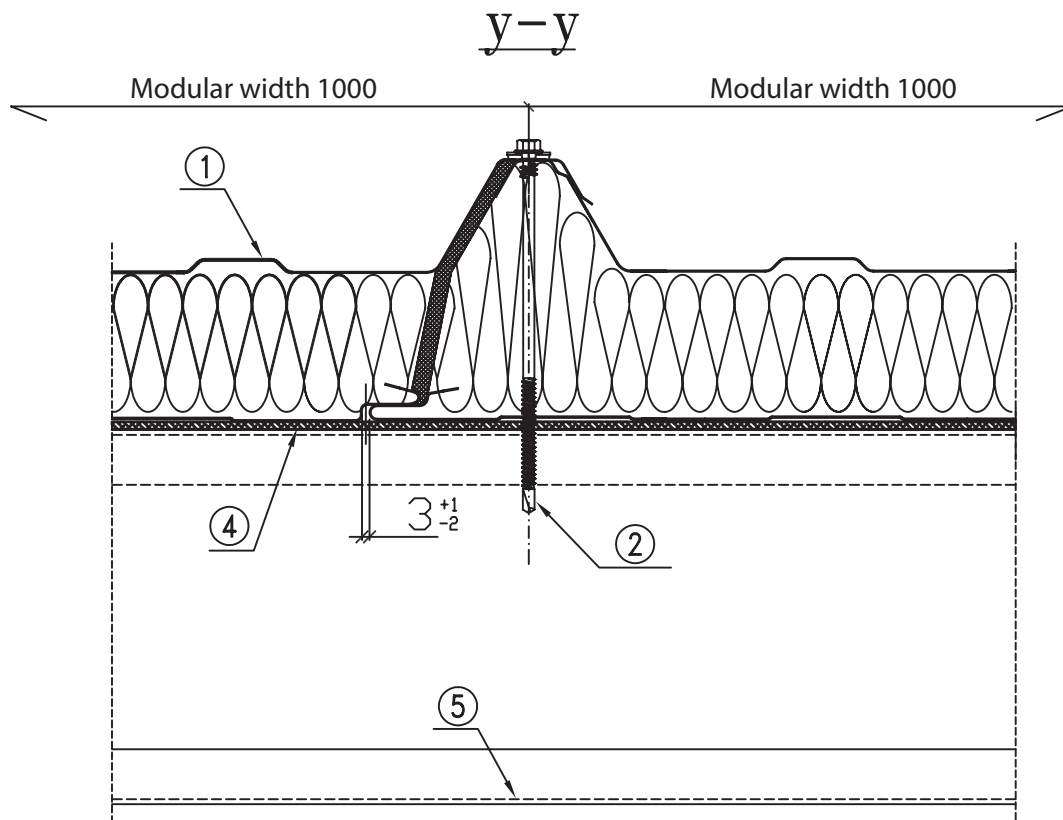


3.2. D02/1
Fastening panel to a steel purlin



3.3. D02/2

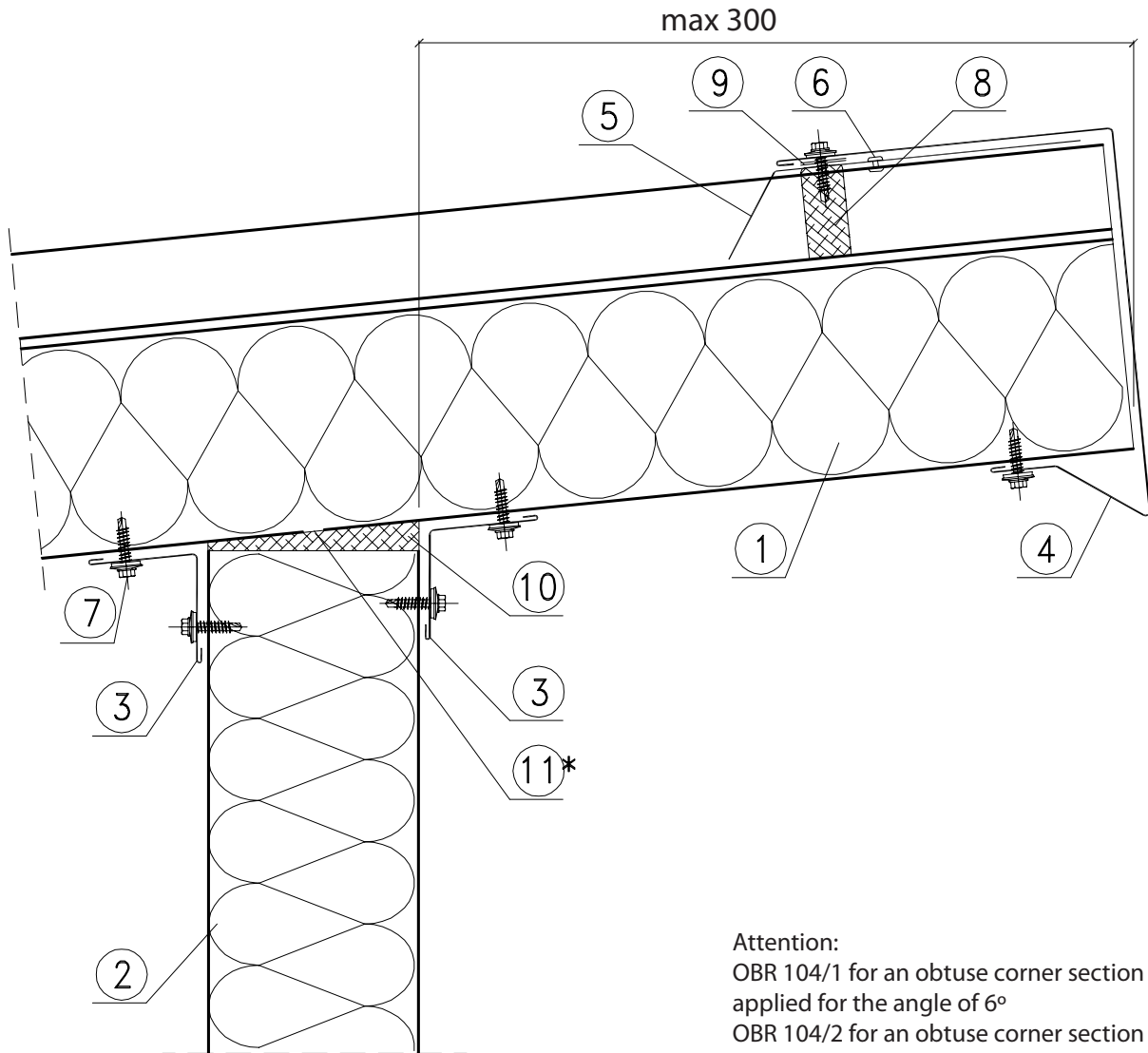
Fastening panel to a steel purlin – Y-Y section



1. BALEX THERM D roof panel
2. LB 1- LB 5 fasteners for fastening panels to purlins
4. PES 3x20 self-adhesive sealing tape (recommended)
5. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design

3.4. D03

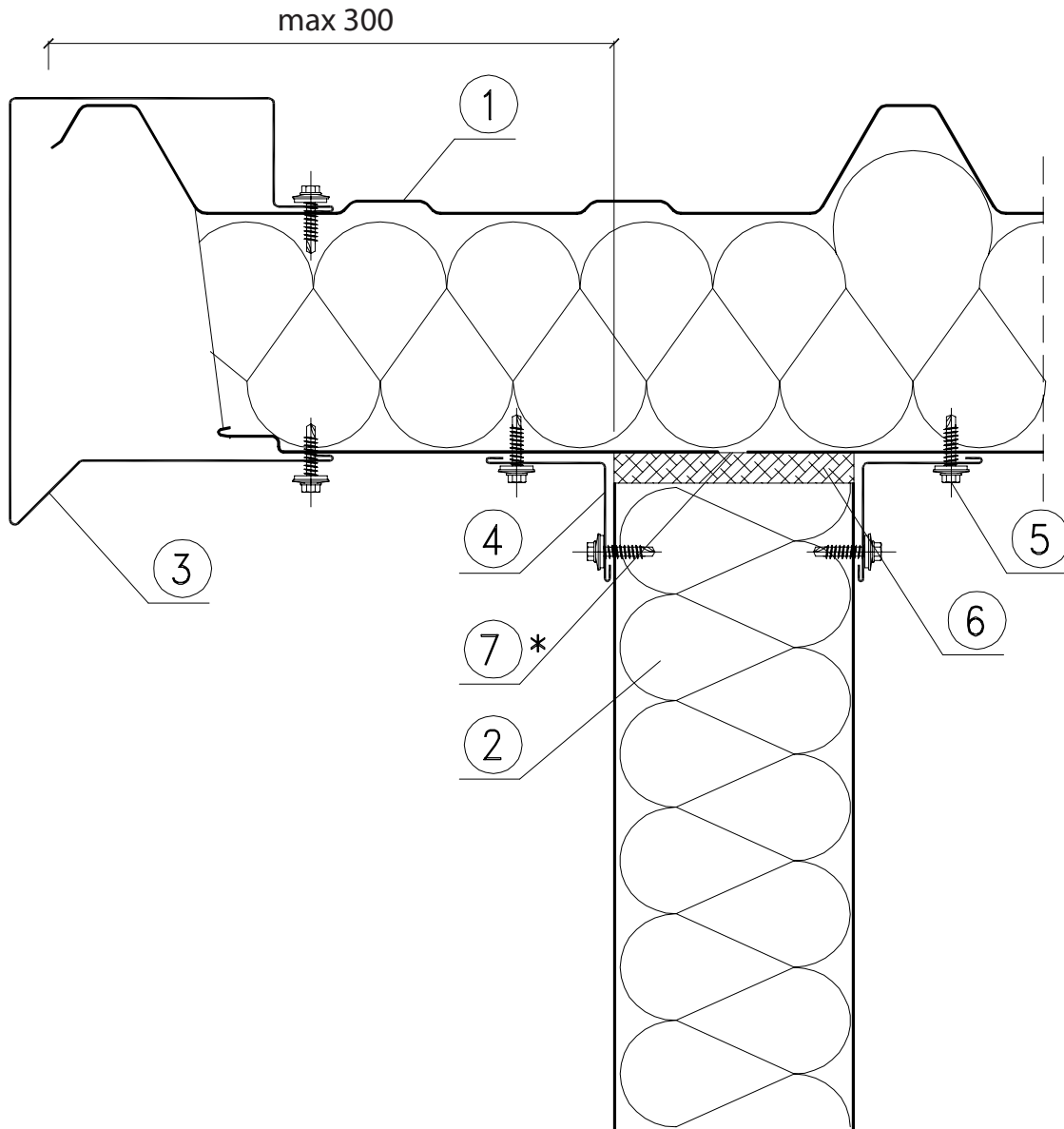
Panel ending for a monopitch roof



Attention:
OBR 104/1 for an obtuse corner section
applied for the angle of 6°
OBR 104/2 for an obtuse corner section
applied for the angle of 22°

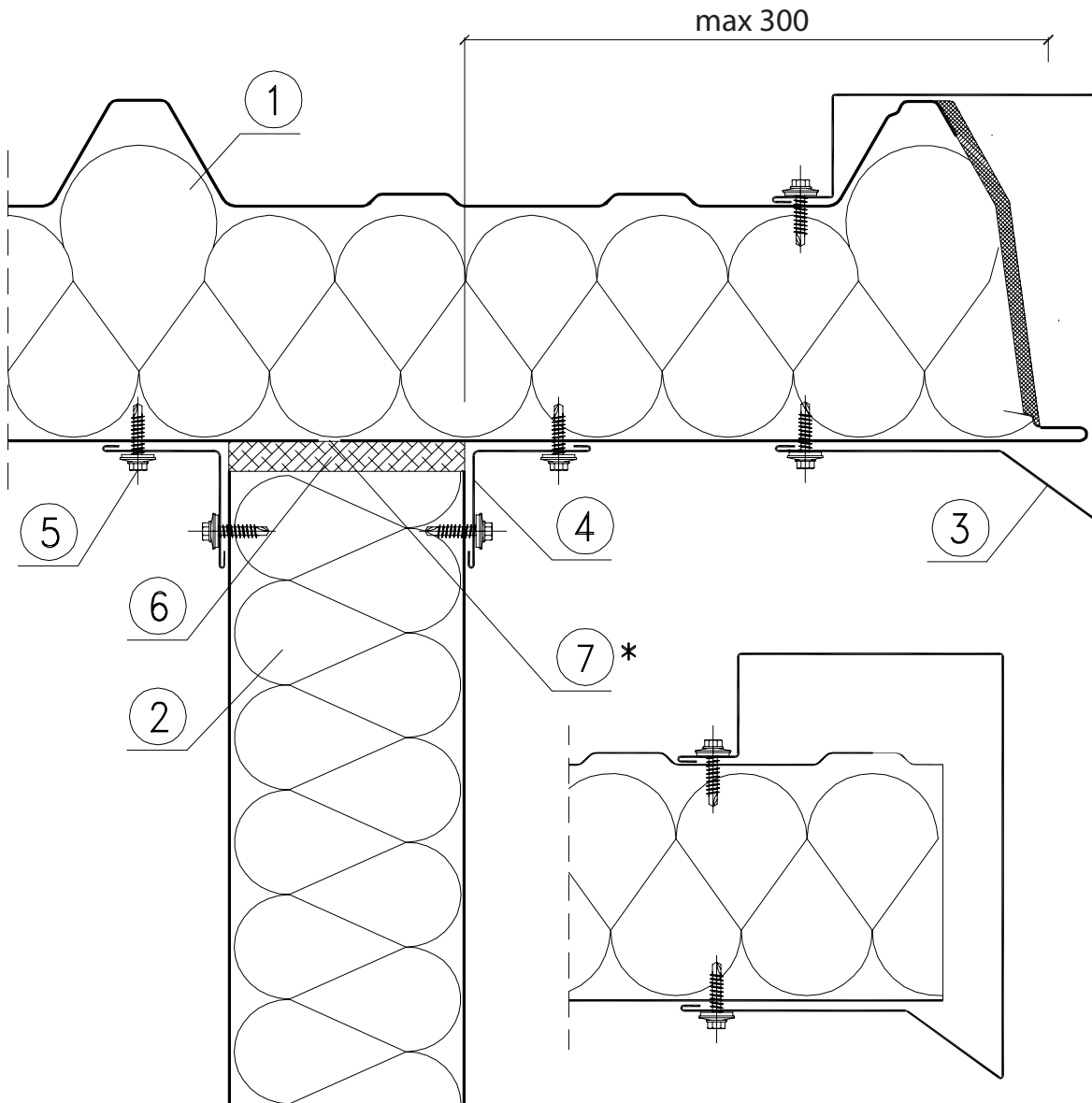
1. BALEXTERM D roof panel
2. BALEXTERM ST or BALEXTERM PLUS wall panel
3. OBR 104 flashing
4. OBR 200 flashing
5. OBR 210 flashing
6. AL/Fe assembly blind rivet between sinusoid tops every 1000mm
7. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof cladding)
8. TUN 45 sealing tape
9. Butyl sealing tape (recommended)
10. Assembly foam or polyurethane gasket
11. Cladding with a 10mm wide gap (throat distance of the support max 300mm)
*refers to increased thermal performance requirements

3.5. D04/1 Gable-end roof edge



1. BALEX THERM D roof panel
 2. BALEX THERM ST or BALEX THERM PLUS wall panel
 3. OBR 202 flashing
 4. OBR 104 flashing
 5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof cladding)
 6. Assembly foam or polyurethane gasket
 7. Cladding with a 10mm wide gap (throat distance of the support max 300mm)
- *refers to increased thermal performance requirements

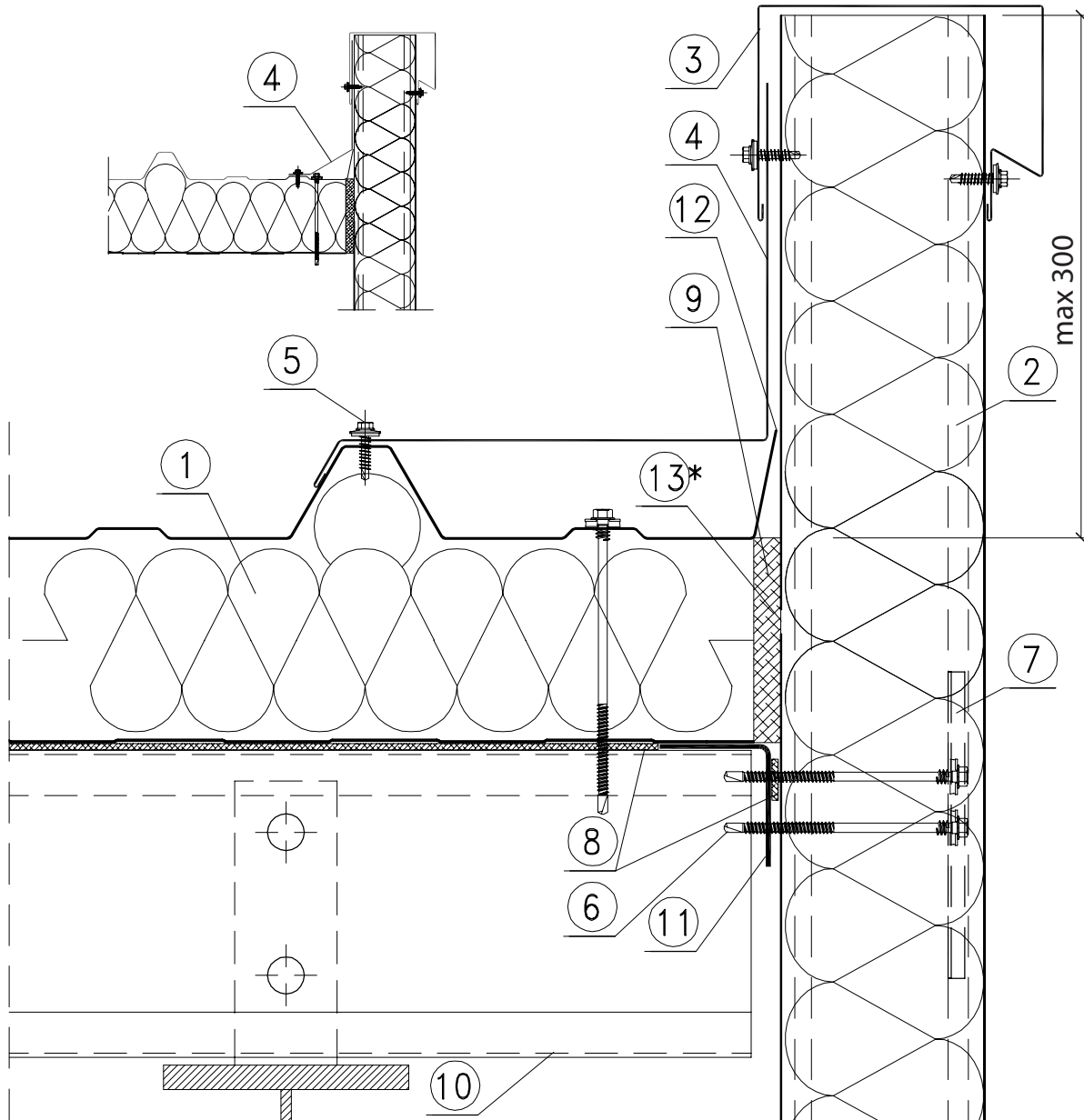
3.6. D04/2
Gable-end roof edge



1. BALEXTHERM D roof panel
 2. BALEXTHERM ST or BALEXTHERM PLUS wall panel
 3. OBR 202 flashing
 4. OBR 104 flashing
 5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof cladding)
 6. Assembly foam or polyurethane gasket
 7. Facing with a 10mm wide gap (throat distance of the support max 300mm)
- *refers to increased thermal performance requirements

3.7. D05

Joint of panels with a wall panel by the attic

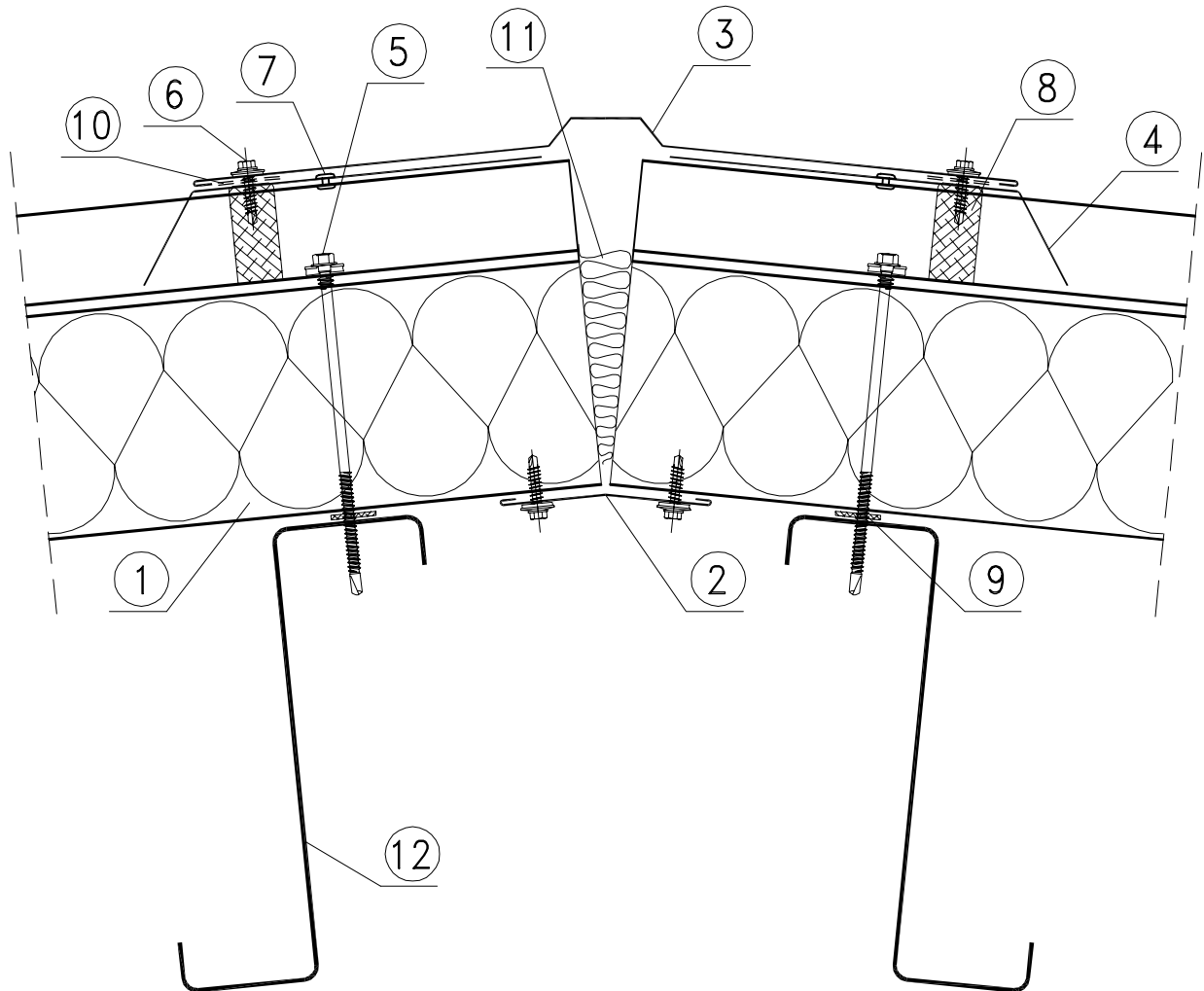


1. BALEX THERM D roof panel
2. BALEX THERM ST or BALEX THERM PLUS wall panel
3. OBR 112 flashing
4. Individual flashing
5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof cladding)
6. LB 1- LB 5 fasteners for fastening BALEX THERM panels
7. LB 25 steel washer under fasteners
8. PES 3x20 self-adhesive sealing tape (recommended)
9. Assembly foam or polyurethane gasket
10. Purlin acc. to the construction design
11. Angle fastened to a purlin acc. to the construction design
12. Bent out upper cladding
13. Facing with a 10mm wide gap (throat distance of the support max 300mm)

*refers to increased thermal performance requirements

3.8. D06

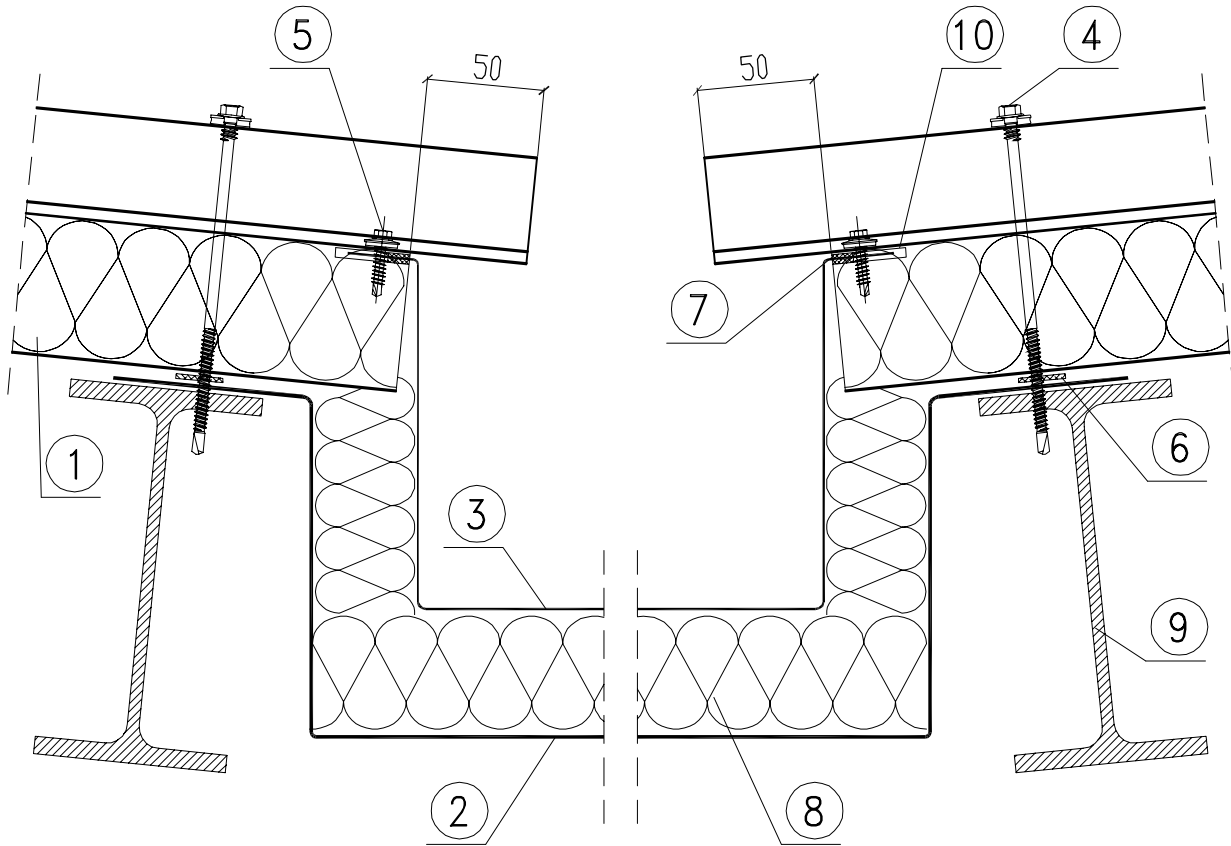
Joint of panels at the roof ridge



1. BALEXTHERM D roof panel
2. OBR 104 flashing
3. OBR 52 or OBR 205 flashing
4. OBR 201 flashing
5. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
6. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
7. AL/Fe assembly blind rivet every 1000mm
8. TUN 45 sealing tape
9. PES 3x20 self-adhesive sealing tape (recommended)
10. Butyl sealing tape (a tight rivet on the external roof cladding)
11. Heat insulating material or assembly foam
12. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design

3.9. D07

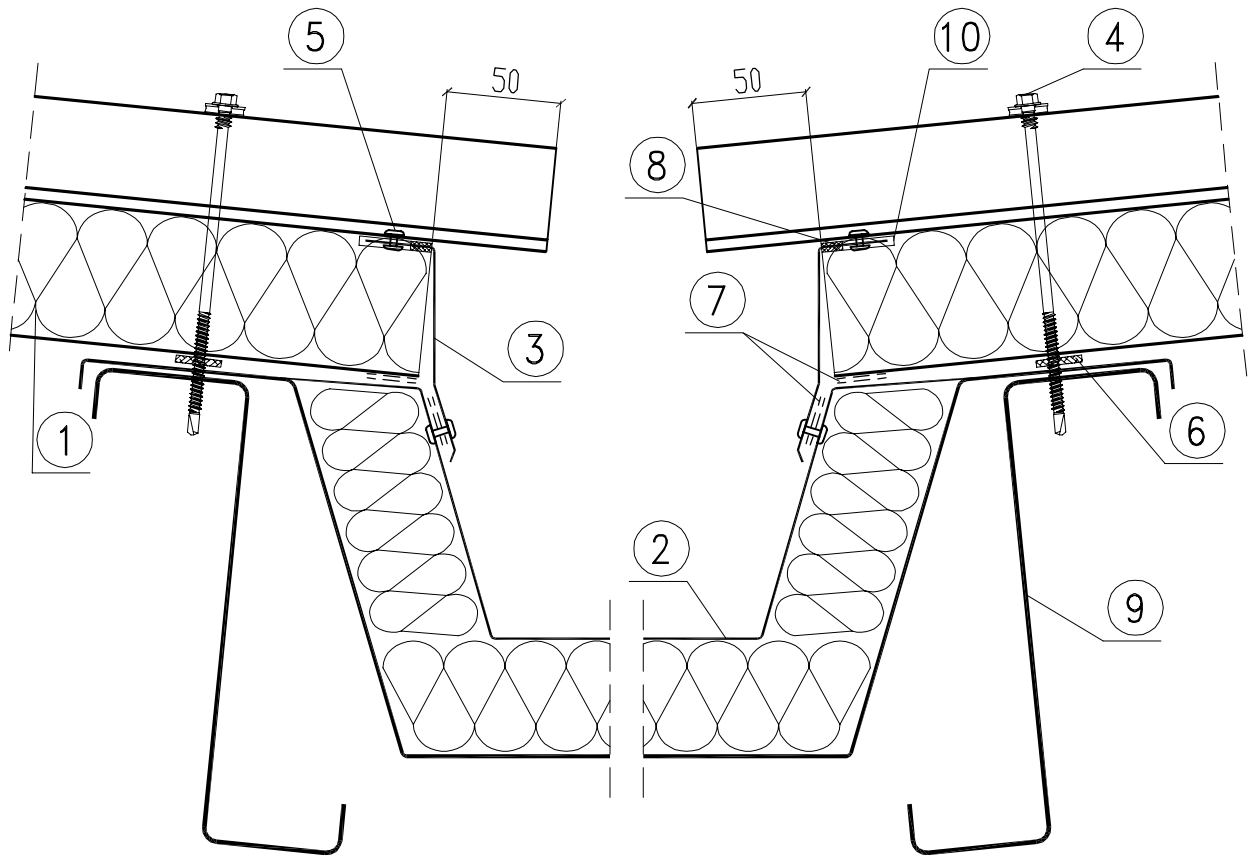
Joint of panels with an internal gutter



1. BALEX THERM D roof panel with undercut core
2. Gutter internal profile
3. Gutter external profile
4. LB 1- LB 5 fasteners for fastening BALEX THERM panels
5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Butyl sealing tape (recommended)
8. Gutter heat-insulating material
9. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design
10. Panel core cut to the depth of approx.30mm

3.10. D08

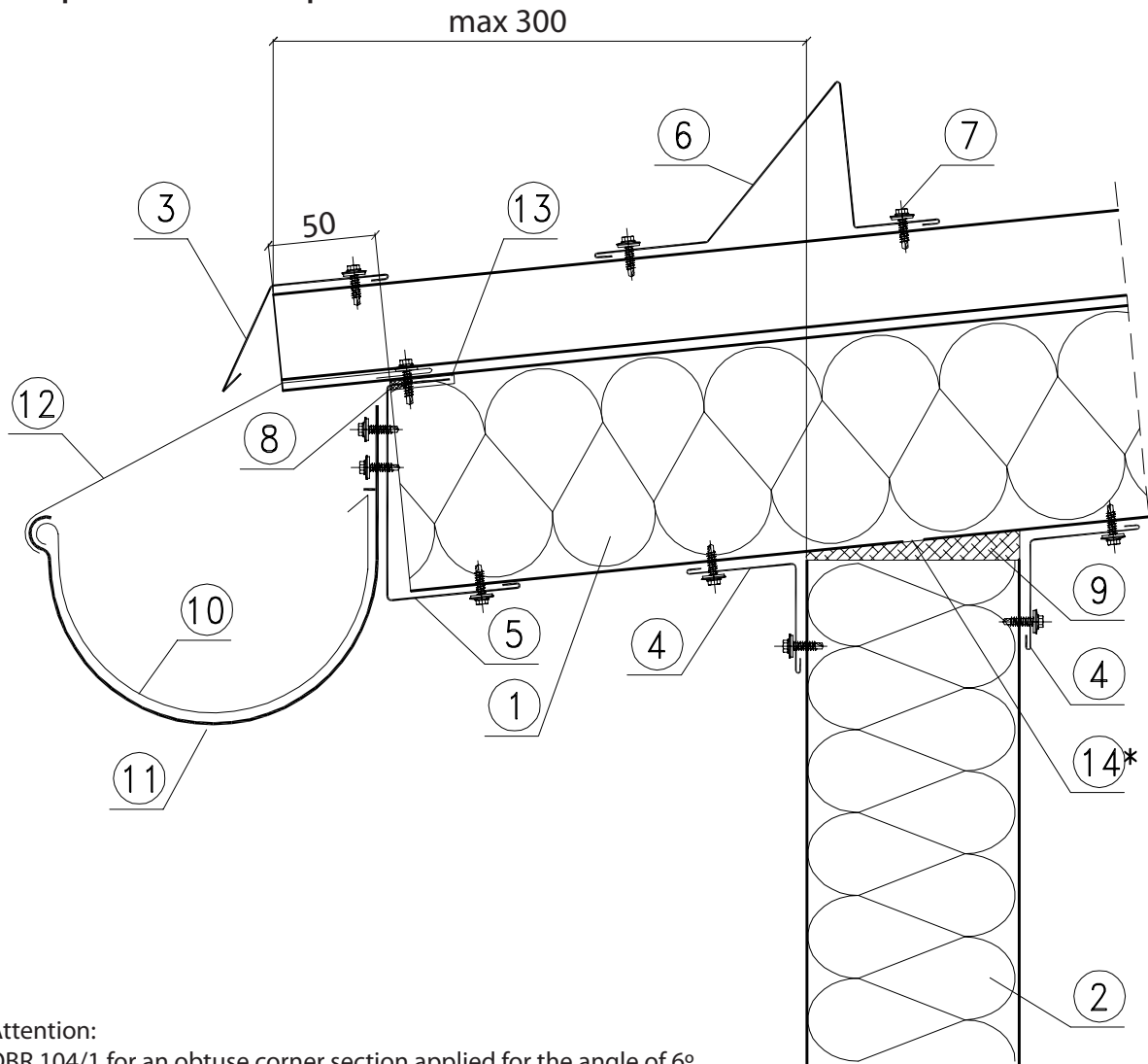
Joint of panels with a prefabricated internal gutter



1. BALEX THERM D roof panel with undercut core
2. Prefabricated gutter acc. to the architecture design (with a slope)
3. Individual flashing
4. LB 1- LB 5 fasteners for fastening BALEX THERM panels
5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Butyl sealing tape
8. Butyl sealing compound
9. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design
10. Panel core cut to the depth of approx.30mm

3.11. D09/1

Joint of panels with a wall panel in the eaves



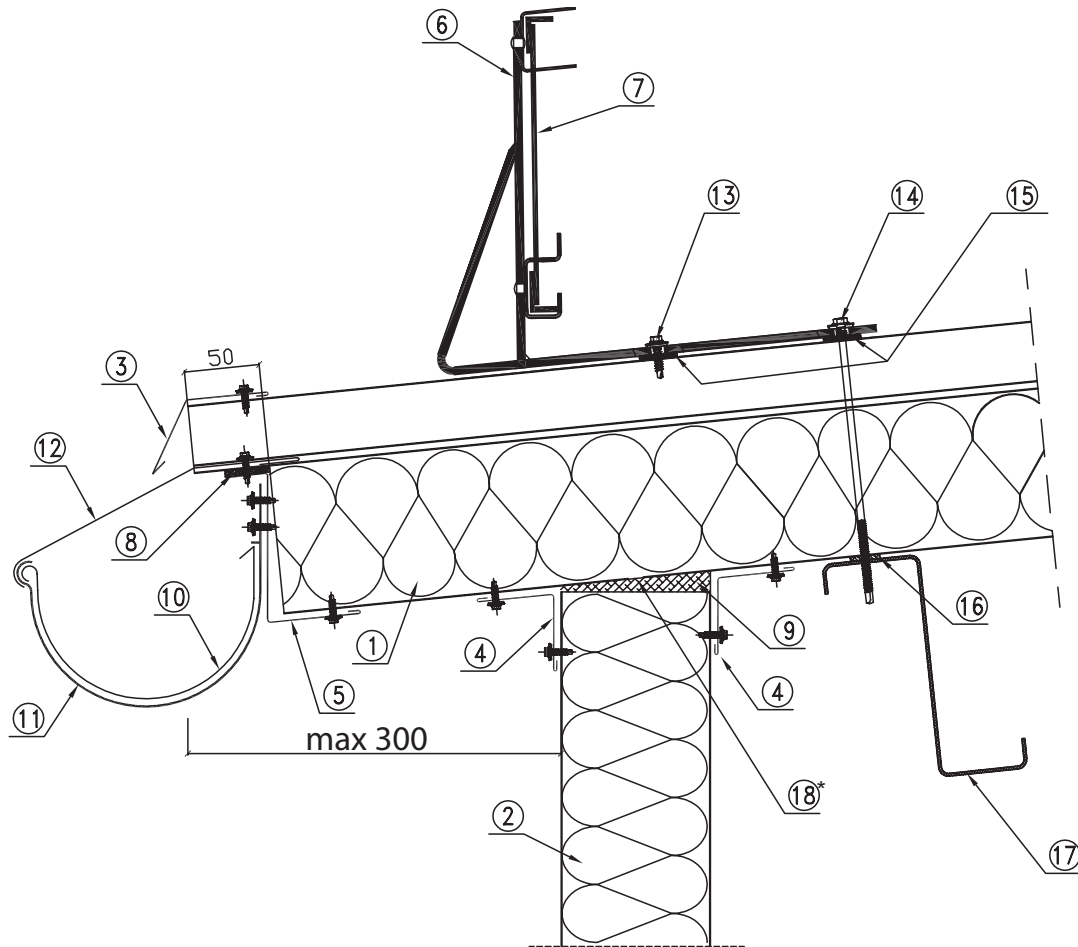
Attention:

OBR 104/1 for an obtuse corner section applied for the angle of 6°
 OBR 104/2 for an obtuse corner section applied for the angle of 22°

1. BALEX THERM D roof panel with undercut core
 2. BALEX THERM ST or BALEX THERM PLUS wall panel
 3. OBR 203 flashing
 4. OBR 104 flashing
 5. OBR 62 flashing
 6. OBR 204 flashing – snow guard
 7. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof cladding)
 8. Butyl sealing tape
 9. Assembly foam or polyurethane gasket
 10. Gutter acc. to the architecture design (with a slope)
 11. Gutter bracket
 12. Gutter brace
 13. Panel core cut to the depth of approx.30mm
 14. Cladding with a 10mm wide gap (throat distance of the support max 300mm)
- *refers to increased thermal performance requirements

3.12. D09/2

Joint of a roof panel with a wall panel in the eaves with a snow guard



Attention:

OBR 104/1 for an obtuse corner section applied for the angle of 6°

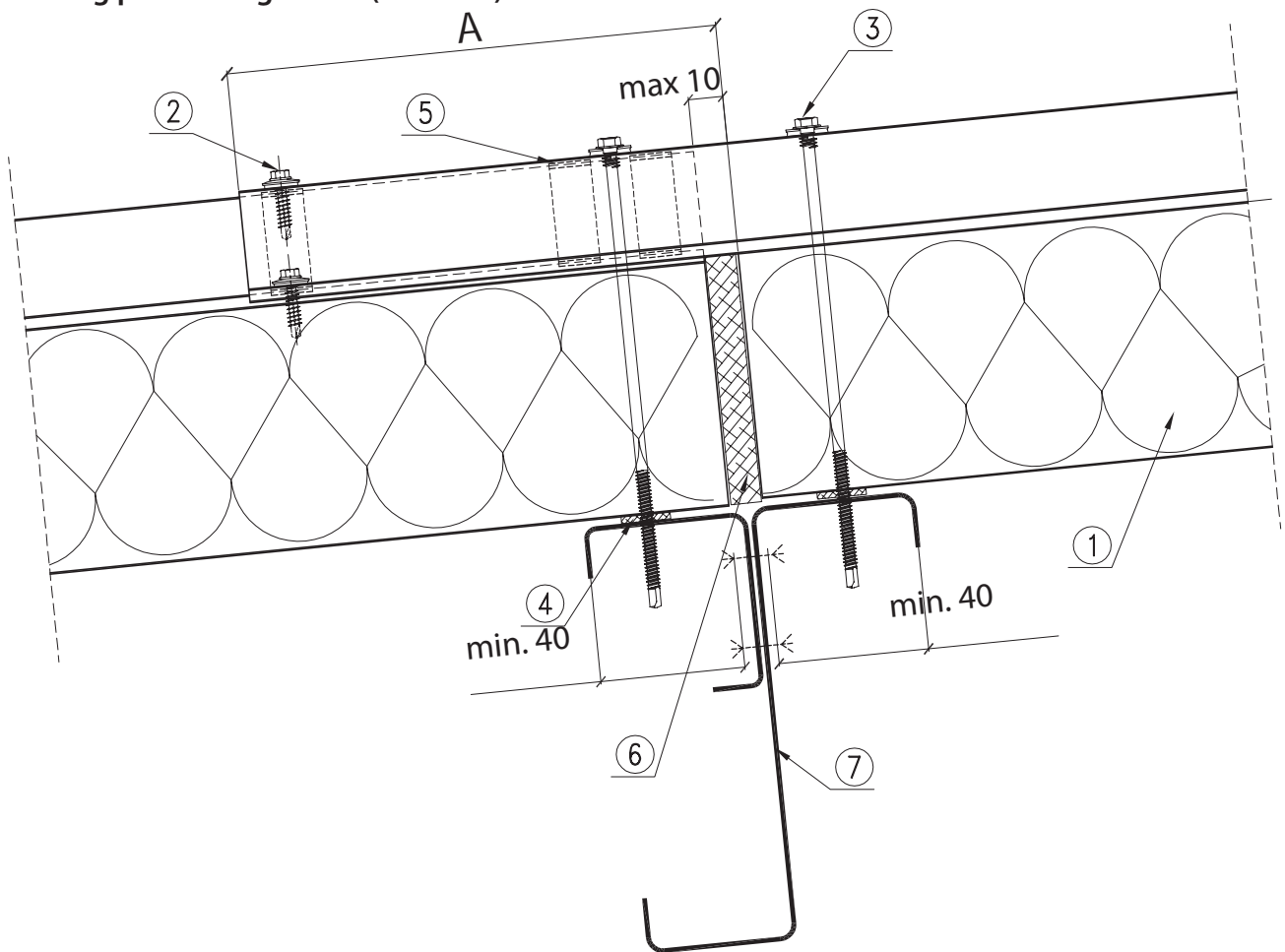
OBR 104/2 for an obtuse corner section applied for the angle of 22°

1. BALEX THERM D roof panel with undercut core
2. BALEX THERM ST or BALEX THERM PLUS wall panel
3. OBR 203 flashing
4. OBR 104 flashing
5. OBR 62 flashing
6. Guard support for the WPT trapezium (3 pieces per each guard)
7. Snow guard PP L=2000 mm
8. Butyl sealing tape (recommended)
9. Gutter acc. to the architecture design (with a slope)
10. Gutter acc. to the architecture design (with a slope)
11. Gutter bracket
12. Gutter brace
13. Self-drilling screw 4.80 x 20 mm
14. LB 1 – LB 5 fasteners for fastening BALEX THERM panels
15. Butyl sealing tape (recommended)
16. PES 3x20 self-adhesive sealing tape
17. Steel purlin, cold-bent (Z-bar)
18. Cladding with a 10mm wide gap (throat distance of the support max 300mm)

*refers to increased thermal performance requirements

3.13. D10/1

Joining panels lengthwise ($L > 18$ m)

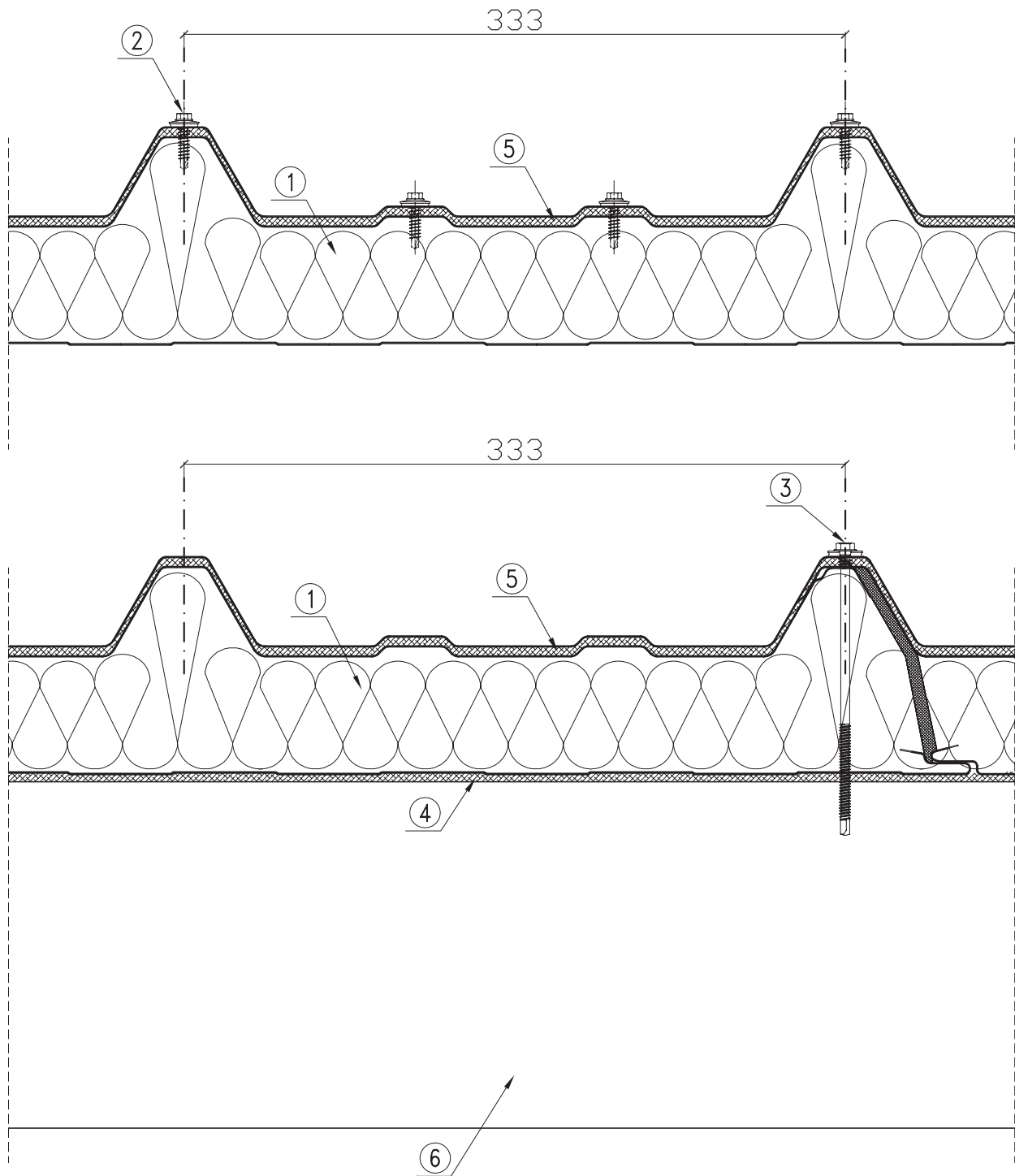


1. BALEX THERM D roof panel with undercut core
2. LB 6 self-drilling fastener or AL/Fe blind rivet in every upper wave
3. LB 1- LB 5 fasteners for fastening BALEX THERM panels
4. PES 3x20 self-adhesive sealing tape (recommended)
5. Butyl sealing tape (recommended)
6. Impregnated polyurethane gasket or assembly foam
7. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design

Attention !

- Standard $A=50$ mm next to the eaves
- Standard $A=150$ mm next to the overlap
- max. $A=200$ mm next to the overlap
- min. $A=10$ mm without any overlap

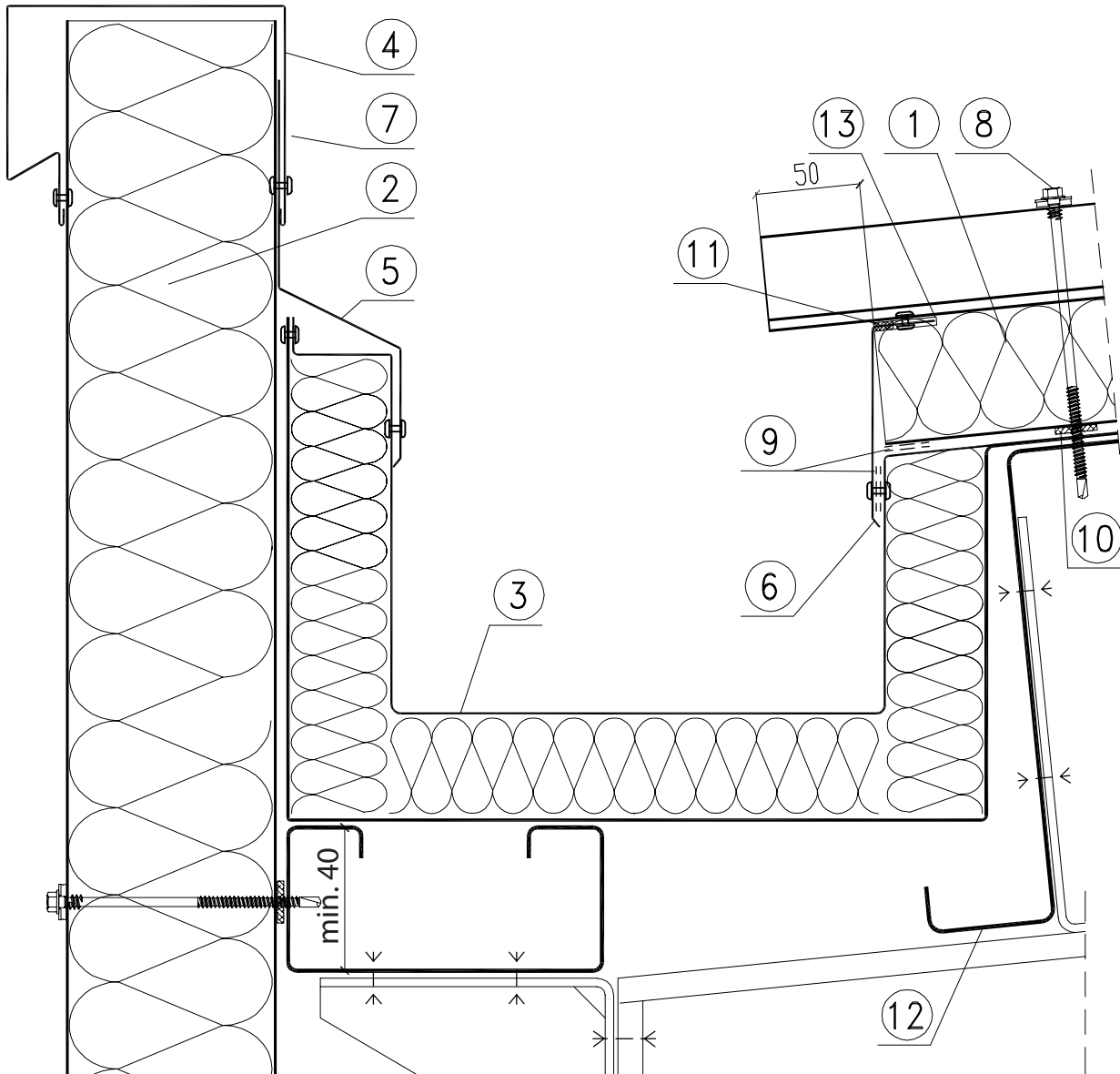
3.14. D10/2
Joining panels lengthwise (L > 18 m)



1. BALEX THERM D roof panel with undercut core
2. LB 6 self-drilling fastener or AL/Fe blind rivet in every upper wave
3. LB 1- LB 5 fasteners for fastening BALEX THERM panels
4. PES 3x20 self-adhesive sealing tape (recommended)
5. Butyl sealing tape (recommended)
6. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design

3.15. D11

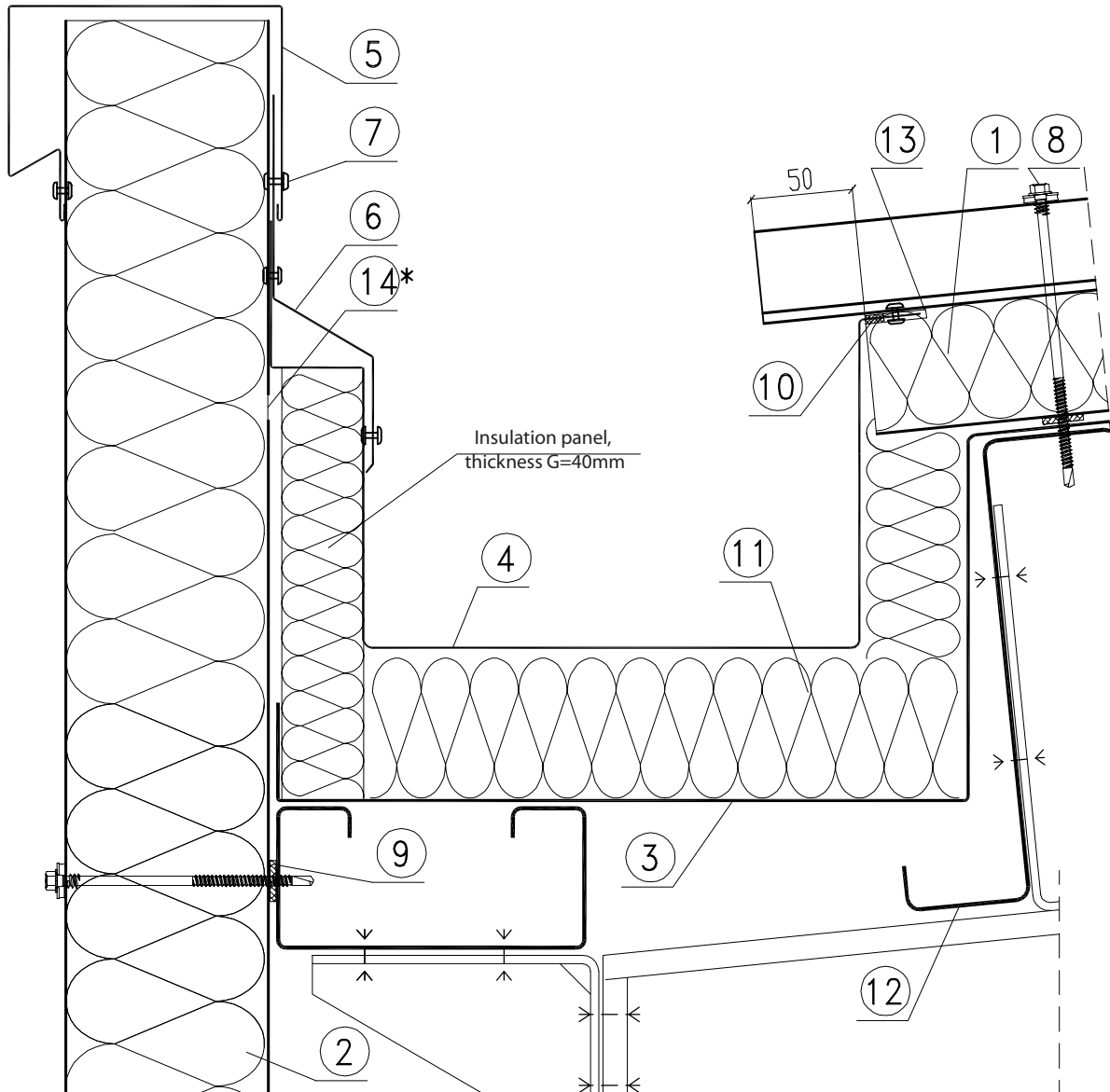
Joint of panels with a prefabricated gutter by the attic



1. BALEX THERM D roof panel with undercut core
2. BALEX THERM ST or BALEX THERM PLUS wall panel
3. Prefabricated gutter acc. to the architecture design (with a slope)
4. OBR 112 flashing
5. Individual flashing
6. Individual flashing
7. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof and gutter cladding)
8. LB 1- LB 5 fasteners for fastening BALEX THERM panels
9. Butyl sealing tape (recommended)
10. PES 3x20 self-adhesive sealing tape (recommended)
11. Butyl sealing compound (recommended)
12. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design
13. Panel core cut to the depth of approx. 30mm

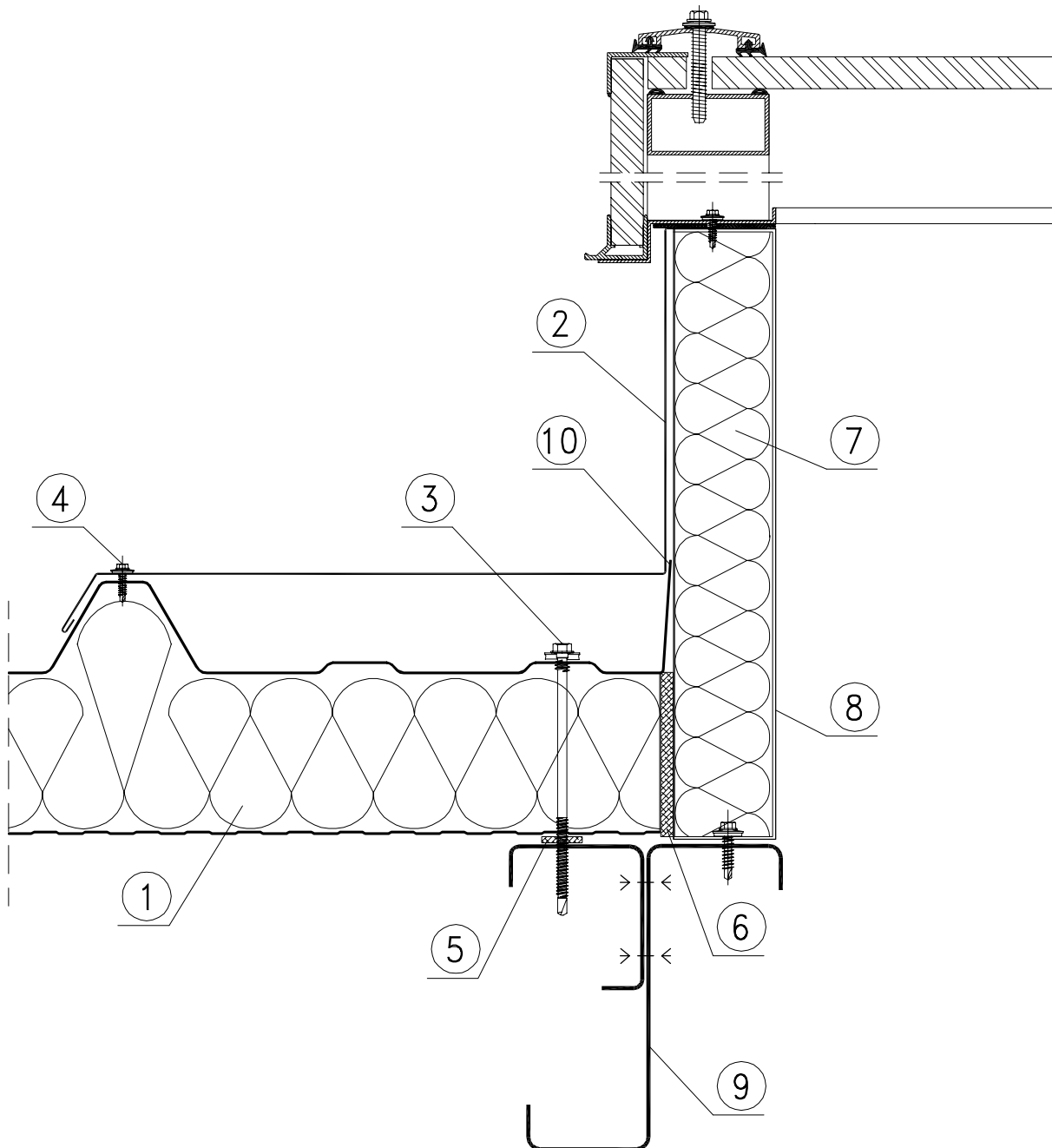
3.16. D12

Joint of panels with an internal gutter by the attic



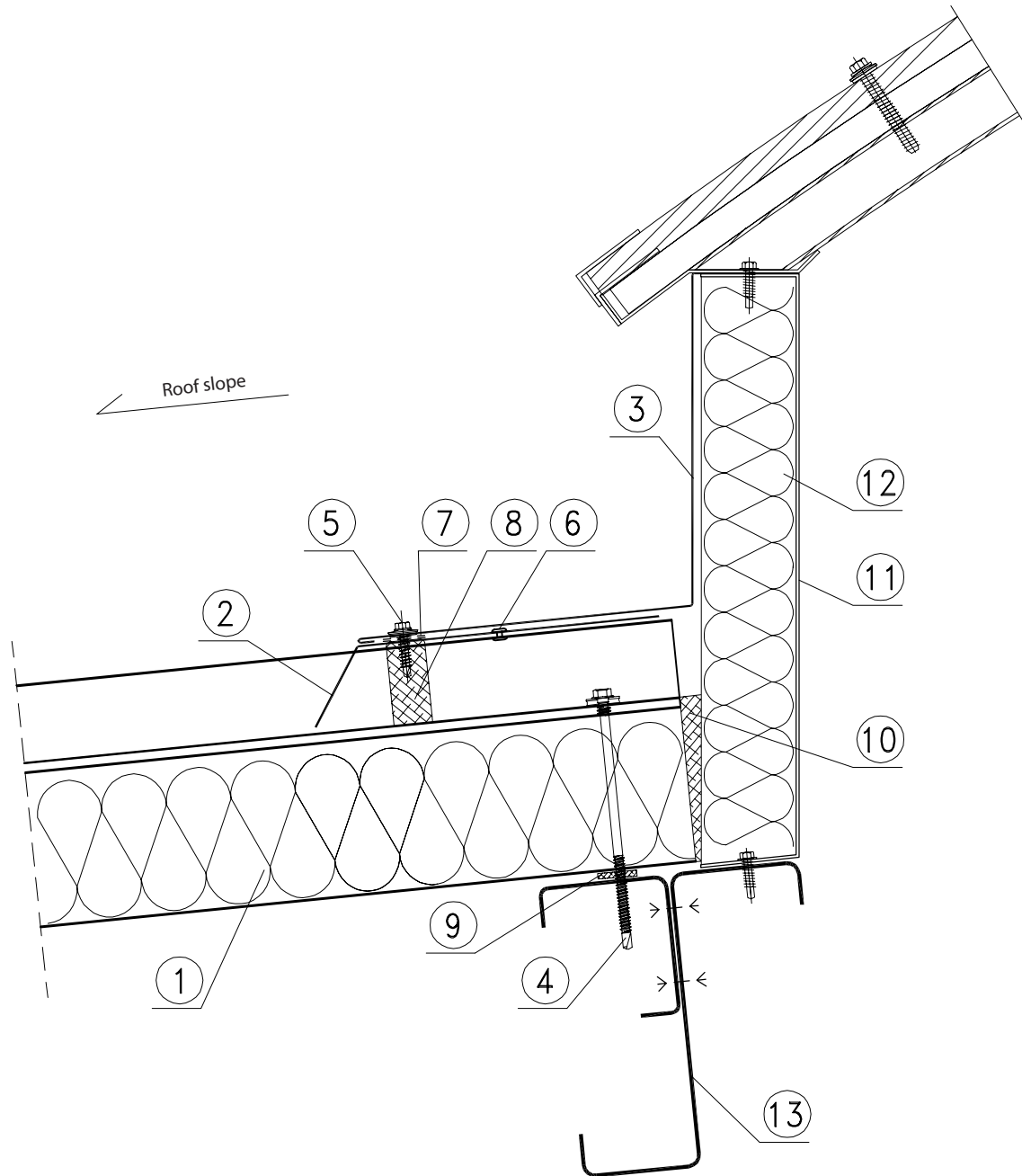
1. BALEXTHERM D roof panel with undercut core
 2. BALEXTHERM ST or BALEXTHERM PLUS wall panel
 3. Gutter internal profile
 4. Gutter external profile
 5. OBR 112 flashing
 6. Individual flashing
 7. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof and gutter cladding)
 8. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
 9. PES 3x20 self-adhesive sealing tape (recommended)
 10. Butyl sealing compound (recommended)
 11. Gutter heat-insulating material
 12. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design
 13. Panel core cut to the depth of approx.30mm
 14. Cladding with a 10mm wide gap (throat distance of the support max 300mm)
- *refers to increased thermal performance requirements

3.17. D13 Roof ridge skylight – longitudinal section



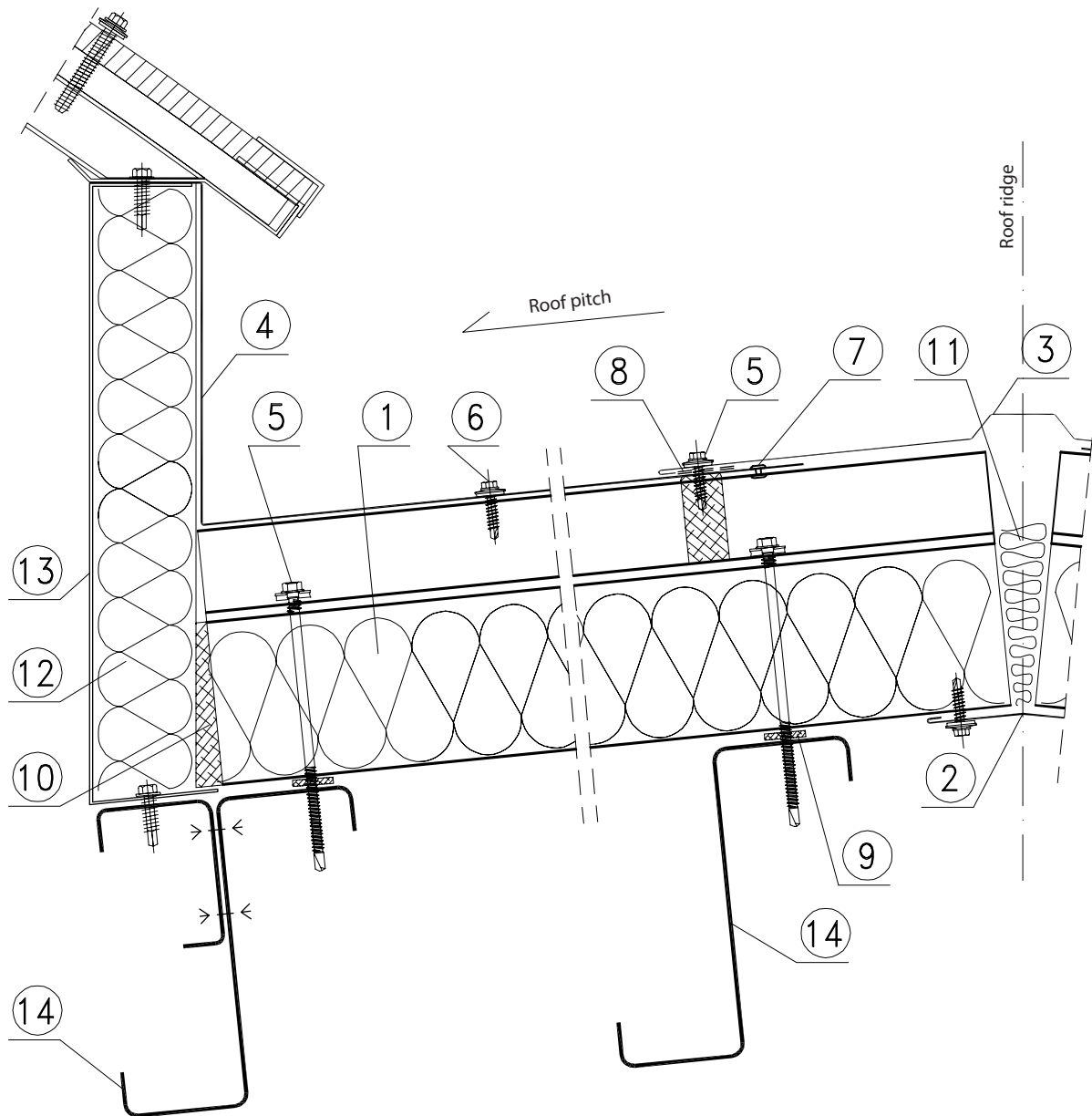
1. BALEXTHERM D roof panel
2. Individual flashing
3. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. PES 3x20 self-adhesive sealing tape (recommended)
6. Assembly foam or polyurethane gasket
7. Skylight heat-insulating material
8. Skylight base
9. Trimmer beam acc to the construction design + angle section
10. Bent out upper cladding

3.18. D14
Roof ridge skylight – cross section



1. BALEXTHERM D roof panel
2. OBR 201 flashing
3. Skylight planking
4. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
5. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof cladding)
6. AL/Fe assembly blind rivet approx. every 1000mm
7. Butyl sealing tape (recommended)
8. TUN 45 sealing tape
9. PES 3x20 self-adhesive sealing tape (recommended)
10. Assembly foam or polyurethane gasket
11. Skylight base
12. Skylight heat-insulating material
13. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design

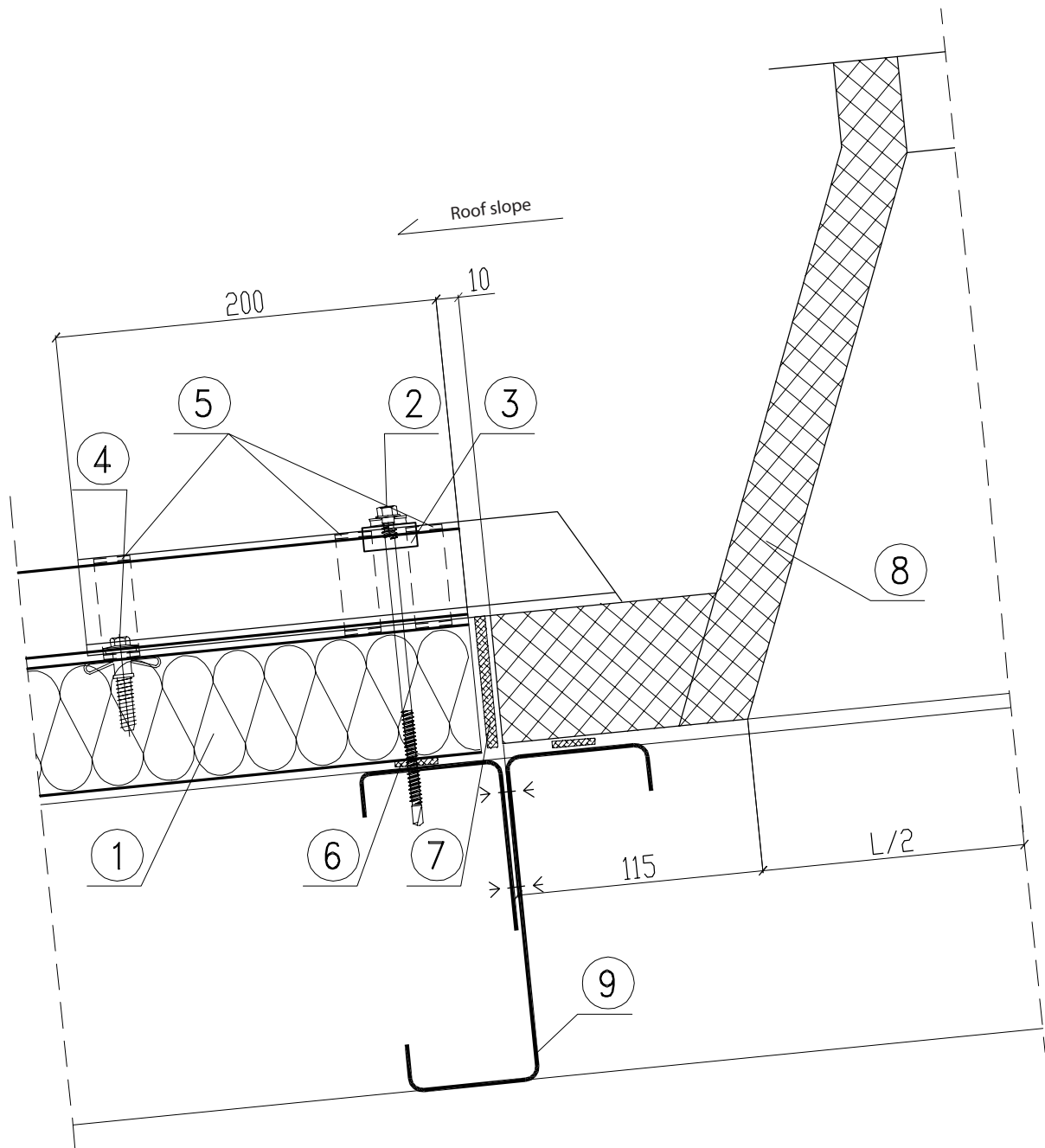
3.19. D15 Roof ridge skylight – cross section



1. BALEX THERM D roof panel
2. OBR 104 flashing
3. OBR 52 or OBR 205 flashing
4. Individual flashing – drawn to the roof ridge
5. LB 1- LB 5 fasteners for fastening BALEX THERM panels
6. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm (a tight rivet on the external roof cladding)
7. AL/Fe blind rivet approx. every 1000mm
8. Butyl sealing tape
9. PES 3x20 self-adhesive sealing tape (recommended)
10. Assembly foam or polyurethane gasket
11. Heat-insulating material or assembly foam
12. Skylight heat-insulating material
13. Skylight base
14. Steel purlin: cold-bent, hot-rolled, wooden etc. acc. to the construction design

3.20. D16/1

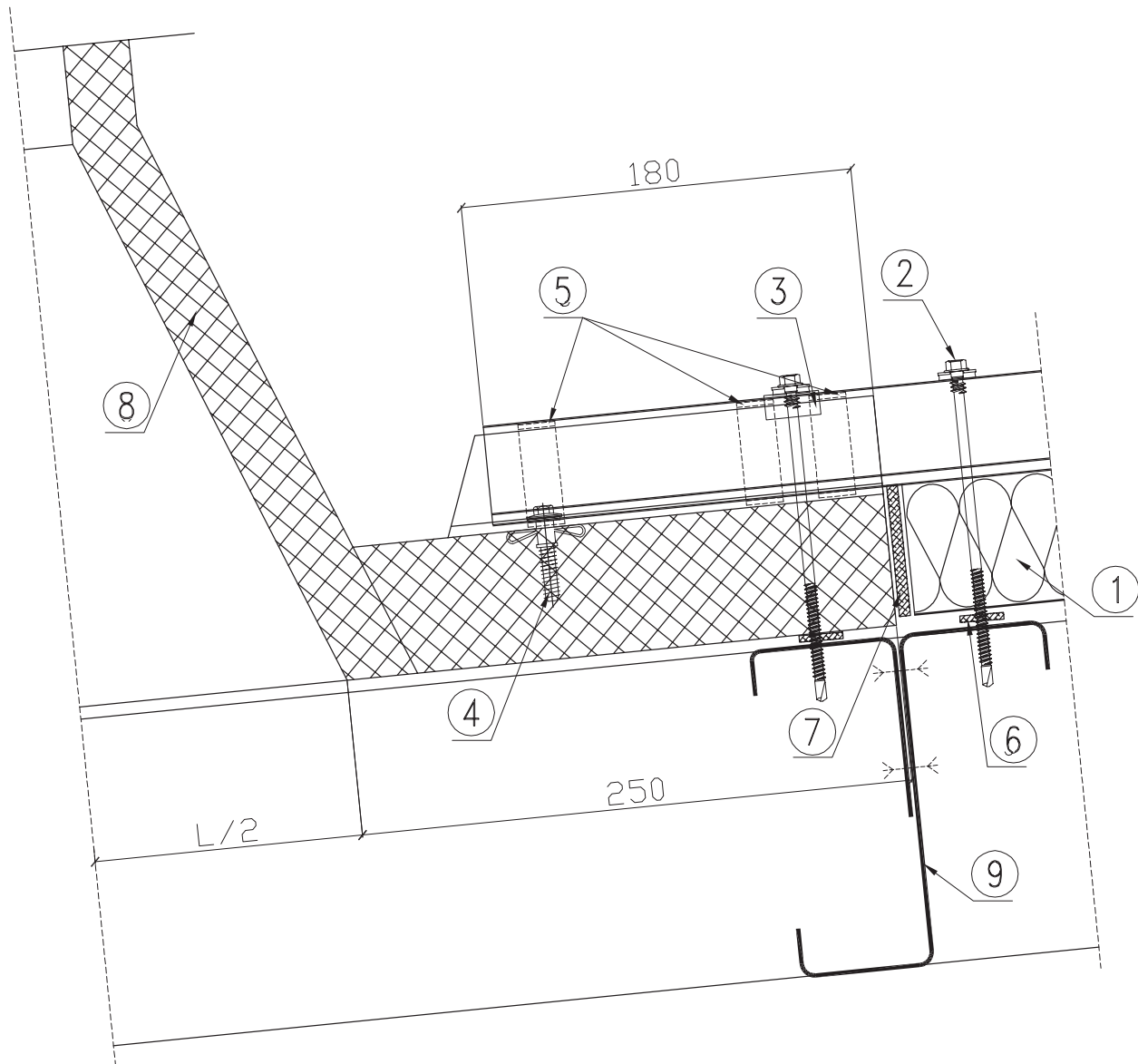
Roof skylight with a profiled flange – longitudinal section – option I



1. BALEXTHERM D roof panel
2. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
3. Pressure washer
4. FAB-LOK fastener
5. Butyl sealing tape
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Polyurethane gasket
8. Skylight, roof hatch, smoke vent – with a profiled base
9. Purlin or trimmer beam acc. to the construction design

3.21. D16/2

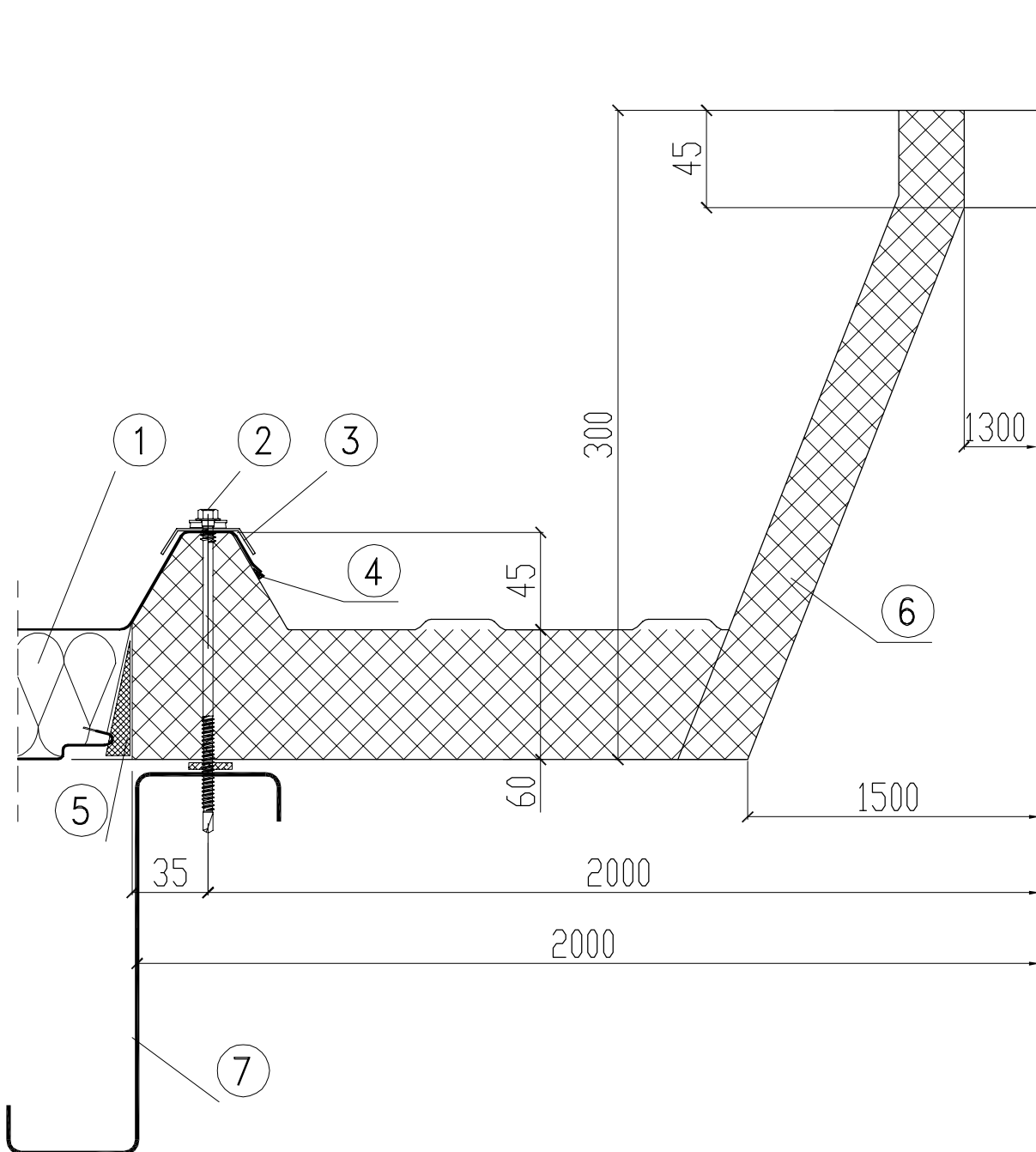
Roof skylight with a profiled flange – longitudinal section – option I



1. BALEX THERM D roof panel
2. LB 1- LB 5 fasteners for fastening BALEX THERM panels
3. Pressure washer
4. FAB-LOK fastener
5. Butyl sealing tape
6. PES 3x20 self-adhesive sealing tape (recommended)
7. Polyurethane gasket
8. Skylight, roof hatch, smoke vent - with a profiled base
9. Purlin or trimmer beam acc. to the construction design

3.22. D16/3

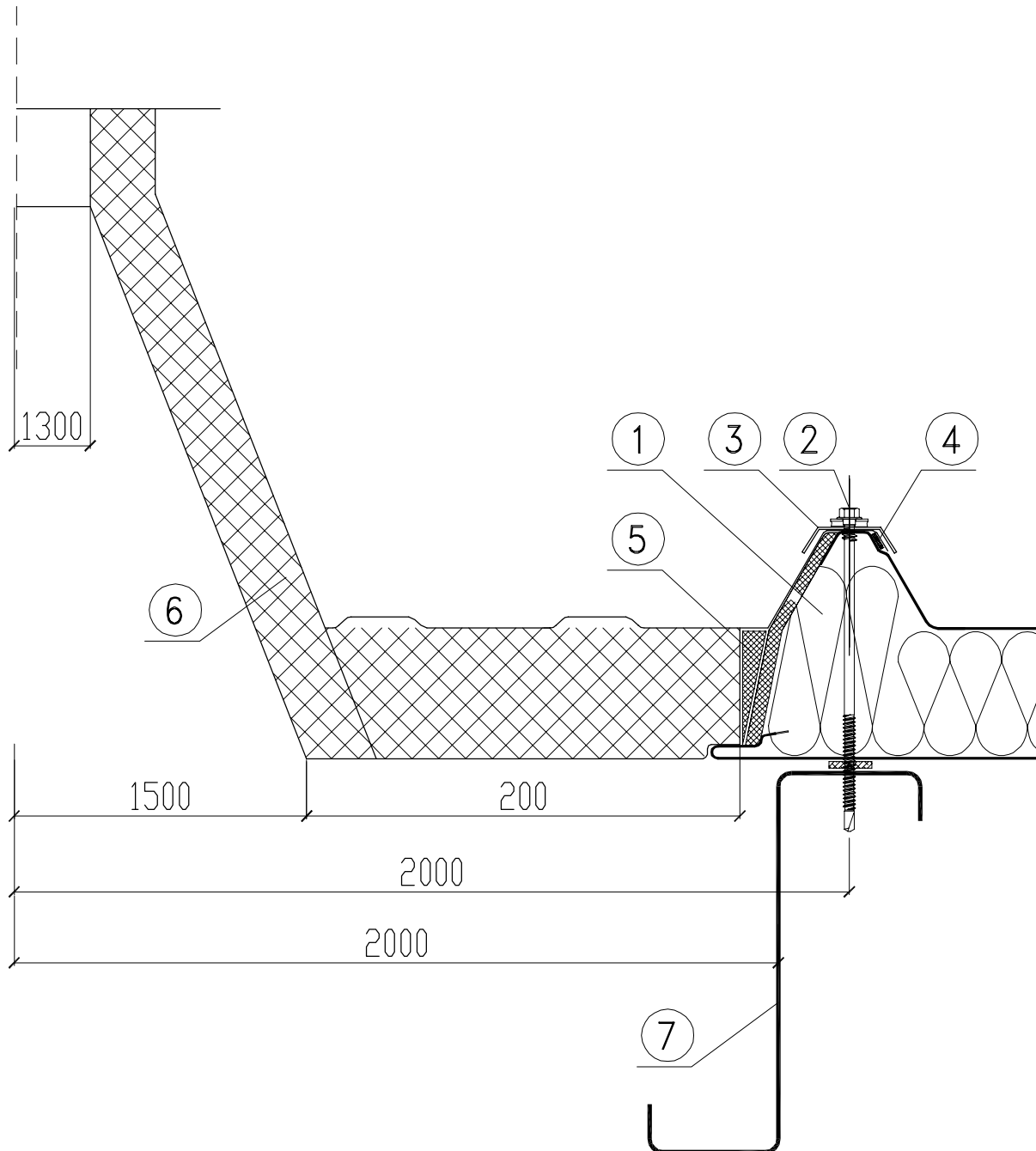
Roof skylight with a profiled flange – cross section – option I



1. BALEXTHERM D roof panel
2. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
3. Pressure washer
4. Butyl sealing tape
5. Polyurethane expansion gasket - illmod
6. Skylight, roof hatch, smoke vent base
7. Trimmer beam acc. to the construction design

3.23. D16/4

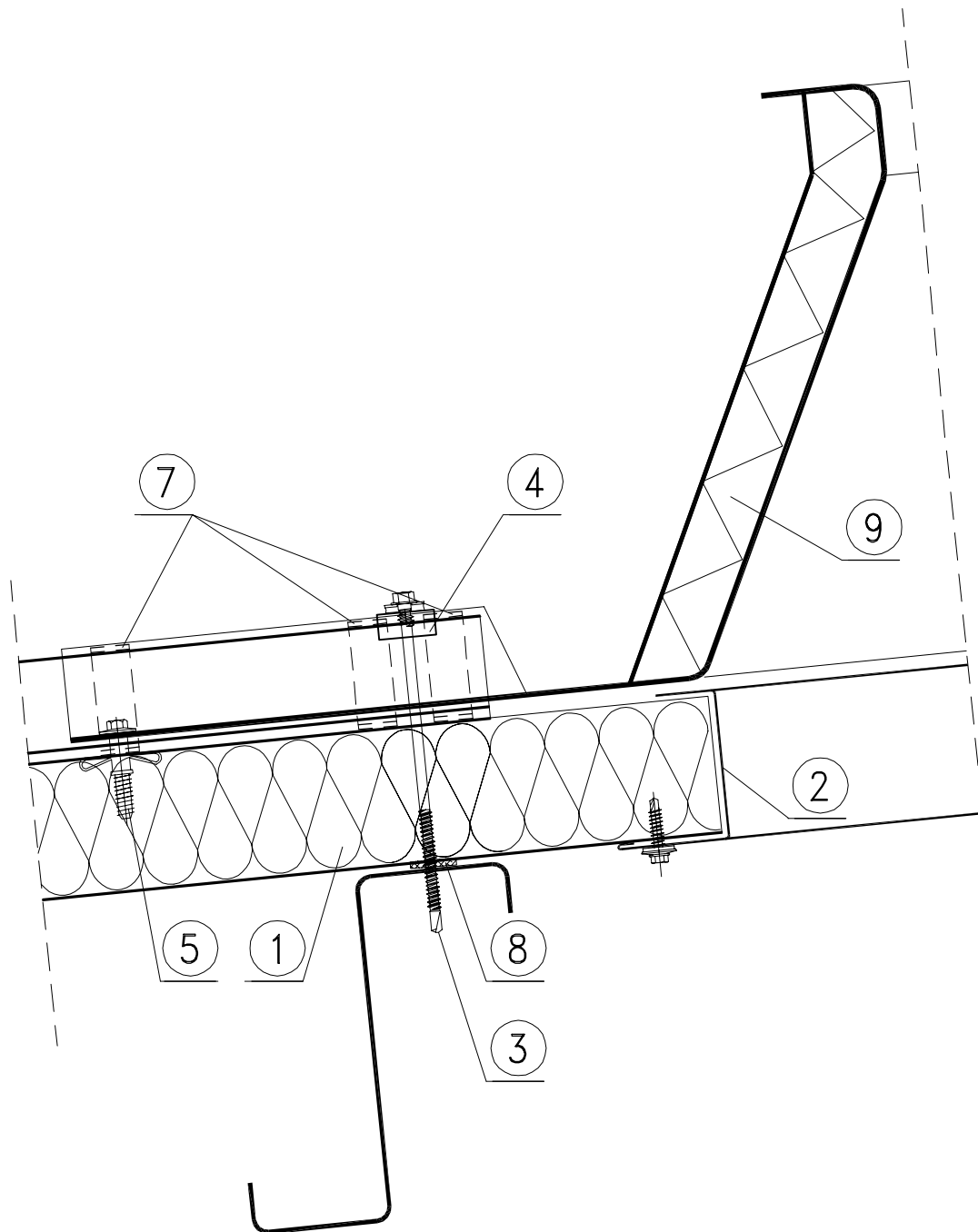
Roof skylight with a profiled flange – cross section – option I



1. BALEX THERM D roof panel
2. LB 1- LB 5 fasteners for fastening BALEX THERM panels
3. Pressure washer
4. Butyl sealing tape
5. Polyurethane expansion gasket - illmod
6. Skylight, roof hatch, smoke vent base
7. Trimmer beam acc. to the construction design

3.24. D17/1

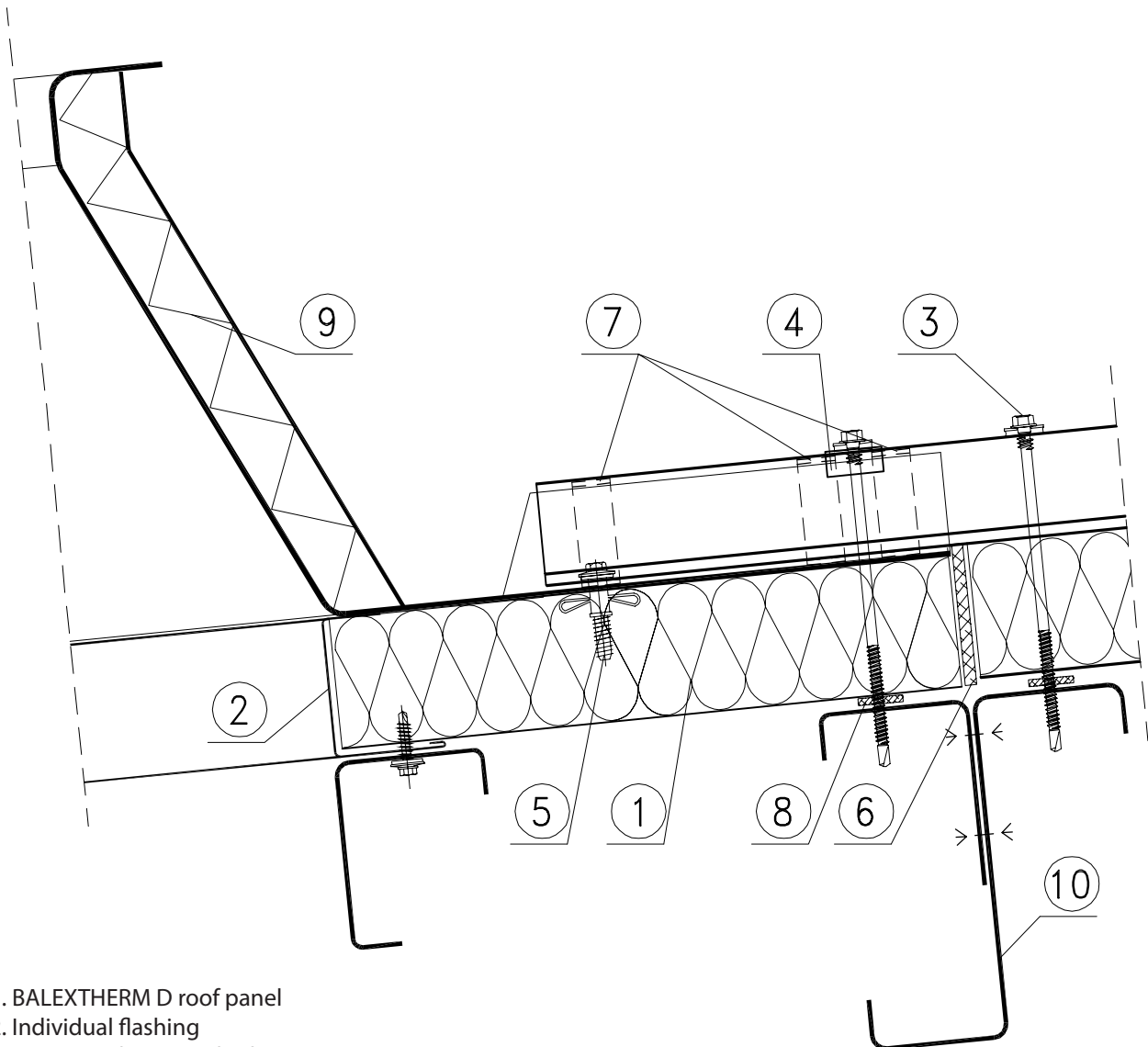
Roof skylight with a profiled flange – longitudinal section – option II



1. BALEXTHERM D roof panel
2. Individual flashing
3. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
4. Fastener washer: KLT
5. FAB-LOK fastener
7. Butyl sealing tape
8. PES 3x20 self-adhesive sealing tape (recommended)
9. Skylight, roof hatch, smoke vent - with a profiled base
10. Purlin or trimmer beam acc. to the construction design

3.25. D17/2

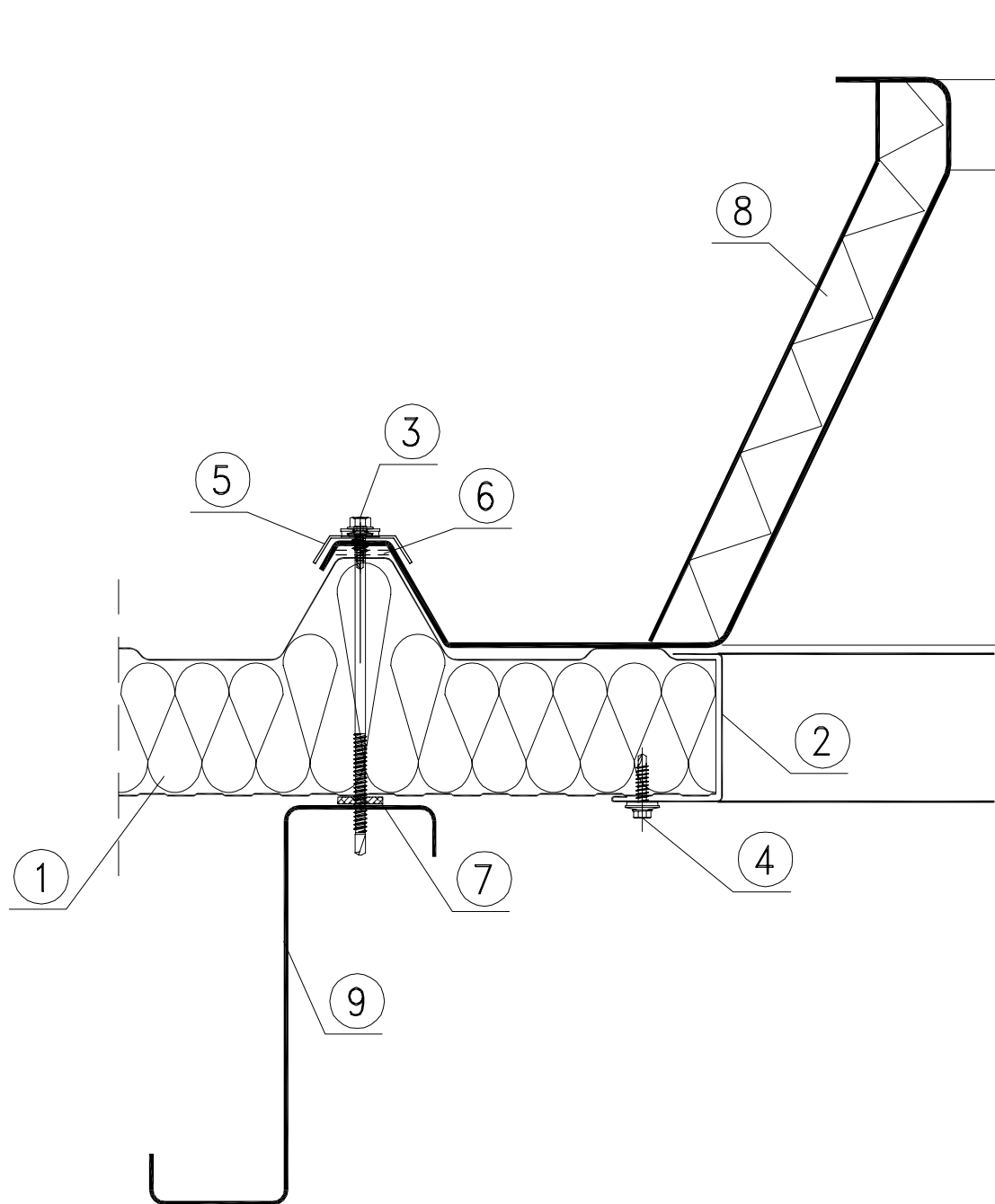
Roof skylight with a profiled flange – longitudinal section – option II



1. BALEX THERM D roof panel
2. Individual flashing
3. LB 1- LB 5 fasteners for fastening BALEX THERM panels
4. Fastener washer: KLT5. FAB-LOK fastener
6. Polyurethane gasket
7. Butyl sealing tape
8. PES 3x20 self-adhesive sealing tape (recommended)
9. Skylight, roof hatch, smoke vent - with a profiled base
10. Purlin or trimmer beam acc. to the construction design

3.26. D17/2

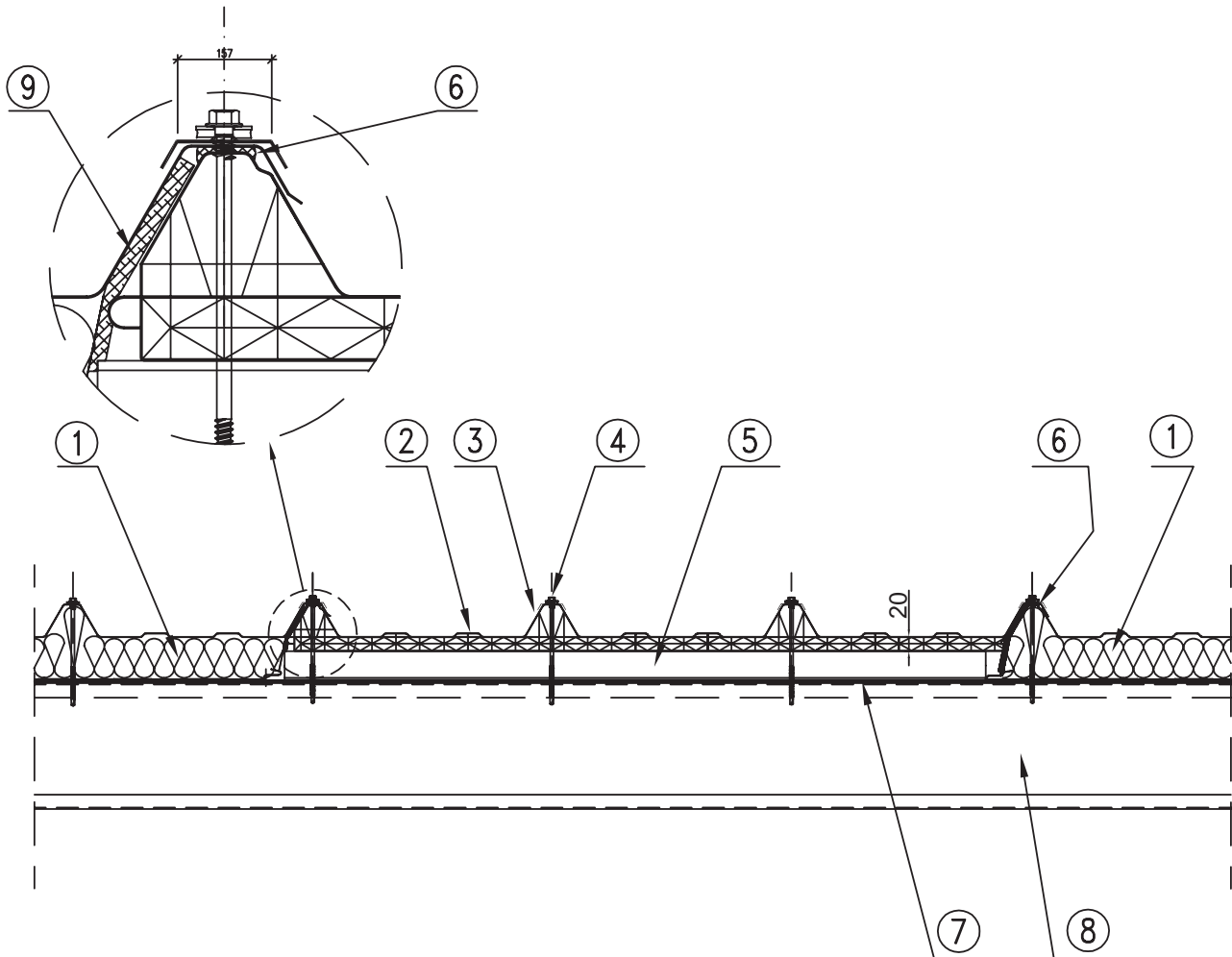
Roof skylight with a profiled flange – cross section – option II



1. BALEXTHERM D roof panel
2. Individual flashing
3. LB 1- LB 5 fasteners for fastening BALEXTHERM panels
4. LB 6 self-drilling fastener or AL/Fe blind rivet every 300mm
5. Fastener washer: KLT
6. Butyl sealing tape
7. PES 3x20 self-adhesive sealing tape (recommended)
8. Skylight, roof hatch, smoke vent - with a profiled base
9. Purlin or trimmer beam according to the construction design

3.27. D18/1

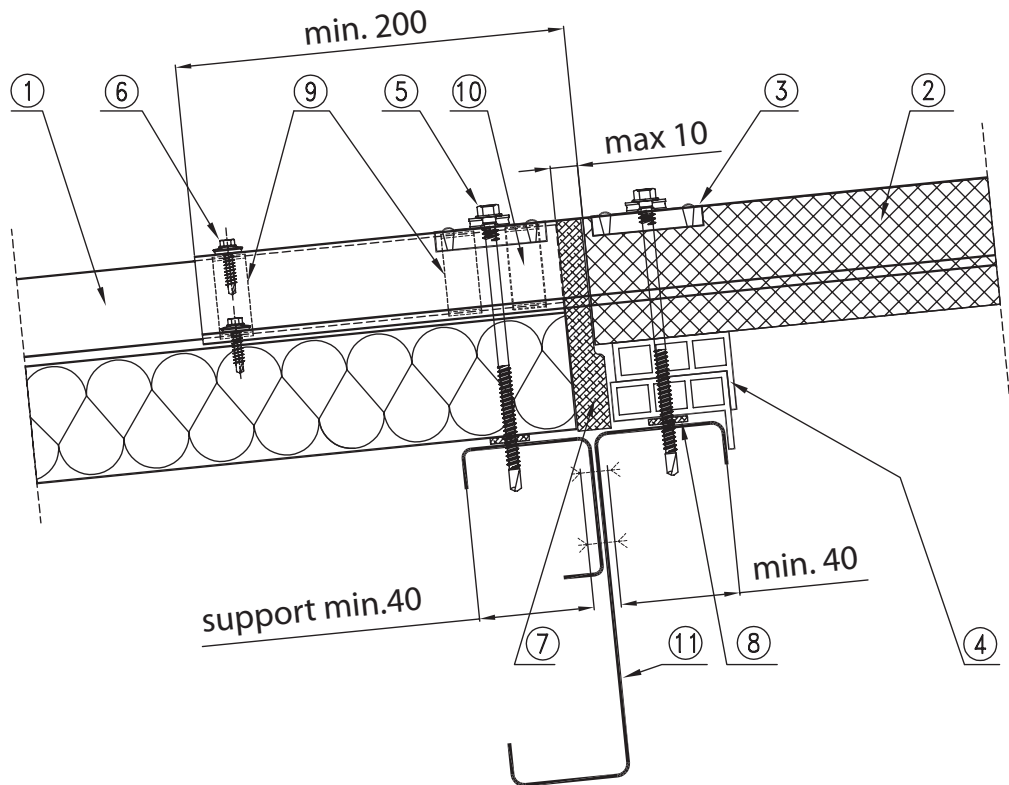
'LEXAN Thermorooft' rooflight for BALEXTHERM D sandwich panels



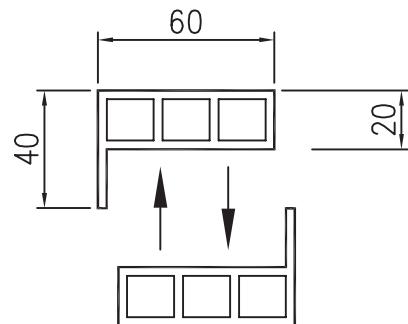
1. BALEXTHERM D roof panel
2. Multi-wall polycarbonate – rooflight for BALEXTHERM D panels, thickness: 20 mm, U=1.90 W/m²K
3. Cap with neoprene insulation
4. Self-drilling screw for sandwich panels
5. PVC spacing between the purlin and the rooflight
6. Butyl (e.g. sealing tape 25 x 4)
7. PES 20x3 self-adhesive sealing tape
8. Purlin (Z-bar)
9. PUS 80x5 self-adhesive sealing tape

3.28. D18/2

'LEXAN Thermoroof' rooflight for BALEXATHERM D sandwich panels – the rooflight cover on the panel

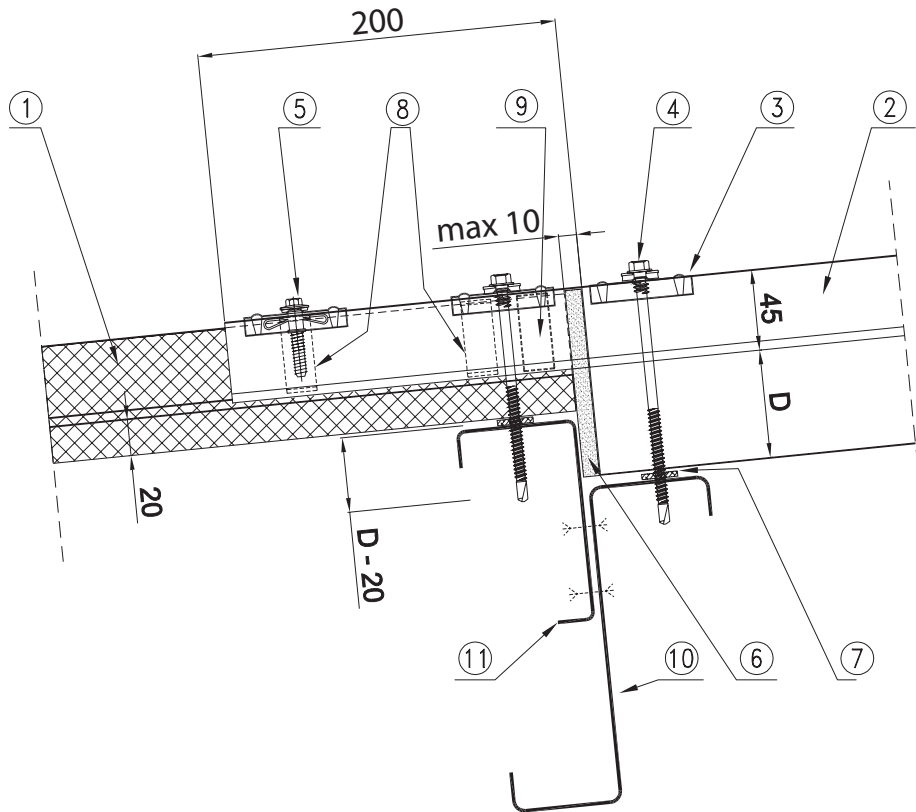


1. BALEXATHERM D roof panel
2. Multi-wall polycarbonate – rooflight for BALEXATHERM D panels, thickness: 20 mm, $U=1.90 \text{ W/m}^2\text{K}$
3. Cap with neoprene insulation
4. PVC spacing between the purlin and the rooflight
5. LB 1 – LB 5 self-drilling fasteners for fastening BALEXATHERM panels
6. LB 6 self-drilling fastener or AL/Fe blind rivet in every upper wave
7. Mineral wool or tape allowing rooflight chambers ventilation.
8. PES 20x3.0 self-adhesive sealing tape
9. Rubber seal ('roofing silicone')
10. Butyl seal (e.g. 25 x 4 tape)
11. Steel purlin: cold-bent or hot-rolled, wooden, etc., according to the construction design



3.29. D18/3

'LEXAN Thermoroof' rooflight for BALEXTHERM D sandwich panels – the panel cover on the rooflight



1. Multi-wall polycarbonate – rooflight for BALEXTHERM D panels, thickness: 20 mm, $U=1.90 \text{ W/m}^2\text{K}$
2. BALEXTHERM D roof panel with undercut on the joint $L_{\min}=200\text{mm}$
3. Cap with neoprene insulation
4. LB 1 – LB 5 self-drilling fasteners for fastening BALEXTHERM panels
5. Butterfly fastener in every upper wave
6. Polyurethane tape or foam closing the skylight chambers
7. PES 20 x 3.0 self-adhesive insulating tape
8. Rubber seal ('roofing silicone')
9. Butyl seal
10. Cold-bent steel purlin
11. Steel profile acc. to the construction design



BALEX METAL Sp. z o.o. HEADQUARTERS

ul. Wejherowska 12C
84-239 Bolszewo, Polska
Infoline: 0 801 000 807
tel. +48 58 778 44 44
fax +48 58 778 44 55
kontakt@balex.eu
www.balex.eu

Balex Metal Sp. z o.o. is a leading manufacturer of construction materials in Poland. The offer of the company includes complete solutions and steel roof and wall systems for residential, commercial and rural constructions. The products gained trust and appreciation in Poland, Belorussia, Lithuania, Latvia, Estonia, Ukraine, Czech Republic, Slovakia, Sweden and Norway. Consultancy and sale is being realized by own net of regional branches, cooperating distributors and a team of professional advisers.



BRANCH OFFICES

 **BALEX METAL S.R.O.
CZECHY**
Hradec Králové
Vázní 1097
tel. +420 495 482 683
fax +420 495 482 683
czeska@balex.eu

 **BALEX METAL UAB
LITWA**
Wilno
Savanoriu 174A
tel. +370 527 30 299
fax +370 527 30 295
lietuva@balex.eu

 **BALEX METAL
SŁOWACJA**
Banská Bystrica
Partizánska cesta 94,
974 01
tel./fax + 421 48 419 75 27
slovensko@balex.eu

 **SIA „BALEX METAL”
ŁOTWA**
Ražotne Brocēnos
Liepnieku iela 10,
Brocēni, Saldus
raj. LV-3851
tel. +371 638 65 886
fax +371 638 07 401
latvija@balex.eu

 **BALEX METAL TOV
UKRAINA**
Kijów
30 Vasilkovska,
office 4-03
tel. +380 44 39 07 144
fax +380 44 39 07 145
ukraina@balex.eu