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TECHNICAL MANUAL

ISOCCLASS



ISOPAN

INSULATING DESIGN

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ISOCLASS



Double skin metal faced wall sandwich panel with polyurethane foam insulating core, used to build curtain walls in civil and industrial buildings, featuring a tongue-and-groove concealed joint system that makes for long-lasting and sleek constructions. The corrugated profile offers a high aesthetic and architectural value.

GEOMETRIC FEATURES

	ISOCLASS
Length	Up to maximum transportable
Useful Pitch (mm)	1000
Insulating Thickness (mm)	72, 92, 102, 122
External face	Micro-ridged lightly profiled metal sheet
Internal face	Corrugated metal profile

METAL FACINGS

- SENDZIMIR system hot dip galvanised steel by continuous process (UNI EN 10346) and pre-painted by means of a coil coating continuous process with different painting cycles based on end use (see: "Guide to Choosing Pre-painted").
- 3000 or 5000 series aluminium alloys with pre-painted finish with the cycles mentioned in the previous point, with a natural or embossed effect.
- In case of aluminium facings, these must be preferably applied on both sides: in fact, if different materials are used on the two sides, the panel may distort and bend due to the different thermal expansion coefficients of the faces.
- For stainless steel facings, one should take into account the possible appearance of flaws that are highlighted by such reflecting surfaces.

PROTECTION OF THE PRE-PAINTED FACES

All pre-painted metal facings are supplied with an adhesive polyethylene protective film that prevents damage to the paint layer. If the material is specifically requested without protective film, Isopan assumes no liability in case of damages to the paint. The protective film that covers the pre-painted panels must be completely removed during assembly and, in any case, within sixty days after the material preparation.

It is also recommended not to expose the panels covered by a protective film to direct sunlight.

INSULATION

Made with rigid polyurethane foam, having the following physical and mechanical features:

- Compressive strength ≥ 0.11 MPa (at 10% of deformation)
- Tensile strength ≥ 0.10 MPa according to EN 826
- Shear strength ≥ 0.10 MPa according to EN 826
- Thermal conductivity coefficient $\lambda = 0.022$ W/mK
- The 95% closed cells guarantee an anhygroscopic structure
- Operating temperature:

minimum	- 40 °C
maximum	+ 80 °C

Foaming agent: N-Pentane in accordance with the Montreal protocol

Thermal transmittance coefficient U*

Panel thickness (mm)	72	92	102	122
U [W/m²K]	0.34	0.26	0.23	0.21

* Mandatory for CE marking of double skin metal faced sandwich panels according to EN 14509.

Thermal resistance coefficient R

Panel thickness (mm)	72	92	102	122
R [m²K/W]	2.94	3.85	4.35	4.76

PANEL WEIGHT

Sheet thickness (mm)		Nominal panel thickness (mm)			
		72	92	102	122
0,5/0,5	kg/m ²	10,9	11,7	12,1	12.9
0,6/0,6	kg/m ²	12,7	13,5	13,9	14.7

STATIC FEATURES

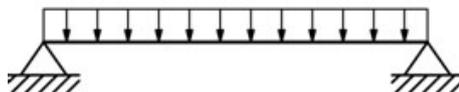
ISOCLASS panels are self-supporting according to the UNI EN 14509 definition. "...panel capable of supporting, by virtue of its materials and shape, its own weight and in case of panel fastened to spaced structural supports, all applied loads (snow, wind, air pressure), and transmitting these loads to the supports.", depending on the type of metal supports, their thickness and the thickness of the thermal insulating core.

The resistance values refer to a panel assembled horizontally and subject to the action of a distributed load that simulates the action of wind pressure; the calculation method used by ISOPAN does not consider the thermal effects, which are verified by the designer. Depending on the weather conditions of the installation location and the colour of the external face, if the designer feels a detailed verification of the stresses caused by thermal actions and long-term effects is necessary, he/she should contact the ISOPAN Technical Office. The designer is still responsible for checking the fastening systems, based on their number and the way they are placed.

Below are some examples of indicative load bearing tables:

The indications included in the following tables doesn't take into account the thermal load effects. Furthermore, the indicative values reported may not be used to replace the project calculations drawn up by a qualified technician, who will have to validate these instructions in accordance with the laws in the country of installation of the panels.

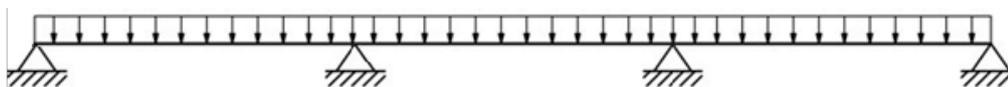
- panel on two supports:



STEEL SHEETS 0.5/0.5 mm - Simple support 120 mm				
UNIFORMLY DISTRIBUTED LOAD [kg/m ²]	NOMINAL PANEL THICKNESS mm			
	72	92	102	122
	MAXIMUM SPAN cm			
50	455	570	610	650
60	420	515	555	600
80	360	455	490	525
100	350	430	465	505
120	310	390	425	455
140	280	350	385	420
160	260	330	360	395
180	260	325	355	385
200	240	305	330	360

STEEL SHEETS 0.6 / 0.6 mm - Simple support 120 mm				
UNIFORMLY DISTRIBUTED LOAD [kg/m ²]	NOMINAL PANEL THICKNESS mm			
	72	92	102	122
	MAXIMUM SPAN cm			
50	475	600	640	680
60	440	540	580	620
80	380	475	510	545
100	365	450	480	520
120	320	400	435	470
140	290	360	395	425
160	265	335	365	395
180	265	330	360	390
200	240	305	330	360

- panel on multiple supports:



STEEL SHEETS 0.5/0.5 mm - Multi-Support 120 mm				
UNIFORMLY DISTRIBUTED LOAD [kg/m ²]	NOMINAL PANEL THICKNESS mm			
	72	92	102	122
	MAXIMUM SPAN cm			
50	455	570	605	645
60	410	515	540	570
80	355	435	455	475
100	330	400	425	445
120	290	355	365	385
140	265	320	335	345
160	235	290	305	315
180	225	285	300	315
200	195	265	275	295

STEEL SHEETS 0.6 / 0.6 mm - Multi-Support 120 mm				
UNIFORMLY DISTRIBUTED LOAD [kg/m ²]	NOMINAL PANEL THICKNESS mm			
	72	92	102	122
	MAXIMUM SPAN cm			
50	475	600	635	680
60	430	540	565	595
80	370	455	475	495
100	340	420	440	460
120	300	365	380	395
140	270	330	340	355
160	240	295	310	320
180	225	290	305	320
200	195	265	275	295

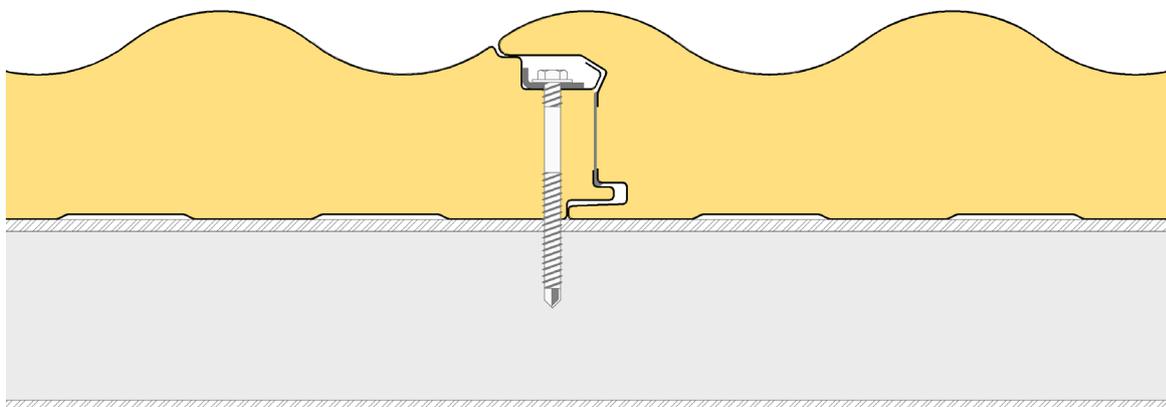
JOINT

The joint is fitted with a continuous sealing gasket, inserted during production. The shape of the joint is specifically designed to assure product functionality.

For special end-use requirements, an optional gasket can be put in on site to increase the airtightness of the joint.



Gasket crushing, leading to increased seal, due to the side pressure required to assure suitable coupling



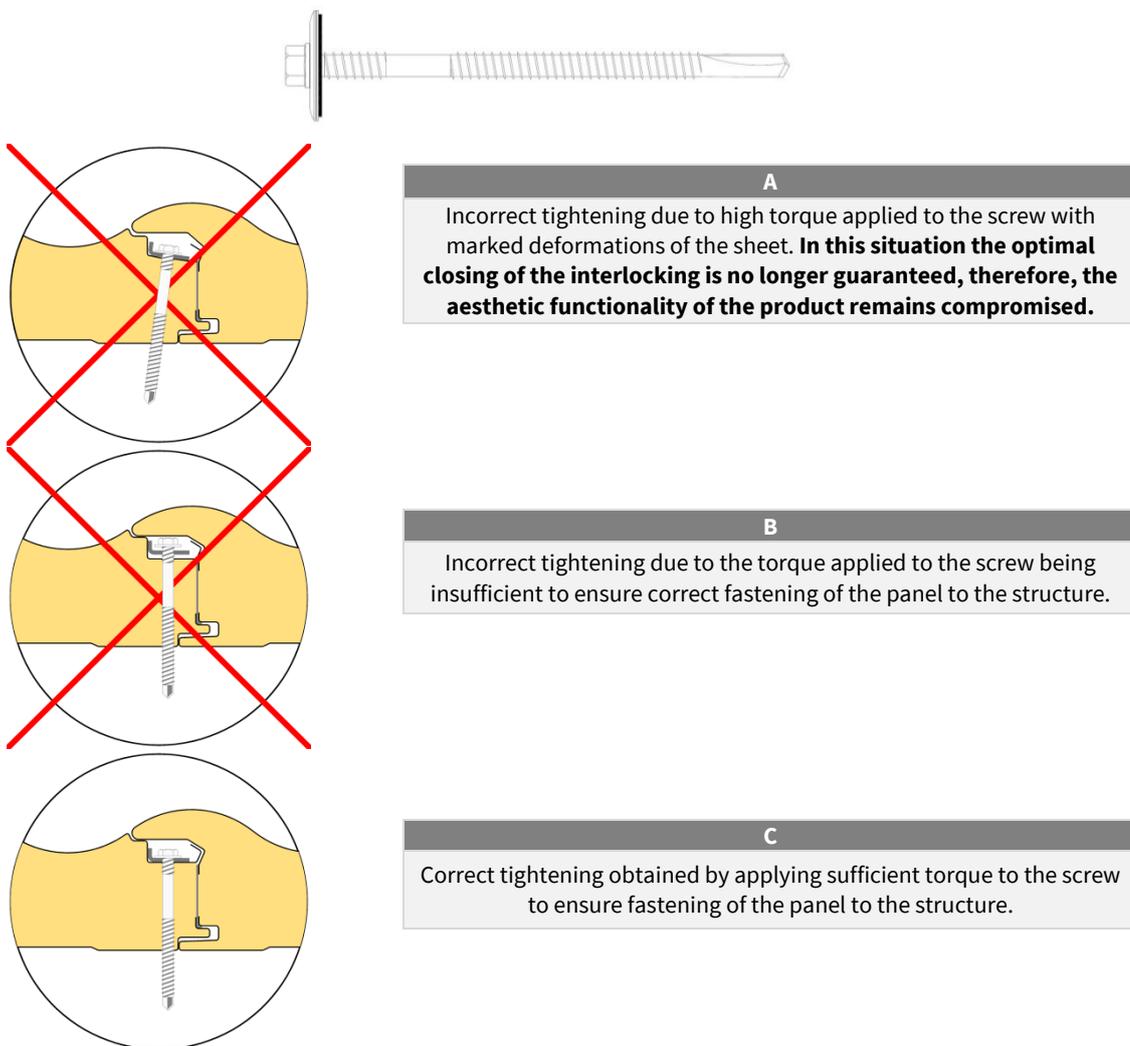
FASTENING INSTRUCTIONS

The purpose of the fastening elements is to efficiently anchor the panel to the load-bearing structure; the type of fastening unit depends on the type of face. The number and position of the fastening elements must guarantee resistance to the stresses induced by dynamic loads, which can also exist in depression.

Appropriately coated carbon steels or austenitic type stainless steels must be chosen as suitable materials to fasten panels. Pay particular attention to the compatibility of the steel and aluminium materials in order to prevent the formation of galvanic currents.

Fastening methods

Fastening varies depending on the project to be implemented and site application system of the panels. Isopan recommends using double-threaded screws with washer and sealing gasket with 19 mm minimum diameter.

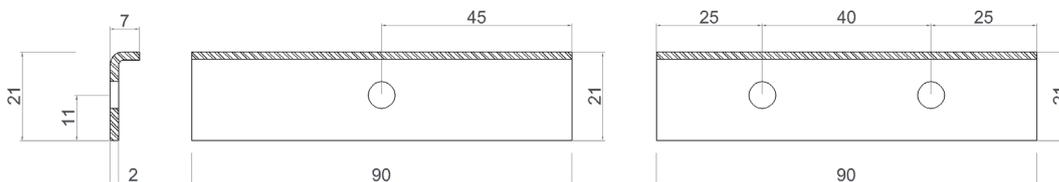


Screw length

The correct length of the screw depends on the panel thickness and on the type of support (steel, wood).

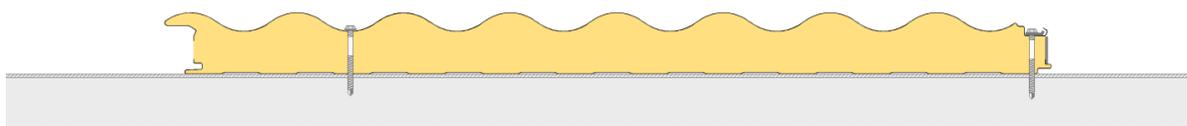
Fastening support	Screw length in the joint or corrugation valleys (mm)
Steel	Panel thickness + 10 mm
Wood	Panel thickness + 20 mm

Load spreading plate (recommended by Isopan)



Wall panel fastening

The panels are usually anchored to metal sheets positioned transversally to the length of the panels, which are, in turn, appropriately fastened to the load-bearing structure of the building as required by the design for stability. The width of the support must be at least 50 mm; said width must be checked and, if necessary, increased based on design requirements. In the event of head junction between two panels, said width must be at least 120 mm. Panels must be fastened to the load-bearing structure using the devices identified and sized in the design. The number of fastening elements varies depending on the different climatic conditions where the building is situated. Normally, for each panel, a fastening unit must be used at each support sheet. With high spans between supports and/or in areas that are particularly exposed to wind action, the density of the fastening elements must be established by the designer on a case by case basis, appropriately increasing the number and positioning the second screw as shown in the figure:



For wind suck-out loads on the bases of experimental tests, a percentage reduction coefficient ϕ is considered, which can be applied to the distances between the faces described in the "static features" paragraph, according to the following tables (only approximate values are shown for limited loads in depression).

LOADS IN DEPRESSION					
Concealed fastening with a screw on every support with load spreading plate					
Nominal panel thickness (mm)	Load (kg/m ²)				
	60	80	100	120	140
	ϕ depression (%)				
72	25%	40%	50%	55%	60%
92	45%	50%	55%	60%	65%
102	50%	55%	60%	65%	70%

LOADS IN DEPRESSION TABLES						
Concealed fastening with a concealed screw per support with load spreading plate						
Steel sheets 0.5 mm - support 120 mm						
Uniformly distributed load (kg/m ²)						
	Nominal panel thickness (mm)					
	72	92	102	72	92	102
Maximum span (cm)						
50	320	330	335	375	380	380
60	280	260	260	320	300	290
80	190	205	205	220	240	240
100	145	170	165	165	190	190
120	120	135	130	135	150	150

LOADS IN DEPRESSION TABLES						
Concealed fastening with a concealed screw with load spreading plate and two through screws per support						
Steel sheets 0.5 mm - support 120 mm						
Uniformly distributed load (kg/m ²)						
	Nominal panel thickness (mm)					
	72	92	102	72	92	102
Maximum span (cm)						
50	400	510	560	470	590	630
60	370	470	520	430	550	580
80	320	410	450	370	480	530
100	290	370	410	330	420	470
120	260	340	370	300	380	420

Using two additional through fastening screws (later concealed by the joint covers) does not require changing the spans between the supports set out in the "static features" paragraph.

ISOPAN recommends some solutions to cover the exposed panel fastening using appropriate tinwork systems (joint covers). (See Annex B)

REACTION TO FIRE (EN 13501-1)

The reaction to fire indicates the degree to which a material participates in the fire to which it is subjected.

The standard of reference for the reaction to fire classification of building materials is **EN 13501-1** (Fire classification of construction products and building elements). This standard specifies:

Euroclasses: the standard distinguishes seven classes, with increasing contribution to fire, from A1 (non-combustible product) to F (product not tested/not classified).

Smoke: smoke opacity growth speed

- **s1** no smoke emission
- **s2** low smoke emission
- **s3** strong smoke emission

Burning droplets: fall of burning particles

- **d0** no burning particles
- **d1** few burning particles
- **d2** many burning droplets

The fire classification of the panel depends on the type of polyurethane foam used and the thickness of the insulation; for further information, please refer to the Isopan catalogue, the website www.isopan.com or contact the Technical Department.

RESTRICTIONS OF USE

- A thermohygroscopic check should be performed during the design stage. In certain conditions (e.g. high indoor humidity level) condensation can appear on the internal face of the panel with consequent dripping inside the building. If these conditions persist long enough, they can accelerate the natural degradation of the organic facing and the face itself.
- **Due to solar radiation, the external face of the panel can reach relatively high temperatures. In some cases, it can reach a temperature of 80÷90°C.** A high temperature gradient should cause the panel deflection the panel and wrinkle the metal sheet. Isopan recommends a minimum thickness of 0.6 mm for the external side face. The occurrence of the problem may be limited with appropriate design, taking into account environmental conditions, length, colour of the panels and thickness of the sheet metal. **(See the "Thermal expansion" section).**
- If an aluminium sheet is used as an external face, it is necessary to consider the possible distortions of the panel (bending) due to the different thermal expansion coefficients.

GENERAL DESIGN INSTRUCTIONS

The wall panels generally require, during the design phase, a structure able to absorb the external loading stress that will not submit the panels to excessive and permanent distortions to the detriment of their basic characteristics. When choosing the panel types during the design phase, you should consider some parameters related to environmental actions like:

- **Wind action:** depends on the climatic area where the building is installed; the values fluctuate based on wind speed, with subsequent greater or lesser load pressure on the exposed surfaces (affects the type and number of panel fastening elements). For this particular panel (with concealed fastening elements), wind action in depression should be considered, bearing on joint resistance and fastening points, and it is required to use the specific Isopan plate on each screw to distribute stress (we recommend consulting with the ISOPAN Technical Department).
- **Thermal stress:** largely depends on the colour of the external surface of the panel and the building exposure, and can induce significant system deformations.

- **Atmospheric corrosion:** depends on the environment where the panels are installed (marine, industrial, urban, rural); mainly affects the degree of corrosiveness on the panel surfaces. In this regard, suitable metallic or organic facings should be chosen (refer to the available documentation or contact the Isopan Technical Department).

In order to make up for possible lack of material due to damages during handling and assembly, Isopan recommends procuring spare panels (quantity equal to approximately 5% of the total).

TOLERANCES (ANNEX D EN 14509)

- Facing thickness: according to the reference standards for the products used
- Panel thickness: nominal, ± 2 mm
- Length: if ≤ 3000 mm ± 5 mm; if > 3000 mm ± 10 mm

THERMAL EXPANSIONS

All the materials used to build the walls, especially metals, are subject to **thermal expansion and contraction** phenomena, due to temperature changes. The stresses due to metal sheet thermal expansions act on the siding and can cause functional and structural product anomalies, particularly in case of:

- Significant panel length ($L > 5000$ mm);
- Solar radiation;
- Medium and dark colours;
- High panel thickness;
- Inadequate thickness of the metal support.

Material	Thermal expansion coefficient ($^{\circ}\text{C}^{-1}$)
Aluminium	23.6×10^{-6}
Steel	12.0×10^{-6}

-Values of linear thermal expansion coefficients-

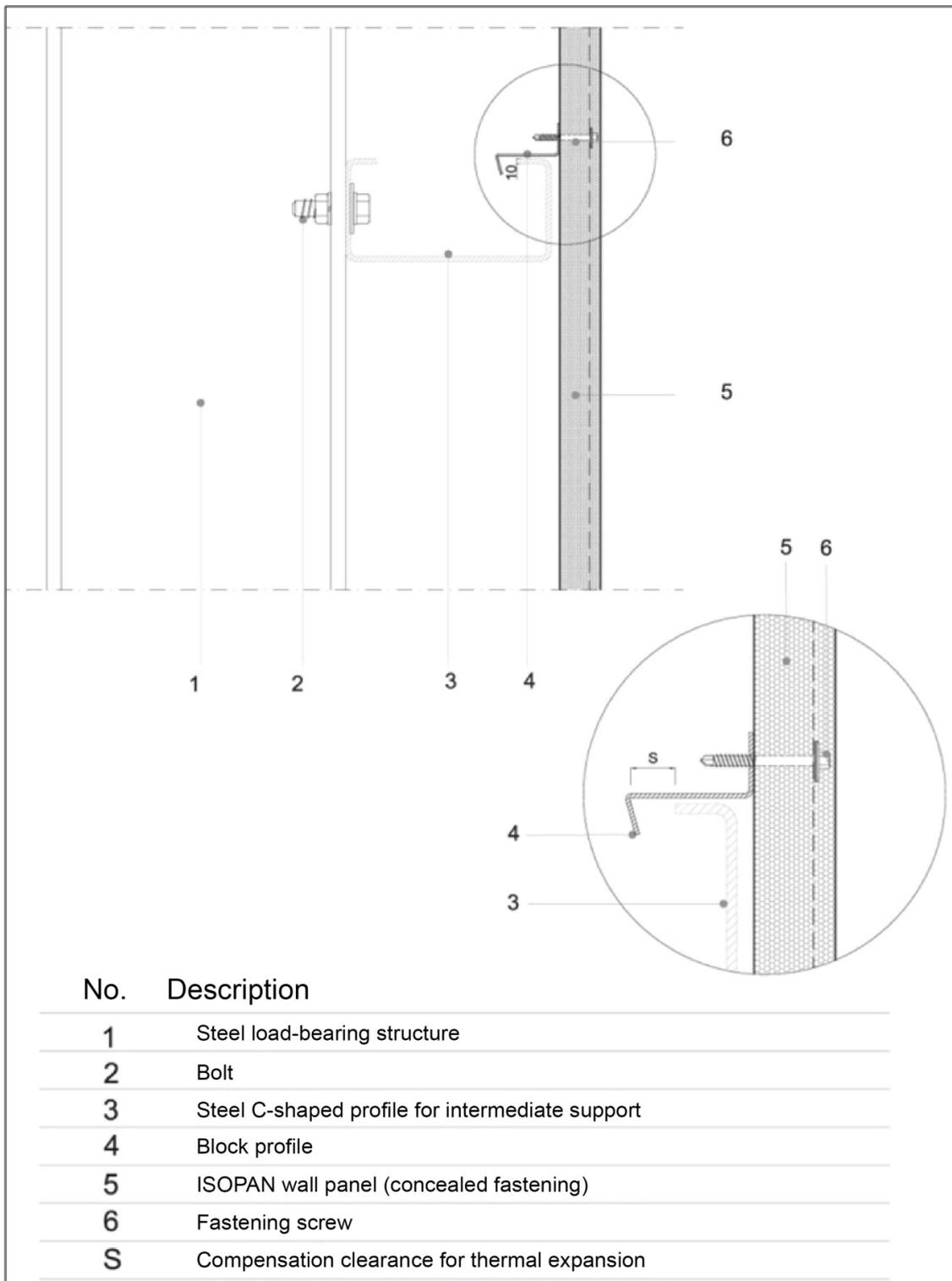
Type of facing		Surface temperature ($^{\circ}\text{C}$)	
		Min.	Max.
Insulated	Light	-20	+60
	Dark	-20	+80

Where "insulated" means that an insulating core is inserted between the external sheet and the structure; "light or dark" means the surface colour of the sheet.

-Temperature range-

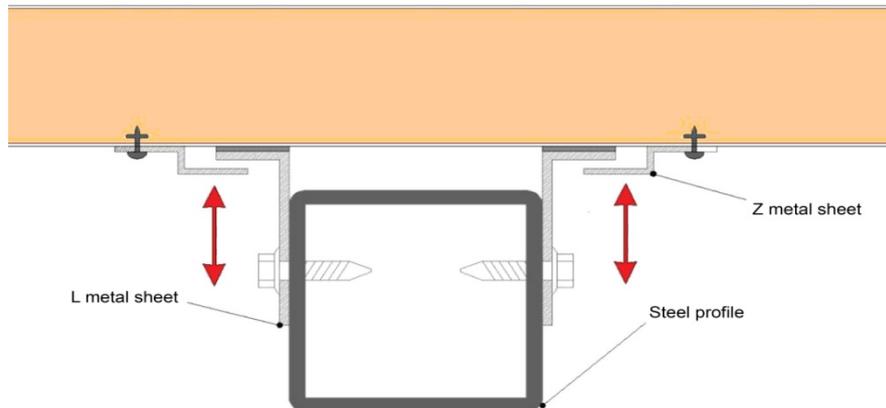
For high surface temperatures, the linear extension of the metal face must be absorbed by the system; cyclic temperature changes related to the day-night or freeze-thaw fluctuations create uncontrollable cyclic stresses that fatigue the support elements. These stresses may cause flaws and undulations in wall panels and, in more severe cases, even wrinkling phenomena. These issues may be overcome by complying with the requirements:

- Calculate in advance the deformation induced on the panel by the thermal expansion.
- Do not use dark colours on long panels.
- Use suitable thickness of the metal supports (minimum 0.6 mm to be assessed based on the design specifics).
- Segment the panels.
- Use a panel fastening system able to offset the shift caused by the excessive thermal expansions; this solution is particularly important when using panels with aluminium faces (see for example figure below).

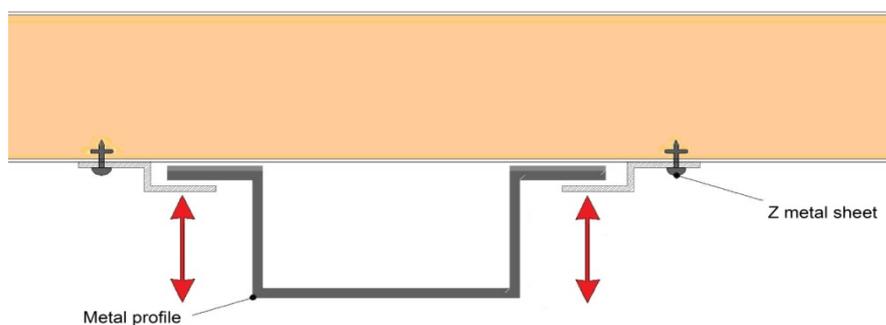


When necessary, intermediate supports are to be used:

Solution 1



Solution 2

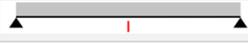


Therefore, the assembly stage is critical for the following reasons:

- **Due to the very nature of the mechanical joint:** the profiles of the tongue-and-groove joints are accurate and, therefore, due to the effect of linear elongation and bowing caused by solar irradiation, the assembly phase can be difficult or compromised;
- **Due to the bending stiffness of the panel:** panels with high thicknesses have a higher stiffness than those with average-low thicknesses; any abnormalities during assembly due to thermal effects cannot be resolved with "adjustments" during installation, causing jointing difficulties.

Sandwich panels with dark external faces that reach external surface temperatures of around +80°C (as described in UNI EN 14509) are submitted to a deflection perpendicular to the longitudinal axis of the panel. This deflection, which depends on the temperature difference between the external and internal metal sheet, is particularly noticeable for long simple span panels. To limit such deformations that undermine the panel's appearance, Isopan recommends complying with the maximum work spans specified in the following table.

It is important to emphasise that for this type of panel (with concealed fastening), the mechanical action brought about by the sum of thermal loads and wind suck-out loads must be considered significant for proper joint functionality and stability. ISOPAN suggests not to exceed the maximum spans between supports shown in the following table:

THERMAL LOAD TABLES WITH $\Delta T = 55^{\circ}\text{C}$ DARK EXTERNAL METAL SHEET COLOUR - GROUP III			
Concealed fastening with a screw on every support with load spreading plate			
Dark steel sheet 0.6 mm - support 120 mm			
$\Delta T = 55^{\circ}\text{C}$ (dark external sheet colour - Group III)			
	Nominal panel thickness (mm)		
	72	92	102
	Maximum span (cm)		
	230	320	350

(*) The calculation considers a deformation limit equal to 1/200 of the span to limit panel deformation due to thermal loads induced by the dark colour of the external metal sheet

ASSEMBLY INSTRUCTIONS

The correct sequence of assembly operations is the following:

Preliminary operations

- Verify that the supports are properly aligned.
- Pay particular attention to the contact points between the supports and the panel support plates to avoid phenomena linked to electrochemical corrosion if incompatible metals are coupled. For this purpose, elastomer or expanded resin strips may be applied as separators.
- Ensure that the site area has appropriate storage and handling capacity in order to prevent material damage.
- Use suitable tools (toothed circular saw, jigsaw, shears, nibbler) for on-site cutting operations. The use of equipment that produces metallic sparks (e.g. abrasive discs, disc cutter) is absolutely not recommended.
- Use suitable handling systems, particularly for long or heavy panels, in order to prevent safety risks on site and damages to the product.

Using acetic silicones is prohibited as they tend to attack the pre-painted galvanised face and form incipient oxidation. It is best to use single component sealant silicones with neutral curing that tend to harden due to the air humidity and, being free of solvents, do not attack the paint.

Assembly

- Apply the basic tinwork (when provided) to the foot of the wall, as well as the tinwork that must be installed before the wall, such as drip edges, roof fittings, etc.
- Remove the protective film from the panels, if any.
- Apply the panels starting from the bottom of the wall, or the side end in case of vertical assembly, taking care to join them properly and to ensure they are plumb.*
- Systematically fasten the elements after ensuring they match correctly. The fastening screw must be inserted orthogonally to the panel.
- If the wall height involves the need to assemble panels vertically, the junction is made at the frame and requires appropriate use of shaped fitting tinwork (ridge caps, drip edges, etc.).
- Use "U"-shaped ridge caps and drip edges for doors and window frames.
- Apply the finishing elements (angle bars, perimeter edgings, fittings).
- Check and clean the walls, with particular attention to metal scraps, fastenings and fittings with door and window frames.
- For horizontal installation, the groove part of the panel must always be facing downward in order to prevent rainwater from stagnating and to promote normal run-off.

***Note: it is mandatory to adhere to the correct installation direction of the panels during assembly.**

PACKAGE COMPOSITION

The panels are normally supplied packaged and wrapped with extensible polyethylene film; the standard composition of the package is as shown below:

Panel thickness (mm)	72	92	102
No. of panels per package	12	10	8

Package compositions and types of packaging other than standard must be explicitly requested when ordering.

TRANSPORT AND STORAGE

Lorry loading

- The packages of panels are loaded on lorries, usually two in width and three in height. The packages include polystyrene spacers at the base, which are thick enough to allow for the lifting straps.
- The goods are arranged on the vehicles so as to ensure safe transportation and integrity of the material, in accordance with the requirements of the carrier, who is solely responsible for load integrity. Pay special attention to ensure the weight bearing on the bottom package, as well as the pressure exerted in the tying points, do not cause damage and the straps do not distort the shape of the product in any way.
- Isopan assumes no liability for loading lorries that are already partially occupied by other materials, or that do not have a suitable loading floor.

Customers who will pick up the material must instruct the drivers accordingly.

Lorry unloading with crane

- Use any type of crane equipped with spreader beam and equipped straps. Isopan can advise customers on the choice of spreader beams and straps. By using correct lifting systems, the panels will not be damaged.
- Never use chains or metal cables for lifting under any circumstances. As a general rule, sling the packages leaving about 1/4 of their length protruding from each end.

Lorry unloading with forklifts

- If the lorries are unloaded using a forklift, the length of the packages and their possible bending should be taken into account in order to prevent damages to the bottom of the package.
- The forks must be wide and long enough in order not to damage the product. When possible, protective material against surface abrasion and scratches should be applied between the fork and the package.

Indoor storage (Annex A)

- The materials must be stored in ventilated indoor facilities that are free of dust and humidity and not subject to temperature changes.
- Moisture that can penetrate (rain) or form (condensation) between two panels can damage the facings since it is particularly aggressive on metals and facings, with subsequent oxidation.
- Pre-painted facings may be more exposed to the negative consequences of combined heat/humidity conditions.

Outdoor storage (Annex A)

- If the packages and accessories are stored outdoors, the surface must absolutely be inclined longitudinally to prevent moisture from accumulating and to allow water run-off and natural air circulation.
- If storage is not shortly followed by pick-up for installation, it is advisable to cover the packages with a protective tarp, assuring impermeability as well as adequate ventilation to prevent condensate from accumulating and puddles of water from forming.

Storage terms (Annex A)

- Based on experience, in order to maintain original product performance, continuous indoor storage in closed and ventilated facilities should not exceed six months, while outdoor storage should never exceed sixty days from the date of production. These terms refer to the properly stored product, as instructed in the "storage" chapter in Annex A. However, the materials must always be protected against direct sunlight, as it may cause alterations.
- In case of transport in containers, the products must be removed from the containers as soon as possible and, however, no later than 15 days from the loading date, to prevent deterioration of the metal supports and organic coatings (e.g. blistering). Moisture inside the container must absolutely be avoided. Upon customer request, Isopan can provide special packages that are more suitable for transport in containers.

PACKAGING

Isopan suggests carefully choosing the type of packaging depending on destination, type of transport, conditions and length of storage.

To choose the correct type of packaging, please refer to the "**Packaging and Services**" document on www.isopan.com.

DURABILITY

Product durability depends on the intrinsic features of the panel used in relation with its final use. The panel, including the features of the metal supports, must be chosen after the wall has been properly designed.

In this regard we recommend, if necessary, using the Isopan documentation, also available on the web (www.isopan.com), and/or the reference standards.

MAINTENANCE

All types of facings, including those made with metal sandwich panels, require maintenance.

The type and frequency of maintenance activities depend on the product used for the external facing (steel, aluminium); in any case, we recommend periodically inspecting the building (at least once a year), in order to assess its conditions.

In order to maintain the aesthetic and physical properties of the elements and to extend the efficiency of the protective facing, it is also recommended to regularly clean the walls, paying special attention to the areas that could facilitate rain water stagnation, where substances that are harmful to the durability of the metal support may be concentrated.

If you notice any problems following an on-site inspection, you must react immediately in order to restore the initial general conditions (e.g. restoring the paint where there are local abrasions or scratches).

Upon customer request, Isopan can provide useful information to solve some problems related to this topic.

SAFETY AND DISPOSAL

Pursuant to Directive 68/548/EEC the sandwich panel does not require labelling. To meet customer requirements, Isopan has drawn-up a "Technical details for safety" document, to be referenced for any kind of information related to safety.

Caution: all information contained in the product data sheets must be validated by a qualified technician according to the laws in force in the country where the panels are installed.

Technical specifications and features are not binding. Isopan reserves the right to make changes without prior notice; the latest documentation is available on our website www.Isopan.com. For whatever is not explicitly specified herein, please refer to the "General conditions of sale of the corrugated metal sheets, insulated metal panels and accessories". All the products that fall under the EN 14509 standard field of application are CE marked.

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Annex A

LORRY UNLOADING WITH CRANE

For lifting, the packages must always be sling in at least two points. The distance between them must be no less than half the length of the packages.

Lifting should be possibly carried out using synthetic fibre straps (Nylon) no thinner than 10 cm, so that the load is distributed on the strap and does not cause distortion.

(see Figure 1)

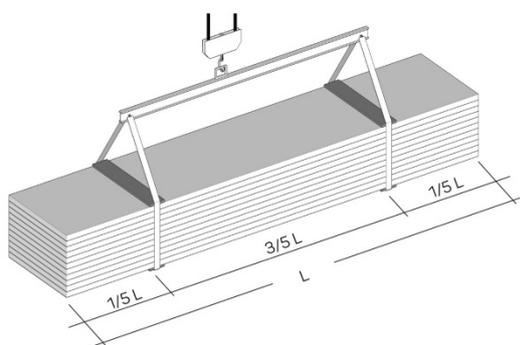


Figure 1

Suitable spacers must be placed under and above the package, made of sturdy solid wood or plastic elements to avoid direct contact of the strap with the package.

These spacers must be at least 4 cm longer than the width of the package and be at least as wide as the strap.

Make sure that the straps and supports cannot move during lifting and that manoeuvres are performed cautiously.

LORRY UNLOADING WITH FORKLIFTS

If the lorries are unloaded with a forklift, take into account the length of the packages and their possible bending in order to avoid damaging the bottom of the package and/or to the extreme failure limit of the panels.

We recommend using forklifts that are suitable for handling panels and similar products.

STORAGE

The packages must always be kept off the ground both in the warehouse and, more so, at the construction site. They must have plastic foam supports with flat surfaces longer than the width of the panels and at a distance adequate to the features of the product.

The packages should preferably be stored in dry facilities to prevent stagnation of condensation water on inner, less ventilated, elements, which is particularly aggressive on metals, resulting in the formation of oxidation.

The panels must be stored in dry ventilated facilities; should this not be possible, open the packages and ventilate the panels (spacing them from one other). If the panels remain packaged outdoors, the galvanised facing may oxidise (white rust) even after a few days, due to electrolytic corrosion.

The panels must be stored to facilitate water run-off, especially when it is necessary to temporarily store them outside (see Figure 2).

If storage is not shortly followed by pick-up for installation, it is advisable to cover the packages with protective tarps.

To maintain original product performance, continuous indoor storage in ventilated facilities should not exceed six months, while outdoor storage should never exceed 60 days.

Packages stored at a height must always be properly bound to the structure.

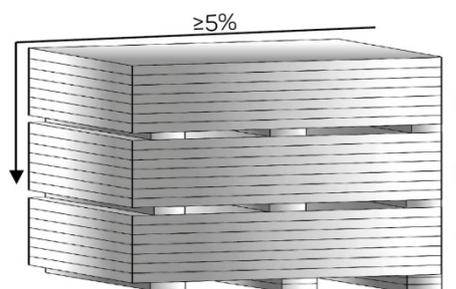


Figure 2

PRE-PAINTED FACES



In case of prolonged storage, the pre-painted products must be stored indoors or under a canopy. There is the risk that stagnant humidity may attack the paint layer, causing it to detach from the galvanised support. It is not advisable to let more than two weeks elapse from when the products were stored at the site.

In case of container transport, the products must be removed from the container within 15 days from the loading date in order to prevent the metal supports from deteriorating.

PANEL HANDLING

The panels must be handled using adequate protection equipment (safety shoes, gloves, overalls, etc.) in compliance with current regulations.

The individual element must always be manually handled by lifting the element without dragging it on the ground and turning it sideways beside the package; it must be transported by at least two people according to the length, keeping the element on its side. (see Figure 3)

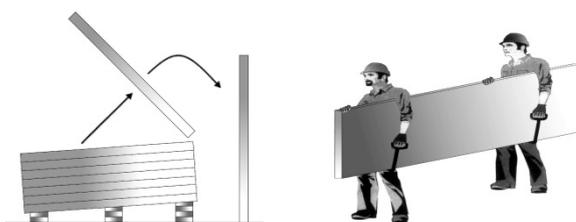


Figure 3
Handling equipment as well as gloves must be clean and such as not to damage the items.

INSTALLATION

The panel installation personnel must be qualified and know the correct technique to perform the work in a workmanlike manner. If required, the seller can provide appropriate guidance and instructions.

The installation personnel must be equipped with footwear with soles that do not damage the external surface of the panel.

On-site cutting operations must be done with suitable tools (jigsaw, shears, nibbler, etc.).

We do not recommend using tools with abrasive discs.

To fasten the panels, it is advisable to use devices that can be provided by the seller.

Tighten the screws using a screwdriver with torque limitation.

For roofs with pitch elements without intermediate joints (overlaps), the slope should usually be no less than 7%. For slopes below that, the seller's requirements must be implemented.

In case of head overlaps, the slope should take into account the type of joint and material used, as well as the specific environmental conditions.

During panel assembly and, in particular, in roofs, it is necessary to immediately remove all residual materials paying special attention to metal ones that may cause early deterioration of the metal faces by oxidising.

PROTECTIVE FILM

The pre-painted metal facings are supplied upon request with adhesive polyethylene protective film that prevents damage to the paint layer.

The protective film covering the pre-painted panels must be completely removed during assembly or, in any case, within 60 days from material preparation.

It is also recommended not to expose the panels covered with protective film to direct sunlight.



For the panels expressly requested without protective film, special care is required during handling on site and installation.

MAINTENANCE

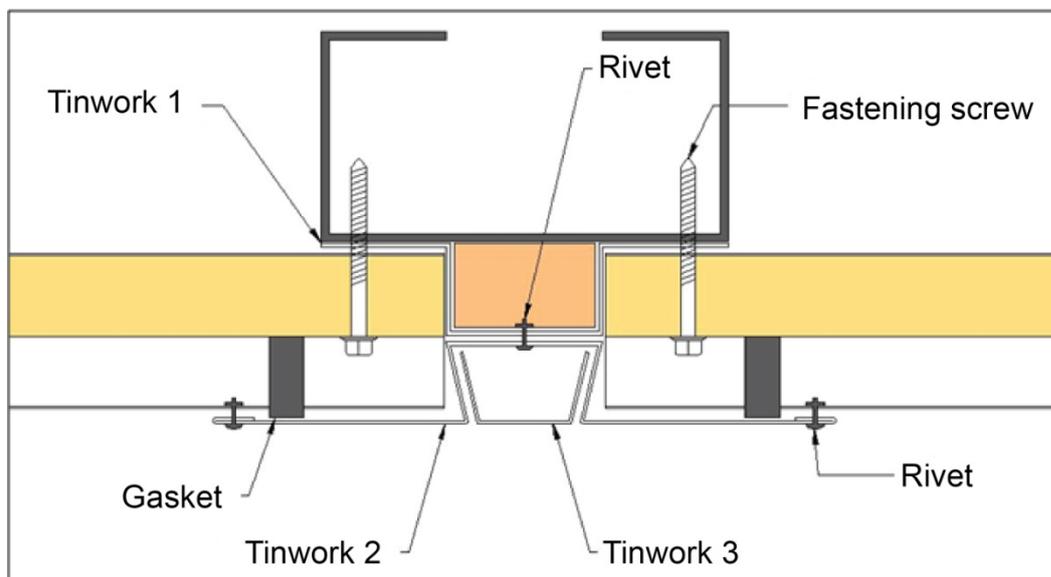
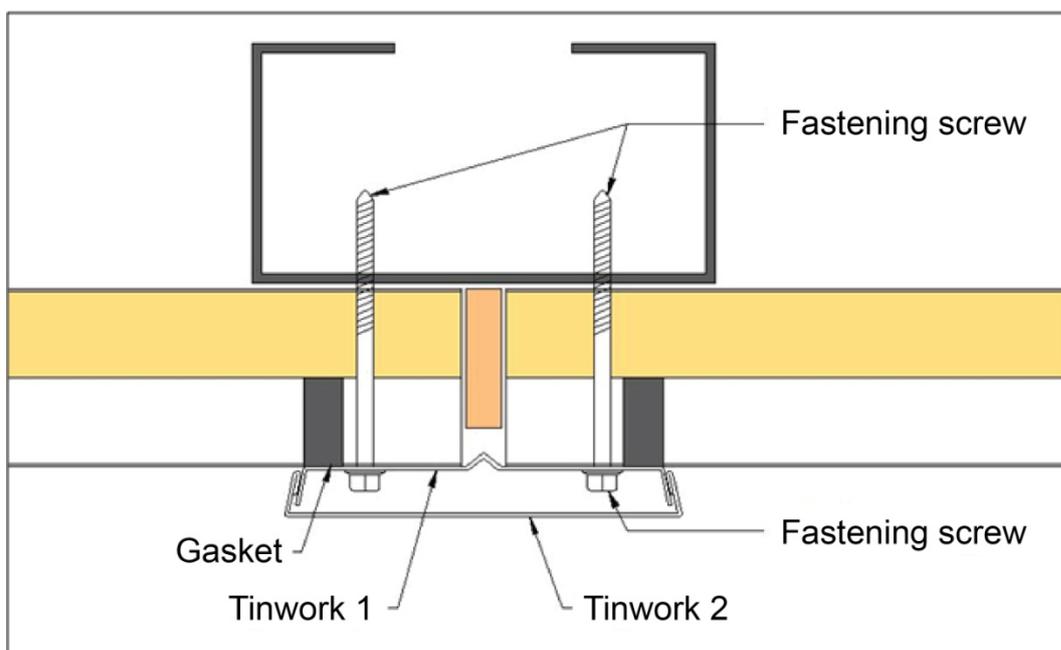
The main routine maintenance operation is cleaning the panels. The panel surfaces that, following visual inspection, are found to be dirty or oxidised can be washed with soap and water using a soft brush. The cleaning water pressure can be applied up to 50 bar, but the jet must not be too close or perpendicular to the surfaces. Near the joints the water must be sprayed at a sufficient angle not to undermine their tightness.

YEARLY CHECKS OF THE ISOPAN PANELS	
WHAT TO INSPECT	CORRECTIVE ACTIONS
Conditions of the pre-painted surfaces (cracks and colour unevenness)	Assess the condition of the surfaces Repaint where possible
Scratches and dents	Repaint and repair dents
Fastening screws	Remove a screw and check if oxidised Tighten the screws where necessary
Angle parts of cut	Check the state of oxidation Clean and repaint

These provisions are taken from the General Conditions of Sale.

Annex B

SYMMETRICAL FASTENING HORIZONTAL PANEL INSTALLATION



Annex C

ISOCCLASS PANEL ASSEMBLY EXAMPLE OF HORIZONTAL INSTALLATION PANEL PREPARATION

Open the panel package and prepare to detach the protective film but without removing it yet. This makes for easier removal when the panel is installed, while keeping the paint protected during handling and installation operations. The temporary protection must then be removed as quickly as possible, before UV photodegradation makes removal complicated.



Turn the edge panel, and hook it with a clamp, prepared with the suitable moulded pad supplied by Isopan S.p.A.

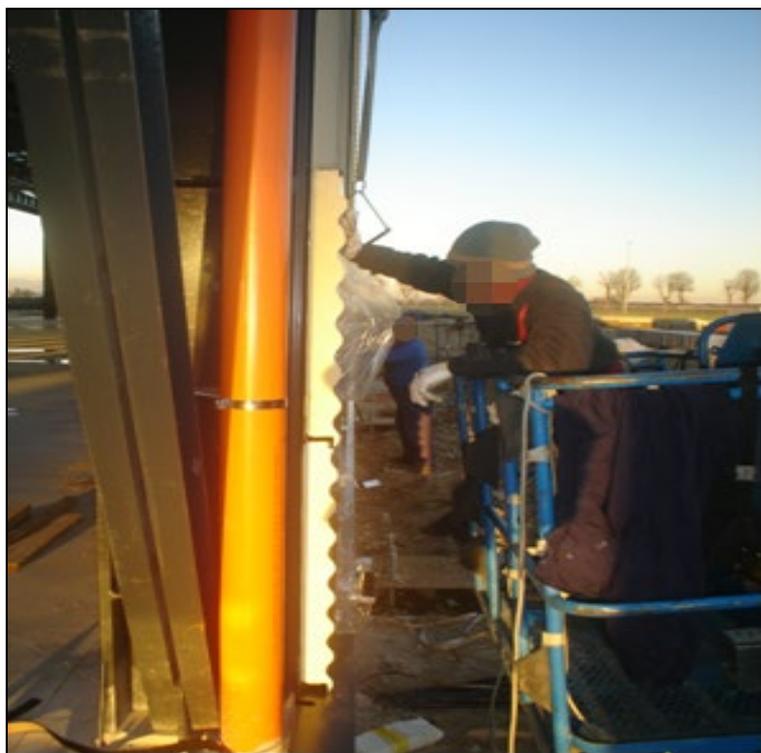
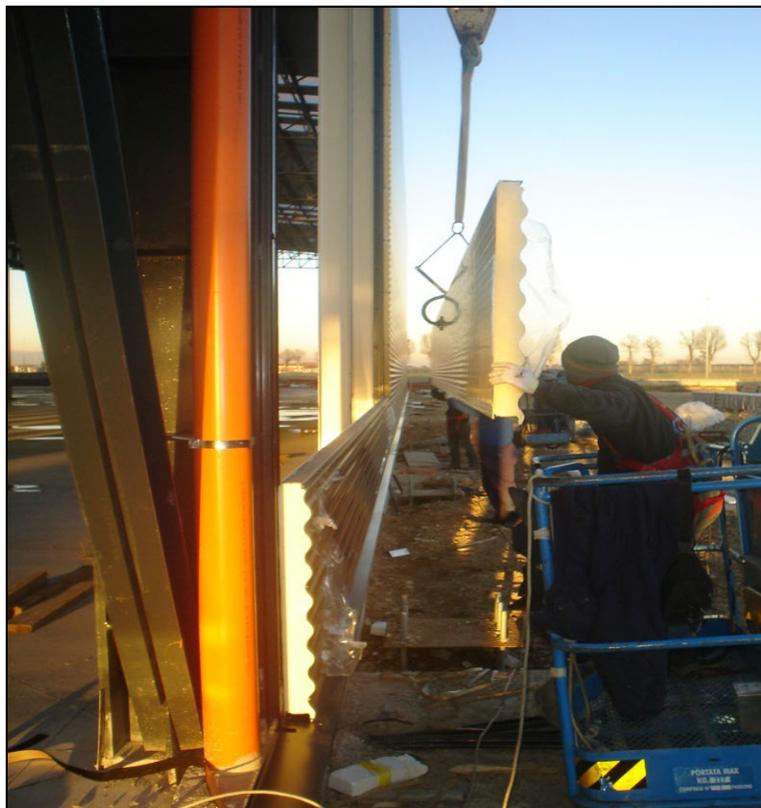




Go near the building to install the panel.



Lay the panel onto the structure and slide it down until it fits into the lower panel. Pay the utmost attention to parallelism with the structure and to ensure the wall is plumb.



Proceed with a suitable fastening screw, apply sufficient pressure between the two panels to close the joint well, drill the panel and the hooking structure with self tapping screws or with pre-drilling drill. The specific Isopan plate must be used on each screw for stress distribution and to prevent joint deformation.



The horizontal Isoclass panel installation system entails using a crane, required to position the panel, and two basket cranes with relevant operators to assist in positioning and fastening.



Annex D

SUCTION CUP LIFTERS

In the event the panels are handled using **suction cup lifters** the operations must be carried out ensuring the panel is not deformed. The action of the suction cup on the sheet during lifting must be **adequately redistributed** taking into account the panel's **length** and **weight**.

To prevent excessive force by the suction cups from causing detachment of the sheet from the insulating core, Isopan recommends complying with the following restrictions:

Polyurethane panels:

Minimum Total Surface of Suction Cups for Polyurethane Panel with Steel face 0.4 / 0.4												
Panel Length	Panel thickness [mm]											
	25	30	35	40	50	60	80	100	120	150	180	200
2000 mm	340 cm ²	350 cm ²	350 cm ²	360 cm ²	380 cm ²	390 cm ²	430 cm ²	460 cm ²	490 cm ²	540 cm ²	590 cm ²	620 cm ²
3500 mm	590 cm ²	600 cm ²	620 cm ²	630 cm ²	660 cm ²	690 cm ²	740 cm ²	800 cm ²	850 cm ²	940 cm ²	1,020 cm ²	1,080 cm ²
5000 mm	840 cm ²	860 cm ²	880 cm ²	900 cm ²	940 cm ²	980 cm ²	1,060 cm ²	1,140 cm ²	1,220 cm ²	1,340 cm ²	1,460 cm ²	1,540 cm ²
6500 mm	1,090 cm ²	1,120 cm ²	1,140 cm ²	1,170 cm ²	1,220 cm ²	1,270 cm ²	1,380 cm ²	1,480 cm ²	1,580 cm ²	1,740 cm ²	1,900 cm ²	2,000 cm ²
8000 mm	1,340 cm ²	1,370 cm ²	1,400 cm ²	1,440 cm ²	1,500 cm ²	1,560 cm ²	1,690 cm ²	1,820 cm ²	1,950 cm ²	2,140 cm ²	2,330 cm ²	2,460 cm ²
10000 mm	1,670 cm ²	1,710 cm ²	1,750 cm ²	1,790 cm ²	1,870 cm ²	1,950 cm ²	2,110 cm ²	2,270 cm ²	2,430 cm ²	2,670 cm ²	2,910 cm ²	3,070 cm ²
13000 mm	2,170 cm ²	2,230 cm ²	2,280 cm ²	2,330 cm ²	2,430 cm ²	2,540 cm ²	2,750 cm ²	2,950 cm ²	3,160 cm ²	3,470 cm ²	3,790 cm ²	3,990 cm ²

Minimum Total Surface of Suction Cups for Polyurethane Panel with Steel face 0.6 / 0.6

Panel Length	Panel thickness [mm]											
	25	30	35	40	50	60	80	100	120	150	180	200
2000 mm	490 cm ²	490 cm ²	500 cm ²	510 cm ²	530 cm ²	540 cm ²	570 cm ²	610 cm ²	640 cm ²	690 cm ²	730 cm ²	770 cm ²
3500 mm	850 cm ²	860 cm ²	870 cm ²	890 cm ²	920 cm ²	940 cm ²	1,000 cm ²	1,060 cm ²	1,110 cm ²	1,200 cm ²	1,280 cm ²	1,340 cm ²
5000 mm	1,210 cm ²	1,230 cm ²	1,250 cm ²	1,270 cm ²	1,310 cm ²	1,350 cm ²	1,430 cm ²	1,510 cm ²	1,590 cm ²	1,710 cm ²	1,830 cm ²	1,910 cm ²
6500 mm	1,570 cm ²	1,590 cm ²	1,620 cm ²	1,640 cm ²	1,700 cm ²	1,750 cm ²	1,850 cm ²	1,960 cm ²	2,060 cm ²	2,220 cm ²	2,370 cm ²	2,480 cm ²
8000 mm	1,930 cm ²	1,960 cm ²	1,990 cm ²	2,020 cm ²	2,090 cm ²	2,150 cm ²	2,280 cm ²	2,410 cm ²	2,530 cm ²	2,730 cm ²	2,920 cm ²	3,050 cm ²
10000 mm	2,410 cm ²	2,450 cm ²	2,490 cm ²	2,530 cm ²	2,610 cm ²	2,690 cm ²	2,850 cm ²	3,010 cm ²	3,170 cm ²	3,410 cm ²	3,650 cm ²	3,810 cm ²
13000 mm	3,130 cm ²	3,180 cm ²	3,230 cm ²	3,280 cm ²	3,390 cm ²	3,490 cm ²	3,700 cm ²	3,910 cm ²	4,120 cm ²	4,430 cm ²	4,740 cm ²	4,950 cm ²

Minimum Total Surface of Suction Cups for Polyurethane Panel with Steel face 0.8 / 0.8

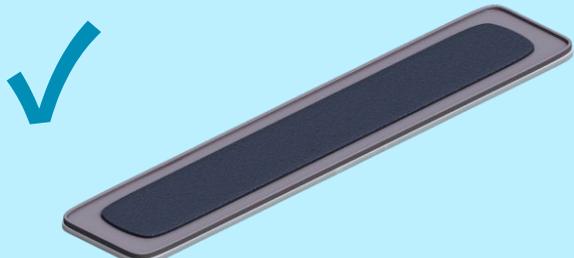
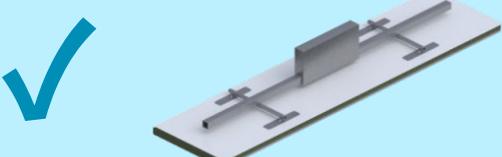
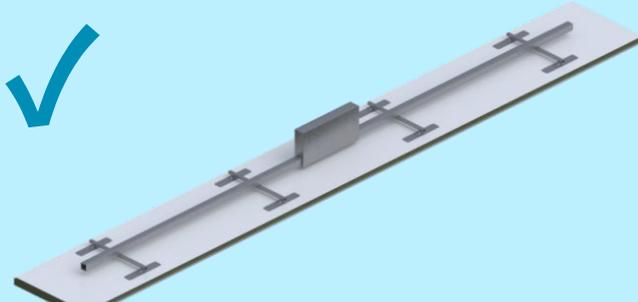
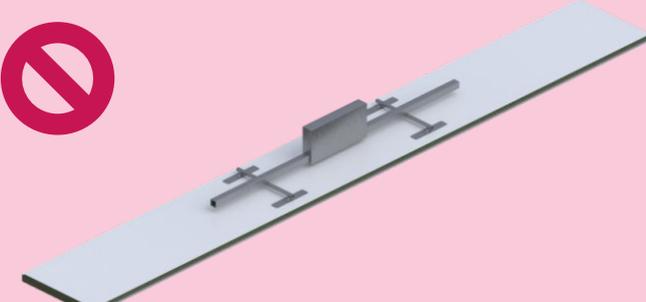
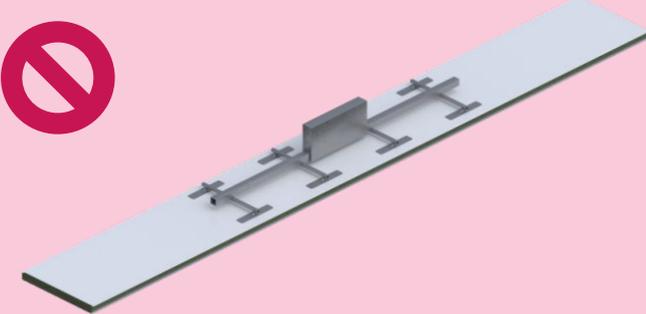
Panel Length	Panel thickness [mm]											
	25	30	35	40	50	60	80	100	120	150	180	200
2000 mm	630 cm ²	640 cm ²	650 cm ²	660 cm ²	670 cm ²	690 cm ²	720 cm ²	750 cm ²	780 cm ²	830 cm ²	880 cm ²	910 cm ²
3500 mm	1,100 cm ²	1,120 cm ²	1,130 cm ²	1,140 cm ²	1,170 cm ²	1,200 cm ²	1,260 cm ²	1,310 cm ²	1,370 cm ²	1,450 cm ²	1,540 cm ²	1,590 cm ²
5000 mm	1,570 cm ²	1,590 cm ²	1,610 cm ²	1,630 cm ²	1,670 cm ²	1,710 cm ²	1,790 cm ²	1,870 cm ²	1,950 cm ²	2,070 cm ²	2,190 cm ²	2,270 cm ²
6500 mm	2,040 cm ²	2,070 cm ²	2,100 cm ²	2,120 cm ²	2,170 cm ²	2,230 cm ²	2,330 cm ²	2,430 cm ²	2,540 cm ²	2,690 cm ²	2,850 cm ²	2,950 cm ²
8000 mm	2,510 cm ²	2,550 cm ²	2,580 cm ²	2,610 cm ²	2,670 cm ²	2,740 cm ²	2,870 cm ²	2,990 cm ²	3,120 cm ²	3,310 cm ²	3,510 cm ²	3,630 cm ²
10000 mm	3,140 cm ²	3,180 cm ²	3,220 cm ²	3,260 cm ²	3,340 cm ²	3,420 cm ²	3,580 cm ²	3,740 cm ²	3,900 cm ²	4,140 cm ²	4,380 cm ²	4,540 cm ²
13000 mm	4,080 cm ²	4,130 cm ²	4,190 cm ²	4,240 cm ²	4,340 cm ²	4,450 cm ²	4,650 cm ²	4,860 cm ²	5,070 cm ²	5,380 cm ²	5,690 cm ²	5,900 cm ²

Mineral wool panels:

Minimum Total Surface of Suction Cups for Mineral Wool Panel with Steel face 0.5 / 0.5							
Panel Length	Panel thickness [mm]						
	50	60	80	100	120	150	200
2000 mm	470 cm ²	490 cm ²	510 cm ²	530 cm ²	570 cm ²	610 cm ²	690 cm ²
3500 mm	820 cm ²	860 cm ²	890 cm ²	930 cm ²	1,000 cm ²	1,070 cm ²	1,210 cm ²
5000 mm	1,170 cm ²	1,220 cm ²	1,270 cm ²	1,320 cm ²	1,420 cm ²	1,520 cm ²	1,720 cm ²
6500 mm	1,520 cm ²	1,590 cm ²	1,650 cm ²	1,720 cm ²	1,850 cm ²	1,980 cm ²	2,240 cm ²
8000 mm	1,870 cm ²	1,950 cm ²	2,030 cm ²	2,110 cm ²	2,270 cm ²	2,430 cm ²	2,750 cm ²
10000 mm	2,340 cm ²	2,440 cm ²	2,540 cm ²	2,640 cm ²	2,840 cm ²	3,040 cm ²	3,440 cm ²
13000 mm	3,040 cm ²	3,170 cm ²	3,300 cm ²	3,430 cm ²	3,690 cm ²	3,950 cm ²	4,470 cm ²

Minimum Total Surface of Suction Cups for Mineral Wool Panel with Steel face 0.8 / 0.8							
Panel Length	Panel thickness [mm]						
	50	60	80	100	120	150	200
2000 mm	690 cm ²	710 cm ²	730 cm ²	750 cm ²	790 cm ²	830 cm ²	910 cm ²
3500 mm	1,210 cm ²	1,240 cm ²	1,280 cm ²	1,310 cm ²	1,380 cm ²	1,450 cm ²	1,590 cm ²
5000 mm	1,720 cm ²	1,770 cm ²	1,820 cm ²	1,870 cm ²	1,970 cm ²	2,070 cm ²	2,270 cm ²
6500 mm	2,240 cm ²	2,300 cm ²	2,370 cm ²	2,430 cm ²	2,560 cm ²	2,690 cm ²	2,950 cm ²
8000 mm	2,750 cm ²	2,830 cm ²	2,910 cm ²	2,990 cm ²	3,150 cm ²	3,310 cm ²	3,630 cm ²
10000 mm	3,440 cm ²	3,540 cm ²	3,640 cm ²	3,740 cm ²	3,940 cm ²	4,140 cm ²	4,540 cm ²
13000 mm	4,470 cm ²	4,600 cm ²	4,730 cm ²	4,860 cm ²	5,120 cm ²	5,380 cm ²	5,900 cm ²

Note: For thicknesses not listed in the table, perform linear interpolation.

<p>TO ASSURE SHEET PLANARITY DURING SUCTION, A SUITABLE STIFFENING PAD MUST BE INSERTED IN THE SUCTION CUP</p>	
<p>AT LEAST 4 SUCTION CUPS EQUALLY DISTRIBUTED FOR PANEL LENGTHS LESS THAN 6 m</p>	
<p>AT LEAST 8 SUCTION CUPS EQUALLY DISTRIBUTED FOR PANEL LENGTHS EXCEEDING 6 m</p>	
<p>INSUFFICIENT NUMBER OF SUCTION CUPS</p>	
<p>SUCTION CUPS NOT EQUALLY DISTRIBUTED</p>	

Annex E

BUILDING DETAILS

RAO 06 – Wall corner connection - recessed

RAO 07 – Wall corner connection

RPCV 13 – Flat roof wall connection

RPCV 14 – Roof wall connection with insulated gutter with parapet

RPCV 27 – Roof wall connection with gutter

RPCV 04 – Roof wall connection with single roof pitch ridge

RPCV 29 – Roof wall connection with insulated gutter

SPO 11 – Horizontal butt joint (flat solution)

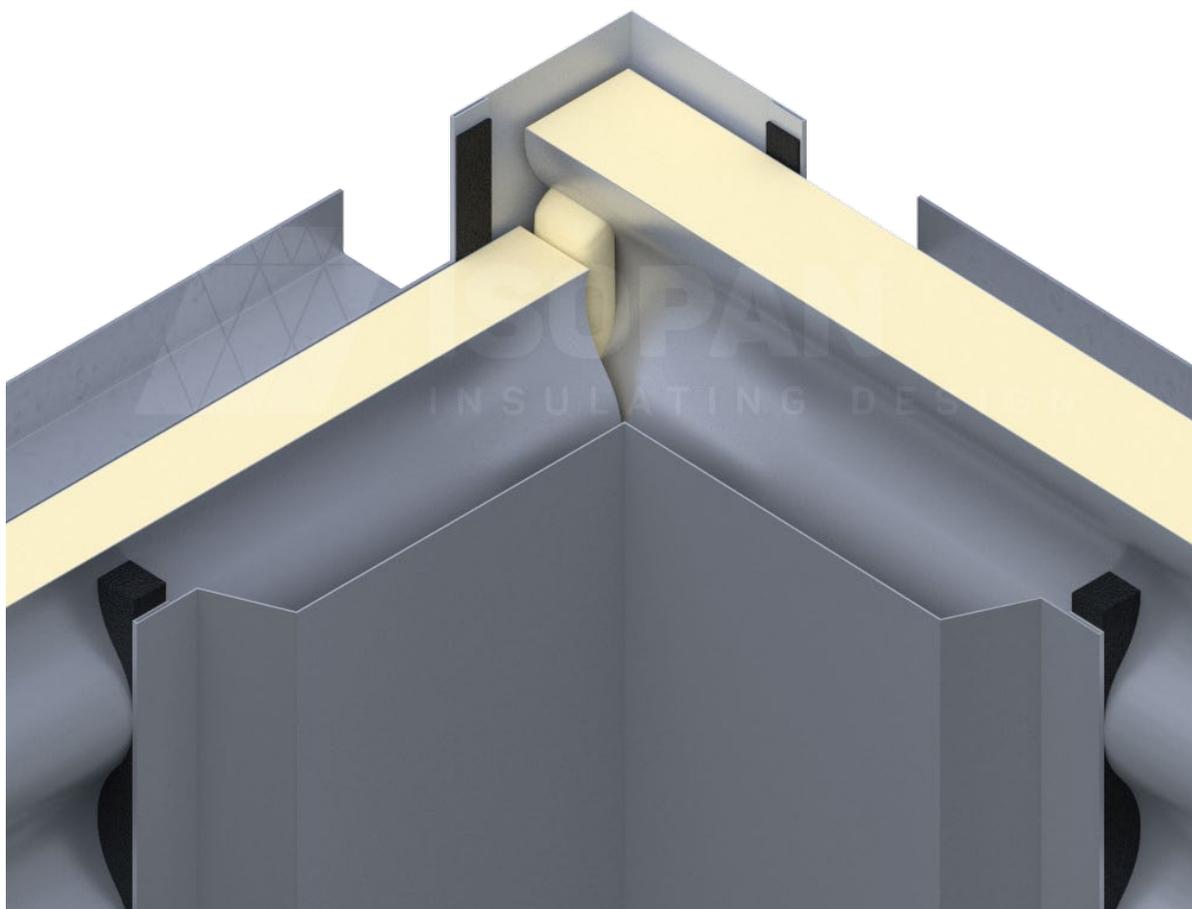
SPO 13 – Horizontal butt joint (thickness solution)

SPO 15 – Horizontal butt joint (for thermal expansion)

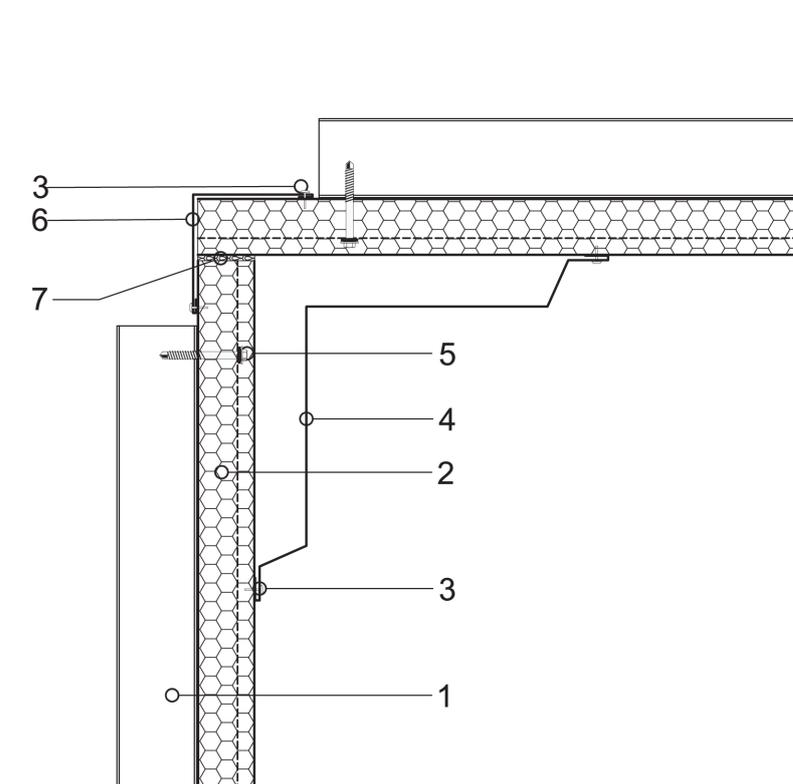
SCV 04 – Concrete base kerb wall panel connection

SCV 22 – Vertical butt joint

WALL CORNER CONNECTION – RECESSED



Type 2 wall corner connection: horizontal cross-section



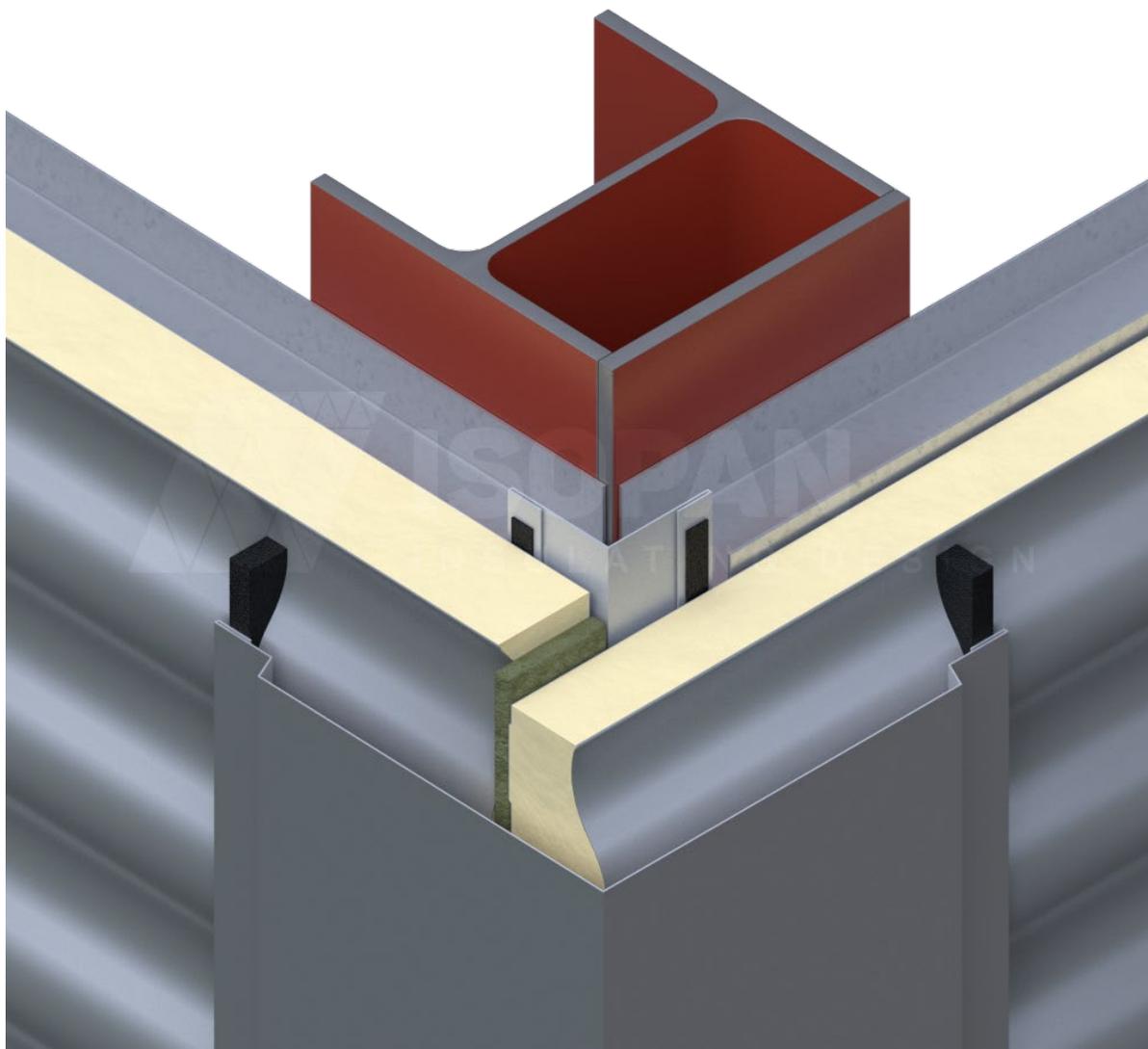
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	Steel structure
2	ISOPAN concealed fastening wall panel
3	Rivet
4	External side corner connection metal sheet
5	Panel fastening screw
6	Internal side corner connection metal sheet
7	Polyurethane foam or mineral wool insulating material

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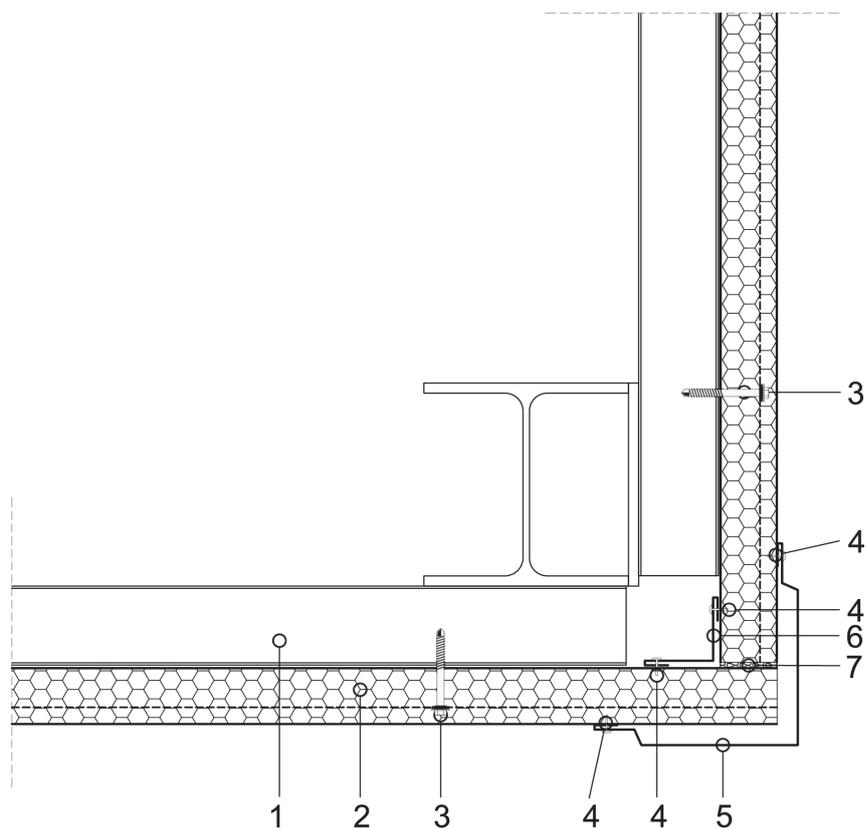
WALL CORNER CONNECTION



ISOPAN

RAO 07

Type 4 wall angular connection: horizontal cross-section



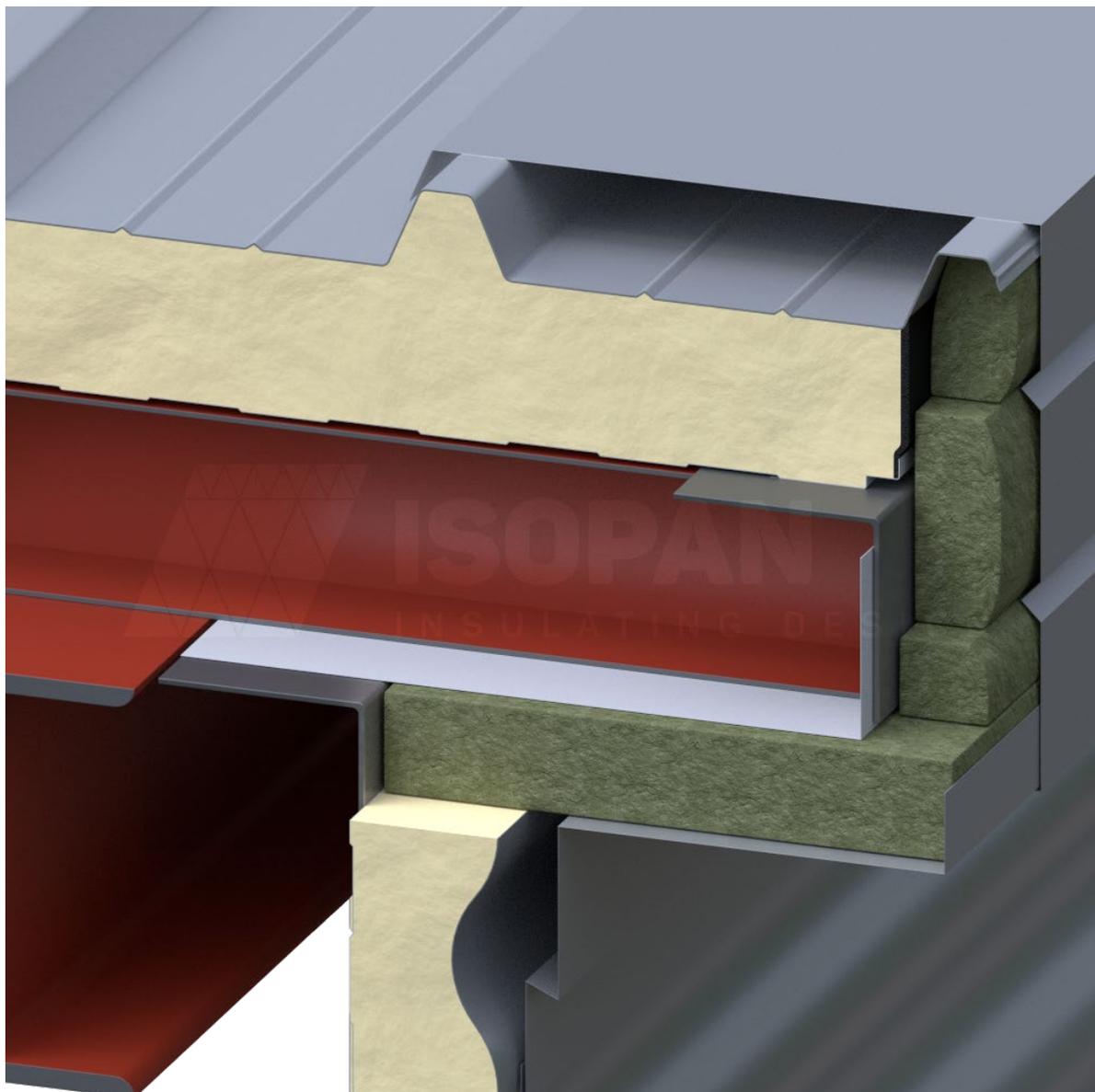
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	Steel structure
2	ISOPAN concealed fastening wall panel
3	Panel fastening screw
4	Rivet
5	External side corner connection metal sheet
6	Internal side corner connection metal sheet
7	Polyurethane foam or mineral wool insulating material

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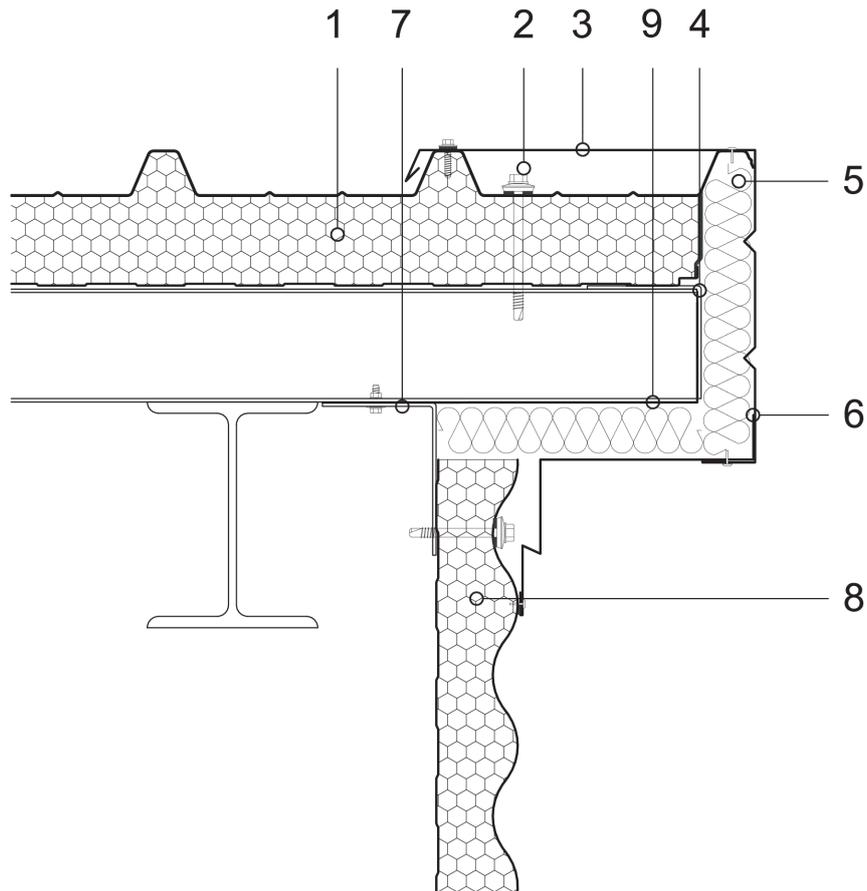
FLAT ROOF WALL CONNECTION



ISOPAN

RPCV 13cl

Roof wall side connection



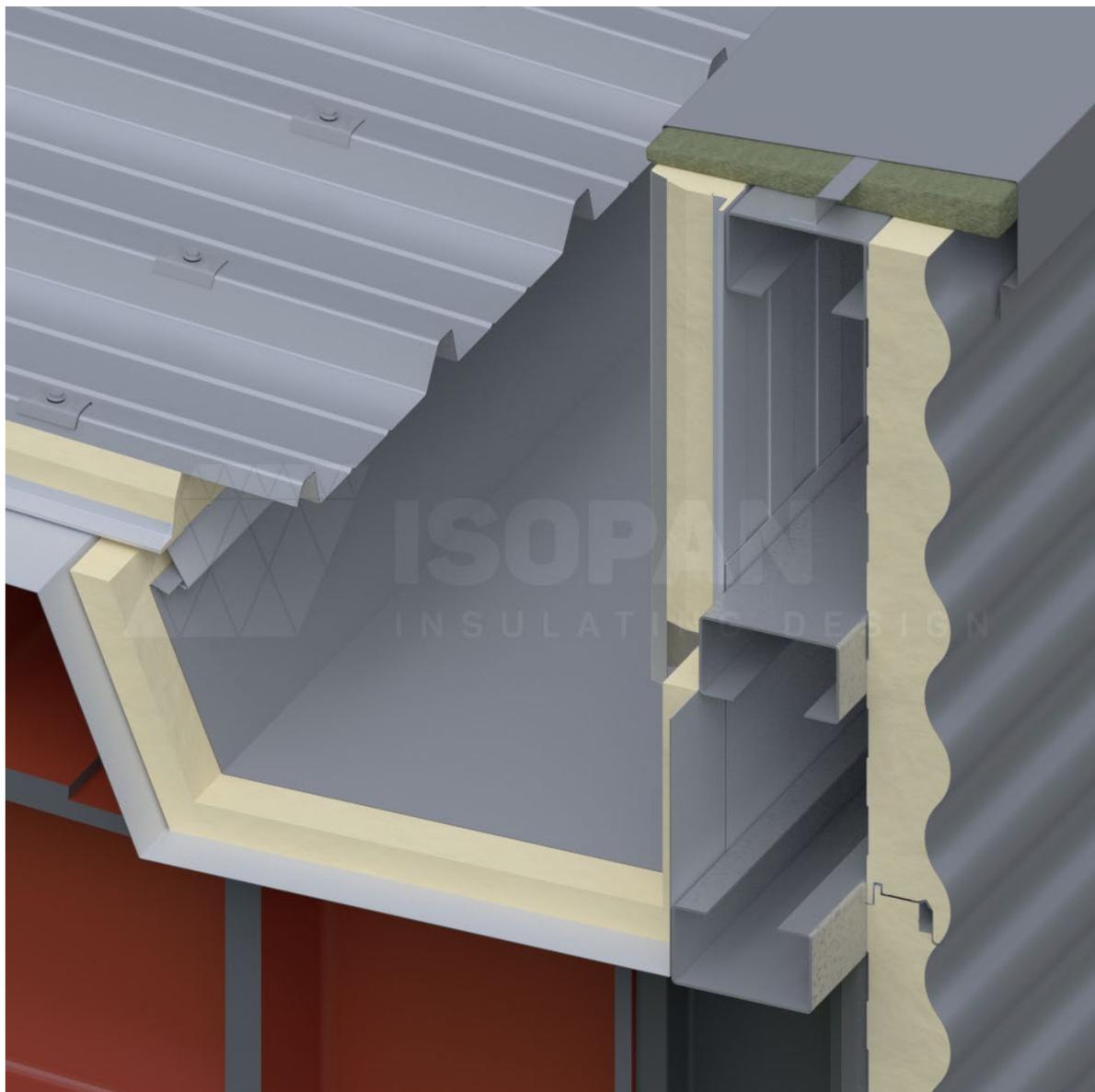
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Key

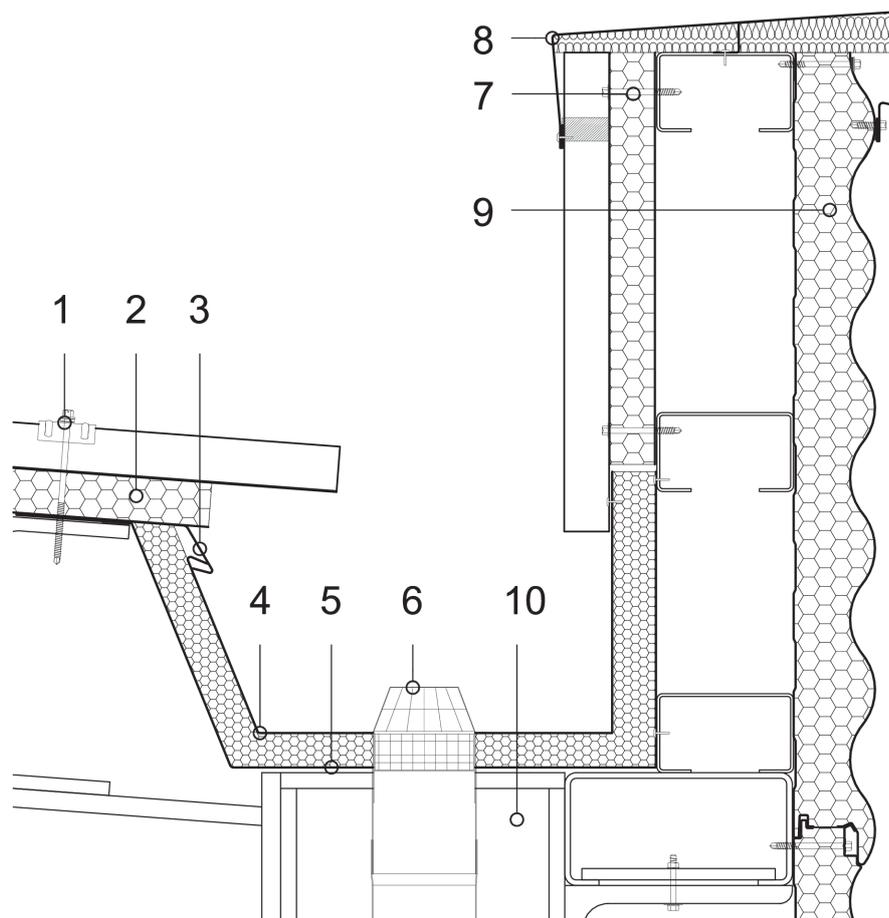
1	ISOPAN roof panel
2	Roof panel fastening screw
3	Protective metal sheet
4	L-shaped closing metal sheet
5	Mineral wool insulating material
6	Protective metal sheet
7	Internal closing metal sheet
8	ISOPAN wall panel
9	L-shaped closing metal sheet

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ROOF WALL CONNECTION WITH INSULATED GUTTER WITH PARAPET



Type 4 roof wall connection with insulated gutter



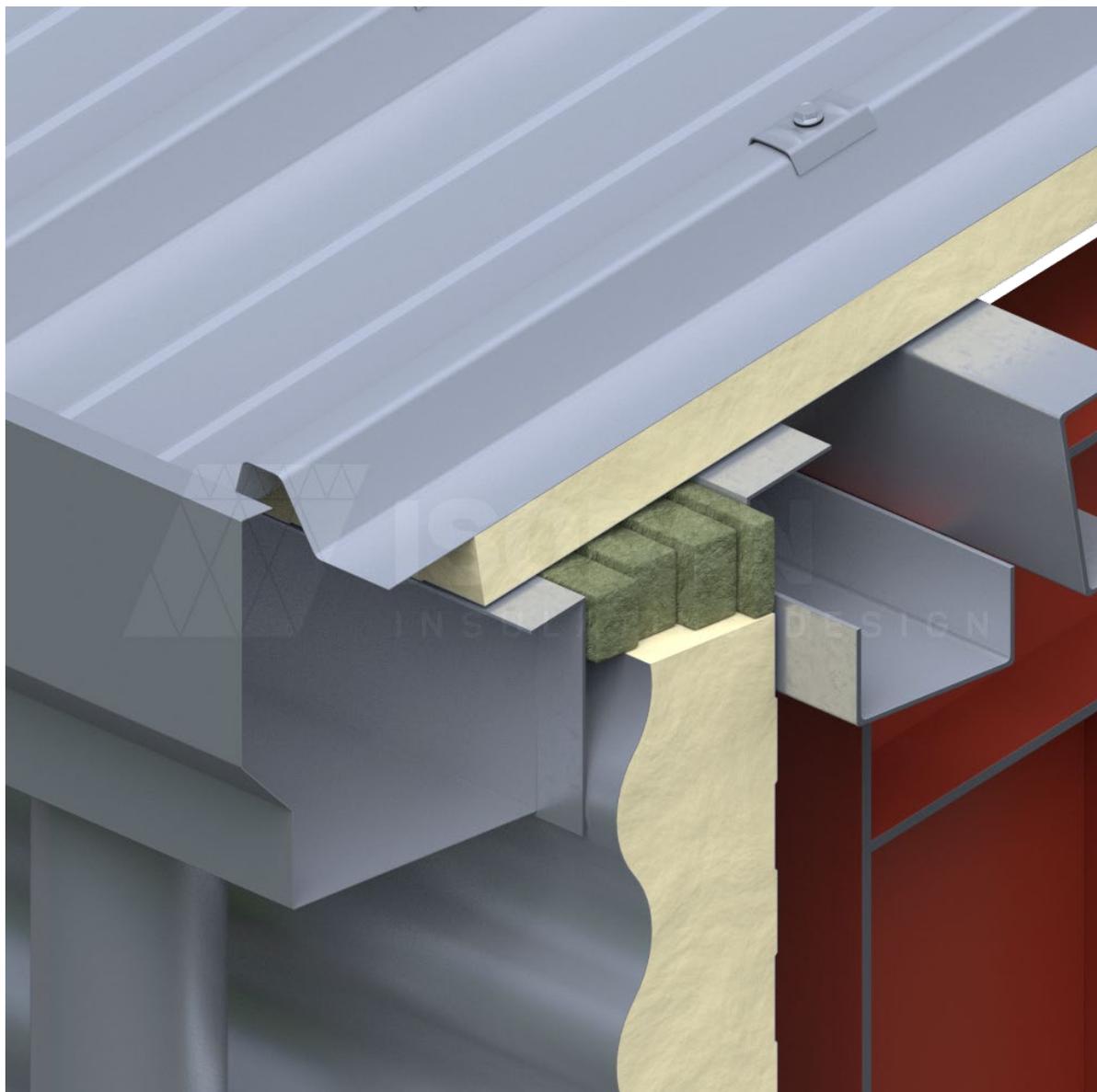
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	Roof panel fastening unit
2	ISOPAN roof panel
3	Drip edge metal sheet
4	Gutter metal sheet
5	Eaves metal sheet
6	Leaf screen
7	Through fastening screw
8	Railing protection metal sheet
9	ISOPAN wall panel (e.g. with ISOCLASS panel)
10	Main steel structure

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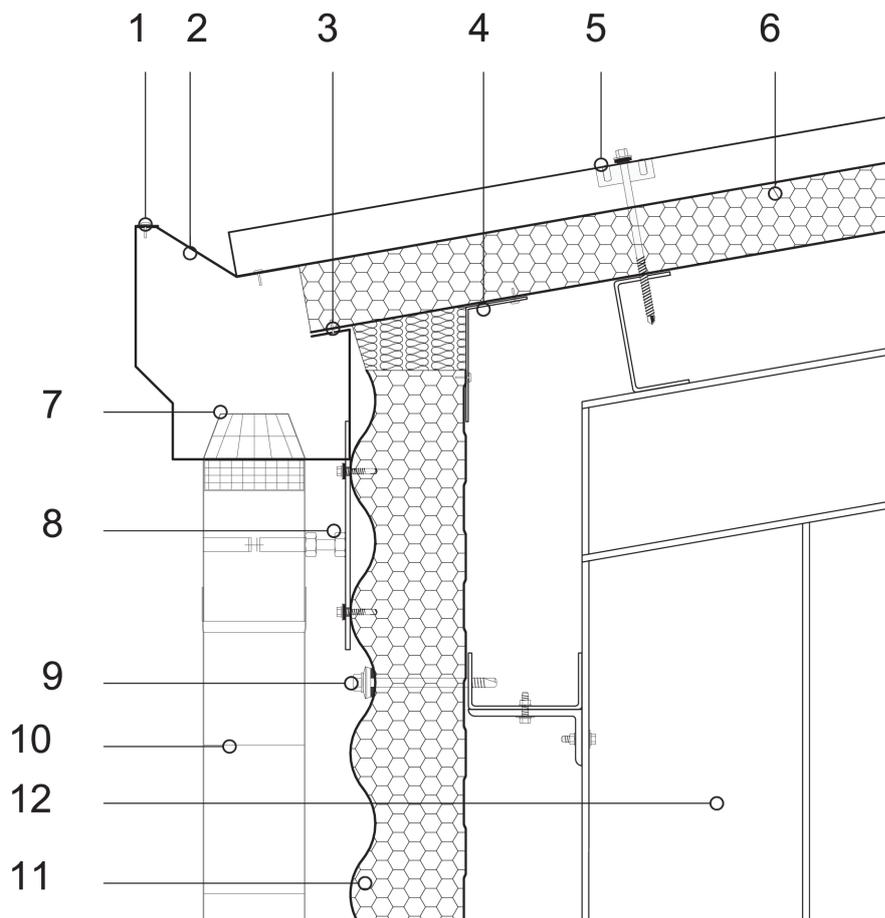
ROOF WALL CONNECTION WITH GUTTER



ISOPAN

RPCV 27

Type 4 roof wall connection with gutter



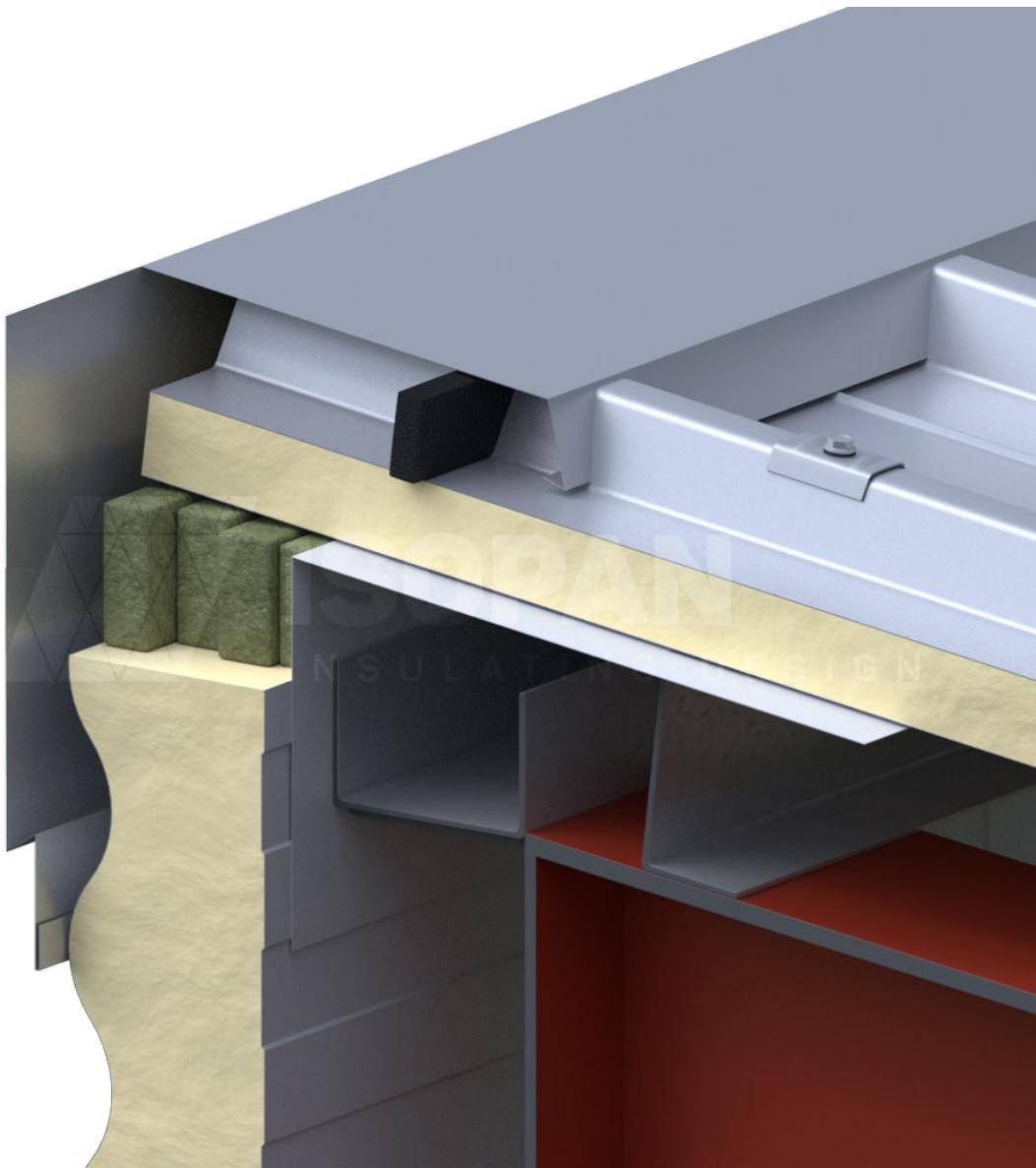
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

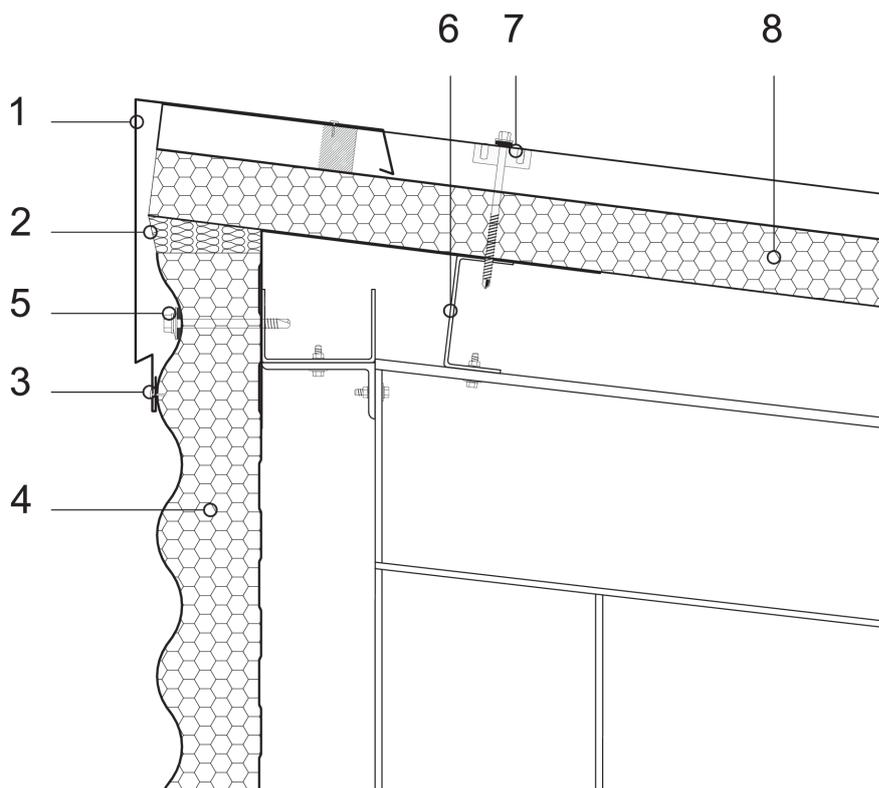
1	Rivet	11	ISOPAN wall panel
2	Gutter support metal sheet	12	Main structure
3	External closing corner metal sheet		
4	Internal closing corner metal sheet		
5	Roof panel fastening unit		
6	ISOPAN roof panel		
7	Leaf screen		
8	Gutter fastening unit		
9	Through fastening screw		
10	Gutter		

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ROOF WALL CONNECTION WITH SINGLE ROOF PITCH RIDGE



Type 1 roof wall connection with gutter



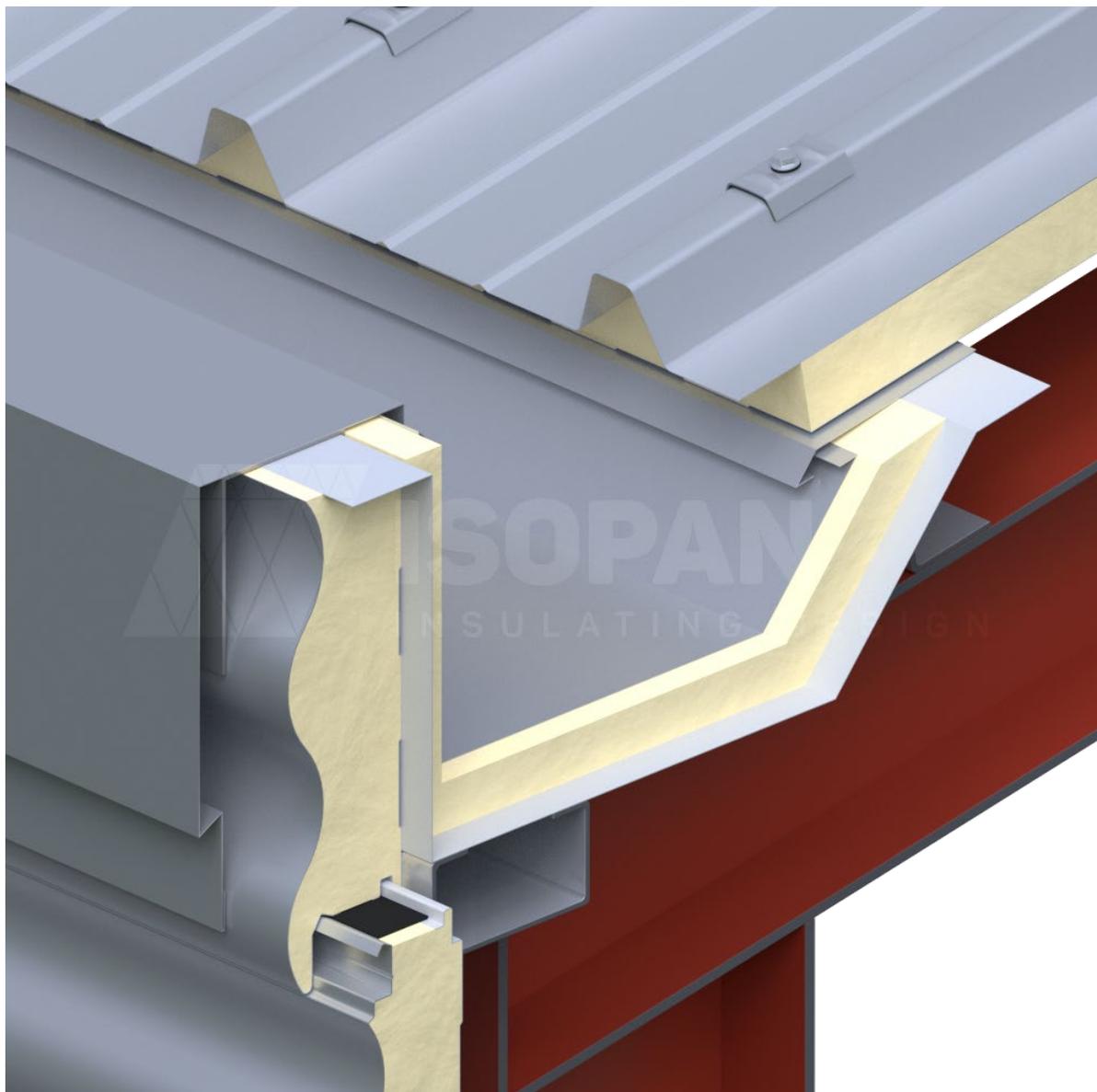
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

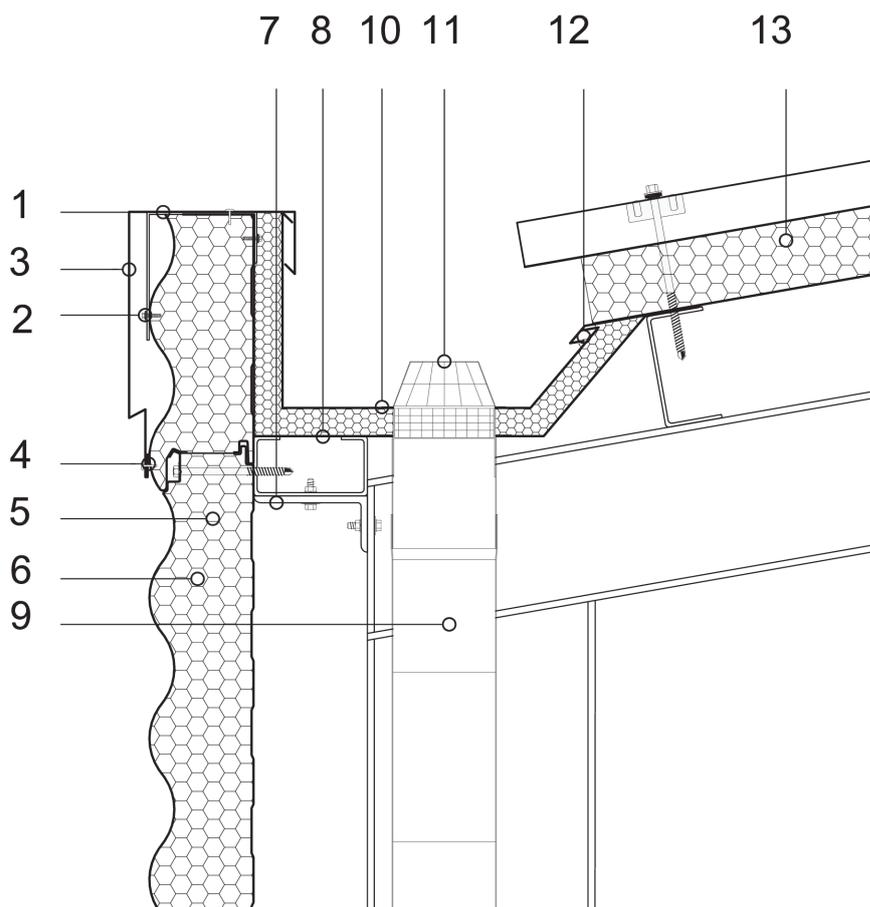
1	Closing metal sheet
2	Polyurethane foam insulating material
3	Rivet
4	ISOPAN wall panel
5	Through fastening screw
6	Secondary steel structure
7	Roof - metal sheet through fastening screw
8	ISOPAN roof panel

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ROOF WALL CONNECTION WITH INSULATED GUTTER



Type 6 roof wall connection with insulated gutter



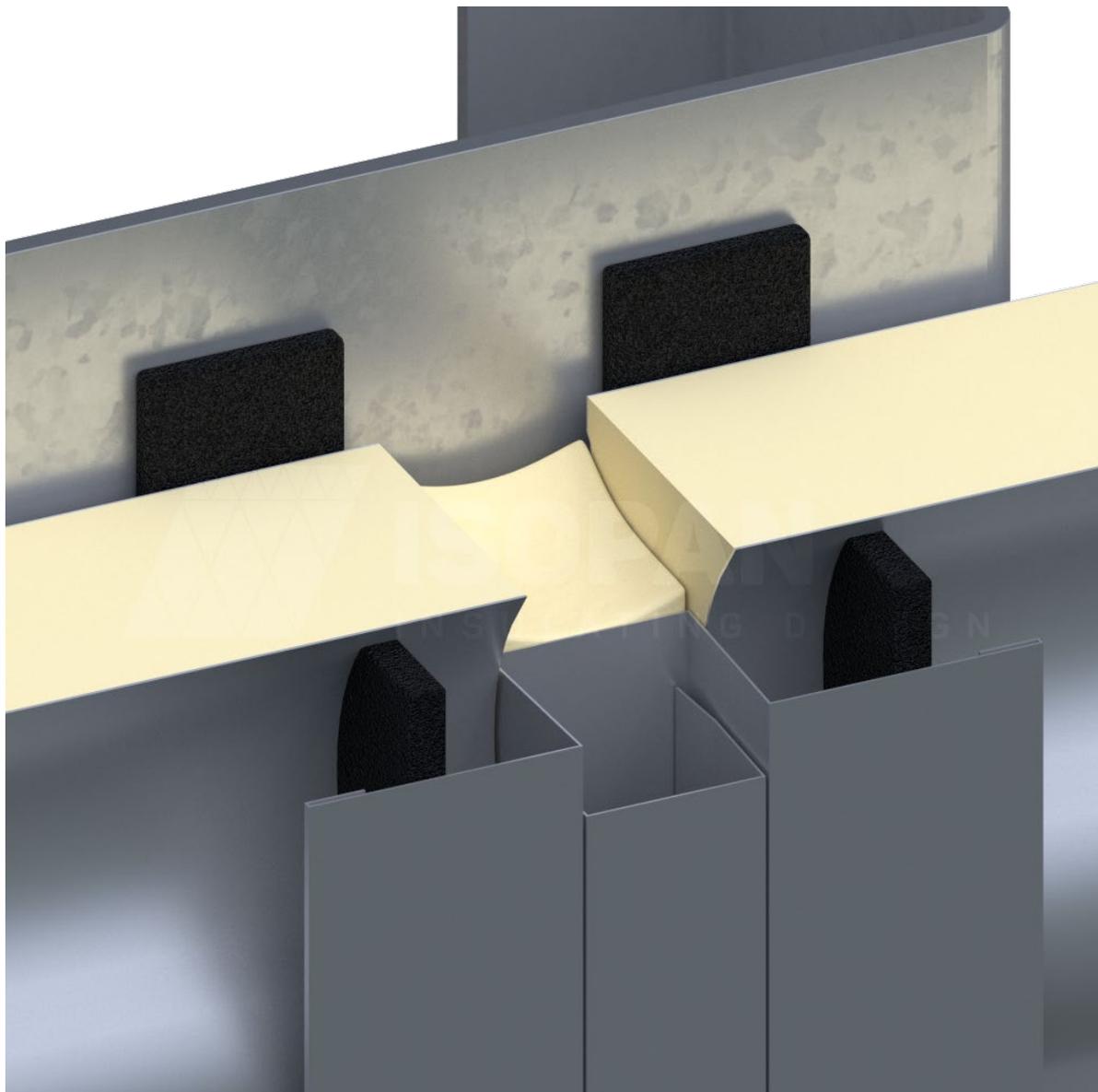
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

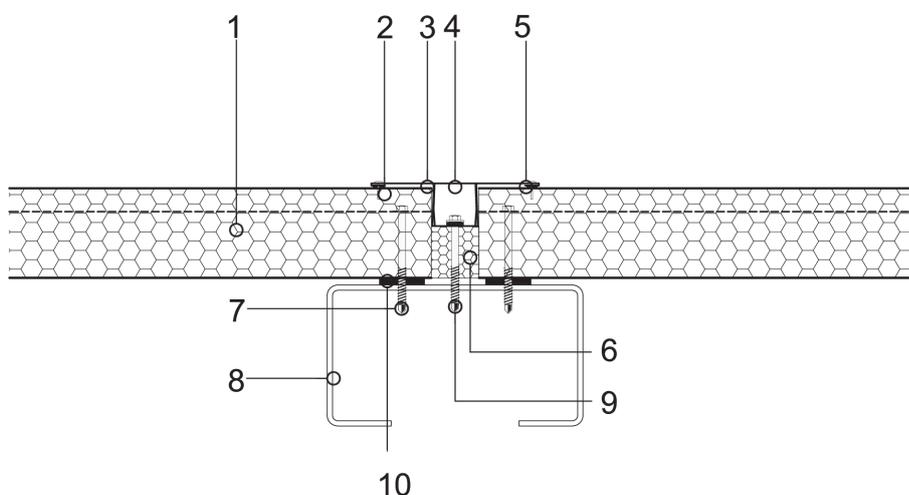
1	Protective metal sheet	11	Leaf screen
2	Fastening screw	12	Drip edge metal sheet
3	Railing cover metal sheet	13	ISOPAN roof panel
4	Rivet		
5	Through fastening screw		
6	ISOPAN wall panel		
7	Steel load-bearing structure		
8	Eaves metal sheet		
9	Drainpipe		
10	Gutter		

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HORIZONTAL BUTT JOINT (FLAT SOLUTION)



Type 1 horizontal junction between wall panels



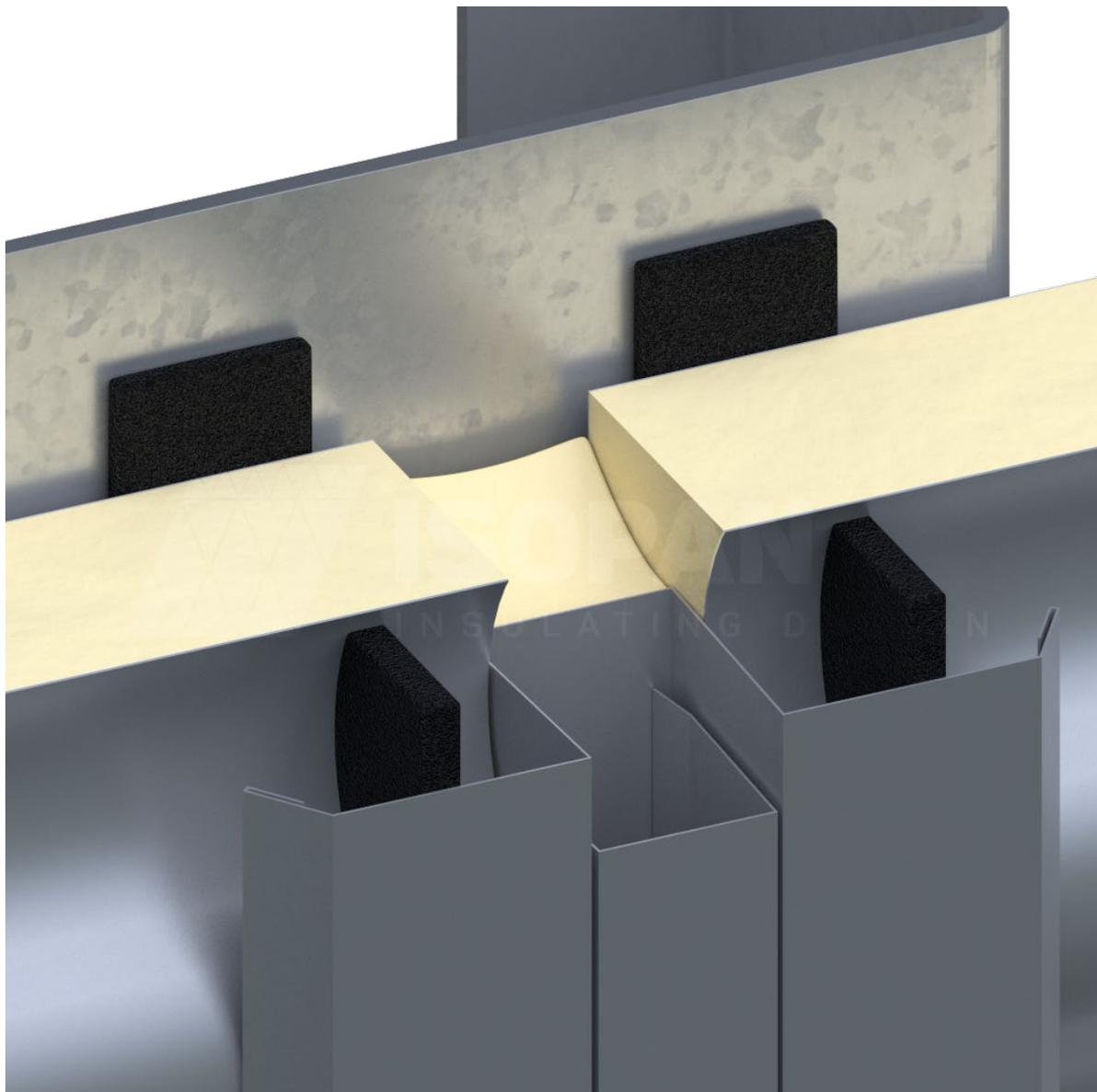
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

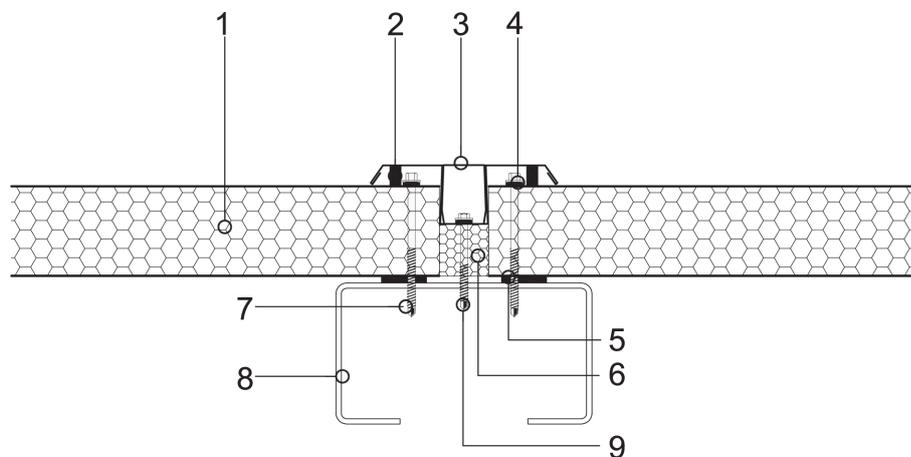
1	ISOPAN concealed fastening wall panel
2	EPDM rubber gasket
3	Joint connection metal sheet
4	Screw covering metal sheet
5	Rivet
6	Polyurethane foam insulating material
7	Panel fastening screws
8	Steel face
9	Metal sheet fastening screw
10	EPDM rubber gasket

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HORIZONTAL BUTT JOINT (THICKNESS SOLUTION)



Type 3 horizontal joint between wall panels



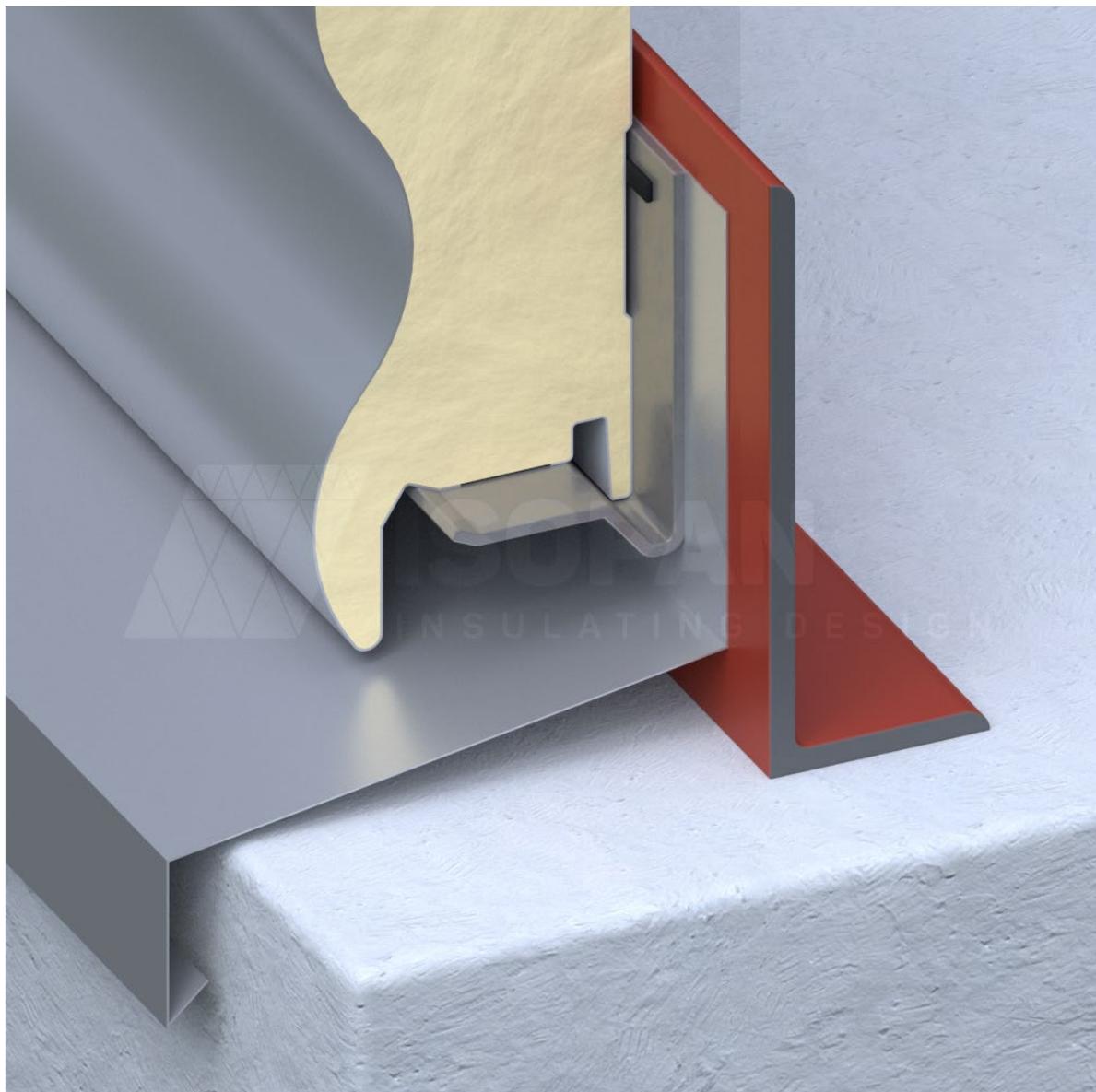
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

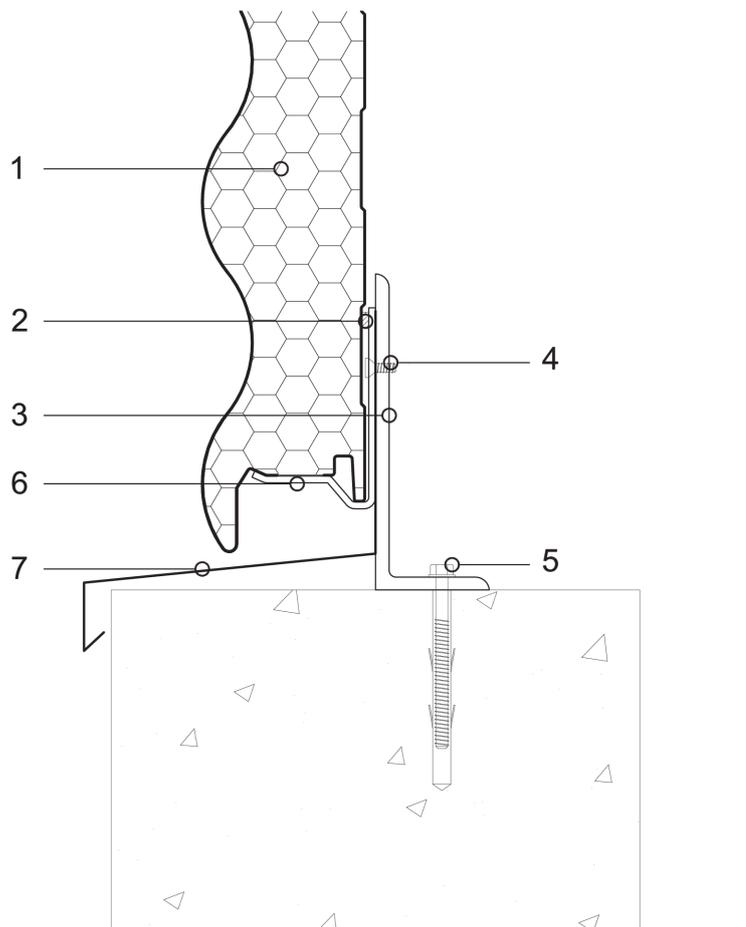
1	ISOPAN wall panel
2	Moulded gasket
3	Joint connection metal sheet
4	Rivet
5	EPDM rubber gasket
6	Polyurethane foam insulating material
7	Panel fastening screws
8	Steel face
9	Metal sheet fastening screw

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CONCRETE BASE KERB WALL PANEL CONNECTION



Type 2 concrete structure panel hooking



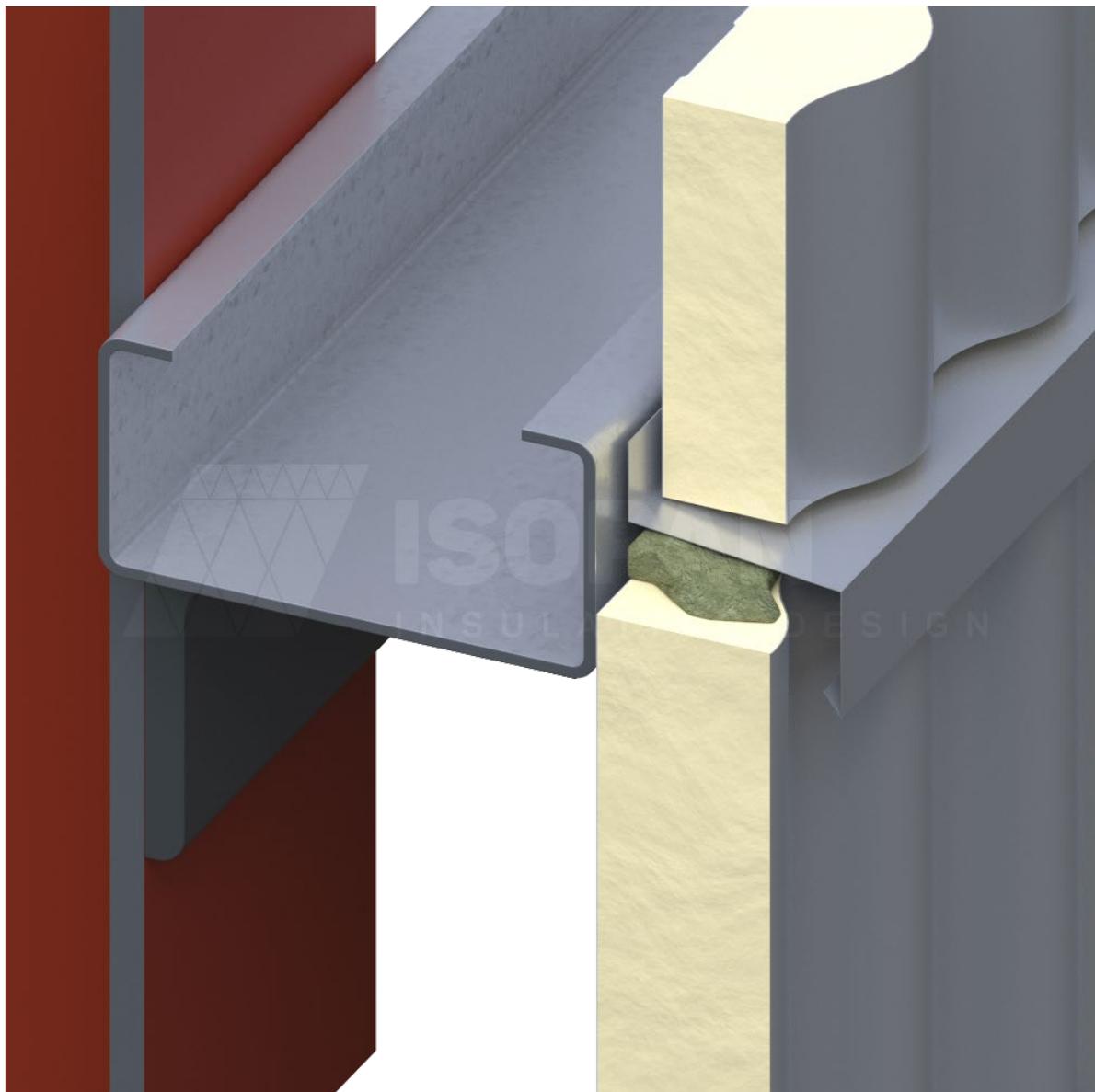
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

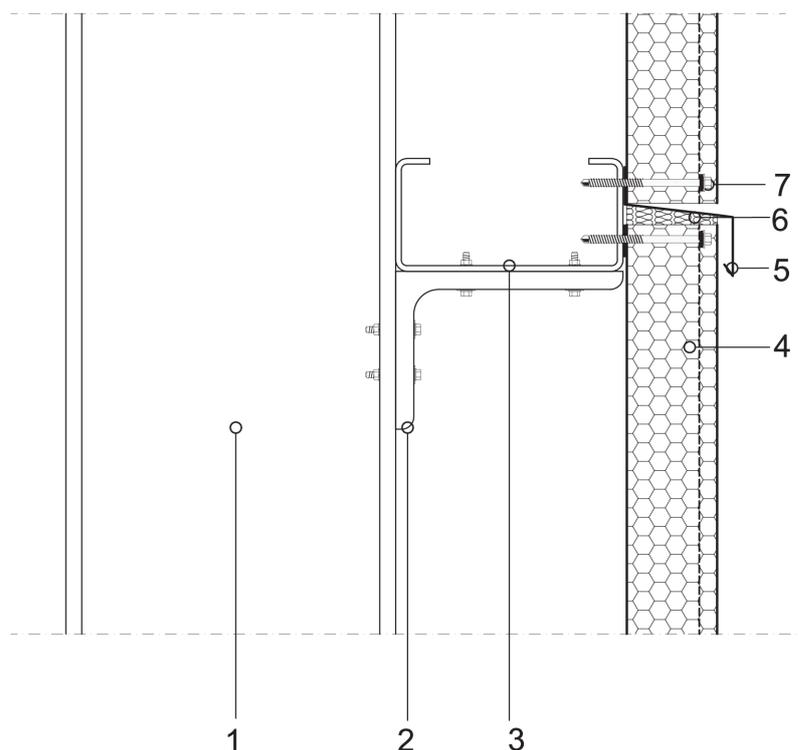
1	ISOPAN wall panel (e.g. with ISOCLASS panel)
2	Adhesive gasket
3	Steel L-shaped face
4	Countersunk head fastening screw
5	Steel L-shaped face fastening screw
6	Special steel face
7	Drip edge tinwork

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VERTICAL BUTT JOINT



Type 7 panel hooking to steel structure



The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	Steel load-bearing structure
2	L-shaped profile
3	C-shaped press-formed profile
4	ISOPAN wall panel (concealed fastening)
5	Drip edge metal sheet
6	Mineral wool insulating material
7	Panel fastening screw

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