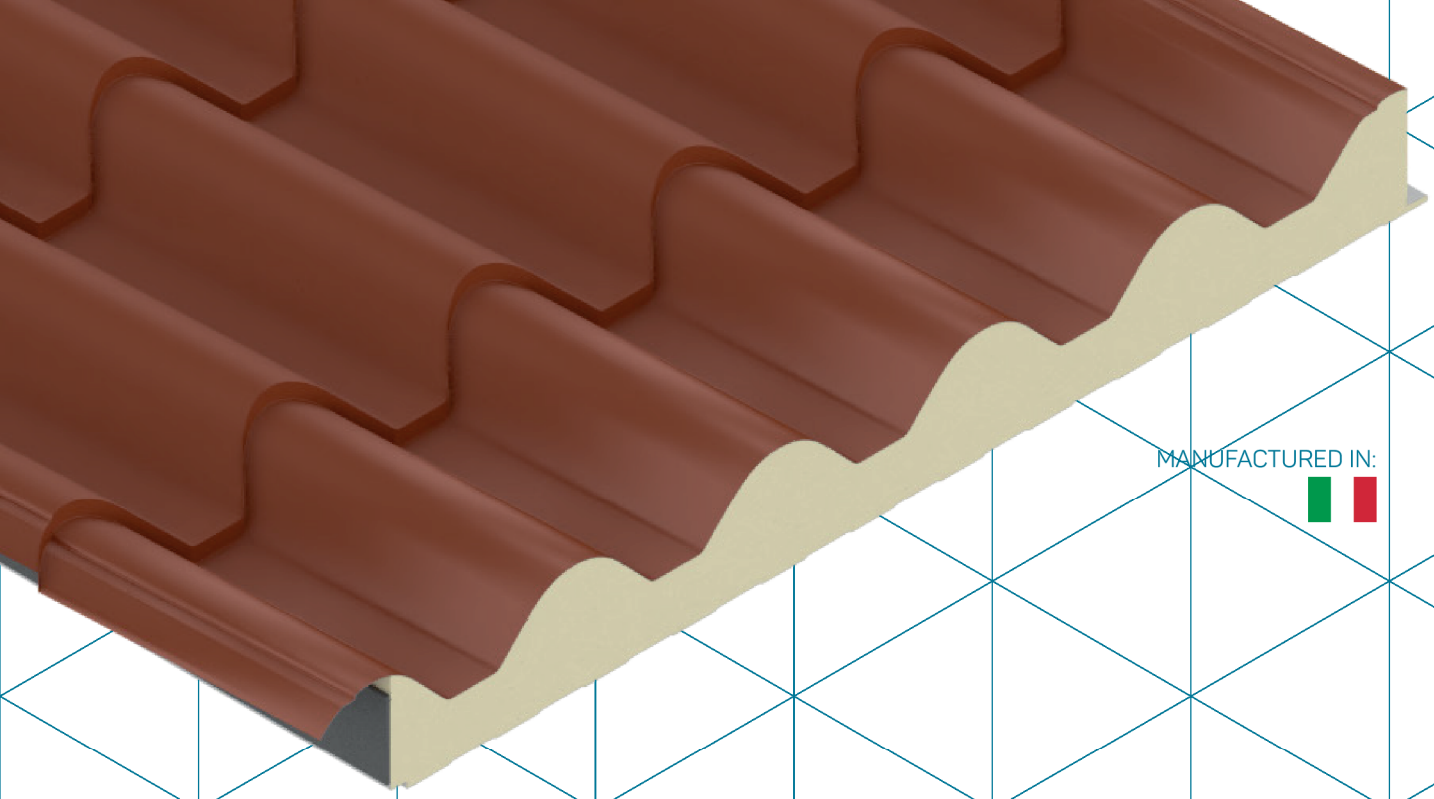

MANUFACTURED IN:

TECHNICAL MANUAL

ISODOMUS Range

ISODOMUS | ISODOMUS CLASSIC

PART OF MANNI GROUP

ISOPAN
INSULATING DESIGN

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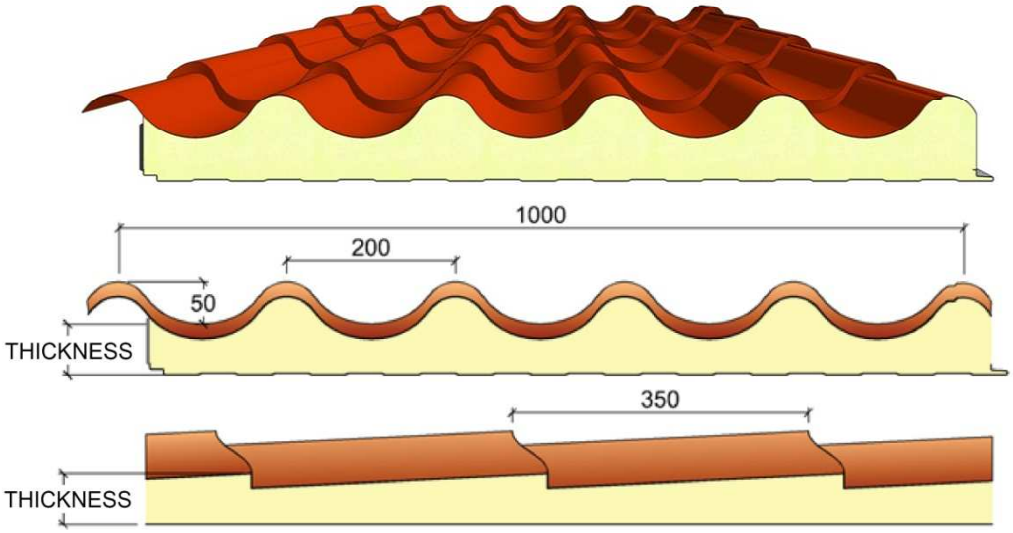
ISODOMUS Range

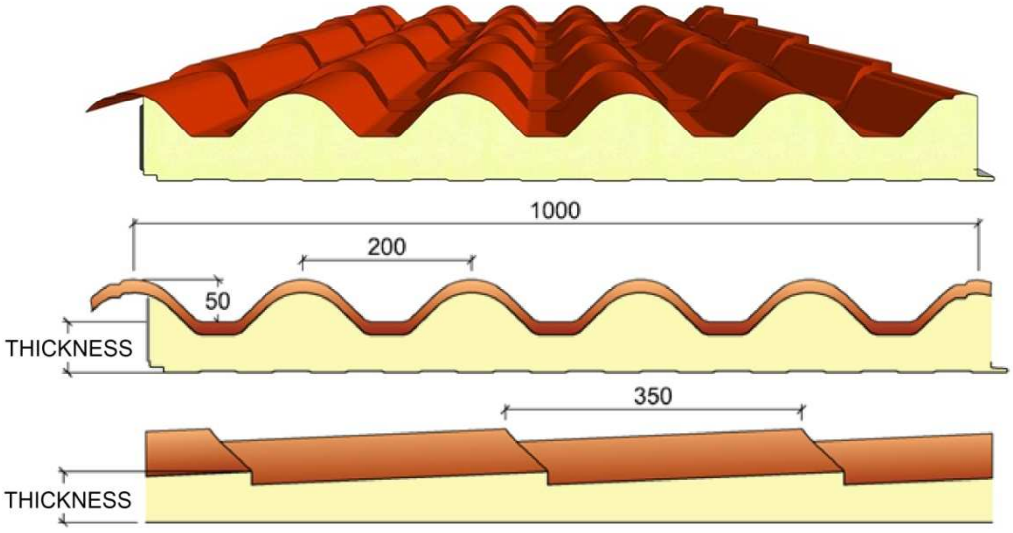
It represents the utmost aesthetic evolution of an insulated panel intended for civil construction roofing. The roof tile design makes it possible to achieve functional roofing that is aesthetically pleasing, light, safe, waterproof and easy and quick to install. It is suitable for civil roofing or in the industrial sector for buildings located in certain urban settings.

TYPES OF PANELS

ISODOMUS



ISODOMUS Classic



Both types can also be produced in single skin version with internal facing in bituminous felt or embossed centesimal aluminium. The absence of the internal sheet and ease of installation make them a cost-effective solution where the panel installation is not visible on the inside.

GEOMETRIC FEATURES

	ISODOMUS	ISODOMUS CLASSIC	ISODOMUS Mono	ISODOMUS CLASSIC Mono
Length Standard	2100 - 2450 - 2800 - 3150 - 3500 - 3850 - 4200 - 4550 - 4900 - 5250 - 5600 - 5950 - 6300 - 6650 - 7000 - 7350 - 7700 - 8050 - 8400 - 8750 - 9100 - 9450 - 9800 - 10150 - 10500 - 10850 - 11200 - 11550 - 11900 - 12250 - 12600 - 12950 - 13300			
Useful Pitch (mm)	1000			
Insulating Thickness (mm)	30 - 40 – 50 – 60 - 80	30 - 40 – 50 – 60 - 80 - 100	30 - 40 – 50 – 60 - 80	
External face	Corrugated profile that mimics the appearance of Portuguese roof tiles	Traditional roof tile profile	Corrugated profile that mimics the appearance of Portuguese roof tiles	Traditional roof tile profile
Internal face	Micro-ridged lightly profiled metal sheet		- bituminous felt - embossed centesimal aluminium	

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.

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.

FEATURES OF THE INTERNAL FACES FOR SINGLE SKIN

Embossed centesimal aluminium

Due to the fragility of the aluminium face, Isopan gives no guarantee for aesthetic flaws on the internal side of the panel, including the perfection of the joint. Any imperfections on the internal side like, for example, creases on the face and the lack of flatness are to be considered normal and accepted for the uses recommended by Isopan.

Bituminous felt

- Upper layer: bitumen
- **Shell**: wool paper
- Lower layer: bitumen

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
- Shear strength ≥ 0.10 MPa
- Thermal conductivity coefficient λ = 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 transmission coefficient U

Panel thickness (mm)	30	40	50	60	80	100
U [W/m²K]	0.55	0.43	0.38	0.29	0.24	0.19

Thermal resistance coefficient R

Panel thickness (mm)	30	40	50	60	80	100
R [m²K/W]	1.81	2.32	2.63	3.45	4.17	5.26

SOUNDPROOFING

It is the ability of a system to acoustically insulate a room from sounds from the outside and vice versa.

The tested ISODOMUS steel panels obtained the following results:

Panel thickness (mm)	Rw (dB)
40	24

PANEL WEIGHT

Isodomus (steel sheet)

Sheet thickness (mm)		Nominal panel thickness (mm)				
		30	40	50	60	80
0,5/0,5	kg/m²	10,5	10,9	11,3	11,7	12,5

Isodomus Mono (steel sheet)

Sheet thickness (mm)		Nominal panel thickness (mm)				
		30	40	50	60	80
0,5/0,5	kg/m²	7,3	7,7	8,1	8,5	9,3

Isodomus Classic (steel sheet)

Sheet thickness (mm)		Nominal panel thickness (mm)					
		30	40	50	60	80	100
0,5/0,5	kg/m²	10,8	11,2	11,6	12,0	12,8	13,6

Isodomus Classic Mono (steel sheet)

Sheet thickness (mm)		Nominal panel thickness (mm)					
		30	40	50	60	80	100
0,5/0,5	kg/m²	7,6	8,0	8,4	8,8	9,5	10,3

STATIC FEATURES

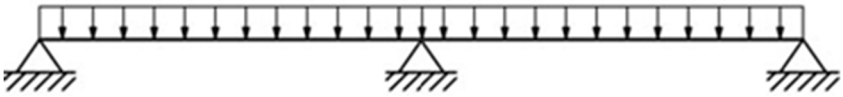
The resistance values refer to a panel assembled horizontally and subject to the action of a distributed load; the calculation method used by Isopan does not consider the thermal effects, which are verified by the designer. Depending on the weather conditions of the installation location and the colour 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.

ISODOMUS double skin metal faced 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.

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 3 supports:



INSULATING THICKNESS	METAL SUPPORTS	MAXIMUM SPAN cm							
		105	140	175	210	245	280*	315*	350*
		ADMISSIBLE LOADS in Kg/m^2							
30	Outer steel 0.5 mm Inner steel 0.4 mm	320	190	115	85	60			
	Outer aluminium 0.6 mm Inner steel 0.4 mm	200	120	60					
40	Outer steel 0.5 mm Inner steel 0.4 mm	415	250	175	130	105	80*	54*	
	Outer aluminium 0.6 mm Inner steel 0.4 mm	285	210	135	100	90	60*		
50	Outer steel 0.5 mm Inner steel 0.4 mm	440	265	190	140	120	90*	60*	
	Outer aluminium 0.6 mm Inner steel 0.4 mm	315	235	160	115	100	70*	50*	
60	Outer steel 0.5 mm Inner steel 0.4 mm	500	305	230	170	145	110*	75*	60*
	Outer aluminium 0.6 mm Inner steel 0.4 mm	375	285	190	140	120	90*	65*	
80	Outer steel 0.5 mm Inner steel 0.4 mm	580	430	320	260	170	140*	90*	70*
	Outer aluminium 0.6 mm Inner steel 0.4 mm	460	355	295	200	155	115*	70*	55*
100	Outer steel 0.5 mm Inner steel 0.4 mm	620	490	365	275	180	155*	95*	75*
	Outer aluminium 0.6 mm Inner steel 0.4 mm	500	390	315	230	170	125*	70*	60*

* Non walkable gaps. Deflection limit 1/200 L

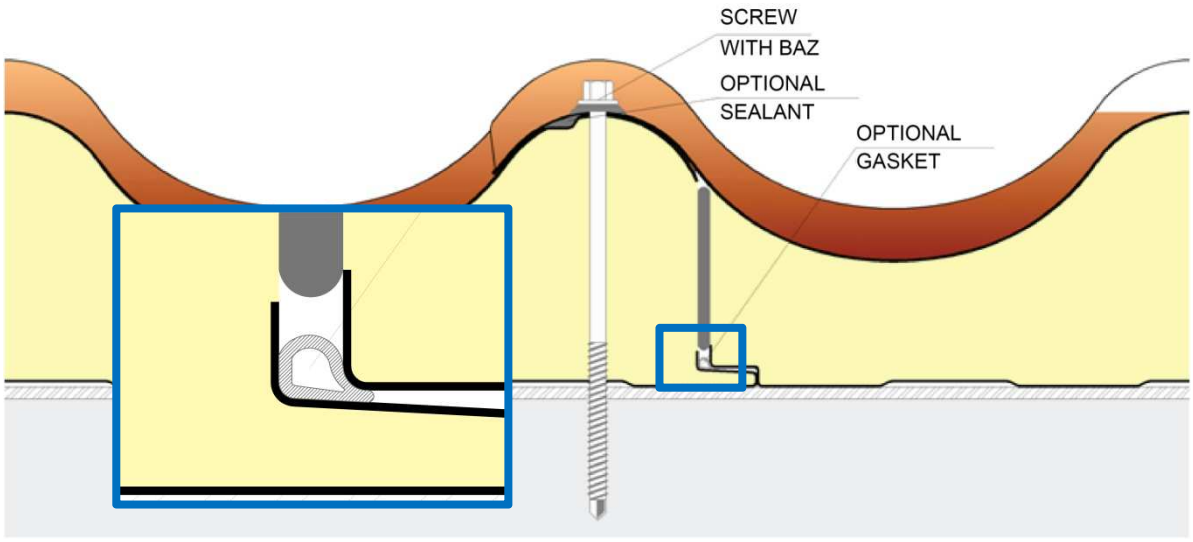
The indicated values, obtained from laboratory tests on panels not fastened to the supports, take into account an adequate safety factor, according to the regulations in force. During inspections for roof maintenance and cleaning, due caution should be exercised in order to prevent crushing the sheets at the deeper folds. Shoes with rubber soles should be used and tools and/or equipment should be used with caution, as they might scratch the paint and zinc below, promoting corrosion. Furthermore, the roof should be inspected periodically (at least once a year), to remove any sediment that might promote undesirable pooling of water.
The data in the tables should be considered indicative, and the designer is responsible for verifying them based on the specific applications.

JOINT

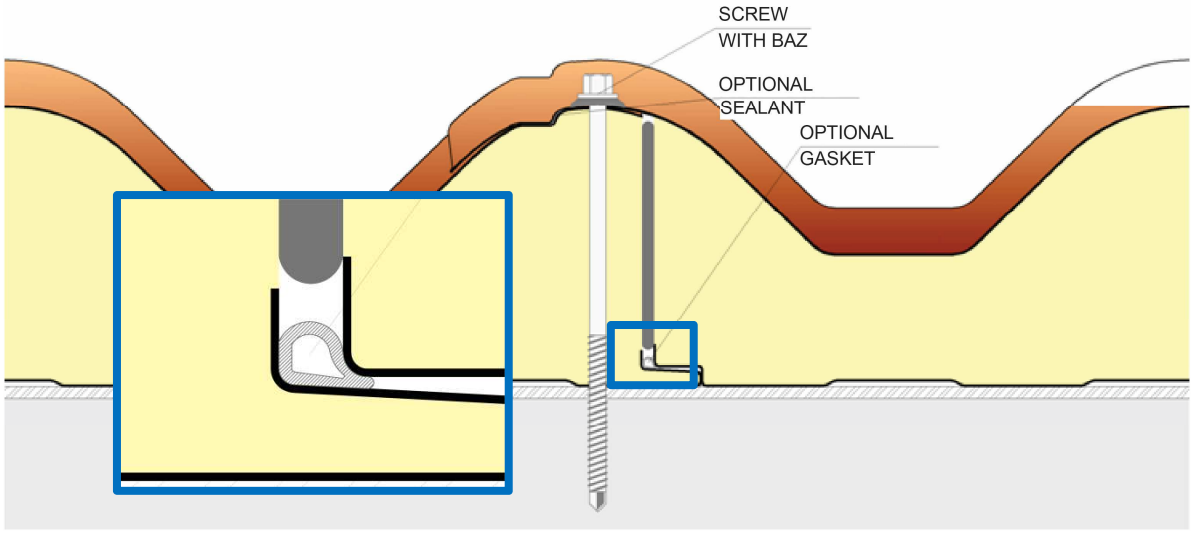
The joint is fitted with a continuous sealing gasket, inserted during production. The joint shape is specifically designed to prevent leaks and reduce thermal bridges.

In heavy-duty conditions, to try to prevent condensate, an optional gasket can be put in to increase joint airtightness (as shown below); this element can be supplied by Isopan and must be installed directly on site during panel installation.

ISODOMUS



ISODOMUS Classic



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.

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 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.

WATER PERMEABILITY

The resistance of a sandwich panel assembly to driving rain under air pressure must be subjected to testing according to **EN 12865**.

The ISODOMUS panel is classified as **CLASS B** according to EN 14509 for water permeability.

AIR PERMEABILITY

Airtightness of a sandwich panel assembly must be subjected to testing according to UNI EN 12114; air permeability measures the air leak with a pressure difference of 50 Pa between the inside and outside of the test structure. Air permeability of the tested ISODOMUS sample is 0.01 m3/m2h.

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 of 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 could cause the panel deflection the panel and wrinkle the metal sheet. The occurrence of the problem may be limited with an accurate design, taking into account environmental conditions, length, colour of the panels and the number of fastening elements. (**See the "Thermal expansion" section**).
- Given the low aesthetic qualities of single skin metal faced panels, concealing them or using them in conditions with low aesthetic requirements is recommended.

GENERAL DESIGN INSTRUCTIONS

The roof panels generally require, during the design phase, a load-bearing structure able to absorb the external loading stress that will not submit the metal supports of 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 zone of the building installation; the values vary depending on the wind speed, with consequent greater or lesser load pressure on the exposed surfaces (affects the type and number of panel fastening systems).
- **Snow load**: depends on the elevation above sea level compared to the one at the building construction site. The formation of water puddles resulting from snowmelt must be taken into account, which can expose the overlapping joints to being pressed under a load of water and possibly create infiltrations. It is recommended to implement appropriate tinwork systems (or suitable constructive measures) to ensure normal water run-off.
- **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 metal or organic facings should be chosen (refer to the available documentation or contact the Isopan Technical Department).
- **Rainfall**: the degree of rainfall affects the slope angle of the roof pitch; in order to ensure normal water run-off and to prevent the metal supports from oxidising, the slope angle of the panels must be chosen on the basis of two types of construction:
  - Roof without intermediate overlapping joints;
  - Roof with intermediate overlapping joints.

  In the first case (low or average level of snowfall) a slope no less than 11% is recommended.

  In the event of roofs built with intermediate overlapping joints, the slope must be increased (for roof pitches with slope <25%) by a value equal to 0.2*L, with L = length of the roof pitch (expressed in metres). The presence of intermediate overlapping joints depends on the slope, the level of snowfall and exposure to wind. Under normal weather conditions, the overlap values generally used are:

Slope (%)	Overlap (mm)
11 < P ≤ 15	200
P > 15	150

  Gutter drip edge: Isopan, in consideration of the rules of best practice, recommends requesting the gutter arrangement in order to make a drip edge and prevent any leaks into the insulating material or inside the building.

  This solution is required to prevent premature panel head decay since, if exposed to stagnating water, the metal might oxidise and the faces might detach from the insulating mass in places.

  After the drip edge, it is recommended to protect the heads (insulation and faces) with Isopan liquid sheath that can be applied on-site.

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).

THERMAL EXPANSION

All the materials used to build the roofs, 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 roof and can cause functional and structural product anomalies, particularly in case of:

- Significant panel length (L > 8000 mm);
- Solar radiation;
- Medium and dark colours;
- High panel thickness.

These stresses are exerted on the head of the fastening element, with bend and shear stress in the event of fastening on rib. These are important parallel to the ribbing as, transversally, they are cancelled out by the flexibility of the metal sheet profile itself.

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

-Linear thermal expansion coefficient values-

Type of facing		Surface temperature (°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 temperature values, linear extension of the metal support must be absorbed by the system. If this is not so, tensions occur that discharge near the sheet section changes by effect of the shape variation. Furthermore, cyclical temperature changes associated to day-night or freeze-thaw differences cause uncontrollable cyclical stresses that fatigue the support elements. These stresses can exceed the material yield point (formation of bubbles) or the failure limit. The effect of this phenomenon is the formation of fatigue cracks, initially not visible, that cause cracking on the face, undermining the product's structural features and water tightness. This problem can be overcome by adopting 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 suitable fastening elements (see proposed Isopan fastening in the "Roof panel fastening" section in this manual)

In the event of **Aluminium** panel installation, we recommend using stainless steel screws with cap and specific washer.

If the roof pitch length requires the use of several panels, the heads of the panels must be spaced by about 5-10 mm (minimum distance in the hotter season, maximum distance in the colder season), taking care to put a flexible gasket between the heads to prevent condensate from forming.

For anything that is not expressly indicated, refer to the **Isopan General Sales Conditions** and annexes.

FASTENING INSTRUCTIONS

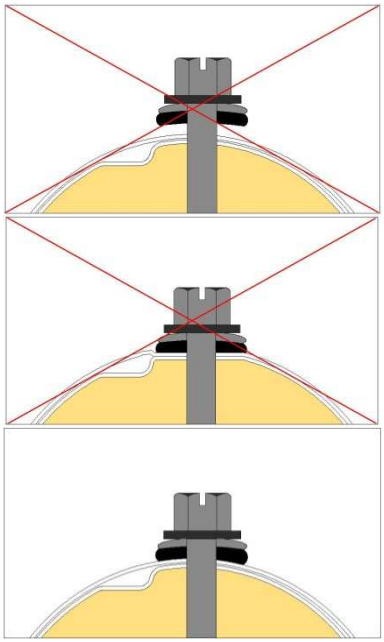
The purpose of the fastening elements is to efficiently anchor the panel to the load-bearing structure; the type of fastening unit depends on the type of support. The number and position of the fastening elements must guarantee resistance to the stresses induced by dynamic loads, which can also exist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

Isopan recommends fastening at the top of the ribs; the possibility of fastening at the bottom of the rib is not to be ruled out, provided the system assures water tightness.

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 based on the design to be constructed and on the panel application system at the construction site.



A
Incorrect tightening due to high torque applied to the screw with marked deformations of the sheet. **In this situation the optimal closing of the interlocking is no longer guaranteed, therefore, the aesthetic functionality of the product remains compromised.**

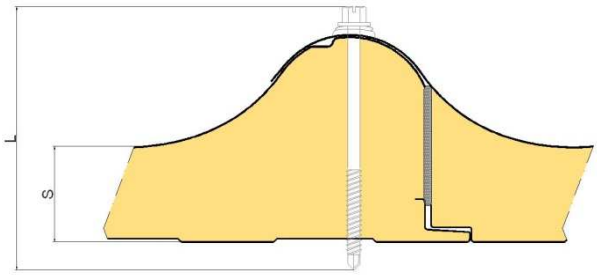
B
Incorrect tightening due to the torque applied to the screw being insufficient to ensure correct fastening of the panel to the structure.

C
Correct tightening obtained by applying sufficient torque to the screw to ensure fastening of the panel to the structure.

Screw length

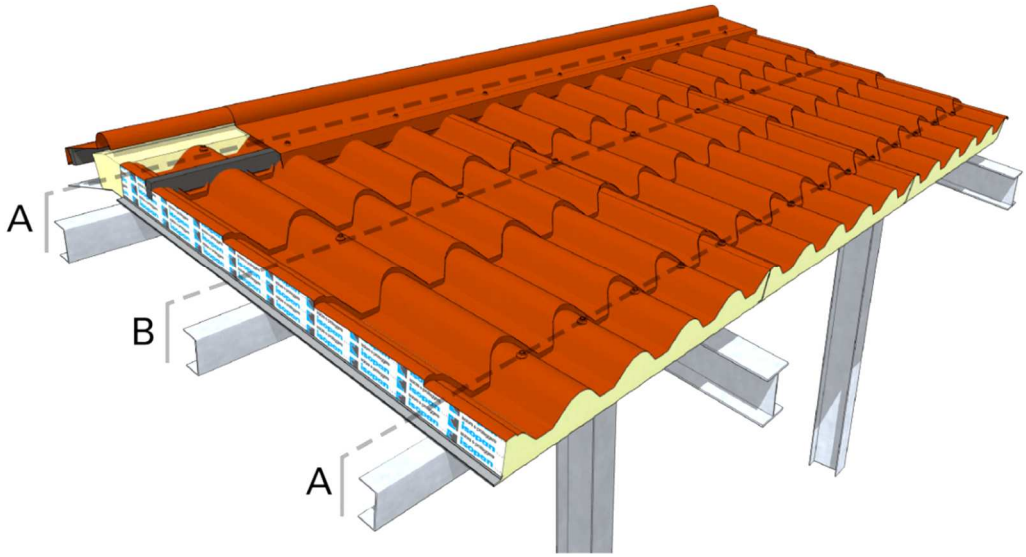
The proper screw length depends on panel thickness and on the type of support (steel, wood).

Fastening support	S (mm)	L (mm)
Wood	40	120 - 130
	50	130 - 150
	60	150 - 160 -180
	80	170 - 180 - 190
Steel	40	120 - 130
	50	
	60	130 - 140
	80	150 - 160



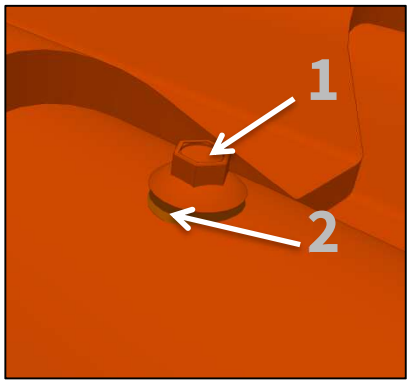
Roof panel fastening

The panels must be installed opposite the direction of the prevailing winds, frequently checking to make sure they are parallel and aligned. The holes must have a smaller diameter to the fastening elements. The number of fastenings depends on the local climatic zone. The normal fastening density entails one on every other rib on central beams and one on every rib on terminal beams.



A. Terminal beams

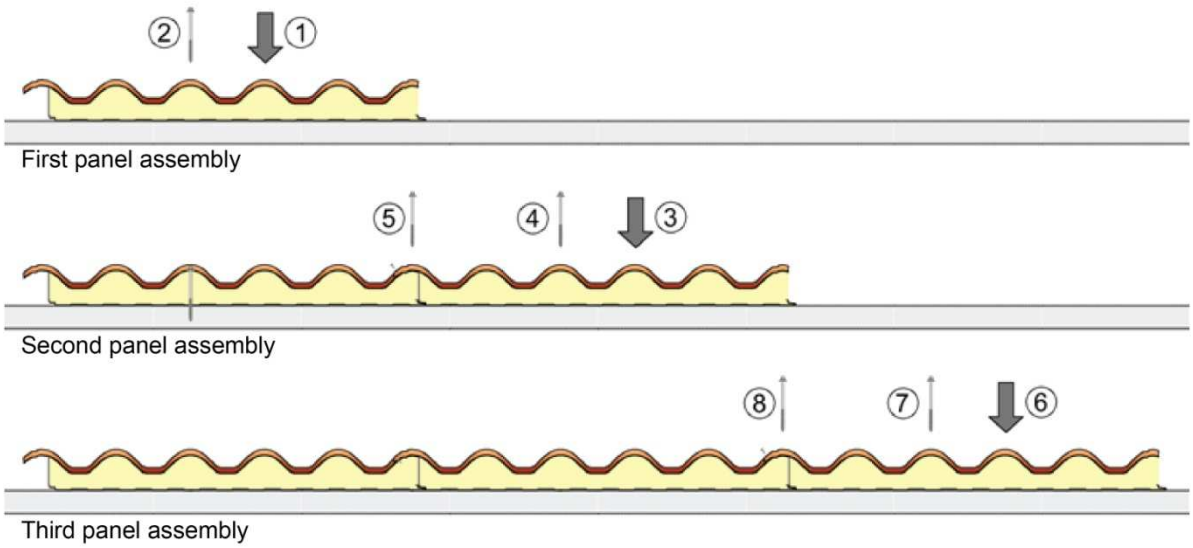
B. Central beams



1. Screw

2. Baz

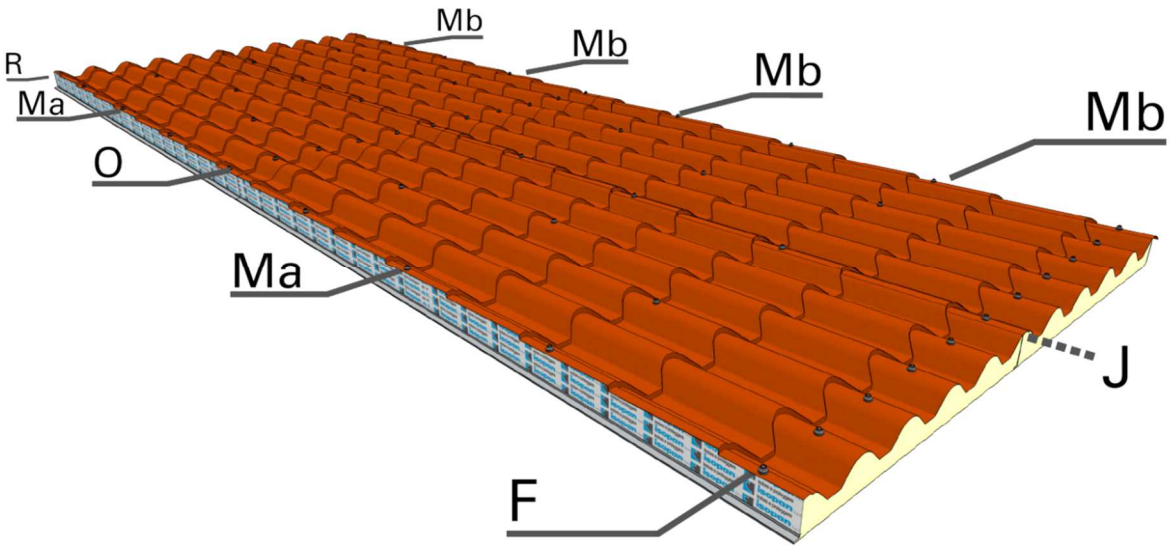
Assembly sequence



1. Install the first panel.
2. Fasten the screw on one of the central ribs.
3. Install the second panel and couple it to the already installed first panel.
4. Fasten the screw on one of the central ribs of the second panel, exerting slight pressure in order to ensure the panels are coupled during this step.
5. Fasten the screw on the overlapping rib. Rivet in the marginal overlapping area as shown in the picture below to improve sheet adhesion.

Example of correct rivet use

Proposed Isopan fastening system



R: Terminal support (ridge)

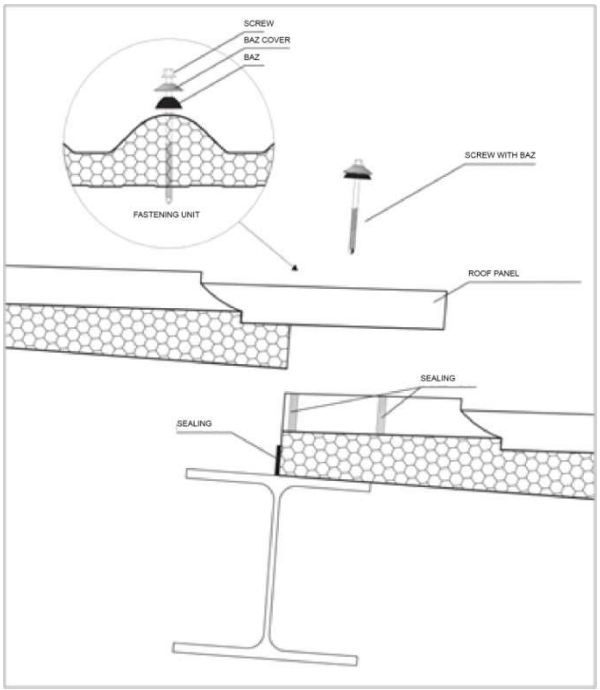
F: Terminal support (gutter)

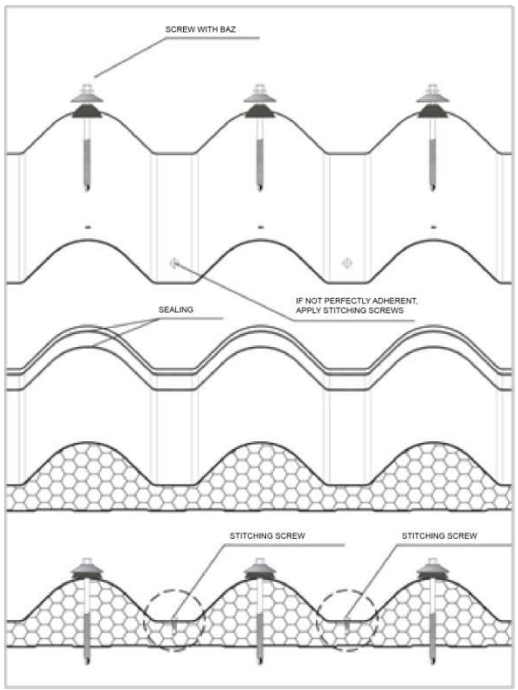
Ma/b: Intermediate supports

O: Support at the head junction

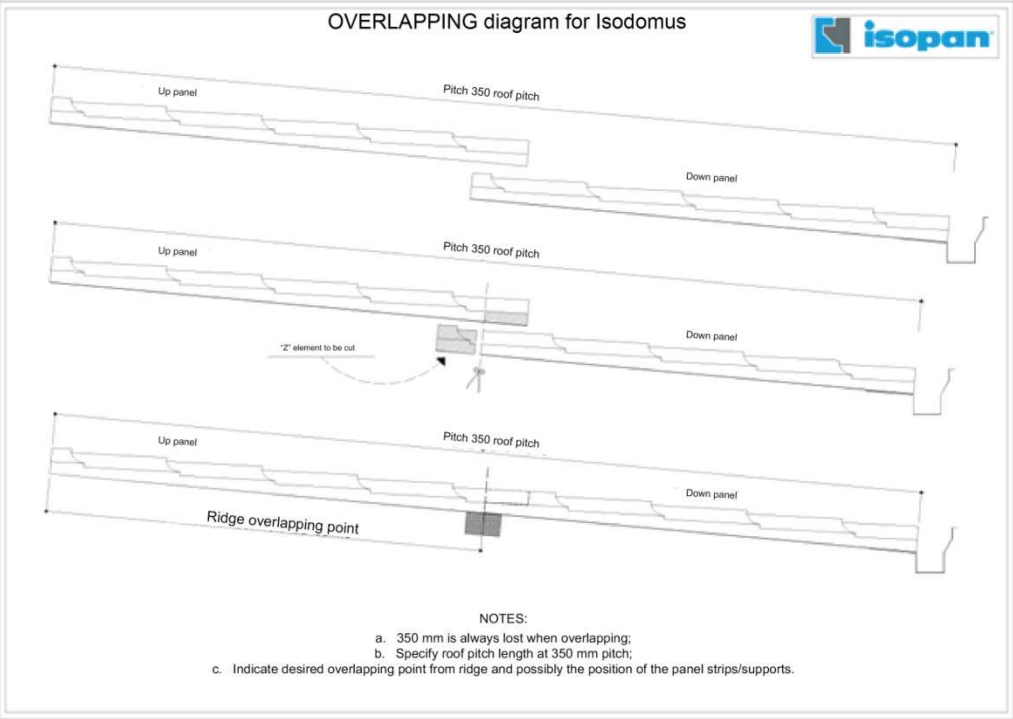
J: Longitudinal joint

Isopan detail of the head junction





Isopan convention called overlapping



Note: should the panels not fit perfectly between the ribs, Isopan recommends applying stitching screws.

ASSEMBLY INSTRUCTIONS

The correct sequence of assembly operations is the following:

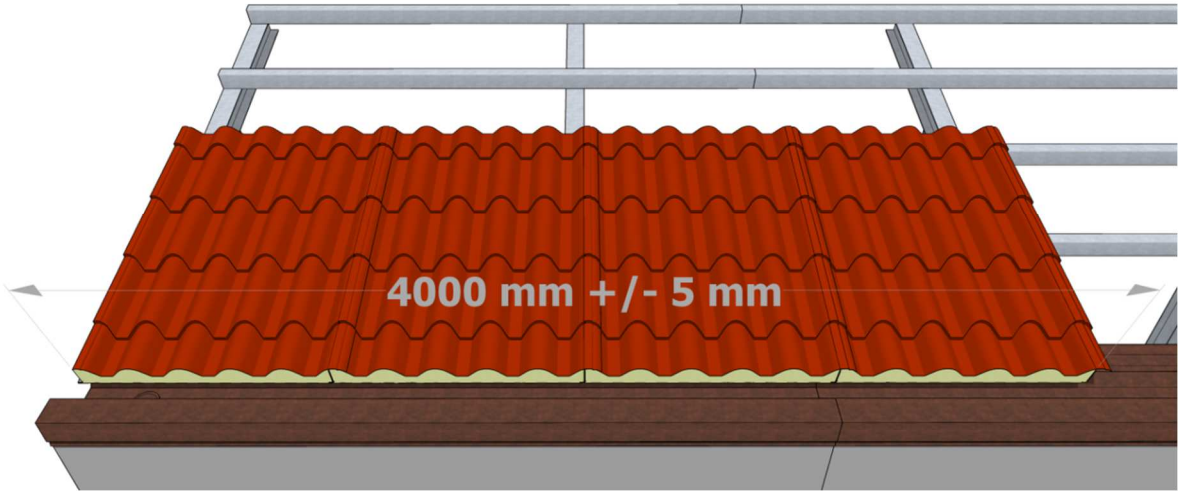
Preliminary operations

- 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

- Install gutters and any sub-ridges and connection ridge caps.
- Remove the protective film from the panels, if any.
- Install the roof panels starting from the gutter and the side of the building, taking care to properly overlap and align the elements and check for perfect orthogonality to the underlying structure.
- Systematically fasten the elements after ensuring they match correctly. All the residual materials must be quickly removed, with special attention to metallic residues.
- Install the subsequent row of elements overlapping the gutter row (when there are roof pitches in two or more elements). The insulating core in the overlapping area must first be removed.
- Fasten the elements on all the ribs on the ridge, gutter, valley and head overlap lines.
- In the overlapping area on ridge (first tile) and gutter (last tile), and in any case where the sheet is not perfectly abutting, rivets must be used in order to assure adequate aesthetic and functional panel performance (see photo attached).
- Install finishing elements (ridges, ridge caps, and tinwork in general) and any related insulating elements.
- Check and clean the roof, with particular attention to metal scraps, fastenings and fittings with door and window frames. After completing panel and tinwork element assembly, make sure no foreign material or processing scraps are left on the roof, as these may trigger corrosion phenomena, prevent proper rainwater draining or create a build-up of aggressive, undesired substances.



Note: take care to properly place the panels during the assembly step (4 panels = 4000 mm ± 5 mm) in order to prevent problems during the next ridge installation step, as shown in the figure.

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)	30	40	50	60	80	100
No. of panels per package	14	12	10	8	6	4

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 roof 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.

We recommend, especially for roof panels with metal facings in pre-painted galvanised steel, checking the roof pitch slope and other construction details in order to promote normal water drainage and prevent aggressive materials from accumulating, which would lead to premature oxidation.

In the event of roof pitches with longitudinal overlapping (panel overlap), we recommend paying special attention during installation to seal the sheets in order to prevent leaks or stagnation on the end part of the panel.

We recommend using accessories like ridge tinwork, caps and gaskets supplied by Isopan, as they are appropriately designed for the specific use of the manufactured products.

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 roof, 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''.

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)

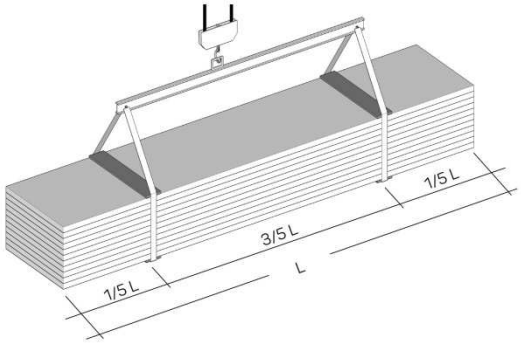


Figure 1
Suitable spacers must be placed under and above the package, made of sturdy solid wood or plastic elements to prevent the strap from coming into direct contact with the package.
These spacers must be at least 4 cm longer than the width of the package and be at least as wide as the strap.
Make 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 each 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 6 months, while outdoor storage should never exceed 60 days.
Packages stored at a height must always be properly bound to the structure.

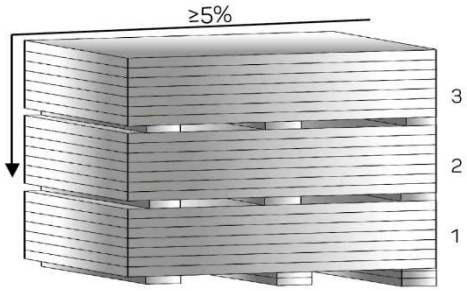


Figure 2

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 face. It is not advisable to wait for more than two weeks 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 (accident-prevention 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)

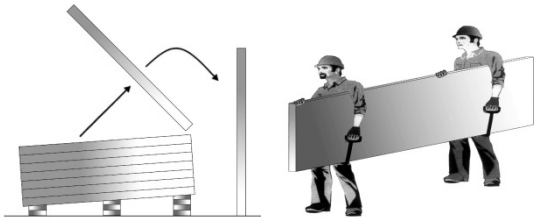


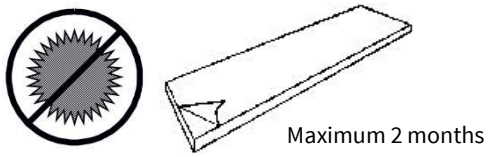
Figure 3
Handling equipment as well as gloves must be clean and such not to damage the items.

INSTALLATION

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.
Installation personnel must be equipped with footwear with soles that do not damage the external facing 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 is usually no less than 7%. For smaller slopes, adopt the seller's provisions.
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 supports 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 by a protective film to direct sunlight.



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

MAINTENANCE

The main routine maintenance operation is cleaning the panels. Panel surfaces that, following visual inspection, are found to be dirty or oxidised can be washed with soap and water using a soft brush. 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
Angular cut-edge parts	Check the state of oxidation Clean and repaint

These provisions are taken from the General Conditions of Sale.

Annex B

BUILDING DETAILS

RPCV 19 - Detail of gutter side on traditional structure

RPCV 53 - Detail of gutter side on traditional structure - with liquid sheath

RPCV 20 - Roof connection to ridge area traditional structure

RPCV 23 - Roof connection to side traditional structure

RPCV 24 - Detail of side roof pitch on traditional structure

SCV 12 - Simple roof ridge

SCV 13 - Hinged roof ridge

SCV 14 - Detail of valley gutter

SCV 24 - Overlap fastening

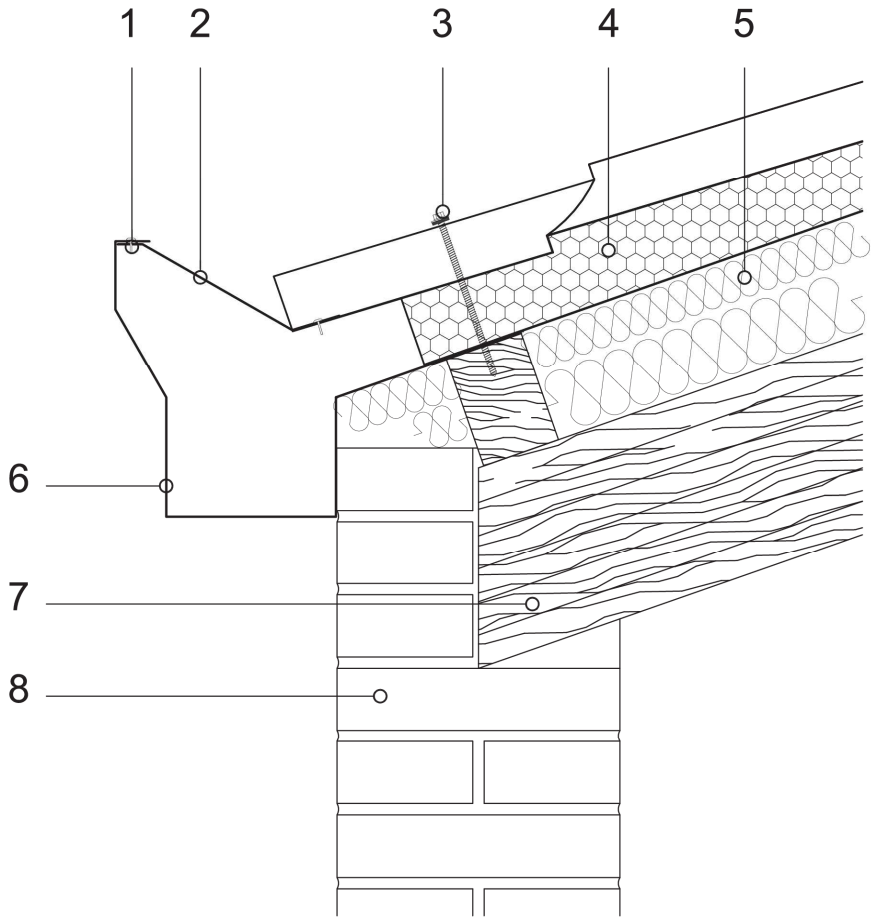
SCV 25 - Stitching screw positioning

ISOSKYdomus

DETAIL OF GUTTER SIDE ON TRADITIONAL STRUCTURE

ISOPAN RPCV 19

Detail of gutter side on traditional structure



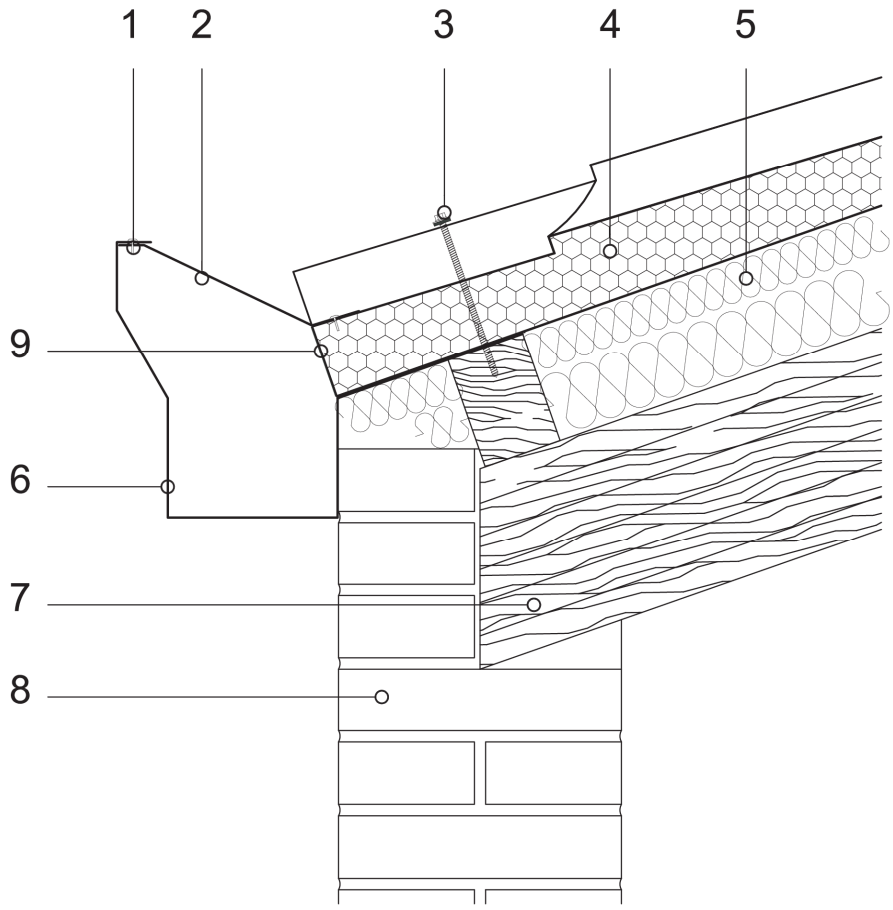
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key	
1	Rivet
2	Gutter support fascia bracket
3	Panel fastening screw
4	ISOPAN ISODOMUS roof panel
5	Mineral wool insulating material
6	Gutter
7	Wooden roof structure
8	Brick wall

DETAIL OF GUTTER SIDE ON TRADITIONAL STRUCTURE - WITH LIQUID SHEATH

ISOPAN RPCV 53

Detail of gutter side on traditional structure - with liquid sheath



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

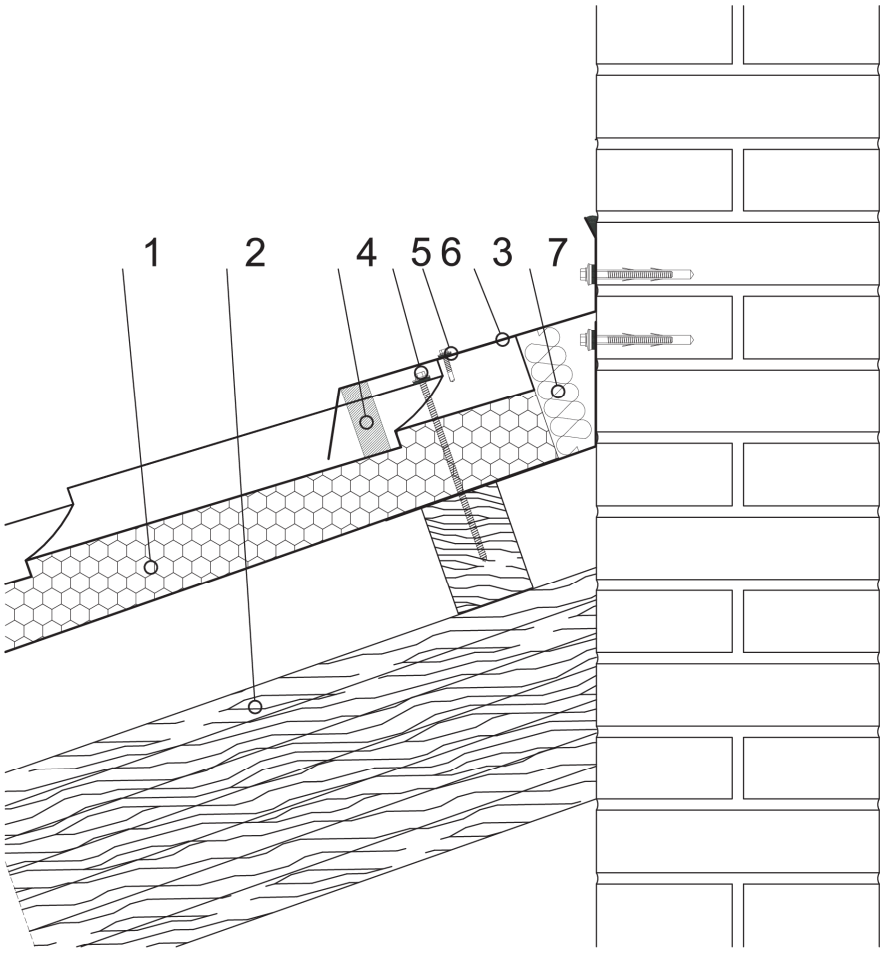
Key	
1	Rivet
2	Gutter support fascia bracket
3	Panel fastening screw
4	ISOPAN ISODOMUS roof panel
5	Mineral wool insulating material
6	Gutter
7	Wooden roof structure
8	Brick wall
9	On-site application of colourless protective liquid sheath

ROOF CONNECTION TO RIDGE AREA TRADITIONAL STRUCTURE

ISOPAN

RPCV 20

Roof connection to ridge area traditional structure



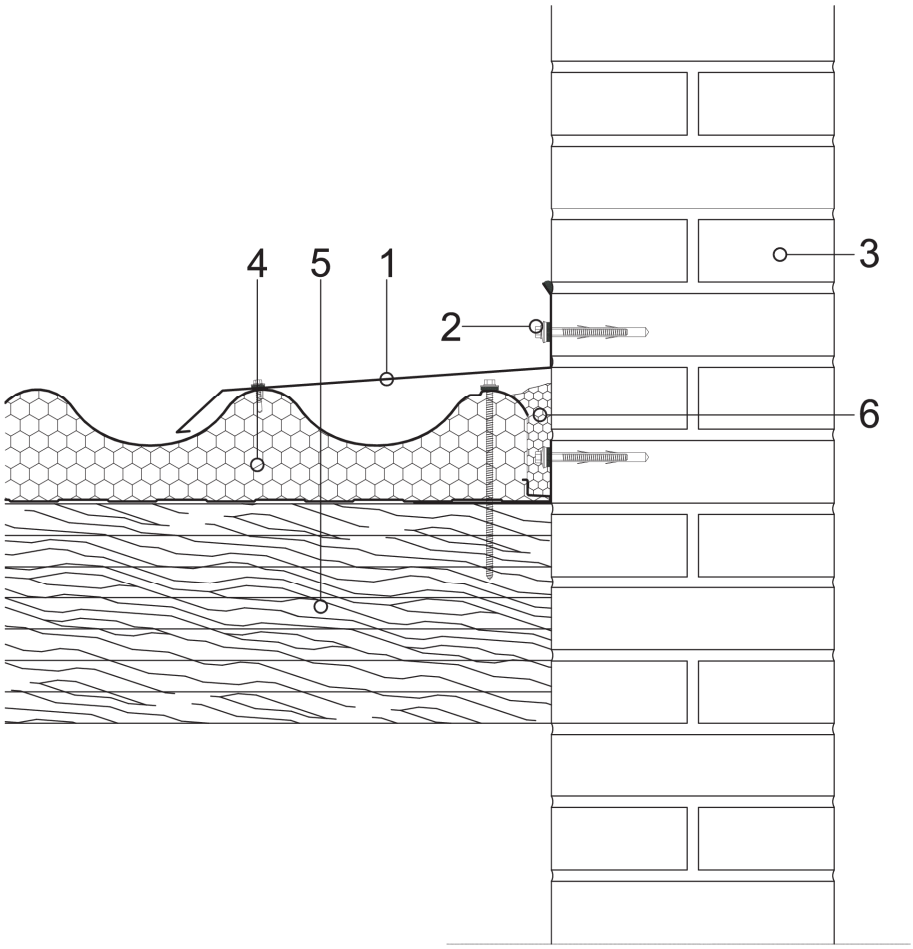
The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.

Key	
1	ISOPAN ISODOMUS roof panel
2	Wooden roof structure
3	Punched liner ridge cap
4	Gasket
5	Panel fastening screw
6	Sheet fastening screw
7	Mineral wool insulating material

ROOF CONNECTION TO SIDE TRADITIONAL STRUCTURE

ISOPAN RPCV 23

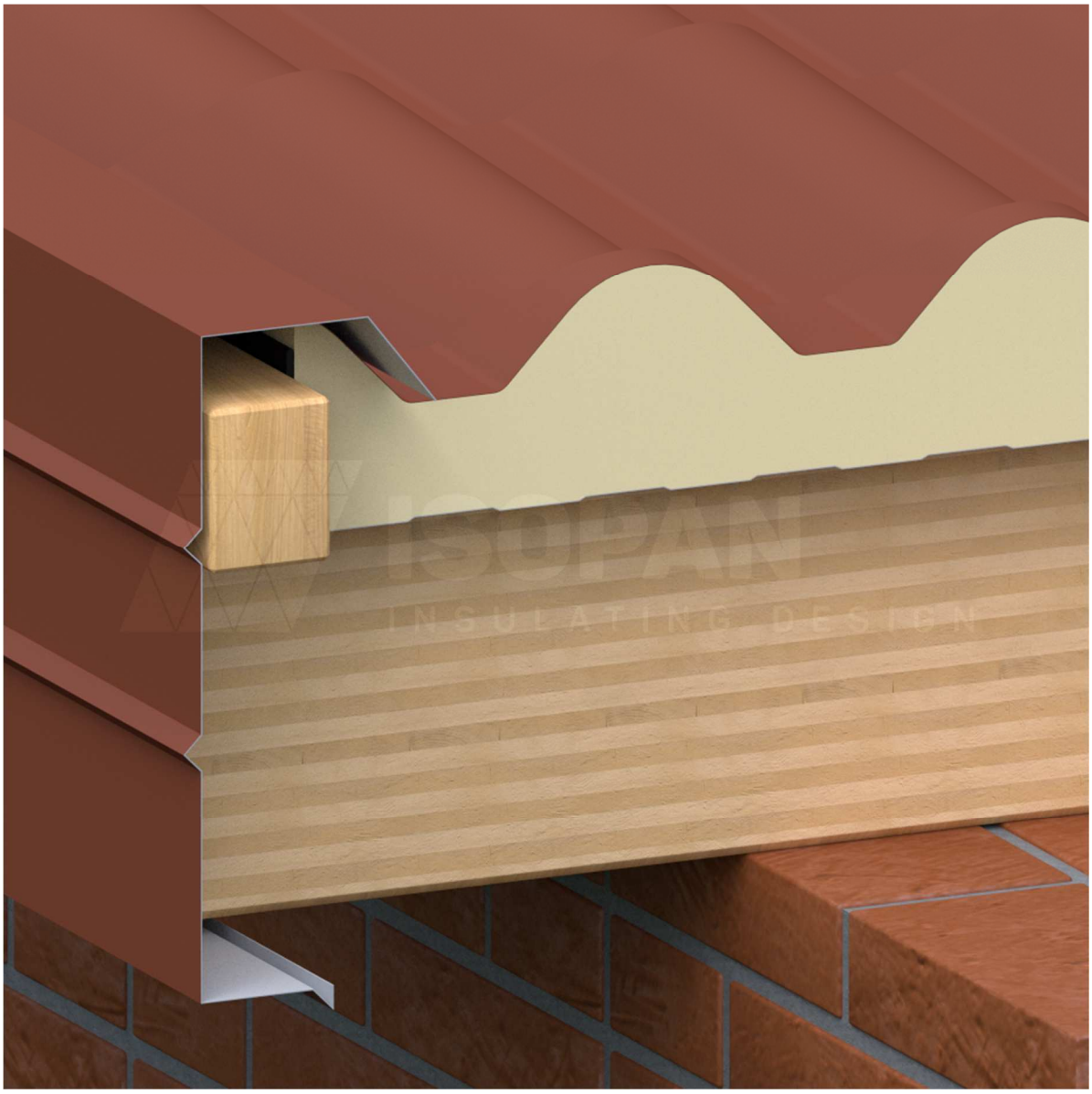
Roof connection to side traditional structure



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

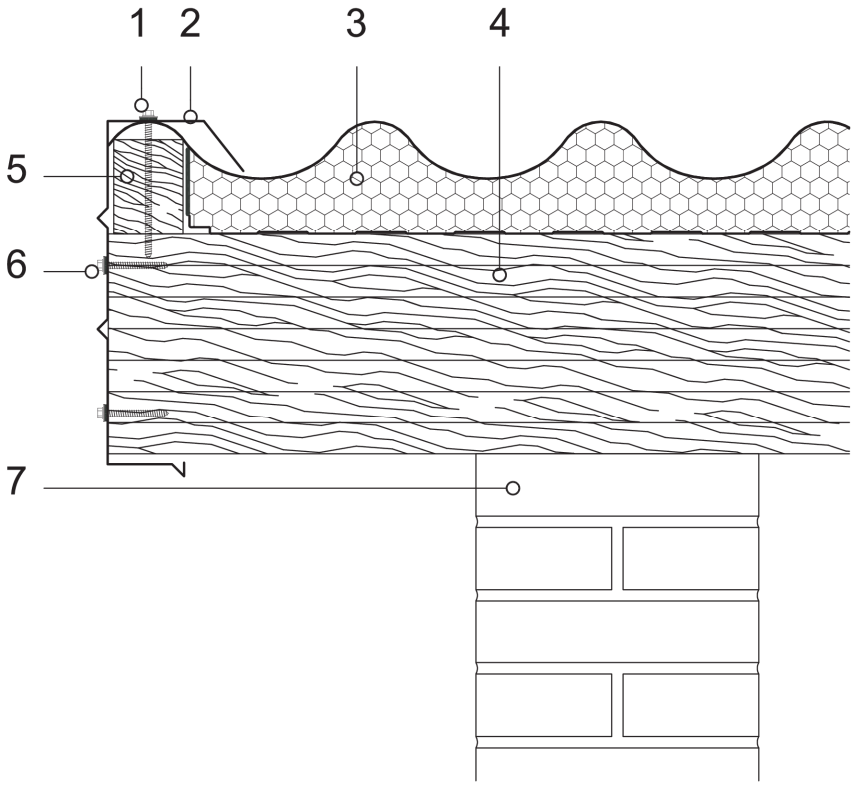
Key	
1	Roof pitch liner ridge cap
2	Panel and ridge cap fastening screw
3	Brick wall
4	ISOPAN ISODOMUS roof panel
5	Main wooden structure
6	Polyurethane foam insulating material

DETAIL OF SIDE ROOF PITCH ON TRADITIONAL STRUCTURE



ISOPAN RPCV 24

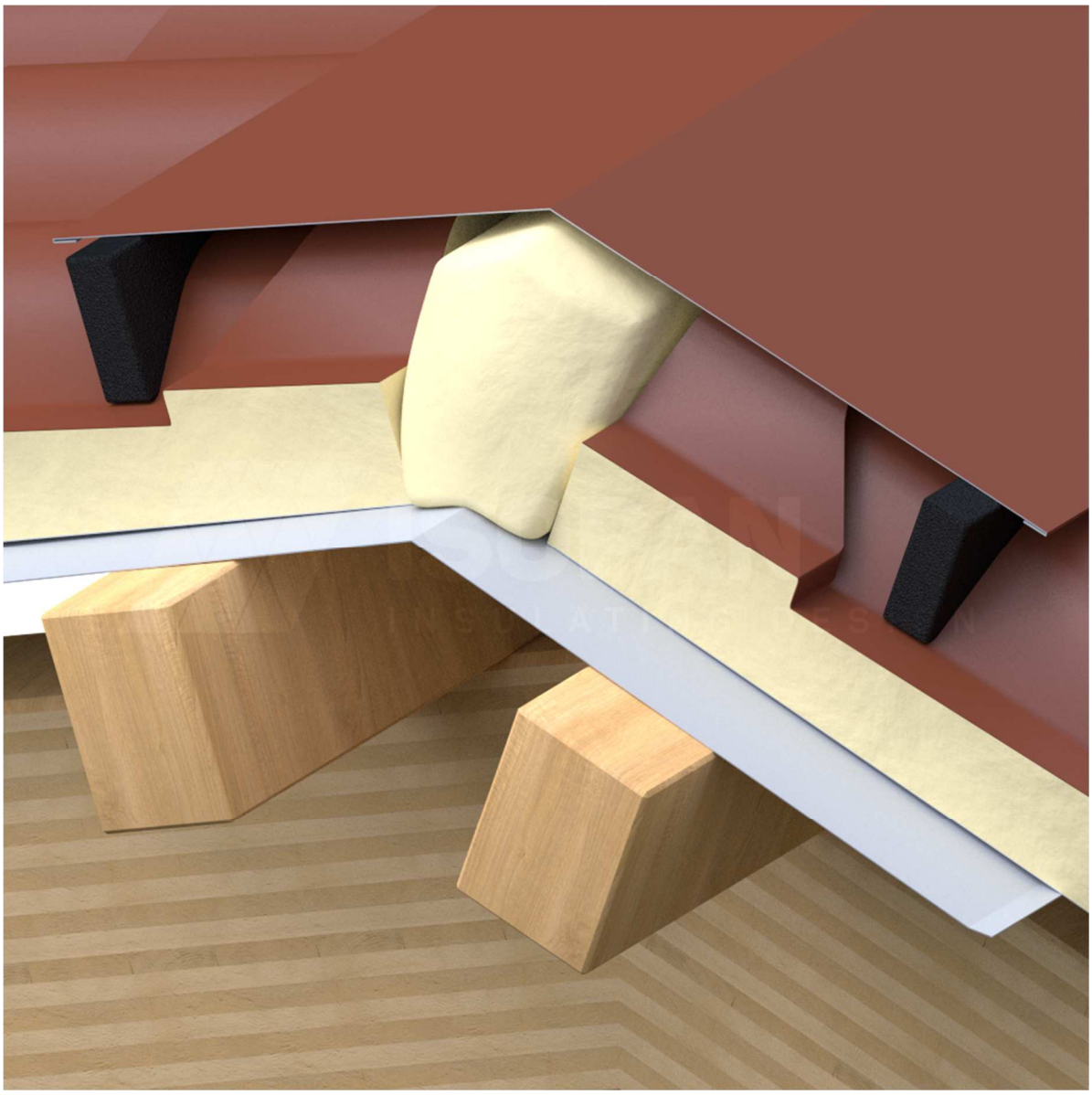
Detail of side roof pitch on traditional structure



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

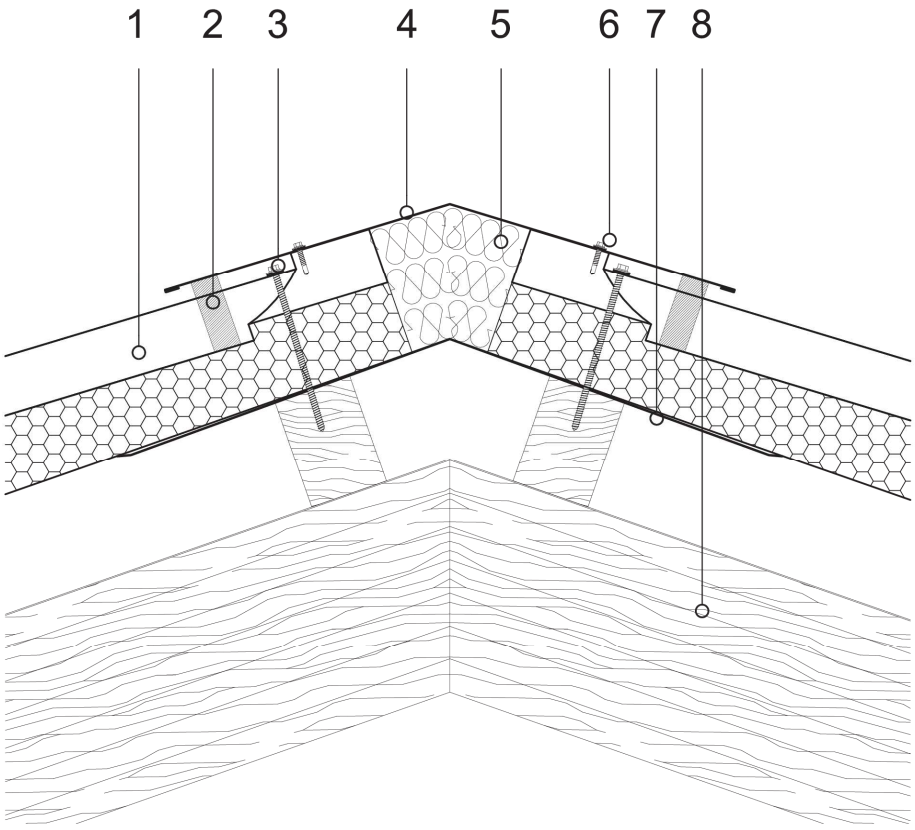
Key	
1	Roof pitch tinwork fastening screw with panel and structure
2	Roof pitch tinwork
3	ISOPAN ISODOMUS roof panel
4	Main wooden structure
5	First corrugation support strip
6	Roof pitch tinwork fastening screw
7	Brick wall

SIMPLE ROOF RIDGE



ISOPAN SCV 12

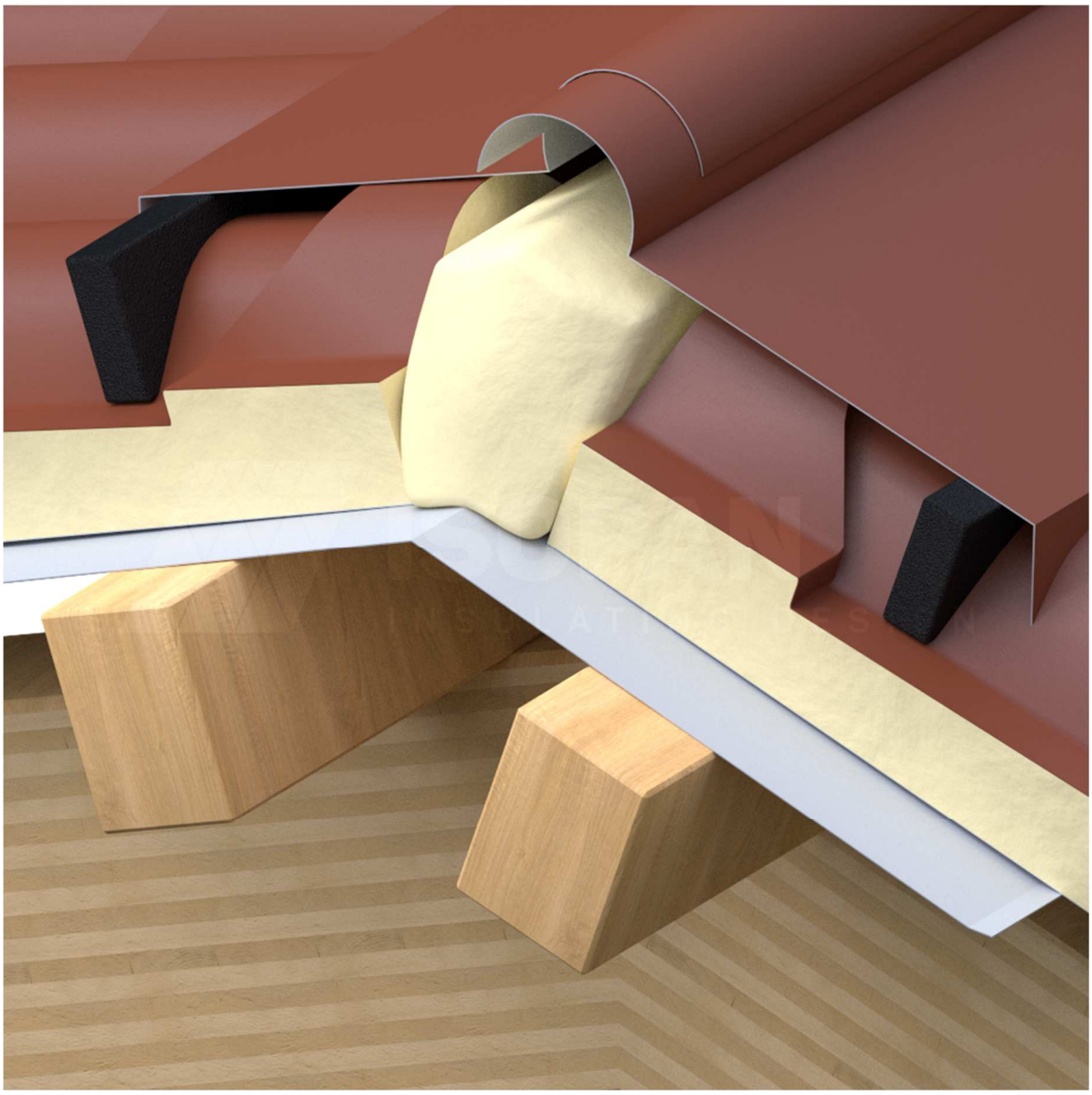
Type 5 roof ridge: vertical cross-section



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

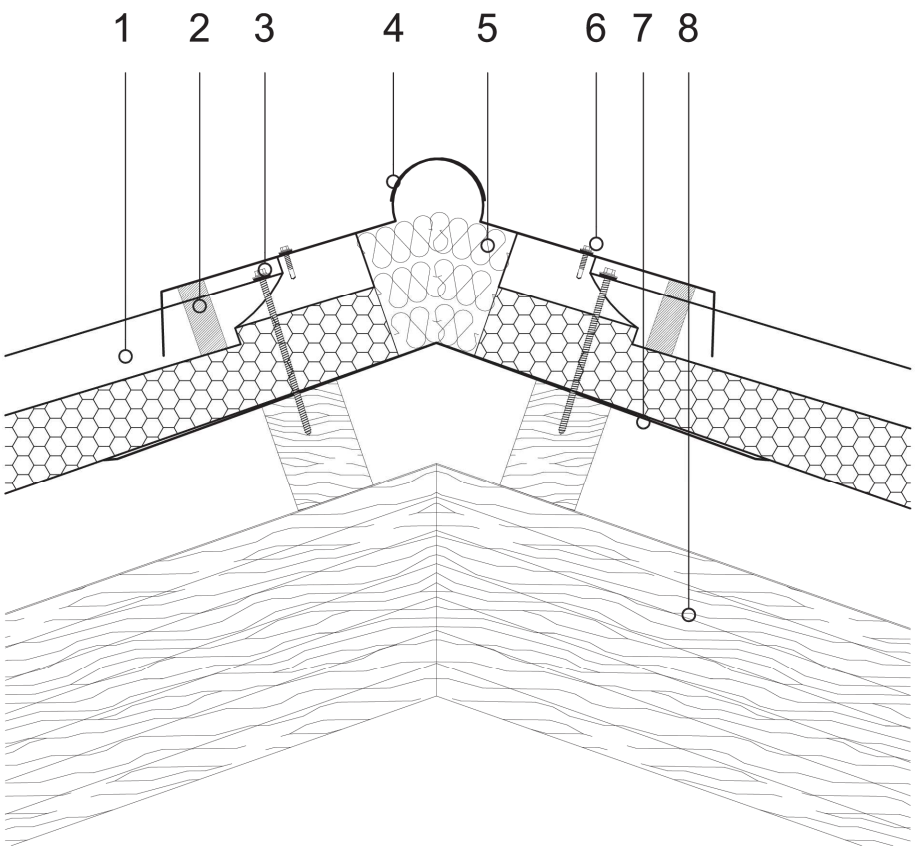
Key	
1	ISOPAN ISODOMUS roof panel
2	Under-ridge rib cover
3	Panel fastening screw
4	Flat ridge outer ridge cap
5	Polyurethane or mineral wool insulating material
6	Ridge fastening screw
7	Under-ridge metal sheet
8	Wood load-bearing structure

HINGED ROOF RIDGE



ISOPAN SCV 13

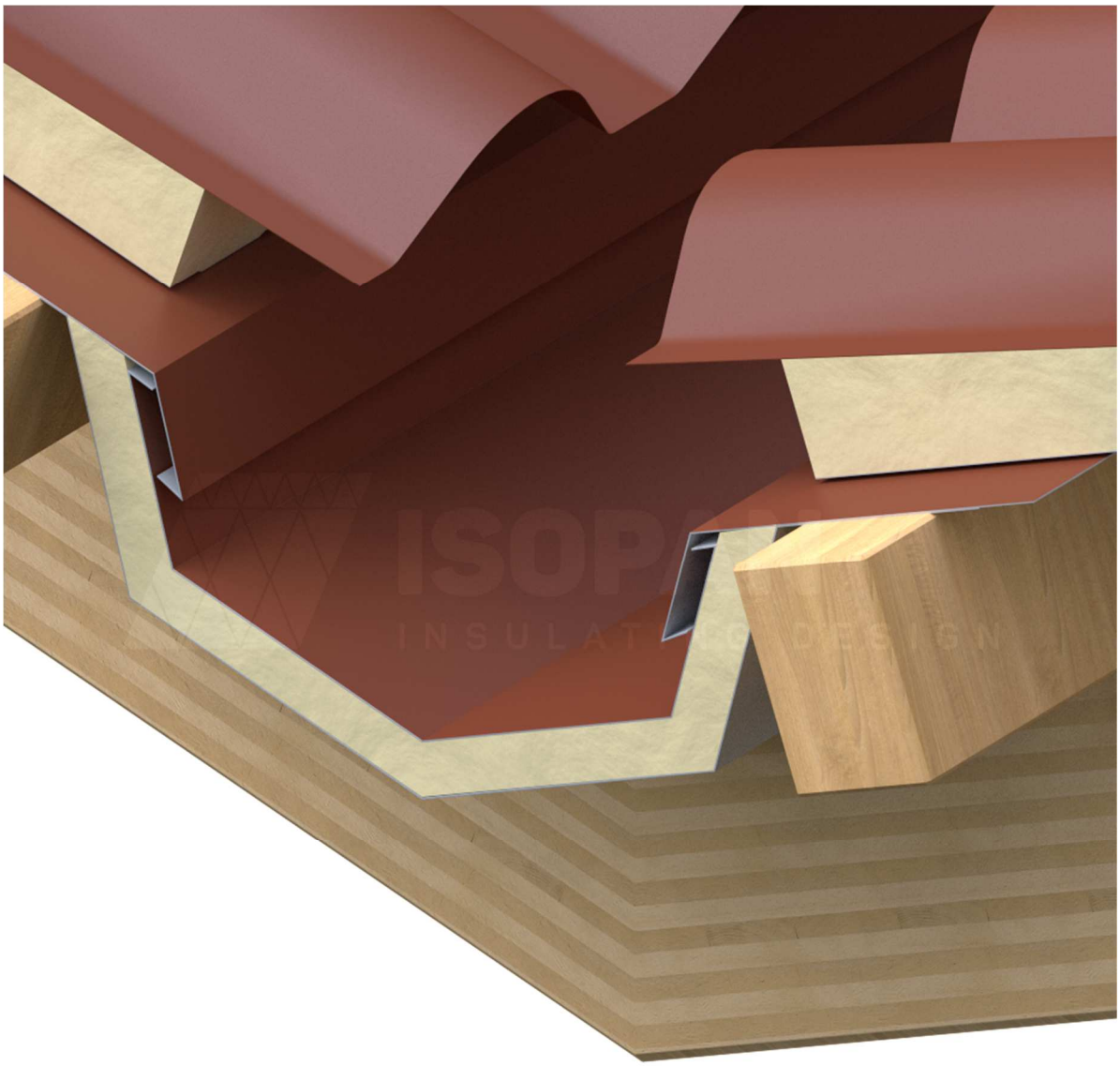
Type 6 roof ridge: vertical cross-section



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

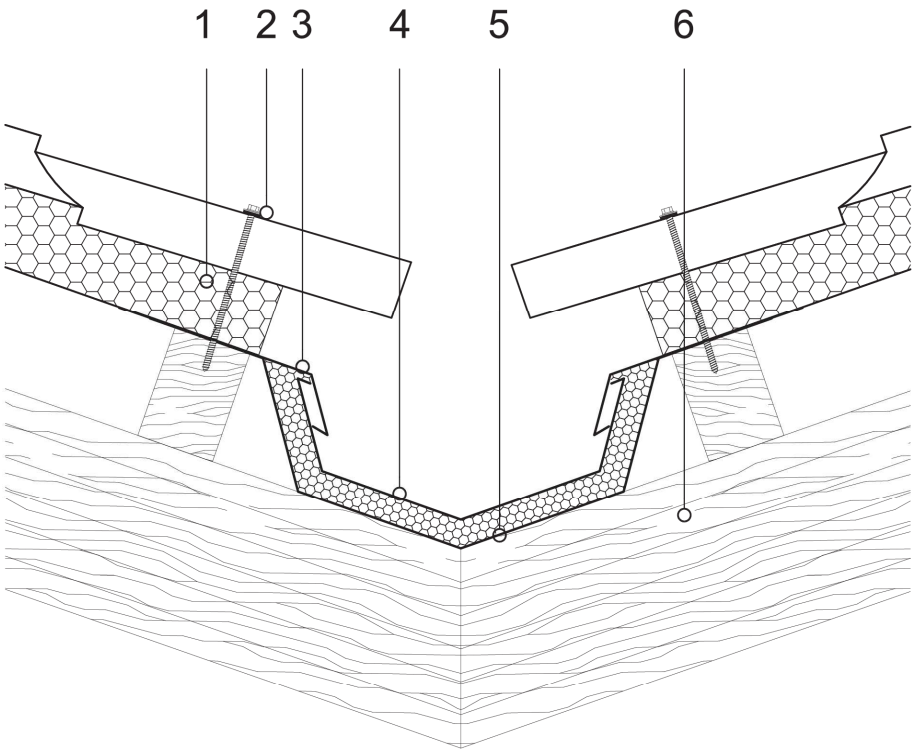
Key	
1	ISOPAN ISODOMUS roof panel
2	Under-ridge rib cover
3	Panel fastening screw
4	Punched ridge outer ridge cap
5	Polyurethane and mineral wool insulating material
6	Ridge fastening screw
7	Under-ridge metal sheet
8	Wood load-bearing structure

DETAIL OF VALLEY GUTTER



ISOPAN SCV 14

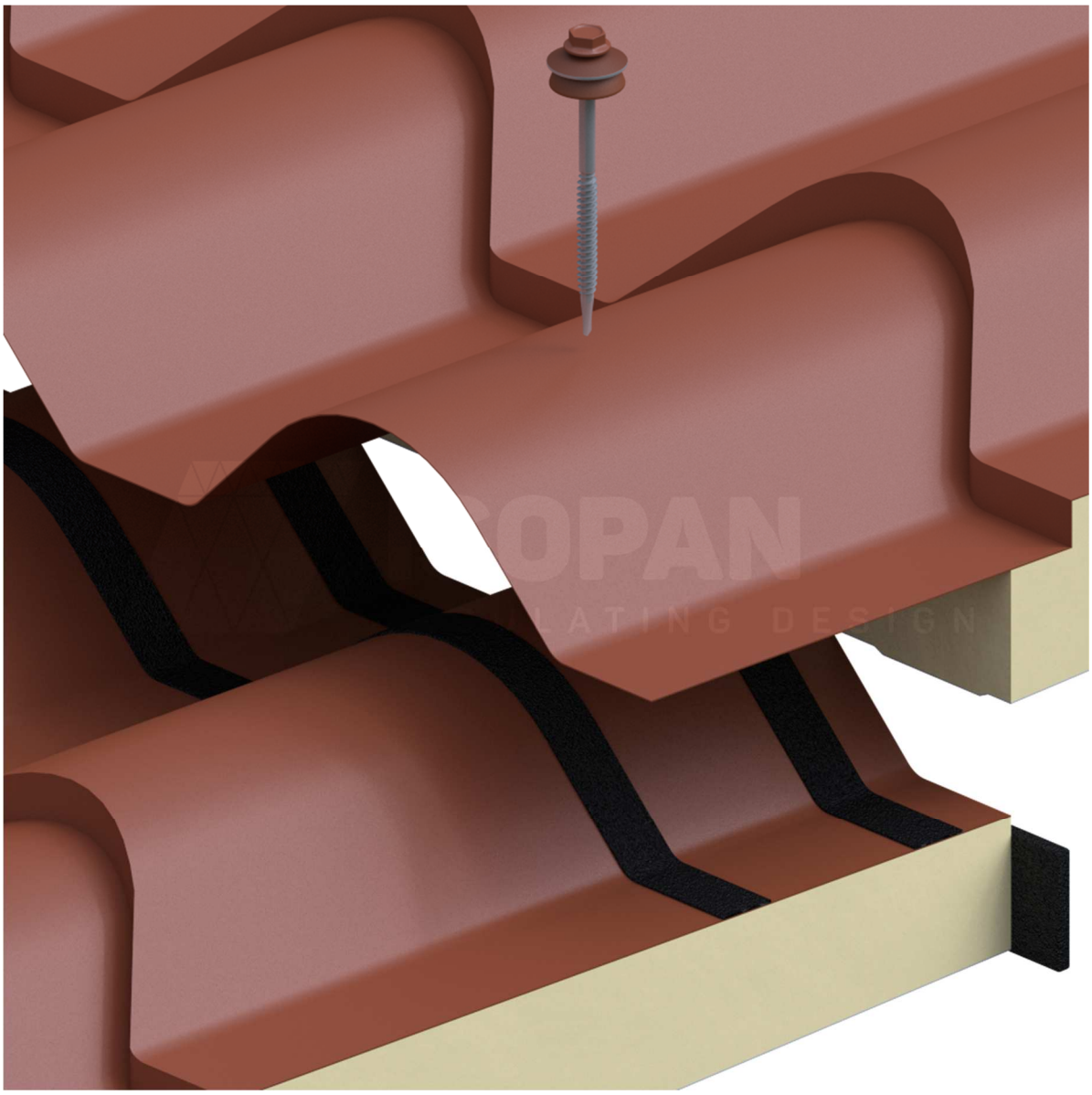
Type 3 gutter with valley detail



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 ISODOMUS roof panel
2	Panel fastening screw
3	Drip edge metal sheet
4	Gutter metal sheet
5	Eaves metal sheet
6	Wood load-bearing structure

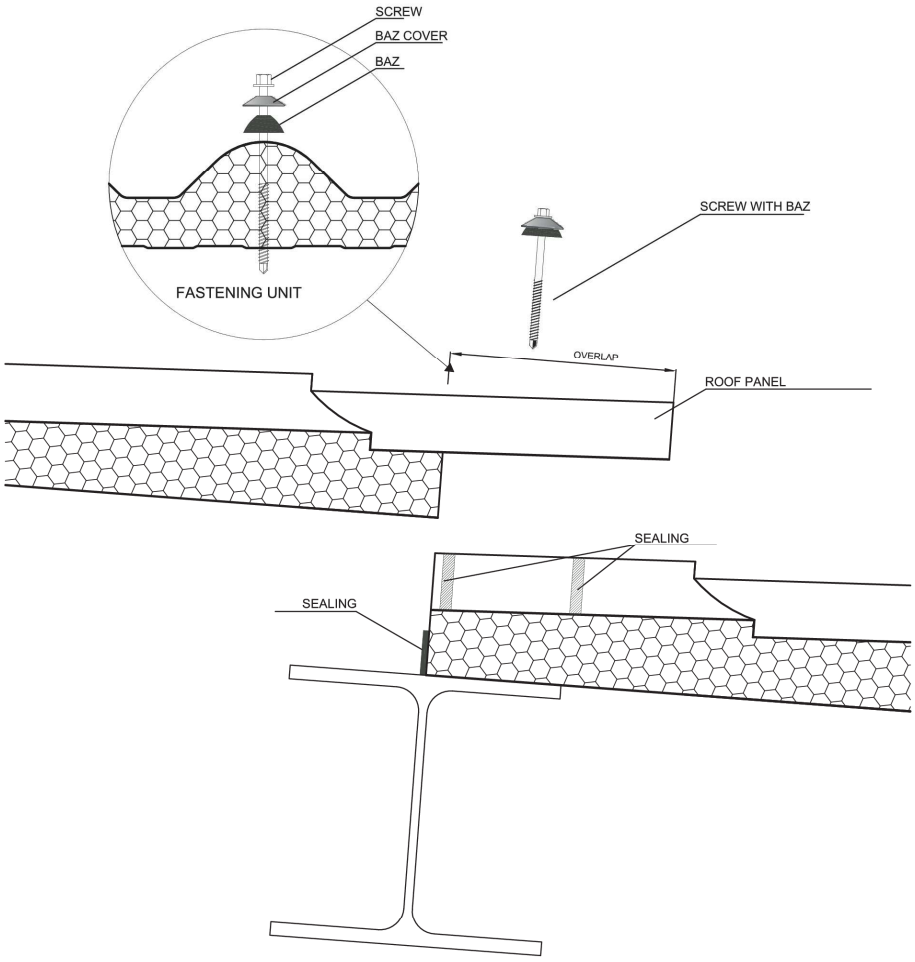
OVERLAP FASTENING



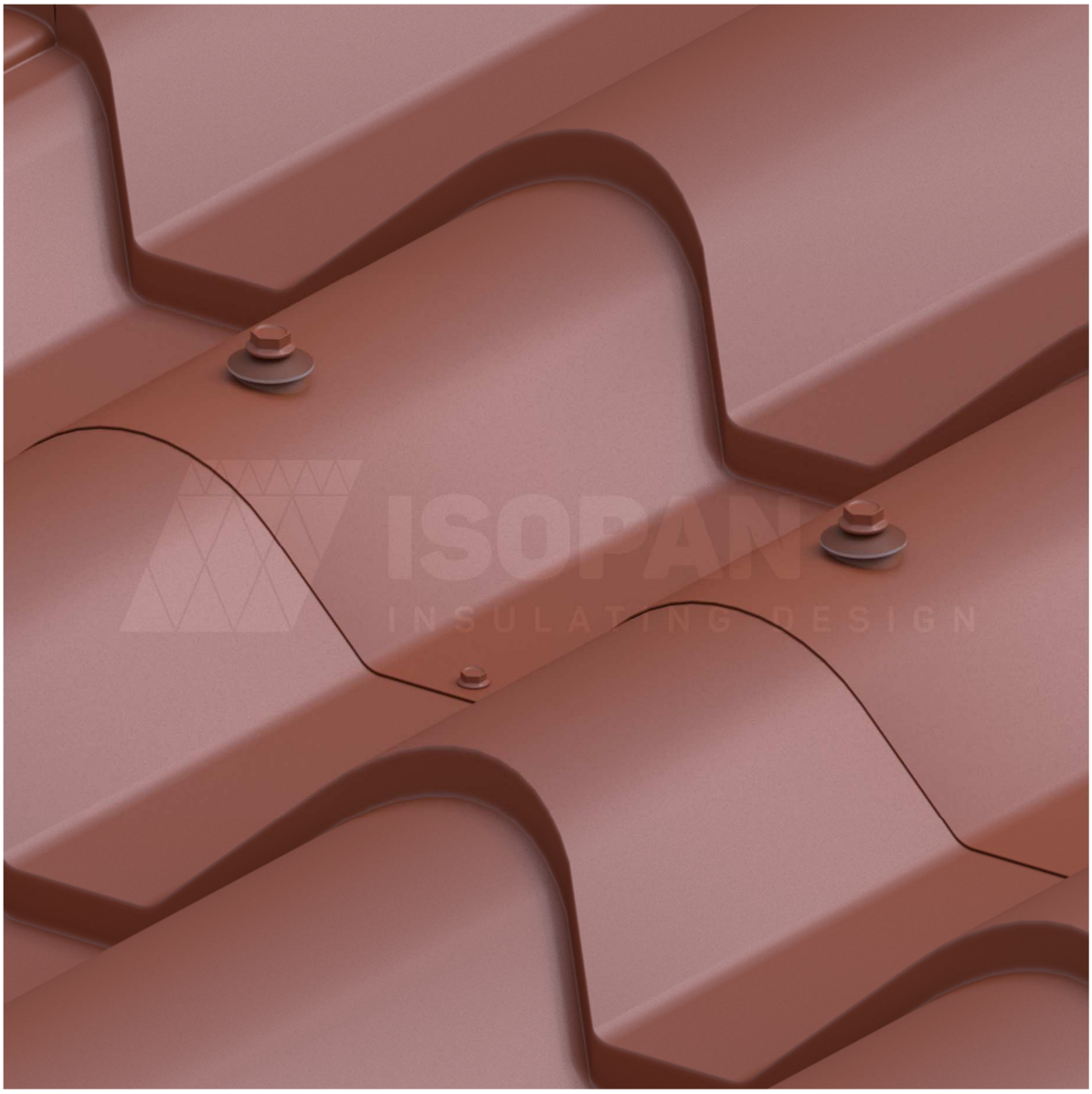
ISOPAN

SCV 24d

Head overlap cross-section



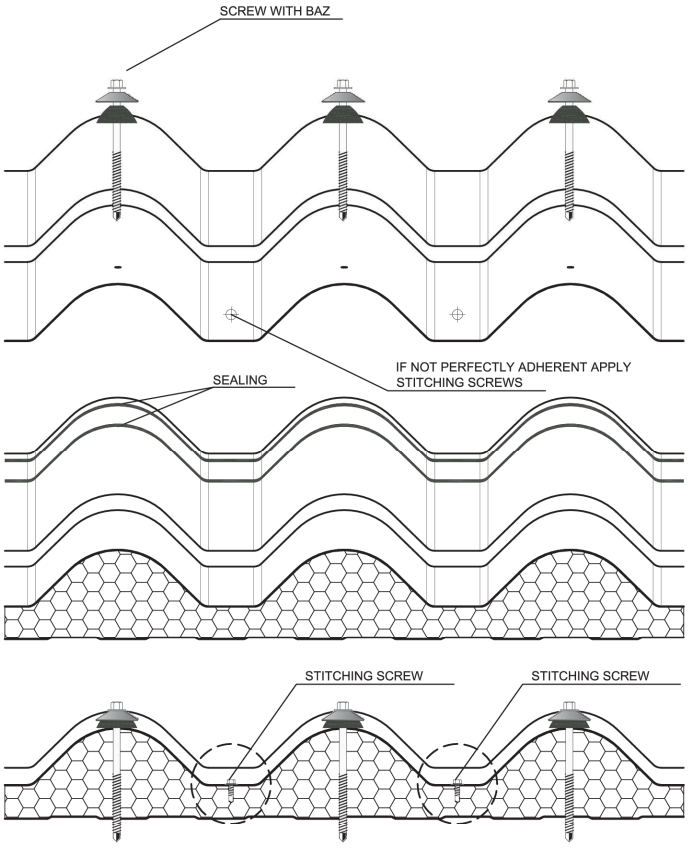
STITCHING SCREW POSITIONING



ISOPAN

SCV 25d

Head overlap cross-section



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PART OF MANNI GROUP

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