



MANUFACTURED IN:



TECHNICAL MANUAL

ISOFIRE WALL Plissé

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ISOFIRE WALL Plissé



Double skin sandwich panel for walls with mineral wool insulating core that assures the product's incombustibility in addition to assuring excellent thermal insulation. It was developed to meet growing performance needs and legislative constraints on fire behaviour for buildings, keeping high mechanical and insulation characteristics. Used for curtain walls of civil and industrial buildings, featuring a tongue-and-groove concealed joint system that makes for long-lasting and aesthetically pleasing constructions.

GEOMETRIC FEATURES

	ISOFIRE WALL PLISSE'
Length	Up to maximum transportable
Useful Pitch (mm)	1000-1100
Insulating Thickness (mm)	50, 60, 80, 100, 120, 150, 170, 200
External face	"Diamond" lightly profiled metal sheet
Internal face	Micro-ridged lightly profiled metal sheet

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.
- Stainless steel AISI 304, 2B finish, according to EN 10088-1.
- 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 rock wool with oriented fibres, having the following physical and mechanical features:

- Incombustibility Class A1 according to standard EN 13501
- Melting temperature > 1000 °C
- Absence of fumes during insulating material combustion
- Resistance to water/vapour penetration $\mu = 1.4$
- Long-term water absorption $W_{lp} < 3 \text{ Kg/m}^2$
- Specific thermal capacity $c_p = 840 \text{ J/kgK}$
- Durability: class DUR2 according to standard EN 14509
- Thermal conductivity coefficient $\lambda = 0.04 \text{ W/mK}$
- Compressive strength $\geq 0.06 \text{ MPa}$ (at 10% of deformation)
- Tensile strength $\geq 0.04 \text{ MPa}$
- Shear strength $\geq 0.05 \text{ MPa}$

Thermal transmittance coefficient U^*

Panel thickness (mm)	50	60	80	100	120	150	170	200
U [W/m²K]	0.86	0.72	0.52	0.41	0.35	0.28	0.24	0.21

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

Thermal resistance coefficient R

Panel thickness (mm)	50	60	80	100	120	150	170	200
R [m²K/W]	1.16	1.39	1.92	2.44	2.86	3.57	4.17	4.76

PANEL WEIGHT

Sheet thickness (mm)		Nominal panel thickness (mm)							
		50	60	80	100	120	150	170	200
0,5/0,5	kg/m ²	13,2	14,2	16,2	18,2	20,2	23,2	25,2	28,2
0,6/0,6	kg/m ²	14,9	15,9	17,9	19,9	21,9	24,9	26,9	28,8

STATIC FEATURES

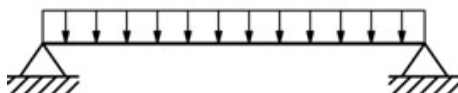
ISOFIRE WALL Plissé panels are self-supporting according to the UNI EN 14509 definition. "...panel capable of supporting, by virtue of its materials and shape, its own weight and in case of panel fastened to spaced structural supports, all applied loads (snow, wind, air pressure), and transmitting these 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.

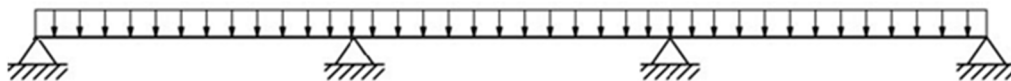
- panel on two supports:



STEEL SHEETS 0.5/0.5 mm - Simple support 120 mm						
UNIFORMLY DISTRIBUTED LOAD [kg/m ²]	NOMINAL PANEL THICKNESS mm					
	50	60	80	100	120	150
	MAXIMUM SPAN cm					
50	345	400	475	545	640	665
60	315	365	440	495	545	610
80	270	315	380	430	470	525
100	240	280	345	380	420	470
120	215	250	310	350	380	430
140	195	230	285	325	355	395
160	190	210	270	300	335	375
180	175	190	245	285	315	350
200	155	185	230	275	295	335

STEEL SHEETS 0.6 / 0.6 mm - Simple support 120 mm						
UNIFORMLY DISTRIBUTED LOAD [kg/m ²]	NOMINAL PANEL THICKNESS mm					
	50	60	80	100	120	150
	MAXIMUM SPAN cm					
50	365	420	525	590	650	715
60	335	380	475	545	590	665
80	285	325	410	470	515	580
100	250	285	365	380	450	510
120	220	260	325	380	420	470
140	200	235	325	355	390	440
160	190	215	275	330	365	410
180	180	195	255	305	345	385
200	165	190	235	285	330	370

- 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					
	50	60	80	100	120	150
	MAXIMUM SPAN cm					
50	400	460	525	555	640	695
60	355	420	475	535	570	630
80	305	355	410	450	485	535
100	270	305	365	400	430	470
120	225	275	325	365	390	420
140	210	245	300	335	355	380
160	190	225	280	305	330	355
180	185	205	265	285	305	330
200	165	190	245	275	290	310

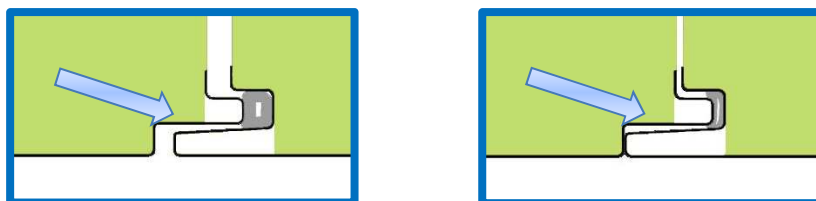
STEEL SHEETS 0.6 / 0.6 mm - Multi-Support 120 mm						
UNIFORMLY DISTRIBUTED LOAD [kg/m ²]	NOMINAL PANEL THICKNESS mm					
	50	60	80	100	120	150
	MAXIMUM SPAN cm					
50	420	485	570	640	685	725
60	375	440	515	570	620	675
80	315	365	440	485	525	570
100	270	315	390	430	460	495
120	240	280	355	390	410	450
140	210	250	325	355	380	410
160	190	230	295	330	355	380
180	180	205	270	305	330	355
200	165	190	250	290	305	330

JOINT

The shape of the joint is specifically designed to assure product functionality.

Featuring a tongue-and-groove concealed joint system that makes for long-lasting and aesthetically pleasing constructions.

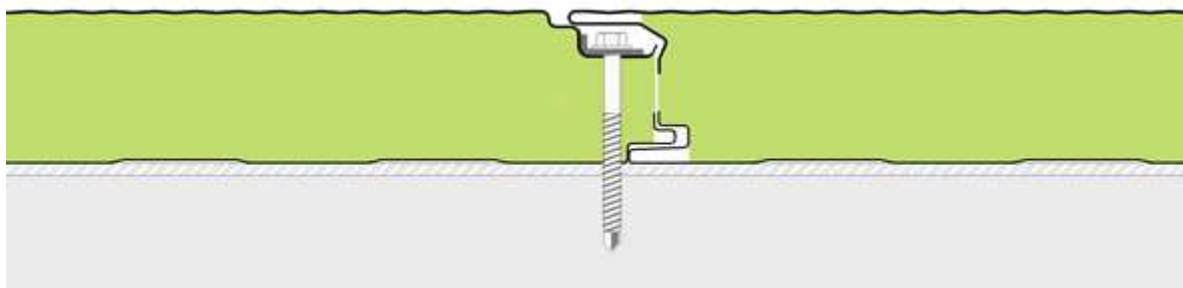
For special end-use requirements, an optional gasket can be put in on site to increase the airtightness of the joint.



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

On the outer part of the panel male-female joint, there is a compensation leak that is useful in promoting enhanced joint appearance and functionality (17mm approx.). This space is related to the product's functional design and is not due to any panel flaws.

ISOFIRE WALL Plissé joint



TOLERANCES (ANNEX D EN 14509)

- Metal sheet 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

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 European reference standards to classify the reaction to fire of construction material 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 ISOFIRE WALL Plissé panel, in rock wool has been tested for fire reaction in accordance to standard **EN 13501-1** obtaining the classification: **A2 S1 D0**. For further information, please refer to the Isopan catalogue, the website www.isopan.com or contact the Technical Department.

RESTRICTIONS OF USE

- A thermohygrometric 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).**
- The perforated face in pre-painted galvanised steel has no protection in the area of the hole, as it is produced by punching. The exposed perforated panel side should be used towards the inside of the building in order to prevent corrosion phenomena.
- 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).

DESIGN FOR FIRE CRITICAL CONDITIONS

The panel may be used for possible fire exposure on both faces only positioned on wall and vertically. Pursuant to the regulations the certified performances refer to and are guaranteed only in conventional test conditions: application of a Standard Fire Curve, as per standard **ISO 834**, implemented in Italy by regulation **UNI EN 1363**, used on small-sized structural elements assembled with the specific joint.

It is the designer's responsibility to justify from an engineering point of view the performance extension at dimensions and under methods other than the laboratory tests, in particular with regards to length and, therefore, the need for intermediate supports, head junction and coupling with other constructive elements, especially structural.

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}
Stainless steel AISI 304	17.0×10^{-6}

-Linear thermal expansion coefficient values-

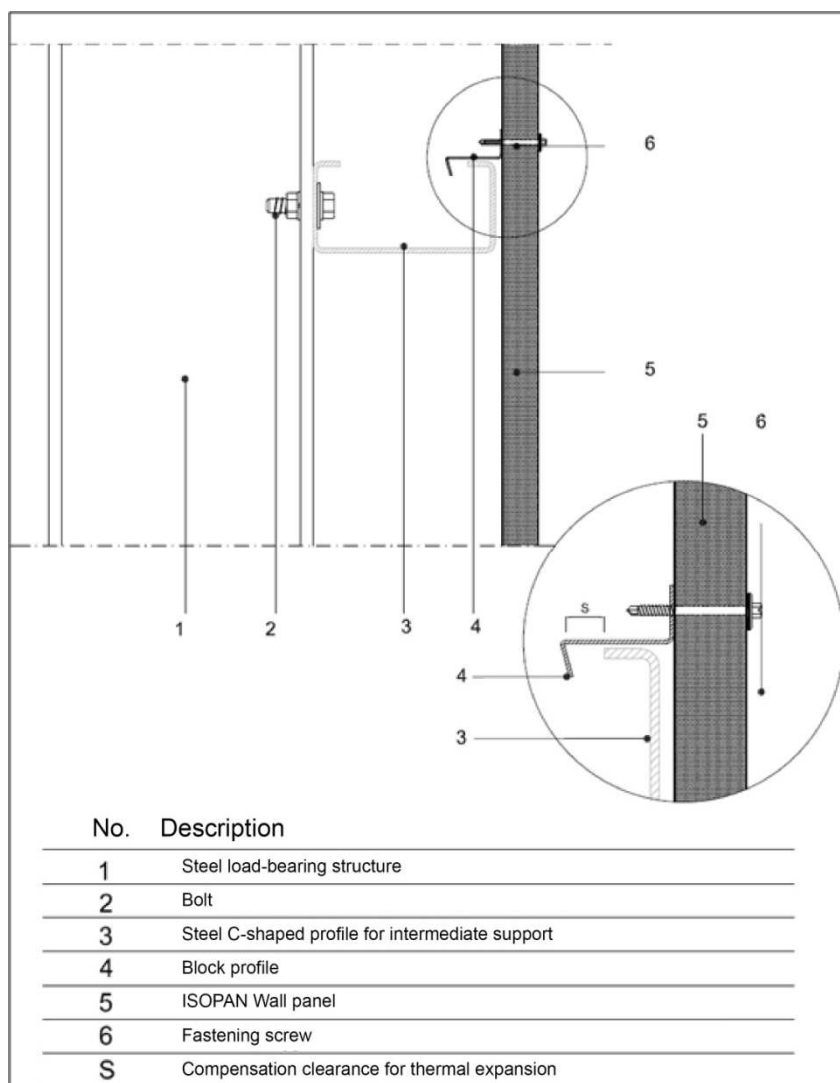
Type of facing		Surface temperature ($^{\circ}\text{C}$)	
		Min.	Max.
Insulated	Light	-20	+60
	Dark	-20	+80

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-

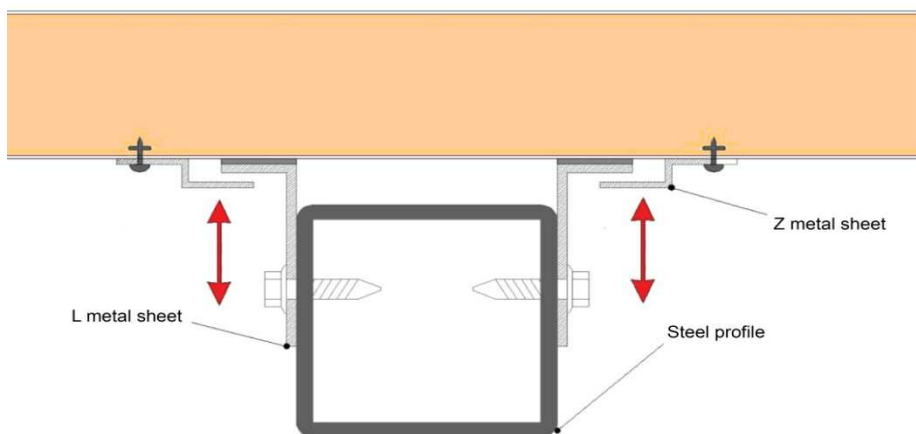
For high surface temperatures, the linear extension of the metal face must be absorbed by the system; cyclic temperature changes related to the day-night or freeze-thaw fluctuations create uncontrollable cyclic stresses that fatigue the support elements. These stresses may cause flaws and undulations 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).

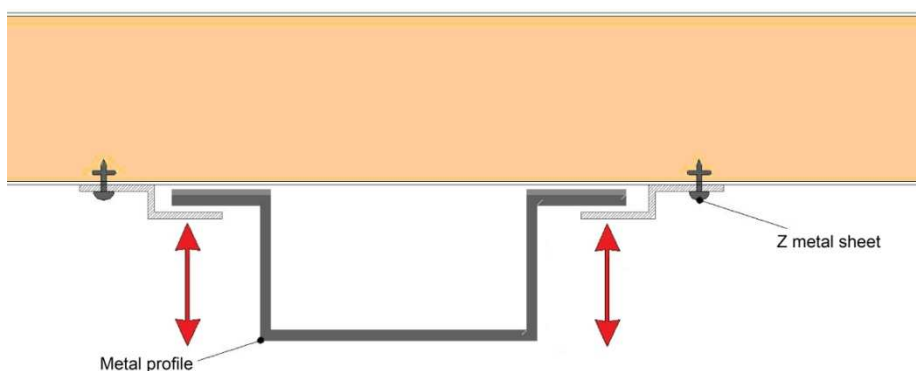


When necessary, intermediate supports are to be used:

Solution 1



Solution 2




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

- **Due to the very nature of the mechanical joint:** exactly because of the needs arising from the concealed fastening, 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 stage may be difficult or be 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 handling, causing jointing difficulties.

Sandwich panels with dark external faces that reach external surface temperatures of around +80°C (as described in standard 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 said particularly unsightly deformation, Isopan recommends following the table below as a guideline for use, which specifies the minimum working spans.

It is important to emphasise that for this type of panel (with concealed fastening where one tends to put only one concealed screw per support), 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. In connection with this issue ISOPAN suggests not to exceed the maximum spans between supports shown in the following tables:

THERMAL LOAD TABLES WITH $\Delta T = 55^{\circ}\text{C}$ DARK EXTERNAL METAL SHEET COLOUR - GROUP III					
Concealed fastening with two screws 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)				
	60	80	100	120	150
	Maximum span (cm)				
	160	260	360	460	530

(*) The calculation considers a deformation limit equal to 1/300 of the span to limit panel deformation due to thermal loads induced by the dark colour of the external metal sheet

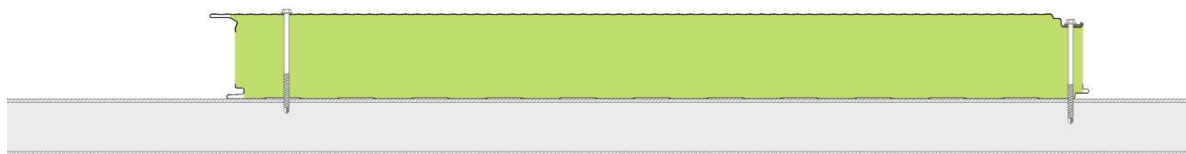
FASTENING INSTRUCTIONS

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.

Wall panel fastening

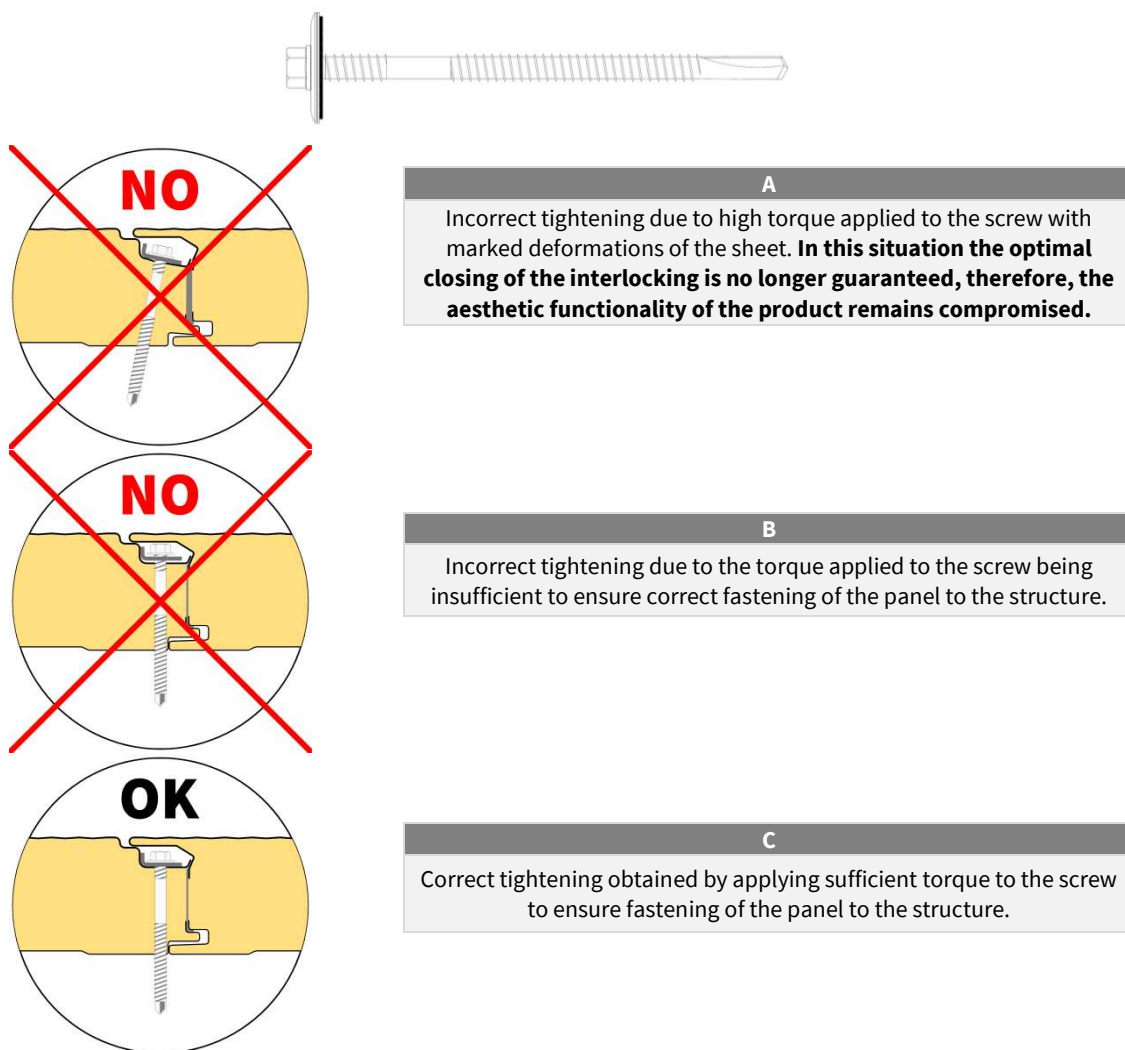
The panels are usually anchored to metal sheets positioned transversally to the length of the panels, which are, in turn, appropriately fastened to the load-bearing structure of the building as required by the design for stability. The width of the support must be at least 50 mm; said width must be checked and, if necessary, increased based on design requirements. In the event of butt jointing 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:



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

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. In order to prevent the making of galvanic current between screw and mineral wool, Isopan recommends to use stainless steel screws.

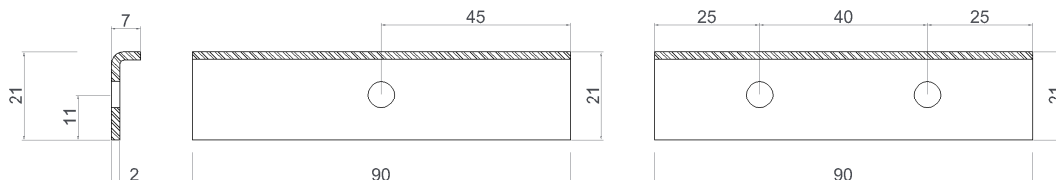


Screw length

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 (mm)	Screw length outside the joint (mm)
Steel	Panel Thickness + 15 mm	Panel Thickness + 30 mm
Wood	Panel Thickness + 25 mm	Panel Thickness + 40 mm

Load spreading plate with 1 or 2 holes (recommended by Isopan for Isofire Wall Plissè)



ASSEMBLY INSTRUCTIONS

Mineral wool panels, if too long, for example longer than 6 m and with inadequate metal sheet supports, can present problems during handling and installation. In fact it must be taken into account the high weight of mineral wool panels. Consequently the handling (both the unloading and the assembly) may be difficult and problematic with a high risk of damaging the material. Finally being the bending of the panels directly related to their length, the assembly of the joints can also be aggravated by imperfections, lack of straightness of the supporting structure and too much space between fasteners.

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)	50	60	80	100	120	150	170	200
No. of panels per package	14	12	9	7	6	5	4	3

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)

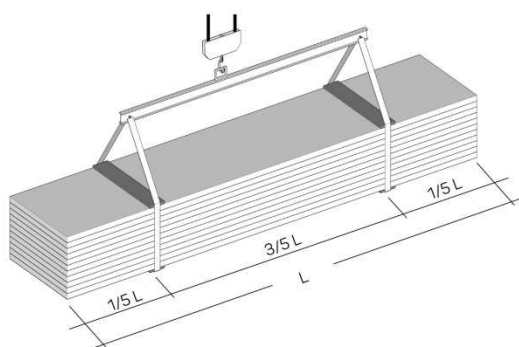


Figure 1

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.

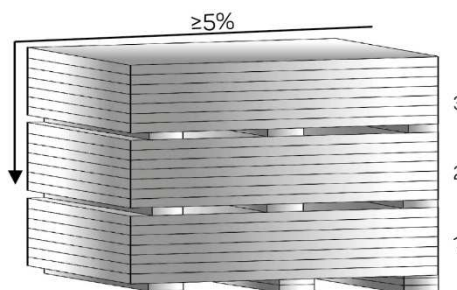


Figure 2

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)

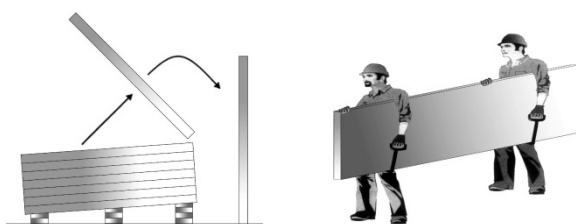


Figure 3
 Handling equipment as well as gloves must be clean and such as not to damage the items.

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.

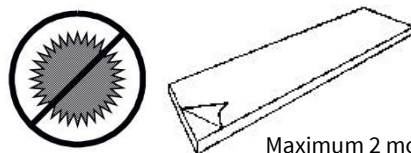
During panel assembly and, in particular, in roofs, it is necessary to immediately remove all residual materials paying special attention to metal ones that may cause early deterioration of the metal faces by oxidising.

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.



Maximum 2 months

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.

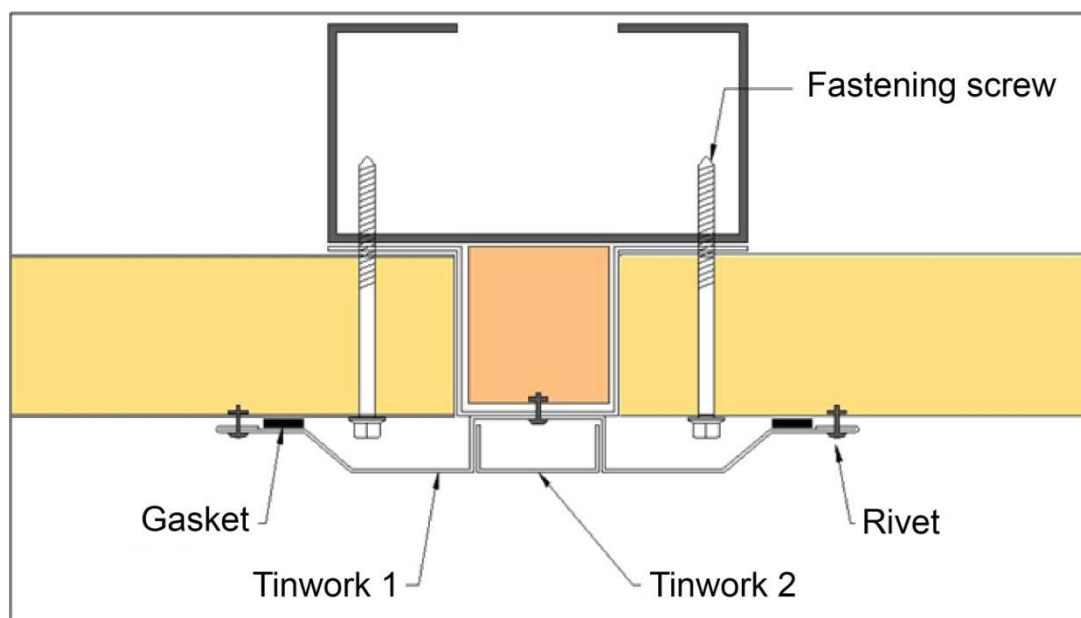
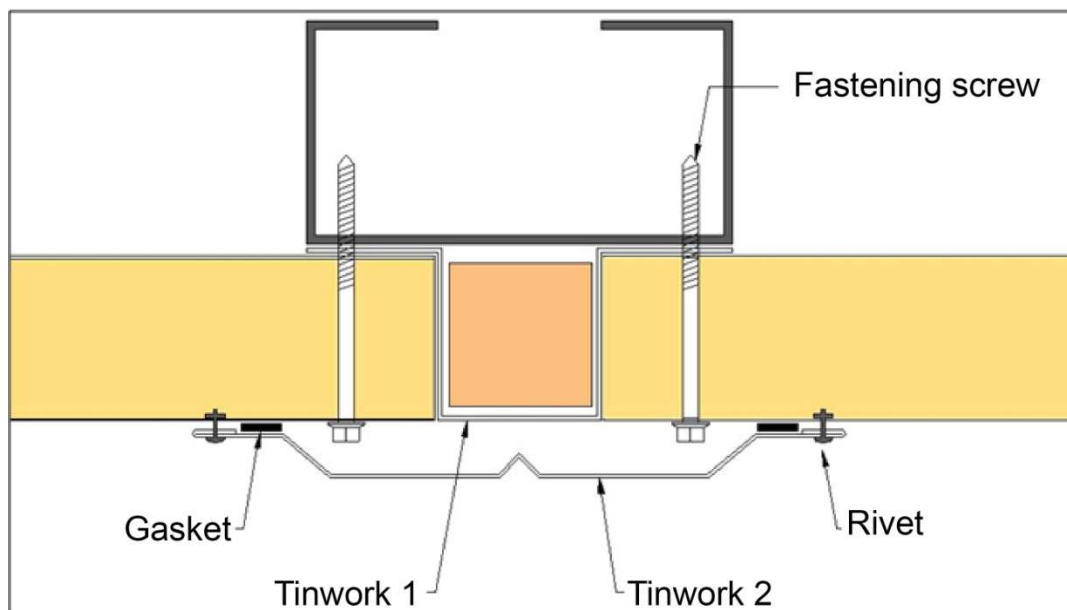
YEARLY CHECKS OF THE ISOPAN PANELS

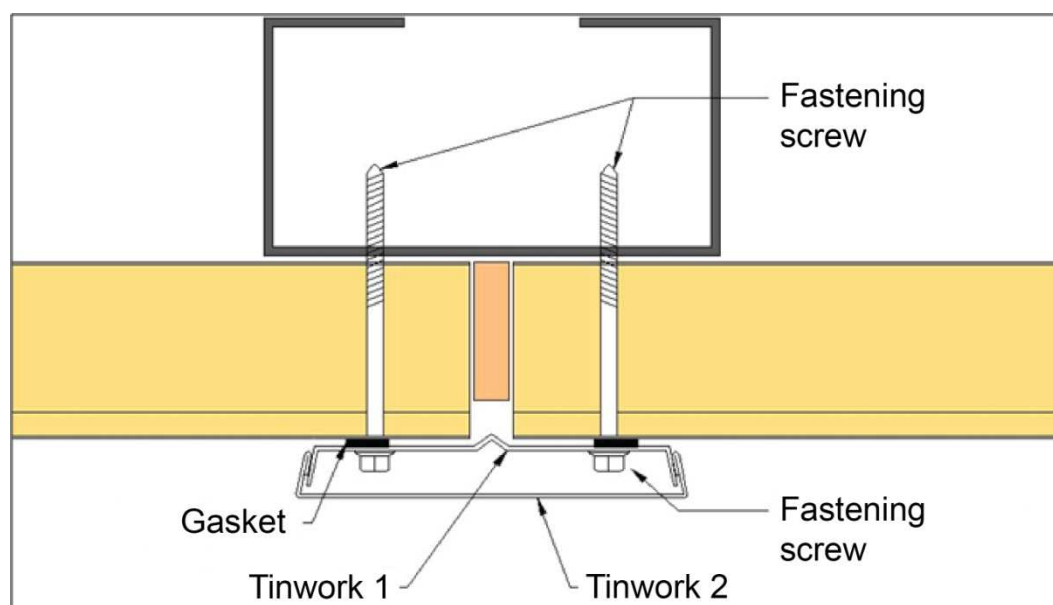
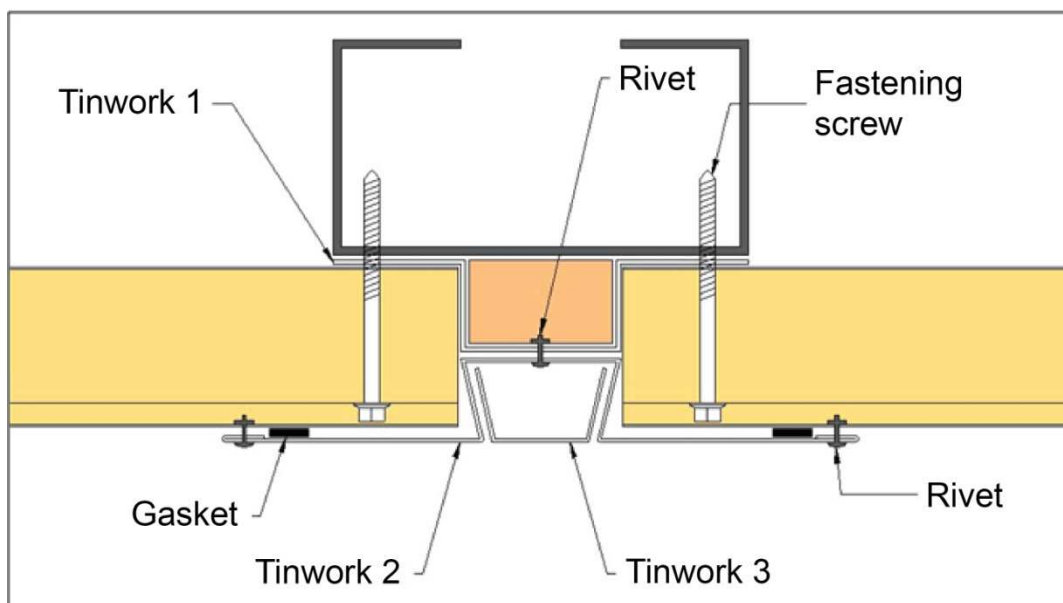
WHAT TO INSPECT	CORRECTIVE ACTIONS
Conditions of the pre-painted surfaces (cracks and colour unevenness)	Assess the condition of the surfaces Repaint where possible
Scratches and dents	Repaint and repair dents
Fastening screws	Remove a screw and check if oxidised Tighten the screws where necessary
Angle 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



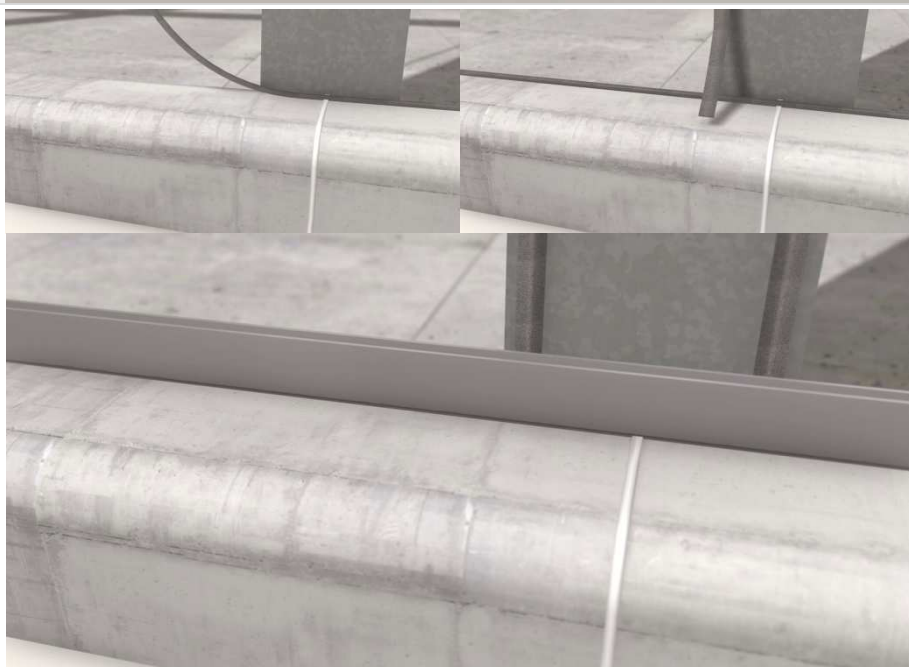


Annex C

Installation phases



The package containing the panels arrives at the construction site.



**Position the watertight gaskets on the panel fastening surfaces as shown in the picture here and in the subsequent construction details (Annex D).
Install the base support to apply the first panel.**



Handle the panel safely, as shown.



Once positioned, unhook the support straps on the lower part of the panel, then insert it carefully into the base support guide.








Once in the correct position, fasten the upper part of the panel. Before putting in the screw, we recommend strengthening the fastening surface with the load spreading plate (the picture shows a single-hole solution that is not ideal for ISOWALL EVO panels).



If necessary, intensify fastening by applying additional fasteners aligned with the previous one, as shown.



Proceed in the same way for the panels above.

	<p>When placing the adjacent panels, keep in mind the distance needed to insert the joint cover for the butt joint.</p>
	<p>Once the panels are fastened, fill the butt joint space with insulating material without jeopardising the subsequent joint cover installation.</p>
	<p>After that, install the joint cover and corresponding screw cover insert.</p>



For the corner sections, special specifically made Insulating Angular Connections (RAC) may be installed to improve the joint's thermal performance. The fastening system is the same as the joint cover.



Wall panel installation is complete.

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 cm2	350 cm2	350 cm2	360 cm2	380 cm2	390 cm2	430 cm2	460 cm2	490 cm2	540 cm2	590 cm2	620 cm2
3500 mm	590 cm2	600 cm2	620 cm2	630 cm2	660 cm2	690 cm2	740 cm2	800 cm2	850 cm2	940 cm2	1,020 cm2	1,080 cm2
5000 mm	840 cm2	860 cm2	880 cm2	900 cm2	940 cm2	980 cm2	1,060 cm2	1,140 cm2	1,220 cm2	1,340 cm2	1,460 cm2	1,540 cm2
6500 mm	1,090 cm2	1,120 cm2	1,140 cm2	1,170 cm2	1,220 cm2	1,270 cm2	1,380 cm2	1,480 cm2	1,580 cm2	1,740 cm2	1,900 cm2	2,000 cm2
8000 mm	1,340 cm2	1,370 cm2	1,400 cm2	1,440 cm2	1,500 cm2	1,560 cm2	1,690 cm2	1,820 cm2	1,950 cm2	2,140 cm2	2,330 cm2	2,460 cm2
10000 mm	1,670 cm2	1,710 cm2	1,750 cm2	1,790 cm2	1,870 cm2	1,950 cm2	2,110 cm2	2,270 cm2	2,430 cm2	2,670 cm2	2,910 cm2	3,070 cm2
13000 mm	2,170 cm2	2,230 cm2	2,280 cm2	2,330 cm2	2,430 cm2	2,540 cm2	2,750 cm2	2,950 cm2	3,160 cm2	3,470 cm2	3,790 cm2	3,990 cm2

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 cm2	490 cm2	500 cm2	510 cm2	530 cm2	540 cm2	570 cm2	610 cm2	640 cm2	690 cm2	730 cm2	770 cm2
3500 mm	850 cm2	860 cm2	870 cm2	890 cm2	920 cm2	940 cm2	1,000 cm2	1,060 cm2	1,110 cm2	1,200 cm2	1,280 cm2	1,340 cm2
5000 mm	1,210 cm2	1,230 cm2	1,250 cm2	1,270 cm2	1,310 cm2	1,350 cm2	1,430 cm2	1,510 cm2	1,590 cm2	1,710 cm2	1,830 cm2	1,910 cm2
6500 mm	1,570 cm2	1,590 cm2	1,620 cm2	1,640 cm2	1,700 cm2	1,750 cm2	1,850 cm2	1,960 cm2	2,060 cm2	2,220 cm2	2,370 cm2	2,480 cm2
8000 mm	1,930 cm2	1,960 cm2	1,990 cm2	2,020 cm2	2,090 cm2	2,150 cm2	2,280 cm2	2,410 cm2	2,530 cm2	2,730 cm2	2,920 cm2	3,050 cm2
10000 mm	2,410 cm2	2,450 cm2	2,490 cm2	2,530 cm2	2,610 cm2	2,690 cm2	2,850 cm2	3,010 cm2	3,170 cm2	3,410 cm2	3,650 cm2	3,810 cm2
13000 mm	3,130 cm2	3,180 cm2	3,230 cm2	3,280 cm2	3,390 cm2	3,490 cm2	3,700 cm2	3,910 cm2	4,120 cm2	4,430 cm2	4,740 cm2	4,950 cm2

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 cm2	640 cm2	650 cm2	660 cm2	670 cm2	690 cm2	720 cm2	750 cm2	780 cm2	830 cm2	880 cm2	910 cm2
3500 mm	1,100 cm2	1,120 cm2	1,130 cm2	1,140 cm2	1,170 cm2	1,200 cm2	1,260 cm2	1,310 cm2	1,370 cm2	1,450 cm2	1,540 cm2	1,590 cm2
5000 mm	1,570 cm2	1,590 cm2	1,610 cm2	1,630 cm2	1,670 cm2	1,710 cm2	1,790 cm2	1,870 cm2	1,950 cm2	2,070 cm2	2,190 cm2	2,270 cm2
6500 mm	2,040 cm2	2,070 cm2	2,100 cm2	2,120 cm2	2,170 cm2	2,230 cm2	2,330 cm2	2,430 cm2	2,540 cm2	2,690 cm2	2,850 cm2	2,950 cm2
8000 mm	2,510 cm2	2,550 cm2	2,580 cm2	2,610 cm2	2,670 cm2	2,740 cm2	2,870 cm2	2,990 cm2	3,120 cm2	3,310 cm2	3,510 cm2	3,630 cm2
10000 mm	3,140 cm2	3,180 cm2	3,220 cm2	3,260 cm2	3,340 cm2	3,420 cm2	3,580 cm2	3,740 cm2	3,900 cm2	4,140 cm2	4,380 cm2	4,540 cm2
13000 mm	4,080 cm2	4,130 cm2	4,190 cm2	4,240 cm2	4,340 cm2	4,450 cm2	4,650 cm2	4,860 cm2	5,070 cm2	5,380 cm2	5,690 cm2	5,900 cm2

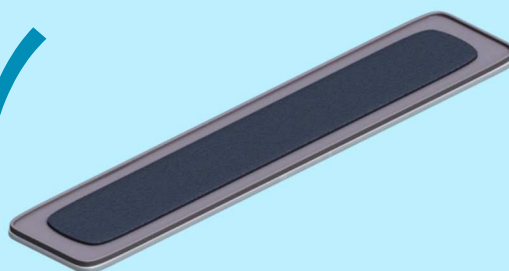
Mineral wool panels:

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

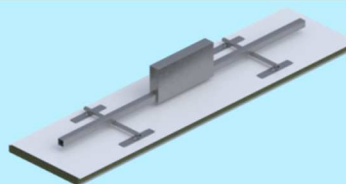
Minimum Total Surface of Suction Cups for Mineral Wool Panel with Steel face 0.8 / 0.8							
Panel Length	Panel thickness [mm]						
	50	60	80	100	120	150	200
2000 mm	690 cm ²	710 cm ²	730 cm ²	750 cm ²	790 cm ²	830 cm ²	910 cm ²
3500 mm	1,210 cm ²	1,240 cm ²	1,280 cm ²	1,310 cm ²	1,380 cm ²	1,450 cm 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.

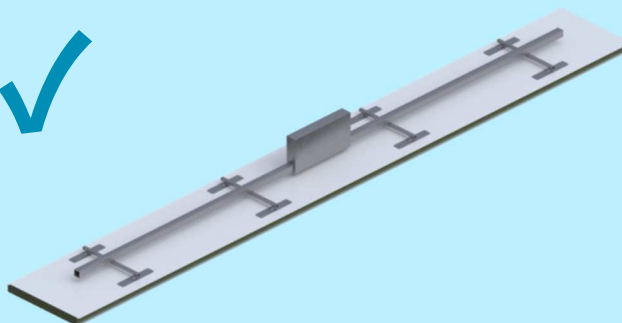
**TO ASSURE SHEET PLANARITY
DURING SUCTION, A SUITABLE
STIFFENING PAD MUST BE
INSERTED IN THE SUCTION CUP**



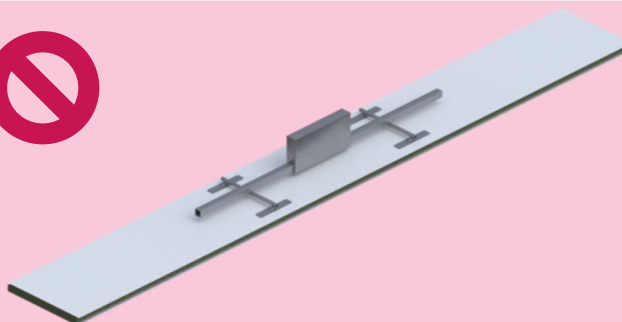
**AT LEAST 4 SUCTION CUPS
EQUALLY DISTRIBUTED FOR
PANEL LENGTHS LESS THAN 6 m**



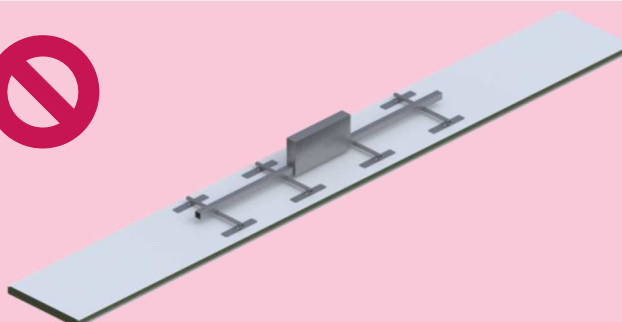
**AT LEAST 8 SUCTION CUPS
EQUALLY DISTRIBUTED FOR
PANEL LENGTHS EXCEEDING 6 m**



**INSUFFICIENT NUMBER OF
SUCTION CUPS**



**SUCTION CUPS NOT EQUALLY
DISTRIBUTED**



Annex E

BUILDING DETAILS

RAO 06 – Wall corner connection - recessed

RAO 07 – Wall corner connection

RPCV 01 – Roof wall connection with insulated gutter

RPCV 03 – Roof wall connection with gutter

RPCV 04 – Roof wall connection with single roof pitch ridge

RPCV 13 – Flat roof wall connection

RPCV 14 – Roof wall connection with insulated gutter with parapet

SPO 11 – Horizontal butt joint (flat solution)

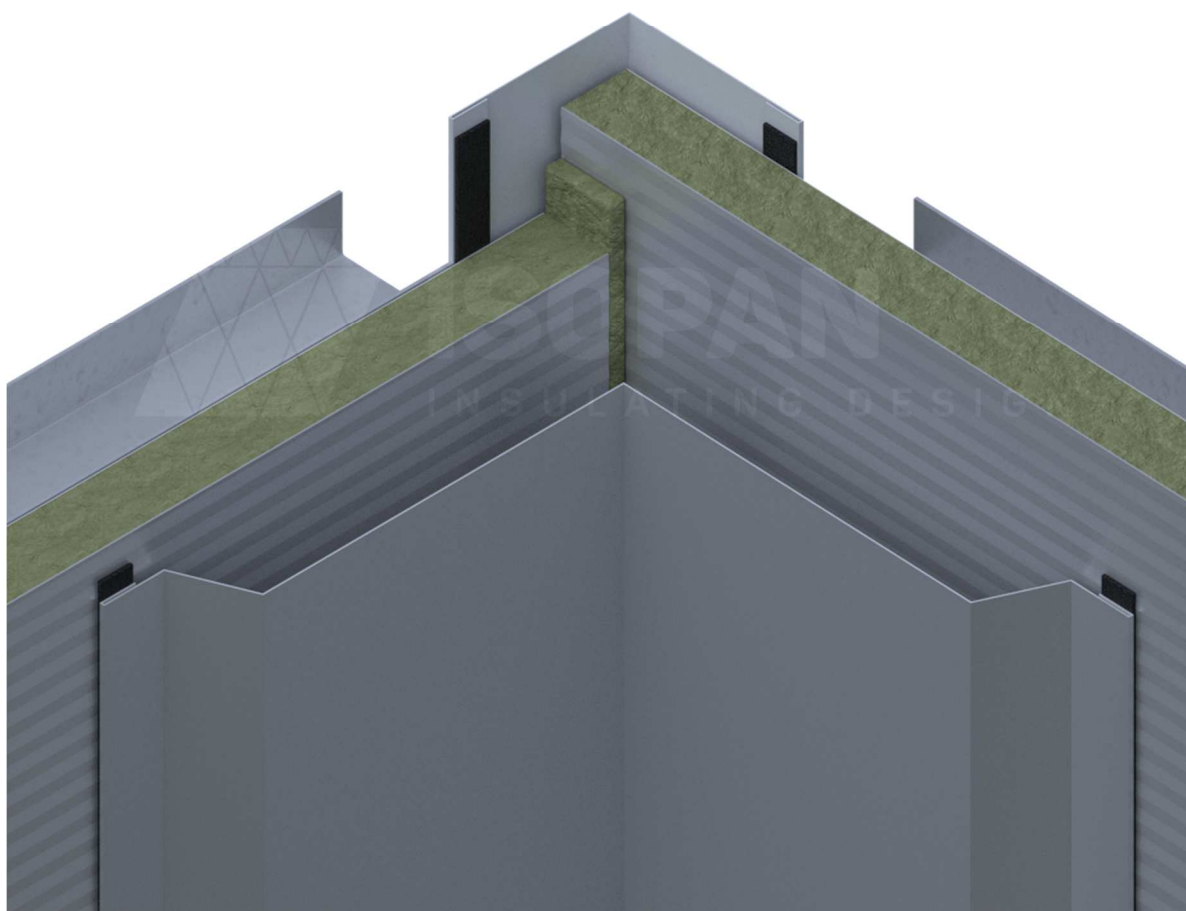
SPO 13 – Horizontal butt joint (thickness solution)

SPO 15 – Horizontal butt joint (for thermal expansion)

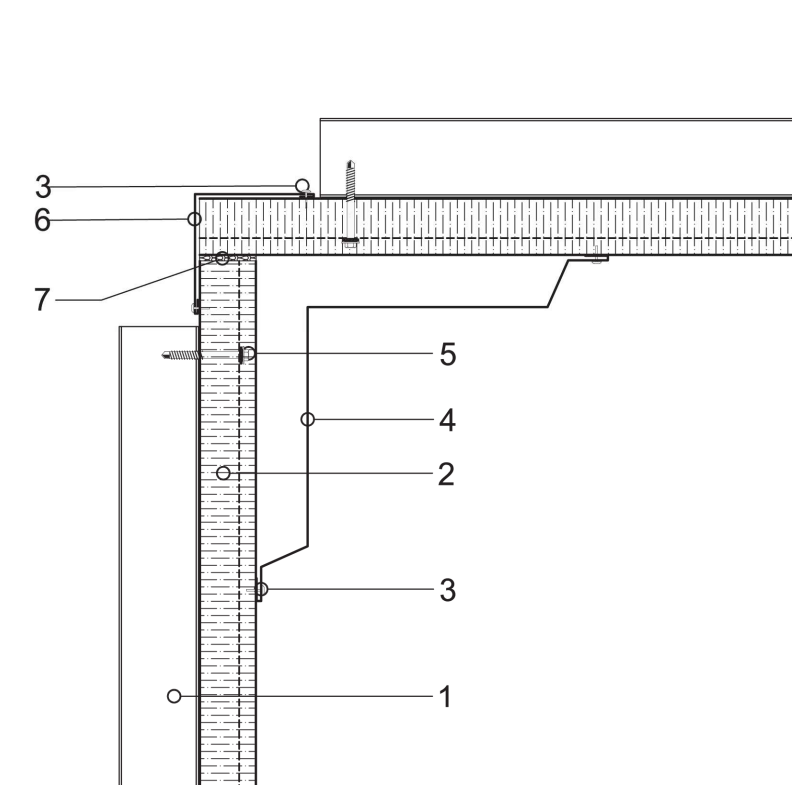
SPV 04 – Concrete base kerb wall panel connection

SPV 22 – Vertical butt joint

WALL CORNER CONNECTION – RECESSED



Type 2 wall corner connection: horizontal cross-section



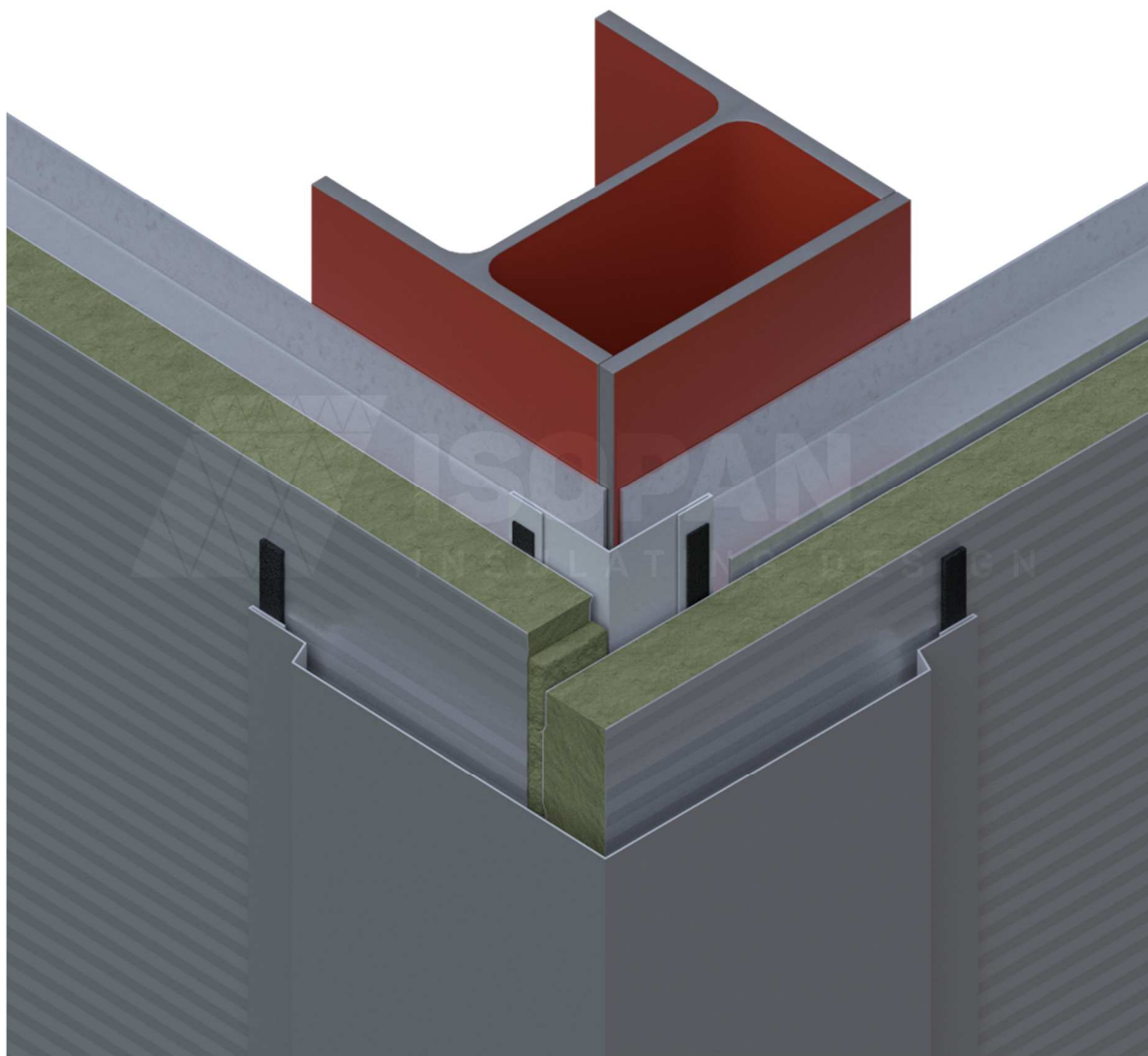
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	Steel structure
2	ISOPAN concealed fastening mineral wool 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

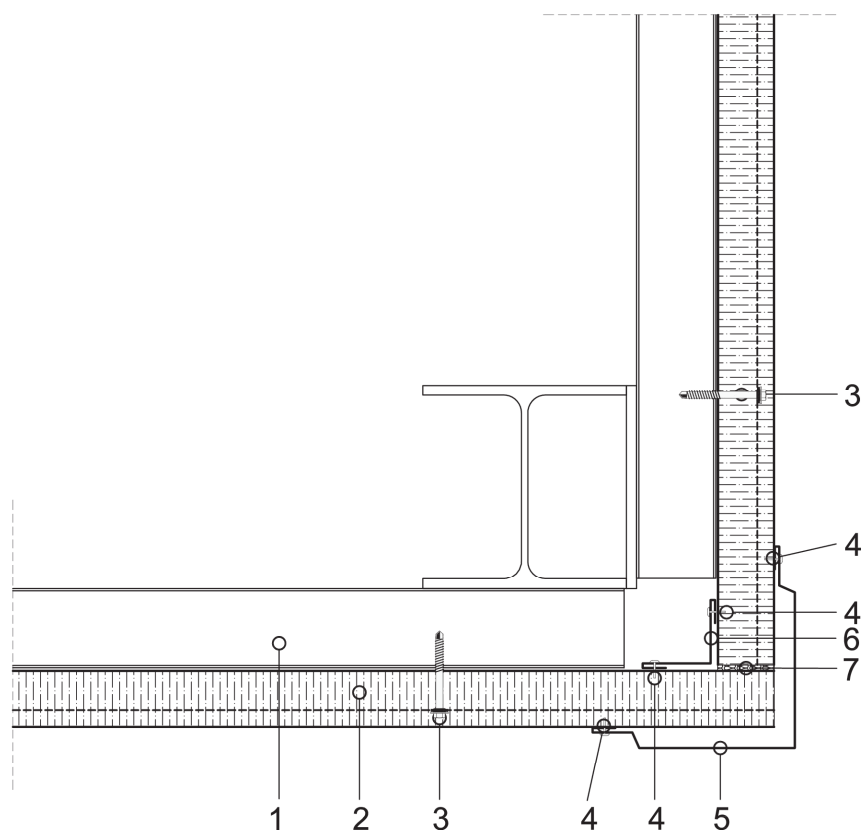
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WALL CORNER CONNECTION




RAO 07fp

Type 4 wall angular connection: horizontal cross-section



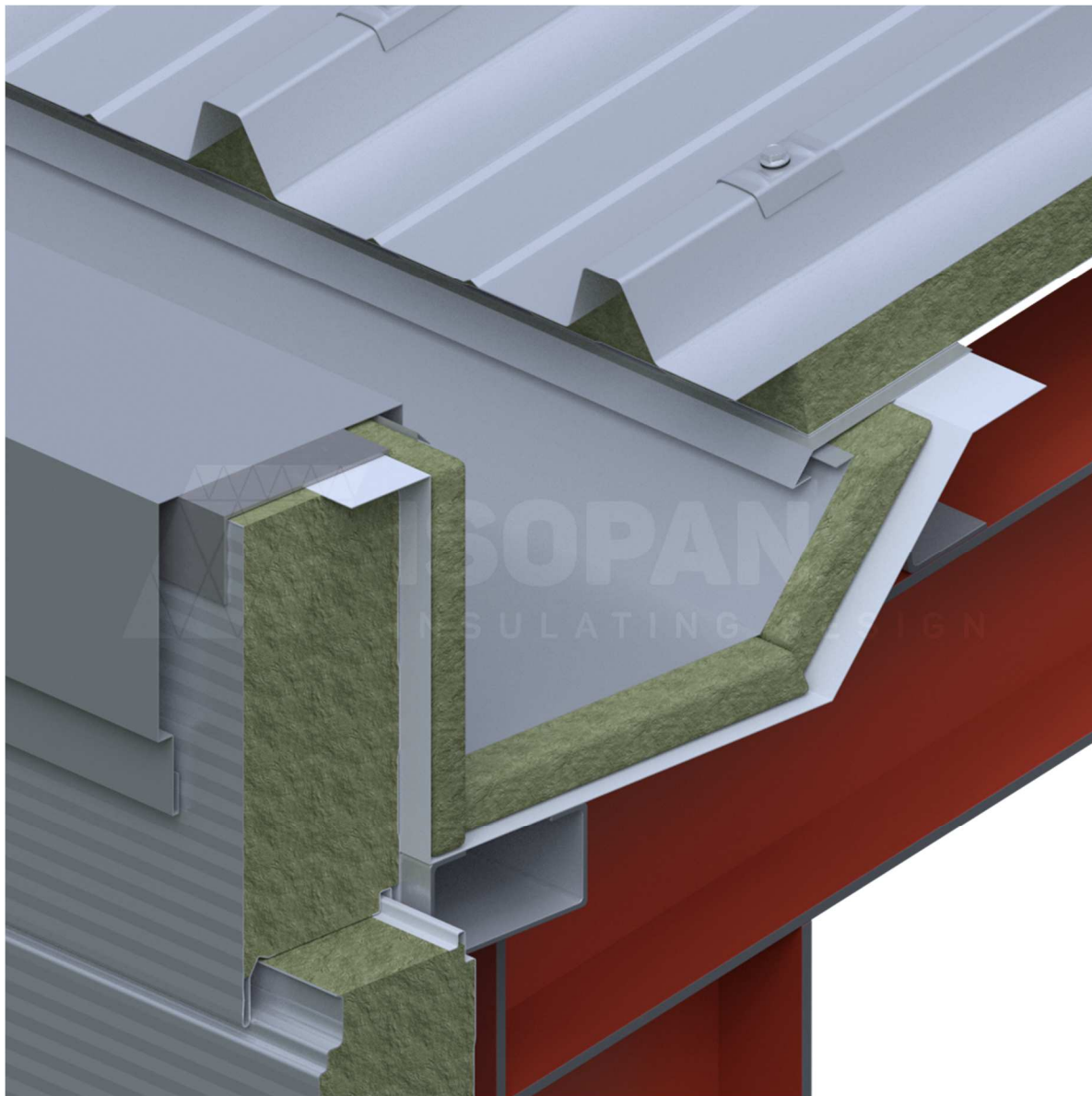
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

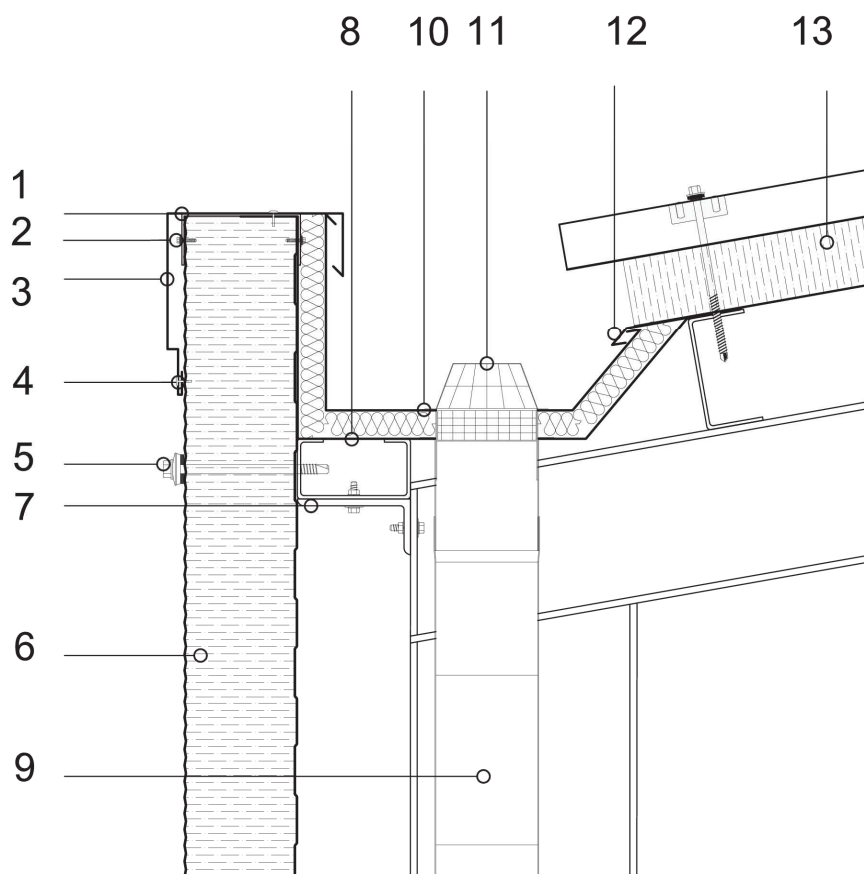
1	Steel structure
2	ISOPAN concealed fastening mineral wool wall panel
3	Panel fastening screw
4	Rivet
5	External side corner connection metal sheet
6	Internal side corner connection metal sheet
7	Polyurethane foam or mineral wool insulating material

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ROOF WALL CONNECTION WITH INSULATED GUTTER



Roof wall connection with insulated gutter



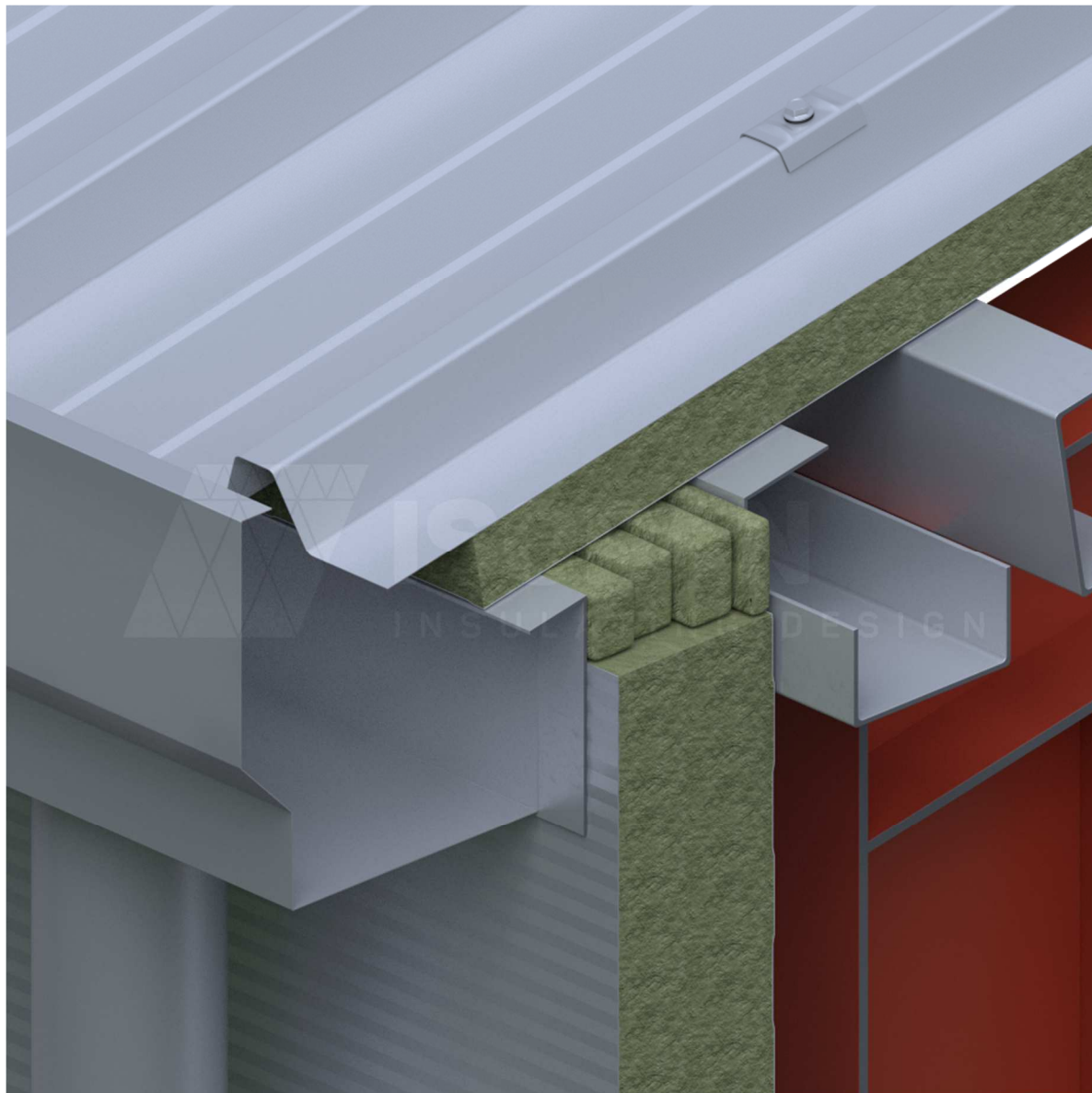
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

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

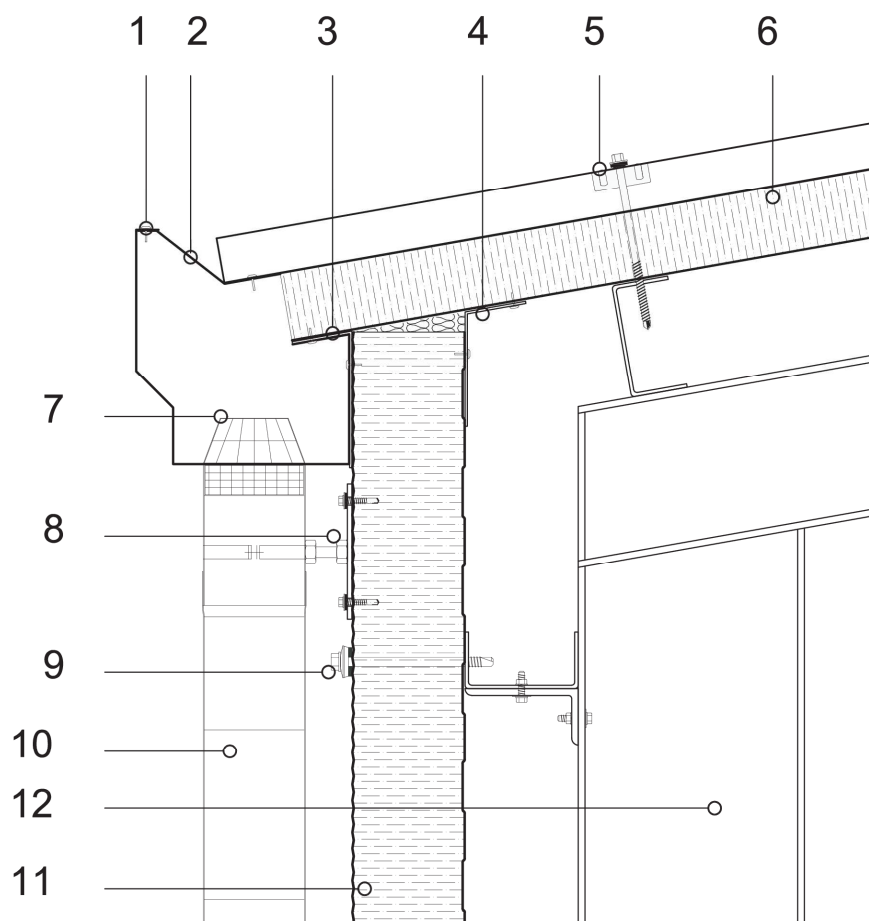
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ROOF WALL CONNECTION WITH GUTTER




RPCV 03fp

Type 1 roof wall connection with gutter



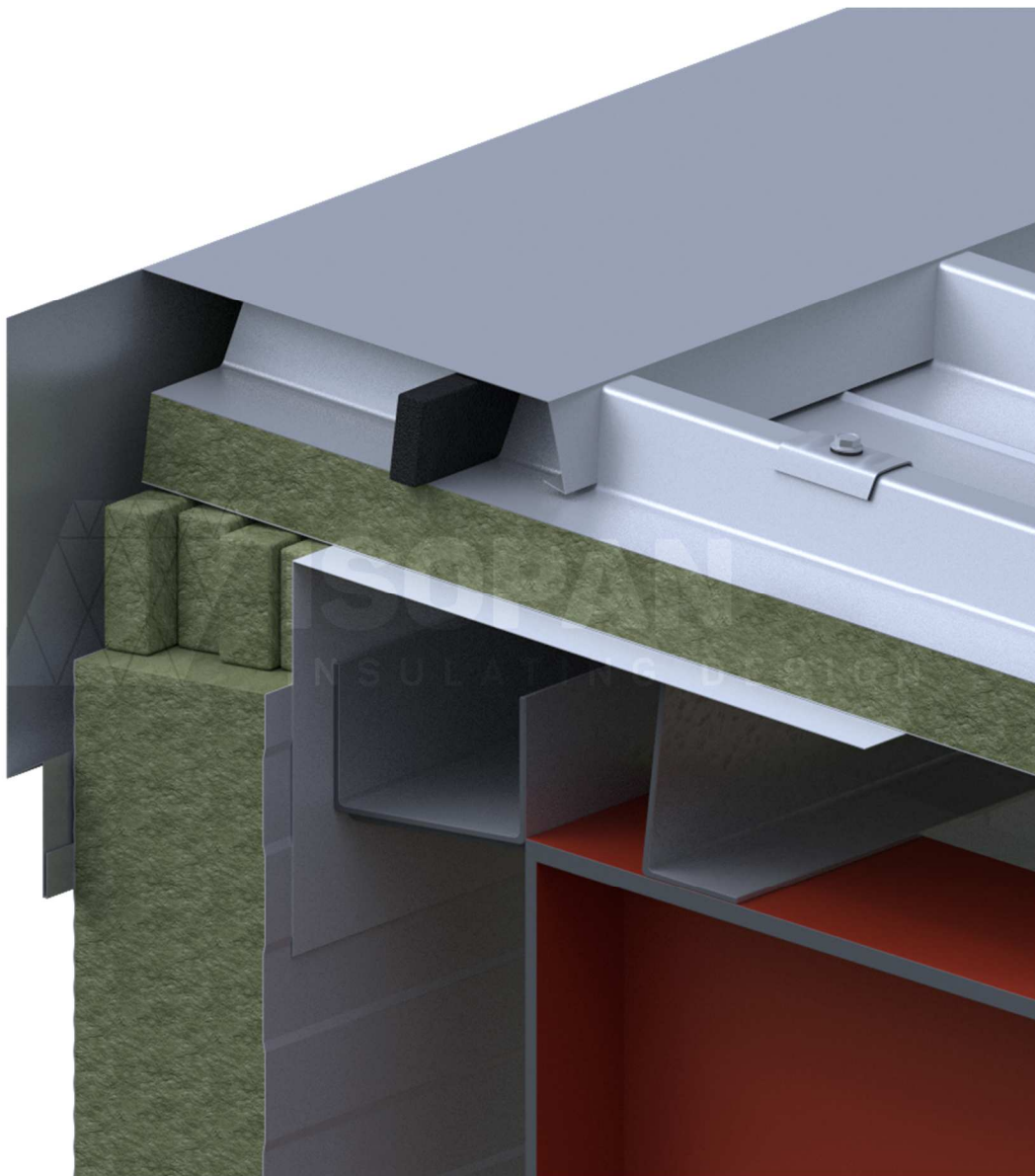
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	Rivet	11	ISOPAN mineral wool 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 mineral wool roof panel		
7	Leaf screen		
8	Gutter fastening unit		
9	Through fastening screw		
10	Gutter		

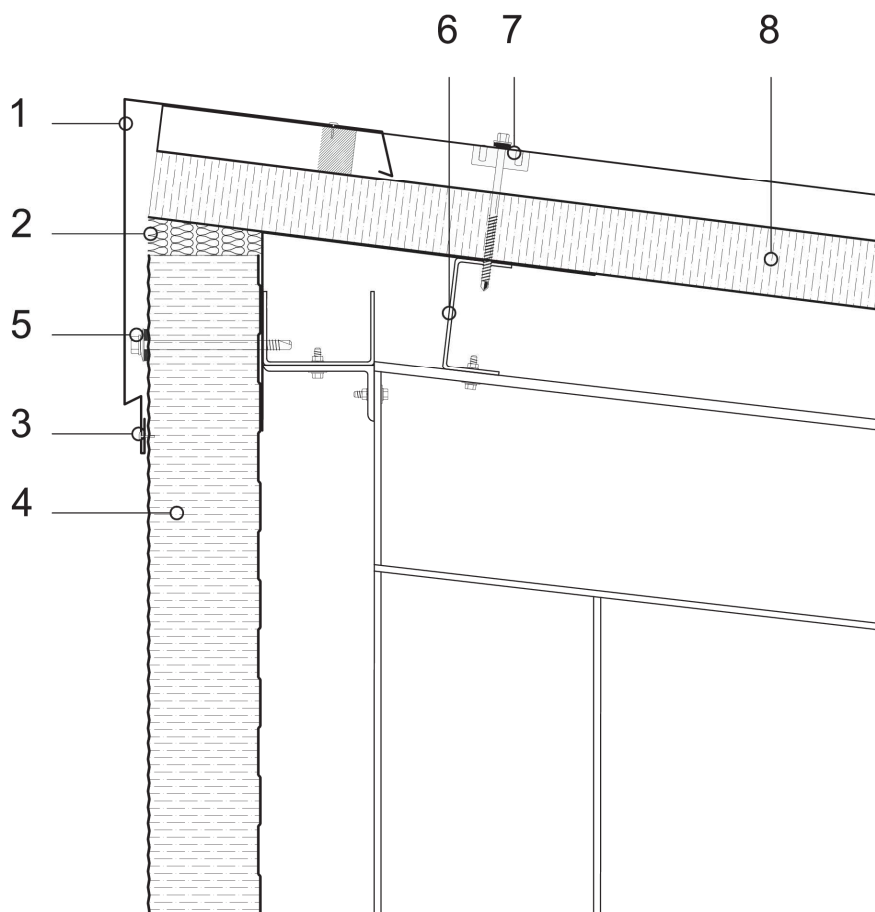
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ROOF WALL CONNECTION WITH SINGLE ROOF PITCH RIDGE




RPCV 04fp

Type 1 roof wall connection



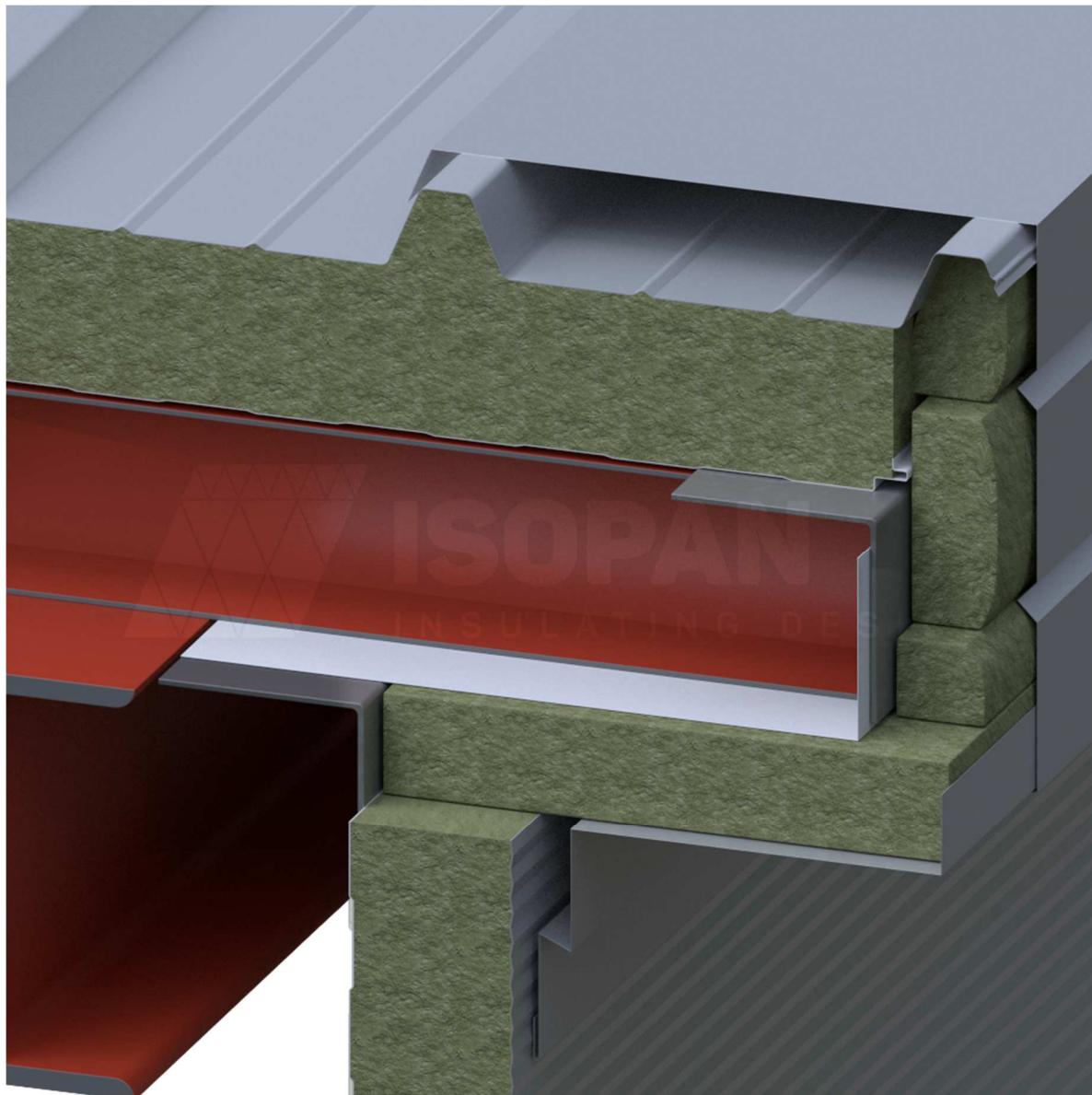
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

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

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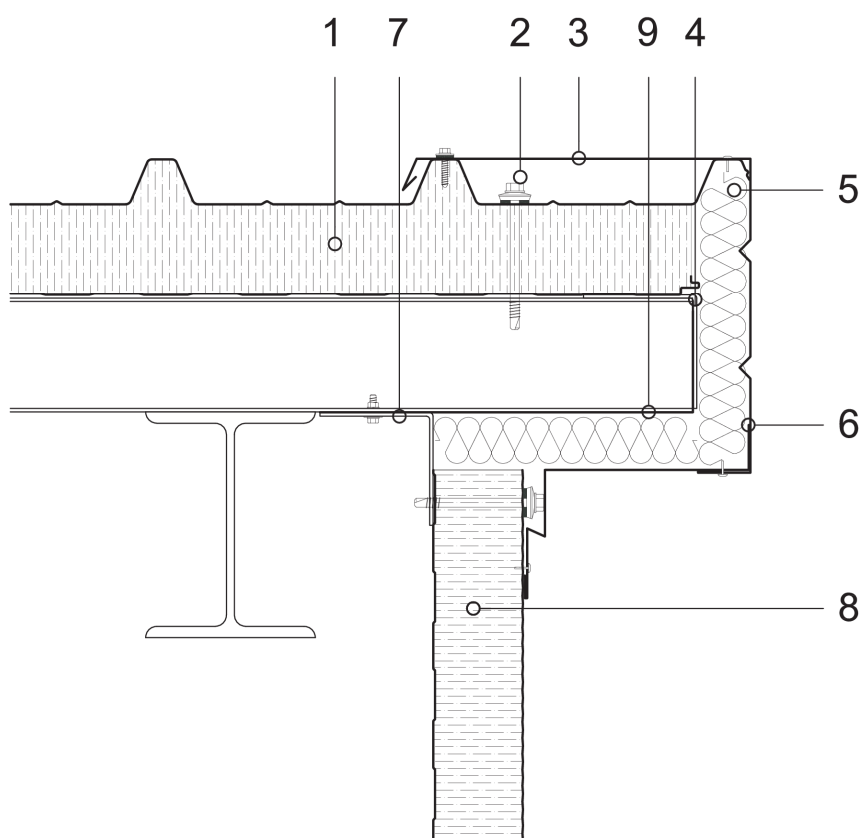
FLAT ROOF WALL CONNECTION





RPCV 13fp

Roof wall side connection



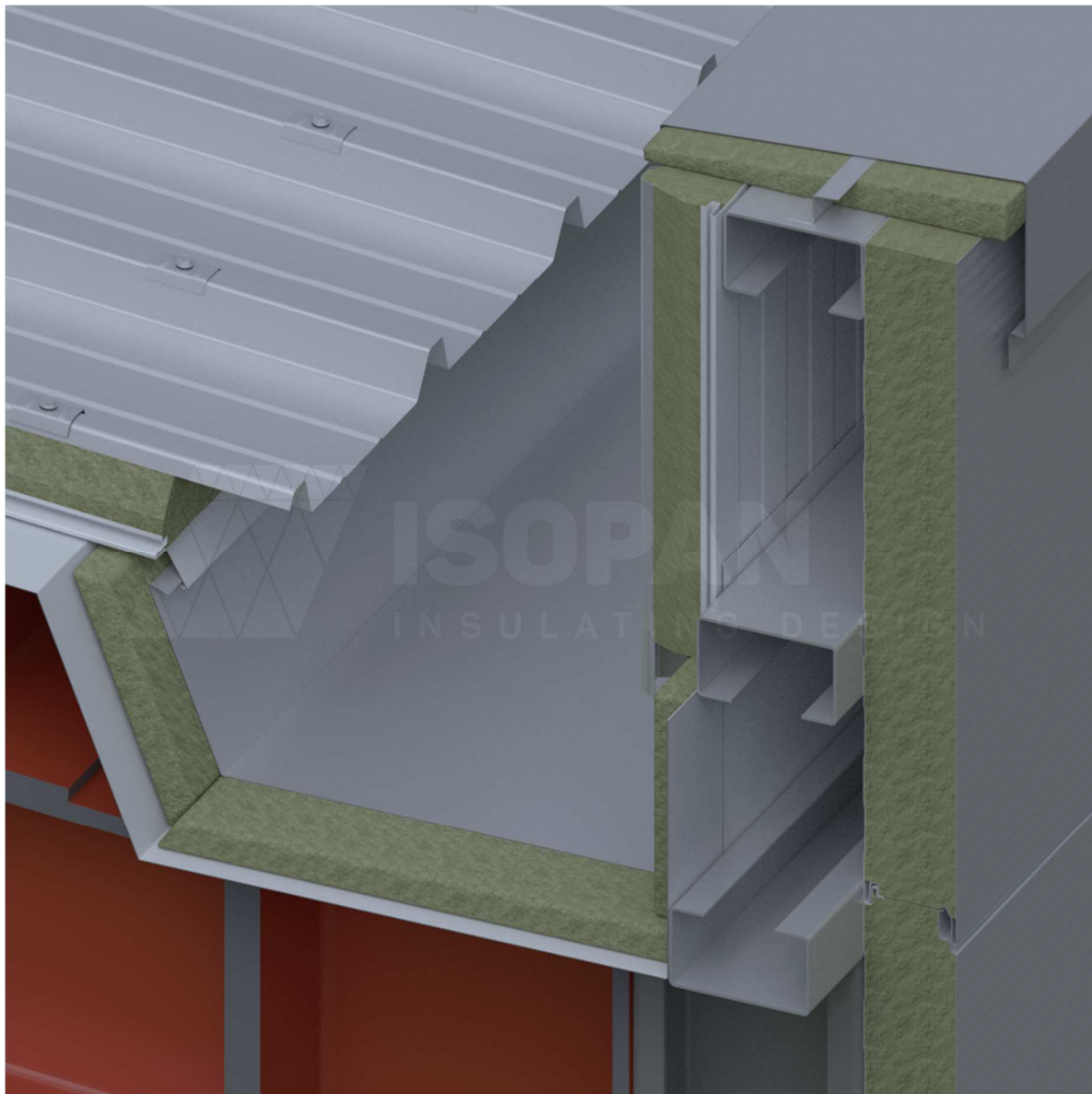
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	ISOPAN mineral wool 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 concealed fastening mineral wool wall panel
9	L-shaped closing metal sheet

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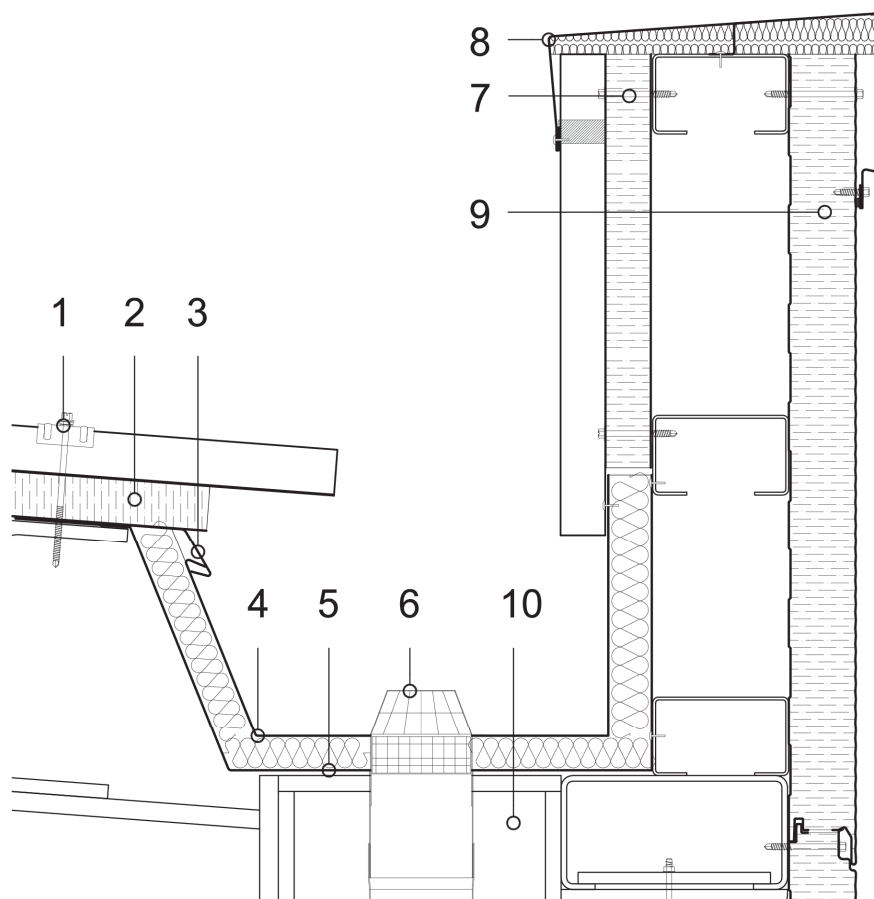
ROOF WALL CONNECTION WITH INSULATED GUTTER WITH PARAPET





RPCV 14fp

Type 4 roof wall connection with insulated gutter



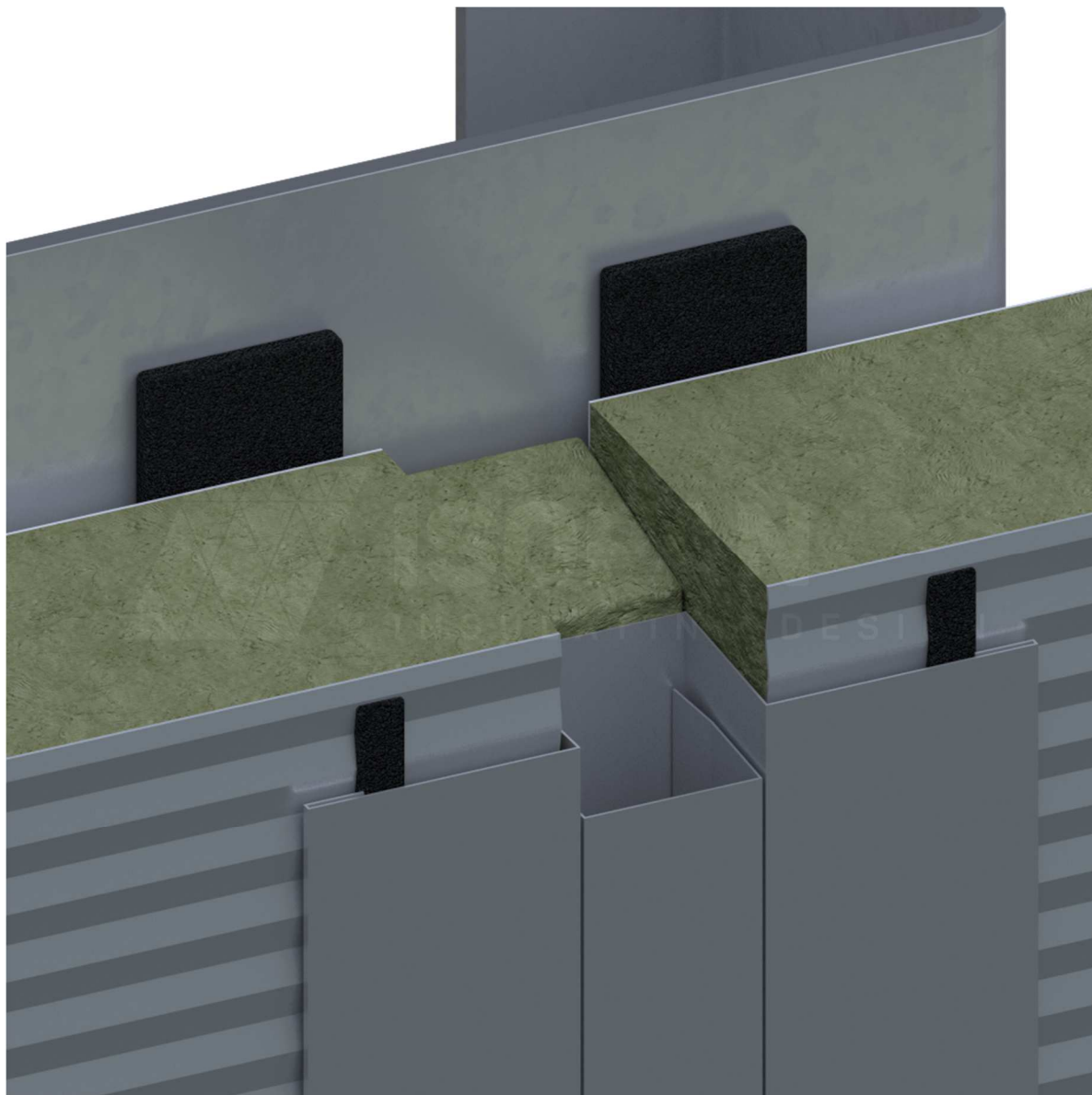
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

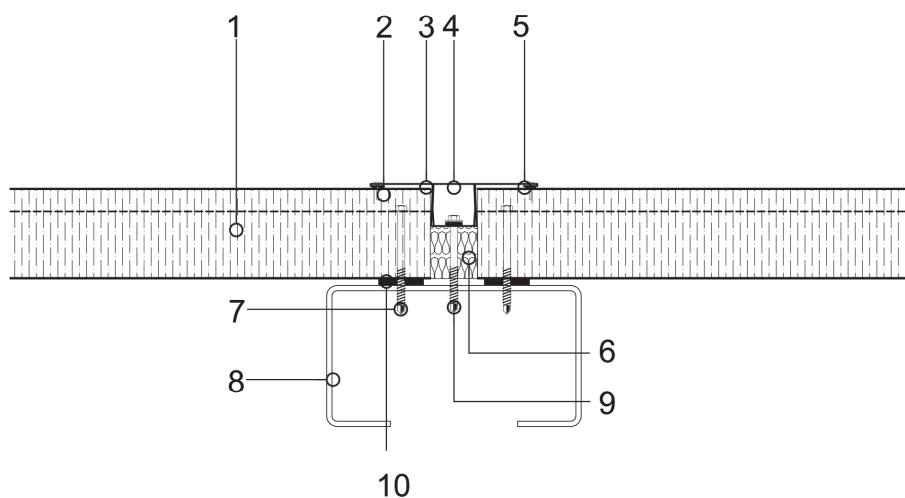
1	Roof panel fastening unit
2	ISOPAN mineral wool roof panel
3	Drip edge metal sheet
4	Gutter metal sheet
5	Eaves metal sheet
6	Leaf screen
7	Through fastening screw
8	Railing protection metal sheet
9	ISOPAN concealed fastening mineral wool wall panel
10	Main steel structure

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HORIZONTAL BUTT JOINT (FLAT SOLUTION)



Type 1 horizontal joint between wall panels



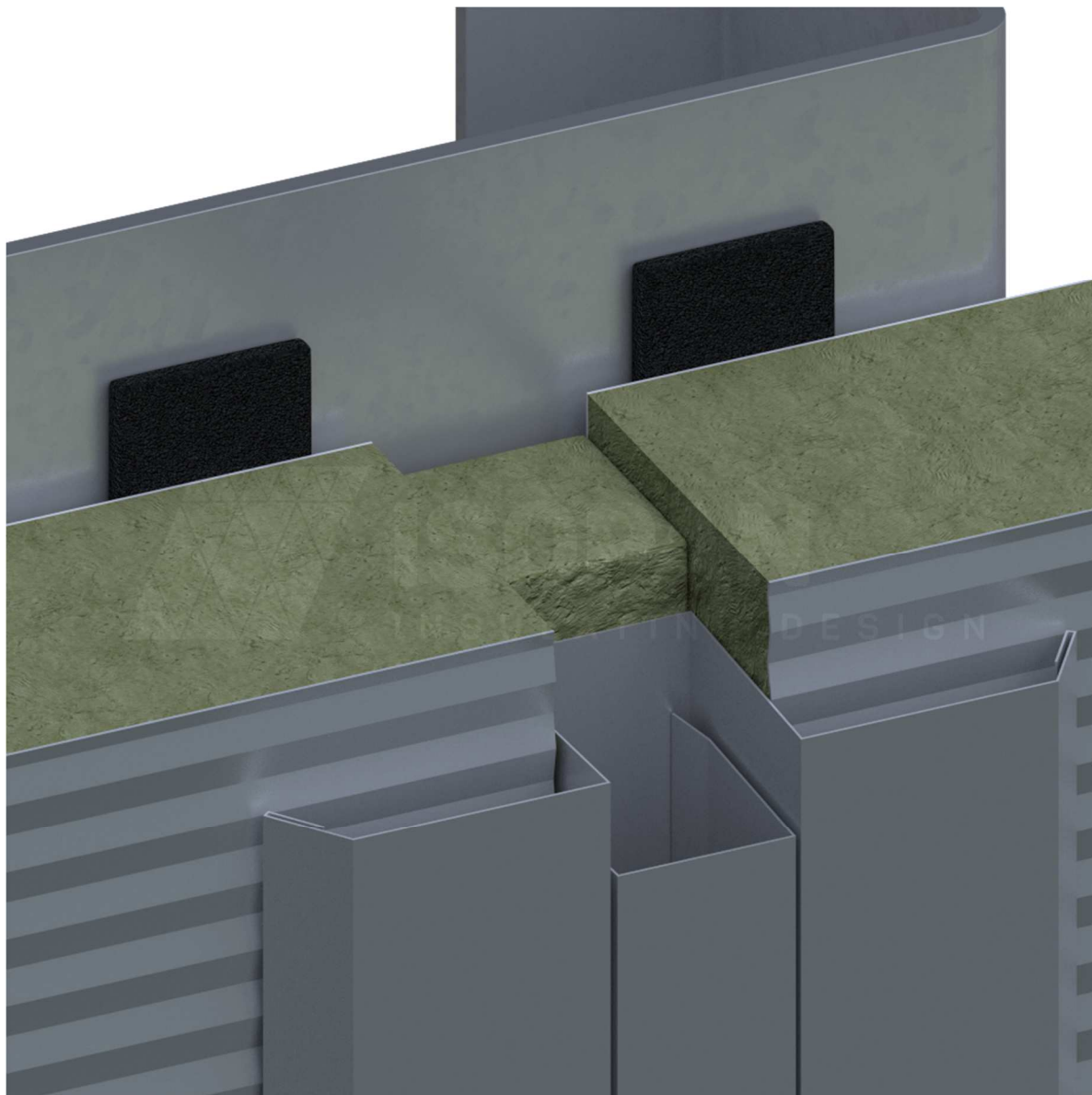
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

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

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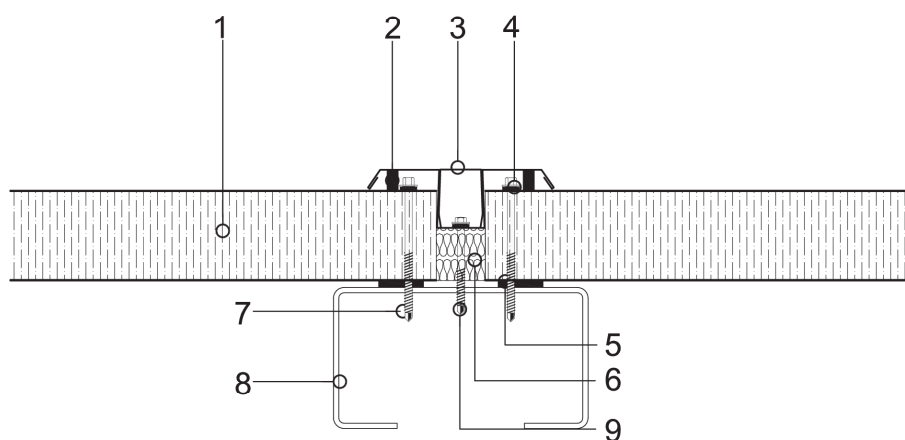
HORIZONTAL BUTT JOINT (THICKNESS SOLUTION)





SPO 13fw

Type 3 horizontal joint between wall panels



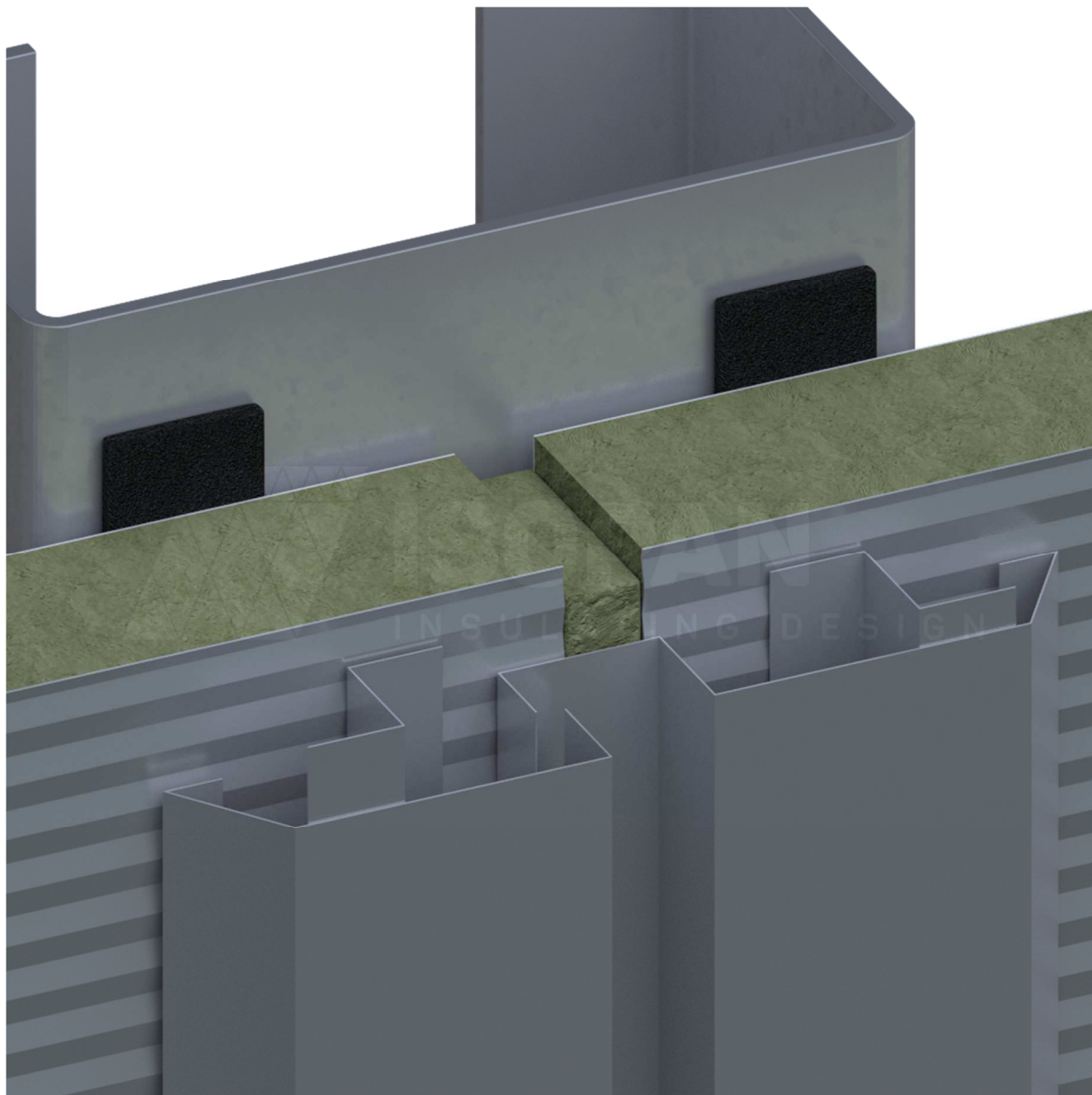
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

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

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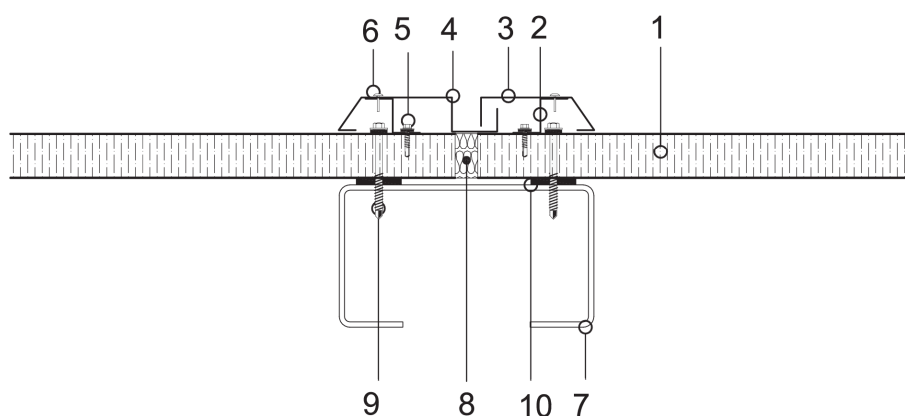
HORIZONTAL BUTT JOINT (FOR THERMAL EXPANSION)





SPO 15fw

Type 5 horizontal joint between wall panels



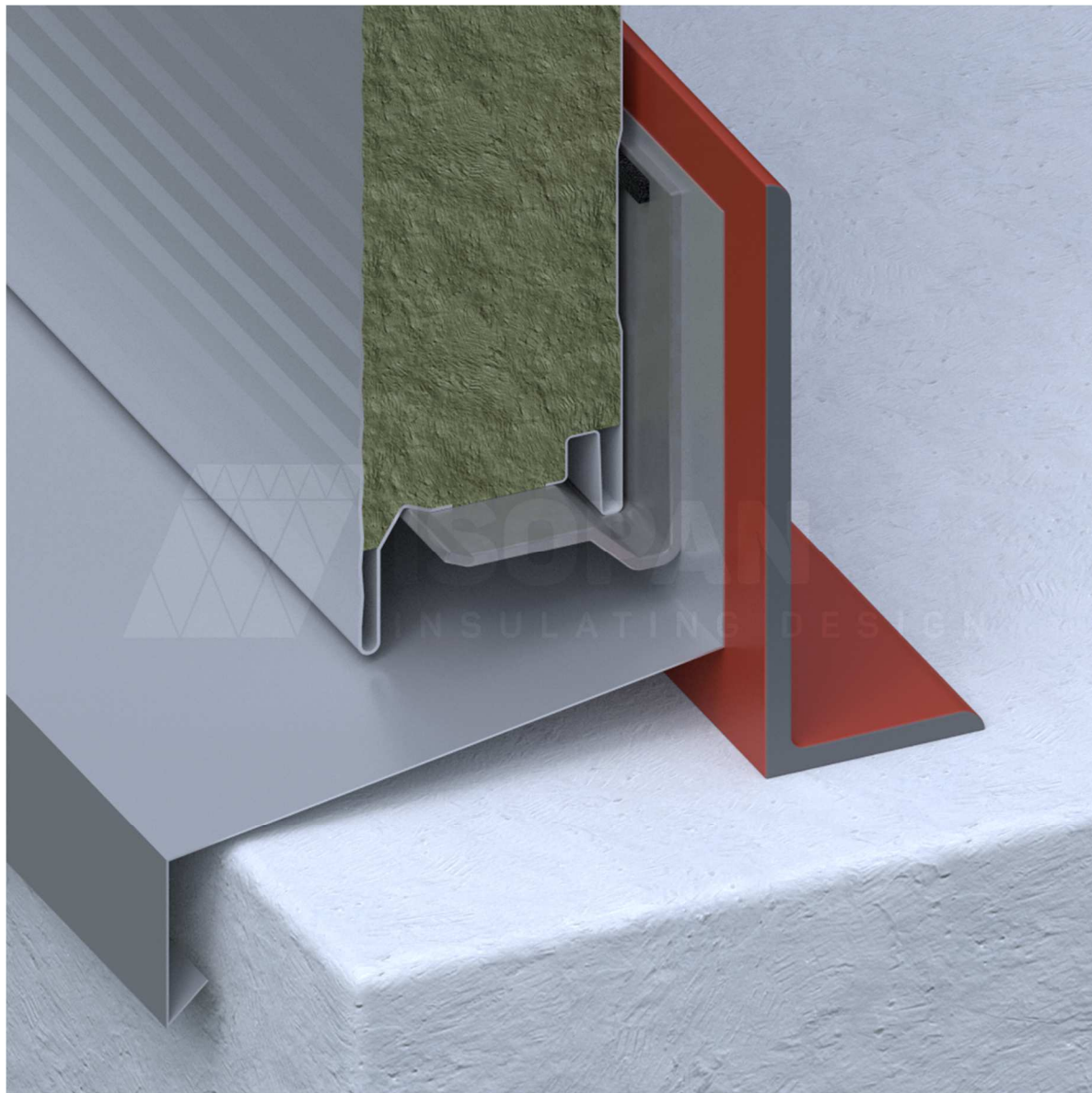
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

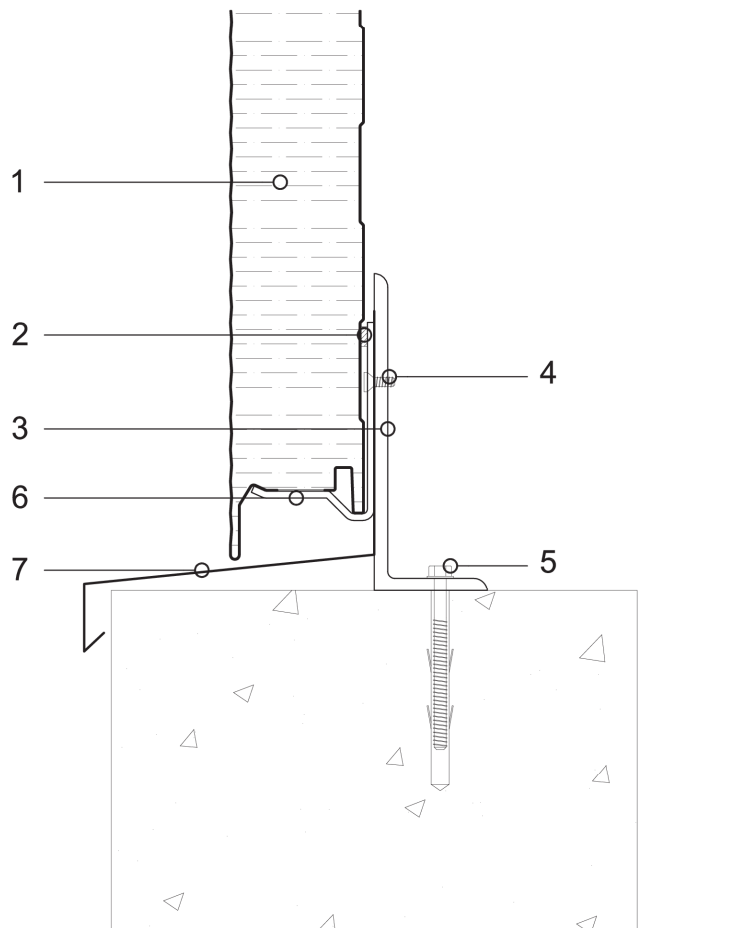
1	ISOPAN mineral wool wall panel
2	Support metal sheet
3	Joint connection metal sheet
4	Joint connection metal sheet
5	Metal sheet fastening screw
6	Rivet
7	Steel face
8	Mineral wool insulating material
9	Panel fastening screw
10	EPDM rubber gasket

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CONCRETE BASE KERB WALL PANEL CONNECTION



Type 1 concrete structure panel hooking



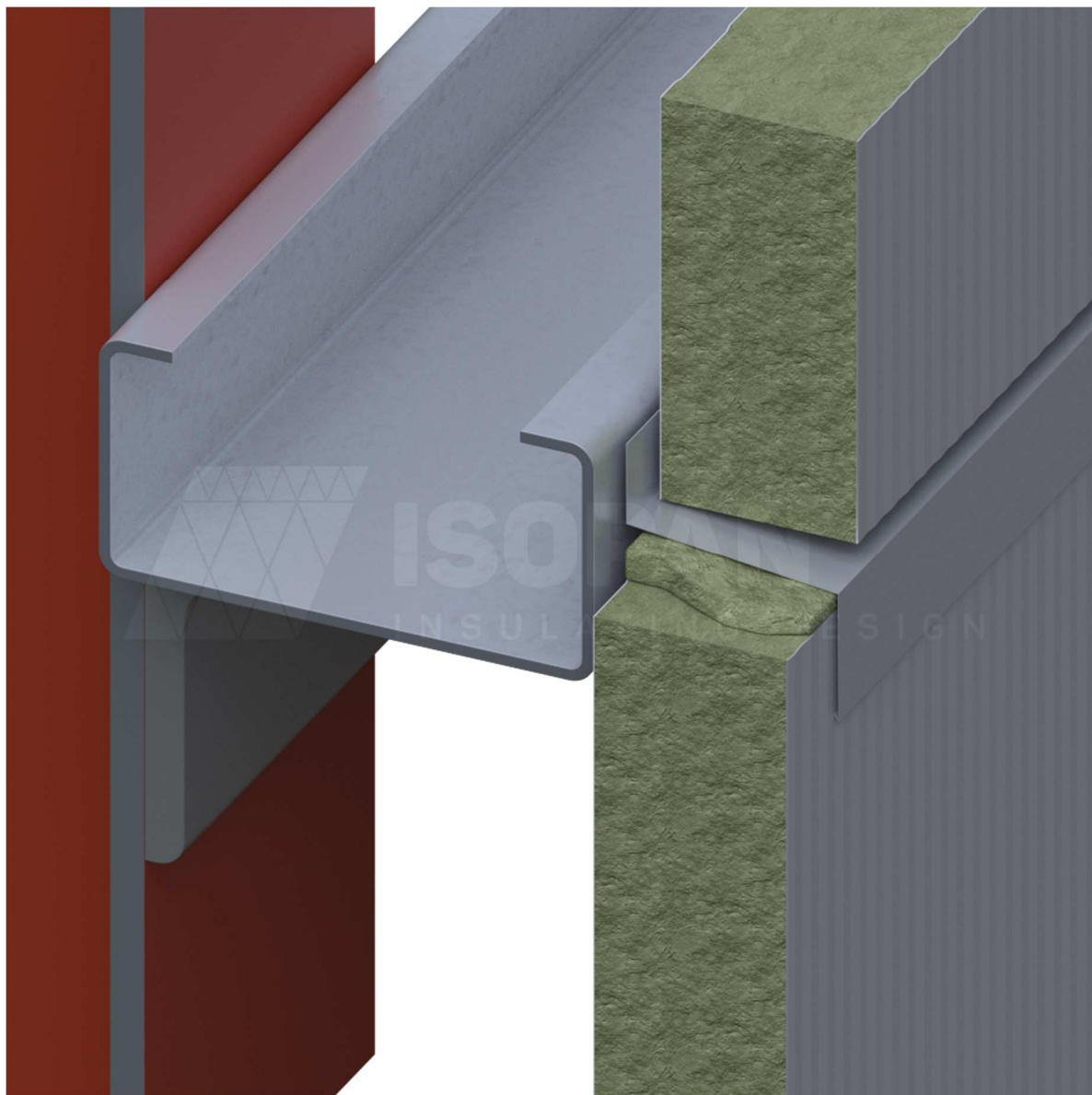
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key

1	ISOPAN mineral wool wall panel (e.g. ISOFIRE WALL Plissé)
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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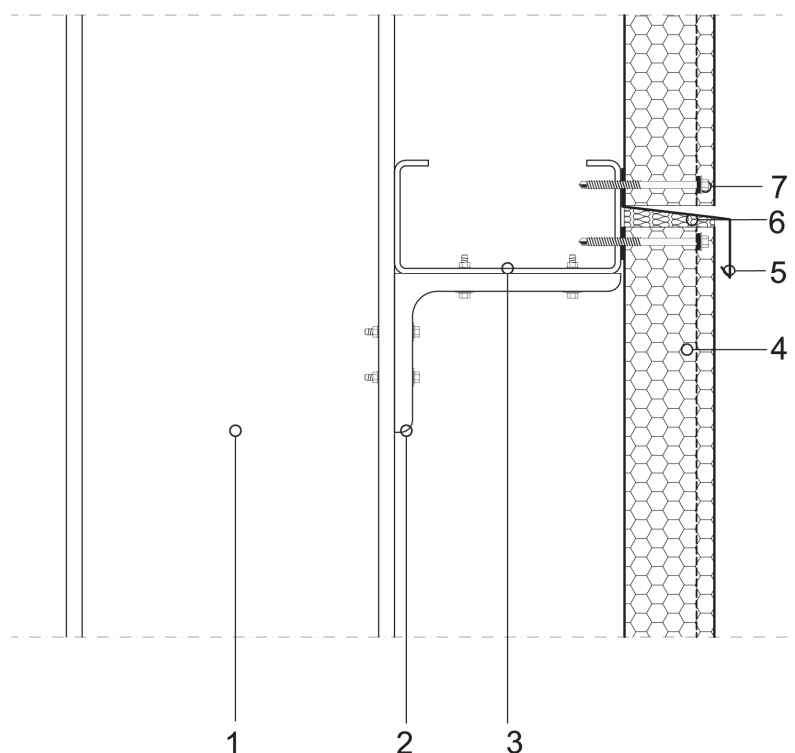
VERTICAL BUTT JOINT





SPV 22

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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