

MANUFACTURED IN:



# TECHNICAL MANUAL

## Flat Roof Range

ISODECK PVSTEEL | ISODECK SYNTH



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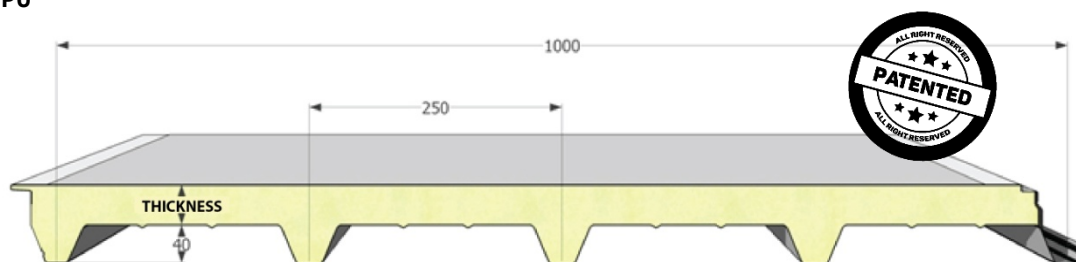
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# Flat Roof Range

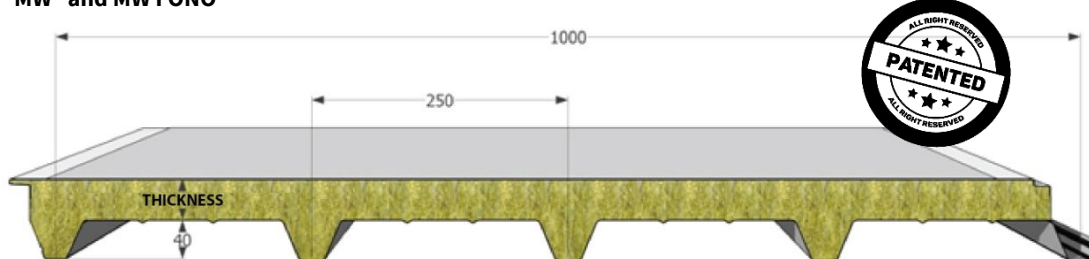
## TYPES OF PANELS

### ISODECK PVSteel

#### - PU



#### - MW\* and MW FONO\*



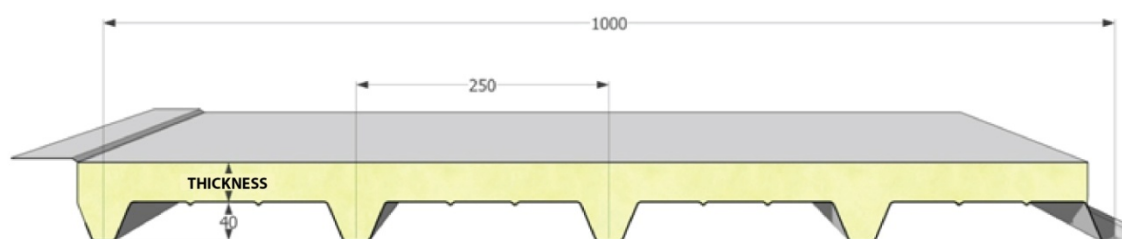
\*Only manufactured in the facility of Trevenzuolo (Verona), IT

Ideal panel to create flat or slightly sloping roofs. The panel consists of a pre-coupled metal external face with a membrane in PVC/TPO, an internal ribbed support and polyurethane or mineral wool insulating core; the solution allows for the creation a fully waterproof roof with high aesthetic value, also ideal for replacing fibre cement roofing.

ISODECK PVSteel panel is an Isopan patented product.

\*\* ISODECK PVSTEEL MW FONO: Internal facing made with micro-holed ribbed metal sheet

### ISODECK Synth



Insulated single skin metal faced roof panel in polyurethane for use in flat or slightly sloping roofs. The non-metallic external surface is made of a synthetic PVC-P/TPO membrane, which ensures waterproofing and high thermal insulation values. There are pass-through fastenings in place and their number and position must be such as to ensure resistance to stress.

## GEOMETRIC FEATURES

	ISODECK PVSTEEL PU	ISODECK PVSTEEL MW	ISODECK PVSTEEL MW FONO*	ISODECK SYNTH
<b>Panel length</b>	Up to maximum transportable			
<b>Useful Pitch (mm)</b>	1000			
<b>Insulating Thickness (mm)</b>	30-40-50-60- 80-100-120-150	50-60-80- 100-120-150-170- 200	50-60-80- 100-120-150	30-40-50- 60-80-100
<b>Internal face</b>	Ribbed metal sheet with 5 ribs: -rib height 40 mm -rib pitch 250 mm			
<b>External face</b>	smooth obtained by applying a waterproof PVC/TPO membrane			synthetic PVC/TPO membrane

\* ISODECK PVSTEEL MW FONO: Internal facing made with micro-holed ribbed metal sheet

## CHARACTERISTICS OF THE PVC/TPO MEMBRANE

### ISODECK PVSteel PVC

PVC membrane (Polyvinyl Chloride with added plasticisers for high flexibility) developed for regions with high UV solar radiation. The single-layer membrane for roofs has an anti-UV facing for creating cold roofs with excellent performance. The membrane is able to reflect part of the solar radiation, thereby granting the building lower heat accumulation. This membrane is therefore able to represent a lasting investment with a low environmental impact.

### ISODECK PVSteel TPO

Synthetic waterproofing membrane obtained via coextrusion of an elastomeric polyolefin based on polypropylene (TPO/FPA), resistant to ultraviolet rays and even. The membrane is made with contrasting colours between the upper and lower sides (signal layer) to allow for a visual check of its surface integrity during and after site installation stages. The membranes comply with the requirements for CE marking, where required.

### ISODECK Synth PVC

Synthetic PVC membrane, obtained by coating. Made up of Plastisol with different chemical-physical properties and dimensionally stabilised. Coupled with a non-woven polyester felt support.

Manufactured in a UNI EN ISO 9001:2000 (quality management system) and UNI EN ISO 14001 (environmental management systems) certified facility. Site installation by expert and qualified personnel (contact Isopan for information).

### Characteristics

- High resistance to weathering and UV rays
- No dimensional shrinkage
- Not sensitive to hot-cold cycles
- Resistance to punching
- Potential RAL colouring for landscape or architectural purposes

### ISODECK Synth TPO

Synthetic waterproofing membrane obtained via coextrusion of an elastomeric polyolefin based on polypropylene (TPO/FPA), resistant to ultraviolet rays and even. The membrane is made with contrasting colours between the upper and lower sides (signal layer) to allow for a visual check of its surface integrity during and after site installation stages. The membranes comply with the requirements for CE marking, where required.

## 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.

## PROTECTION OF THE PRE-PAINTED FACINGS

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 damage 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 preparation of the materials.

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

## INSULATION

### *Polyurethane (ISODECK PVSteel PU and ISODECK Synth)*

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

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

minimum	- 40°C
maximum	+ 80°C

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

Thermal transmission coefficient  $U^*$

Panel thickness (mm)	30	40	50	60	80	100	120	150
<b>U [W/m²K]</b>	0.71	0.54	0.44	0.37	0.28	0.22	0.19	0.15

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

Thermal resistance coefficient R

Panel thickness (mm)	30	40	50	60	80	100	120	150
<b>R [m²K/W]</b>	1.41	1.85	2.27	2.70	3.57	4.55	5.26	6.67

### *Mineral wool (ISODECK PVSteel MW)*

Made with oriented fibre rock wool, with the following physical-mechanical features:

- Incombustibility Class A1 according to EN standard 13501
- Thermal conductivity coefficient  $\lambda = 0.04$  W/mK
- Compressive strength  $\geq 0.06$  MPa (at 10% deformation)
- Tensile strength  $\geq 0.04$  MPa

Thermal transmission coefficient U<sup>\*</sup>

Panel thickness (mm)	50	60	80	100	120	150	170	200
<b>U [W/m²K]</b>	0.78	0.66	0.50	0.41	0.34	0.28	0,24	0,20

\* 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
<b>R [m²K/W]</b>	1.28	1.52	2.00	2.44	2.94	3.57	4,17	5,00

## PANEL WEIGHT

Isodeck PVSteel PU

Internal sheet thickness (mm)		Nominal thickness of the panel (mm)							
		30	40	50	60	80	100	120	150
0.6	kg/m²	14.4	14.8	15.2	15.6	16.4	17.2	18.0	19.2
0.8	kg/m²	16.3	16.7	17.1	17.5	18.3	19.1	19.9	21.1

Isodeck PVSteel MW

Internal sheet thickness (mm)		Nominal thickness of the panel (mm)							
		50	60	80	100	120	150	170	200
0.6	kg/m²	18.4	19.4	21.4	23.4	25.4	28.4	30,4	33,4
0.8	kg/m²	20.4	21.4	23.4	25.4	27.4	30.4	32,4	35,4

Isodeck PVSteel MW FONO

Internal sheet thickness (mm)		Nominal thickness of the panel (mm)					
		50	60	50	100	50	150
<b>0,6</b>	kg/m²	18,2	19,2	21,2	23,2	25,2	28,2
<b>0,8</b>	kg/m²	20,2	21,2	23,2	25,2	27,2	30,2

Isodeck Synth

Sheet thickness (mm)		Nominal thickness of the panel (mm)					
		30	40	50	60	80	100
<b>0.6</b>	kg/m²	9.0	9.4	9.8	10.2	11.0	11.8
<b>0.7</b>	kg/m²	10.0	10.4	10.8	11.2	12.0	12.8
<b>0.8</b>	kg/m²	10.8	11.4	11.8	12.2	13.0	13.8

## 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 that a detailed verification of the stress 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.

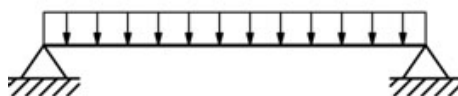
### ISODECK PVSteel

The ISODECK PVSteel panel is self-supporting as defined by UNI EN 14509: "...panel capable of supporting, by virtue of its materials and shape, its own weight and in case of panel fixed to spaced structural supports, all applied loads (snow, wind, air pressure), and transmitting these loads to the supports.", depending on the type of metal facings, their thickness and the thickness of the thermal insulating core.

Below are some examples of indicative load bearing tables:

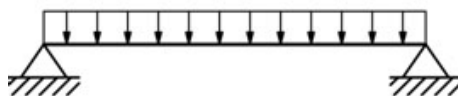
**The indications contained in the following tables do not take into account the effects due to thermal load. Furthermore, the indicative values provided cannot replace the design calculations drawn up by a skilled technician, who must validate this information under the laws in force in the place of installation of the panels.**

- PU panel on two supports:



INTERNAL STEEL SHEET 0.6 mm – Simple support 120 mm								
UNIFORMLY DISTRIBUTED LOAD [kg/ m2]	NOMINAL PANEL THICKNESS mm							
	30	40	50	60	80	100	120	150
	MAXIMUM SPAN cm							
<b>80</b>	305	335	385	405	485	495	520	580
<b>100</b>	280	310	360	395	440	450	485	525
<b>120</b>	250	290	325	360	410	425	450	485
<b>140</b>	215	270	305	340	390	400	420	455
<b>160</b>	185	245	300	310	360	370	405	435
<b>180</b>	165	210	280	300	350	355	380	410
<b>200</b>	150	185	235	295	320	340	365	400
<b>220</b>	140	160	215	270	305	320	345	375
<b>250</b>	115	140	180	225	295	305	325	355

- MW panel on two supports:

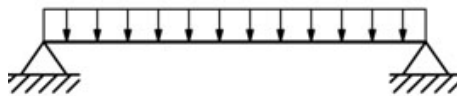


INTERNAL STEEL SHEET 0.6 mm – Simple support 120 mm								
UNIFORMLY DISTRIBUTED LOAD [kg/ m2]	NOMINAL PANEL THICKNESS mm							
	50	60	80	100	120	150	170	200
	MAXIMUM SPAN cm							
<b>80</b>	295	320	365	380	420	470	585	595
<b>100</b>	265	290	330	350	390	450	530	540
<b>120</b>	250	265	305	320	355	405	475	480
<b>140</b>	230	250	280	290	325	380	430	435
<b>160</b>	215	230	265	280	305	355	395	400
<b>180</b>	210	215	250	255	285	335	370	375
<b>200</b>	190	210	240	240	270	310	340	345
<b>220</b>	175	200	225	235	265	295	320	325
<b>250</b>	160	175	210	220	240	280	295	300

\*170/200mm Panel thickness: support width 150mm



**MW FONO** panel on two supports:



INTERNAL STEEL SHEET 0.6 mm - Simple support 120 mm						
UNIFORMLY DISTRIBUTED LOAD [kg/ m2]	NOMINAL PANEL THICKNESS mm					
	50	60	80	100	120	150
	MAXIMUM SPAN cm					
<b>80</b>	265	285	325	340	375	420
<b>100</b>	235	260	295	315	350	405
<b>120</b>	225	235	270	285	315	360
<b>140</b>	205	225	250	260	290	340
<b>160</b>	190	205	235	250	270	315
<b>180</b>	185	190	225	225	255	300
<b>200</b>	170	185	215	215	240	275
<b>220</b>	155	180	200	210	235	265
<b>250</b>	140	155	185	195	215	250

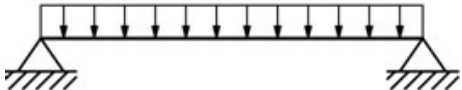
### ISODECK Synth

The ISODECK Synth panel is self-supporting as defined by UNI EN 14509: "...panel capable of supporting, by virtue of its materials and shape, its own weight and in case of panel fixed to spaced structural supports, all applied loads (snow, wind, air pressure), and transmitting these loads to the supports.", depending on the type of metal facings, their thickness and the thickness of the thermal insulating core.

Below are some examples of indicative load bearing tables:

**The indications contained in the following tables do not take into account the effects due to thermal load. Furthermore, the indicative values provided cannot replace the design calculations drawn up by a skilled technician, who must validate this information under the laws in force in the place of installation of the panels.**

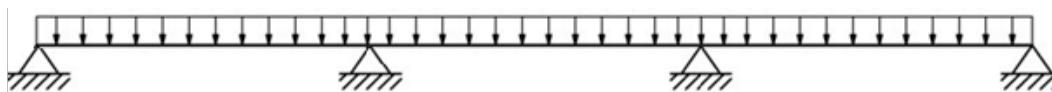
- panel on two supports:



SIMPLE SUPPORT STEEL SHEET					
UNIFORMLY DISTRIBUTED LOAD [kg/ m2]	NOMINAL SHEET THICKNESS mm				
	0.5	0.6	0.7	0.8	1.0
	MAXIMUM SPAN cm				
<b>60</b>	245	260	275	290	315
<b>80</b>	220*	235	250	265	285
<b>100</b>	200*	220*	235	245	265
<b>120</b>	180*	200*	215*	230	250
<b>140</b>	165*	185*	200*	215*	235
<b>160</b>	155*	170*	185*	200*	225
<b>180</b>	145*	160*	175*	190*	215*
<b>200</b>	140*	155*	165*	180*	200*

\*Values with stress limitations.

- panel on multiple supports:



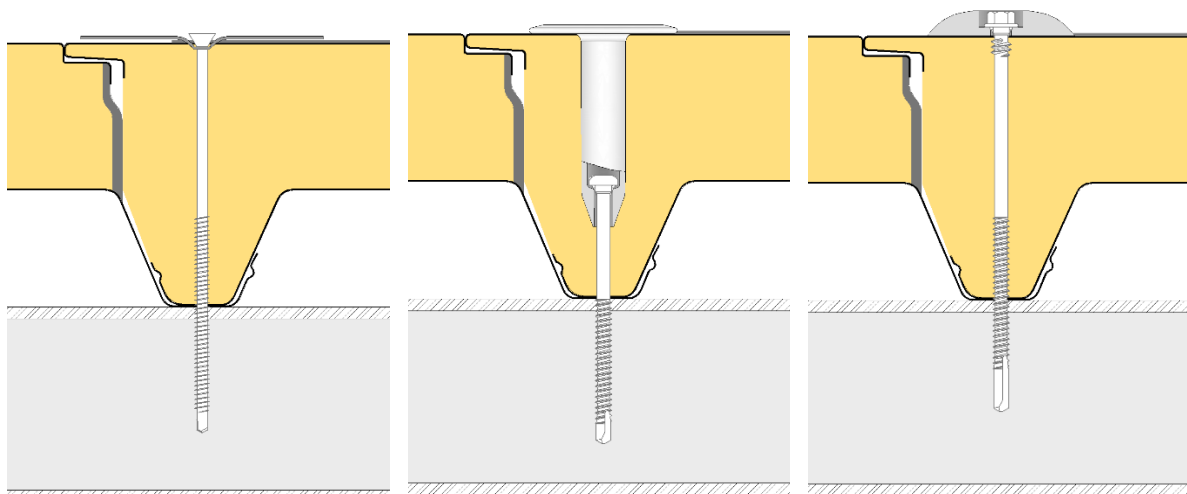
MULTI-SUPPORT STEEL SHEET					
UNIFORMLY DISTRIBUTED LOAD [kg/ m2]	NOMINAL SHEET THICKNESS mm				
	0.5	0.6	0.7	0.8	1.0
	MAXIMUM SPAN cm				
<b>60</b>	275	295	310	325	350
<b>80</b>	250*	270	285	295	320
<b>100</b>	220*	245*	260	275	295
<b>120</b>	200*	225*	240*	260	280
<b>140</b>	185*	205*	225*	240*	265
<b>160</b>	175*	195*	210*	225*	255
<b>180</b>	165*	180*	200*	210*	240*
<b>200</b>	155*	170*	185*	200*	225*

\*Values with stress limitations.

## JOINT

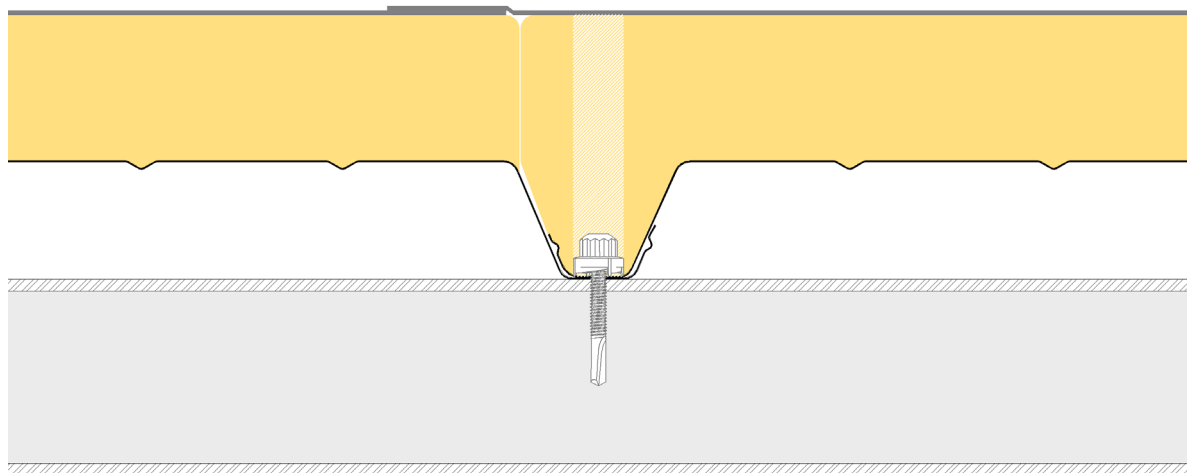
### *ISODECK PVSteel*

The coupling is performed at the junction rib; waterproofing is carried out by performing the heat-sealing operation of the pontage to a professional standard. The bridging strap is made of a 1.5 mm-thick PVC/TPO strip with variable width; the bridging strap is heat-sealed for a width of 5 cm per side (**see "Fastening instructions"**).



### *ISODECK Synth*

The coupling is performed at the junction rib; waterproofing is ensured by performing the heat-sealing operation to a professional standard (**see "Fastening instructions"**).



## TOLERANCES (ANNEX D EN 14509)

- Metal sheet thickness: according to the reference standards for the products used
- Panel thickness: nominal,  $\pm 2$  mm
- Length: if  $\leq 3000$  mm  $\pm 5$  mm; if  $> 3000$  mm  $\pm 10$  mm
- For the ISODECK PVSteel panel, appearance of the sheet coated with PVC/TPO is not comparable to that of the pre-painted galvanised steel sheet; there may be small pressure marks that do not affect the appearance or the functionality of the roof.

## WATER PERMEABILITY

The roof made with panels of the *FLAT ROOF* range ensures complete waterproofing as long as the heat-sealing operation of the ISODECK PVSteel bridging strap or the synthetic extrados membrane for ISODECK Synth is carried out by skilled and specialised personnel.

## 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 support itself.
- As for the characteristics and recommendations for use of the extrados PVC/TPO membrane, please refer to what is indicated in the product sheet in the paragraph "PVC/TPO coat".
- Isopan recommends a careful evaluation of the effects of thermal expansion of metal supports for panels with considerable lengths ( $L > 8$  m).

## 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 face 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 higher or lower 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 flashing systems (or suitable design measures) to ensure normal water run-off.
- **Atmospheric corrosion:** depends on the environment where the panels are installed (marine, industrial, urban, rural); mainly affects the degree of corrosivity 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).
- **Rainfall:** in order to ensure a correct water flow, Isopan recommends applying a minimum slope of 2%.

In order to make up for possible lack of material due to damage during handling and assembly, ISOPAN recommends providing for spare panels (approximately 5% of the total).

## THERMAL EXPANSIONS

All the materials used for the construction of roofs, especially metals, are subject to **thermal expansion and contraction** due to temperature changes. The stress due to the thermal expansions of the metal sheet 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.

## 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 in place. The number and position of the fastening elements must be assessed by an authorised designer, in order to guarantee resistance to the stress induced by dynamic loads, which can also exist in the event of depression.

**The data and indications contained in this annex regarding the various types of fastenings are strictly without prejudice to the need for the customer to evaluate, independently, under their own exclusive responsibility and through a duly qualified designer, the number and type of fastenings gradually required based on the specific characteristics of the project and of the building on which the products of the Flat Roof Range must be installed.**

Isopan recommends only carrying out the fastening at the ribs.

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

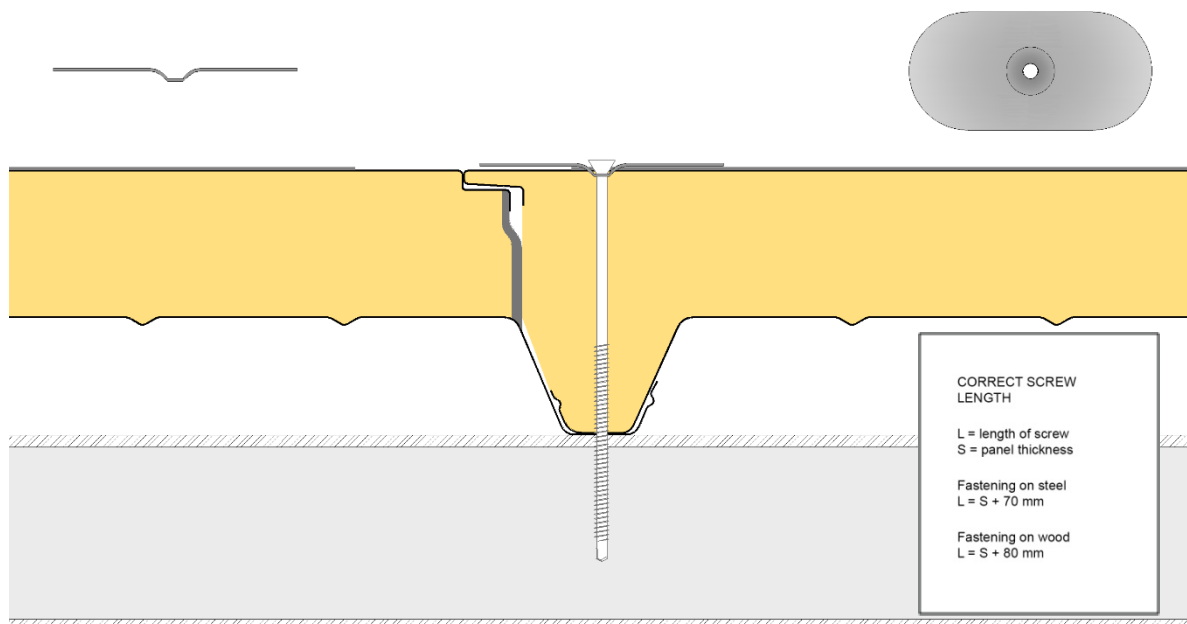
### *ISODECK PVSteel Fastening methods*

Fastening varies depending on the project to be built and the system for applying the panels on site. In order to make a correct choice according to use, contact Isopan's Technical Office.

Note: the correct screw length depends on the type of support (steel, wood). The PVSteel panel is fastened by using three possible solutions:

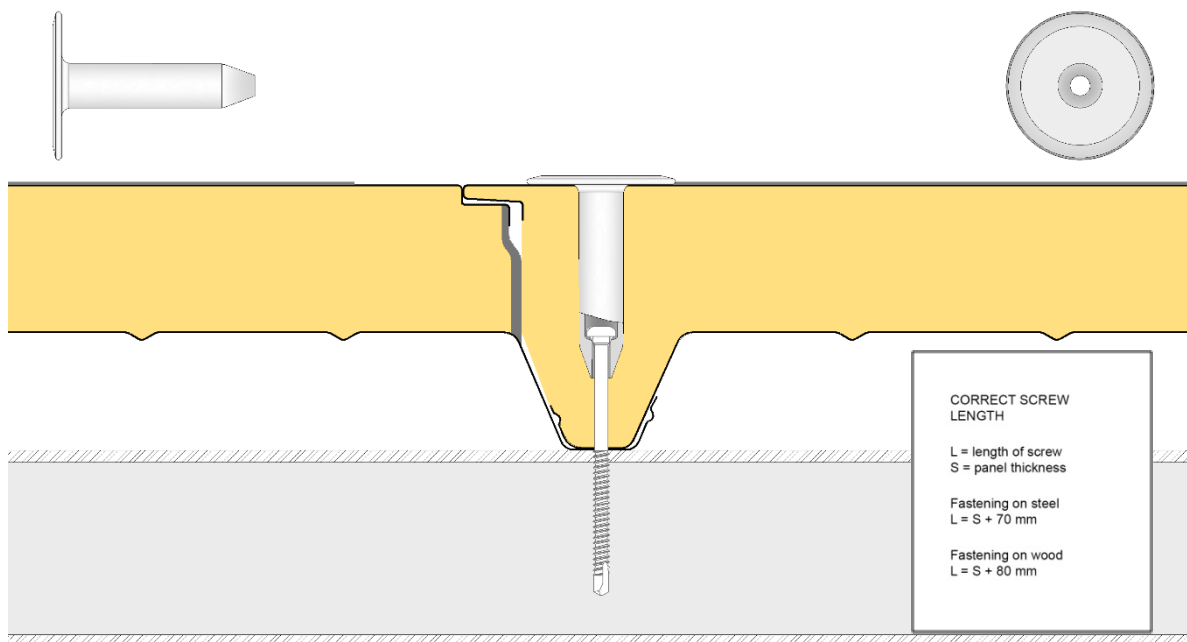
- screw and small plate for stress distribution:

Recommended for use on substructures with a thickness of approximately 2 mm. Isopan recommends the use of countersunk head screws.



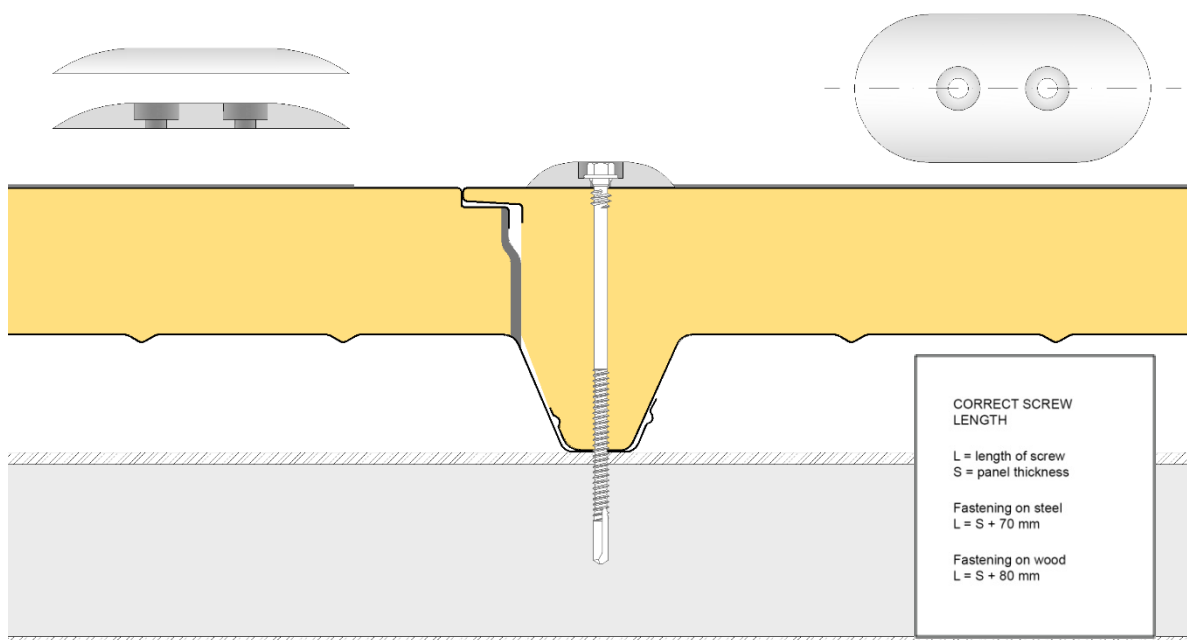
– With screw and sleeve:

Recommended for use on substructures with a thickness of approximately 6 mm. Before carrying out the fixing, it is required to pre-drill the external sheet and the insulating material in order to install the sleeve. Isopan recommends the use of short screws, to be positioned by using an extension.



– With screw and plate:

Recommended for use on substructures with a thickness of approximately 10 mm. Isopan recommends the use of 5mm hexagonal head screws with double thread.

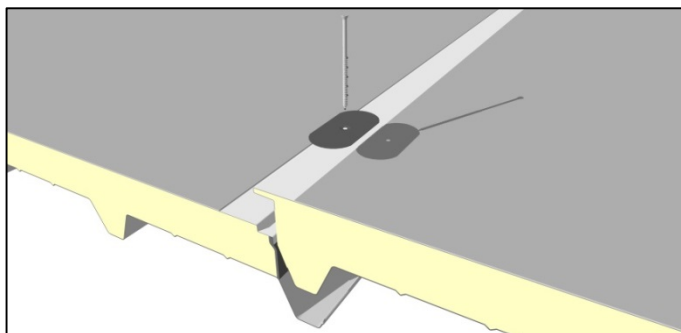


**Note:** the position of the PVC/TPO glued on the sheet may vary; this variation does not affect the effectiveness of the system. The correct length of the screw depends on the panel thickness and on the type of support (steel, wood). For the screw and plate solution, the actual availability of screws suitable for the panel thickness to be installed must be checked beforehand.

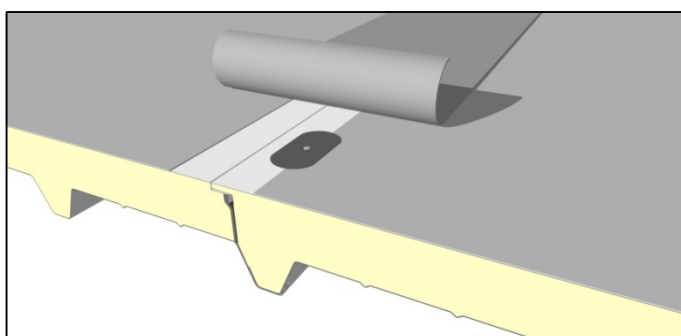
#### ISODECK PVSteel assembly sequence

If ISODECK PVSteel MW is used, Isopan recommends the use of stainless steel screws to prevent galvanic corrosion of the screw in contact with the rock wool.

- 1) Install the first panel
- 2) Install the second panel and couple it to the first panel already installed



- 3) Fastening by means of self-locking screw or screw and plate at the overlapping rib
- 4) Install the entire roof with panels according to the diagram previously described
- 5) In necessary, install aluminium adhesive tape at the joints that is able to temporarily waterproof the roof



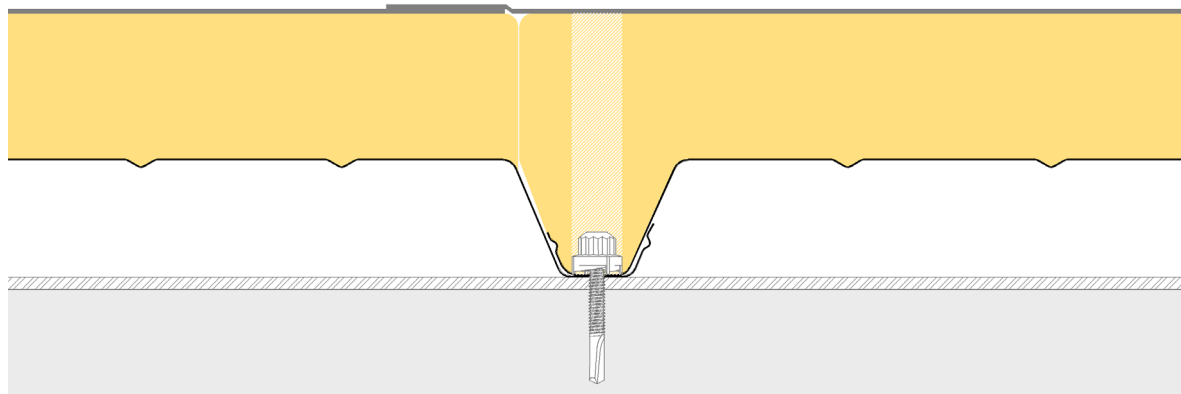
- 6) Install the PVC/TPO bands
- 7) Seal the PVC / TPO bands for a width of 5 cm per side; sealing is performed by means of heat-sealing. This operation must be carried out by expert and specialised personnel.

### ***ISODECK Synth fastening methods***

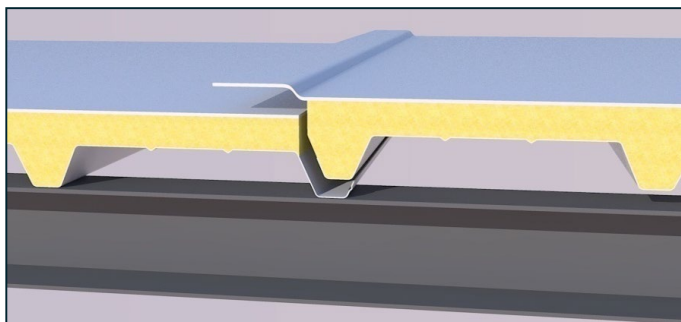
Fastening varies depending on the project to be built and the system for applying the panels on site. In order to make a correct choice according to use, contact Isopan's Technical Office.

Note: the correct length of the screw depends on the type of support (steel, wood).

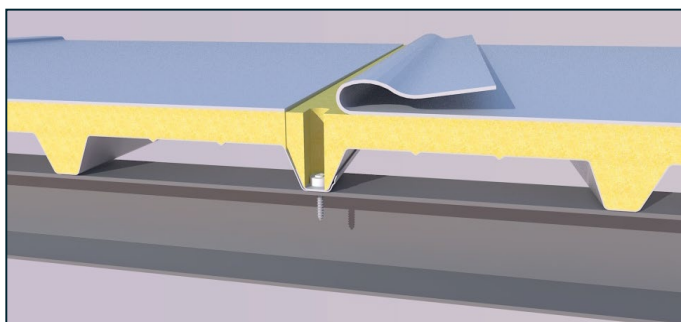
Isopan recommends the use of short self-locking screws, to be positioned by using an extension.



### **ISODECK Synth assembly sequence**

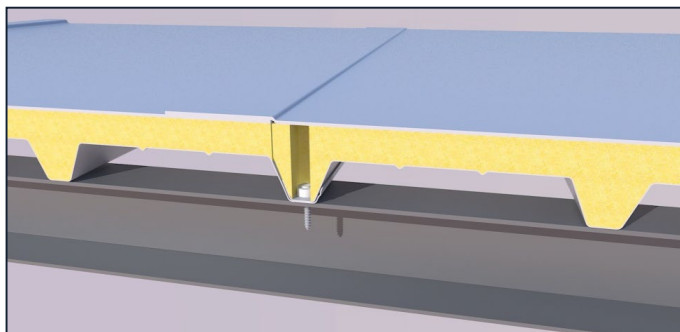


- 1) Assembly of the panels by means of the specific junction rib (special attention must be paid to the integrity of the overlapping selvedge)





- 2) Fastening by means of specific screws supplied by Isopan; the fastening must be carried out at the junction (overlapping rib) of the panels, after raising the overlapping selvage



- 3) Reposition the selvage and proceed with sealing by means of the specific hot air dispensers

**NB: Isopan suggests a distribution of the fastenings equal to no less than two screws per square metre, keeping in mind, in any case, the need for the customer to independently assess, through a qualified designer they trust, the number and type of fastenings required based on the specific characteristics of the project and of the building on which the products of the Flat Roof Range must be installed.**

#### Joint welding

- 1) Drying and cleaning the welding areas
- 2) Automatic and manual welding operations
- 3) In-situ creation of any technical details, e.g. expansion joints, waterspouts, protruding bodies
- 4) Membrane sealing checking and testing operations

These operations must be carried out by specialised personnel in compliance with the instructions of the manufacturer.

**NB: Isopan suggests a distribution of the fastenings equal to no less than two screws per square metre, keeping in mind, in any case, the need for the customer to independently assess, through a qualified designer they trust, the number and type of fastenings required based on the specific characteristics of the project and of the building on which the products of the Flat Roof Range must be installed.**

## **ASSEMBLY INSTRUCTIONS**

Given the special technical nature of the product, Isopan is available to supply references from specialised companies for roofs made with panels of the Flat Roof range.

The correct sequence of assembly operations is as follows:

#### ***Preliminary operations***

- Verify that the supports are properly aligned.
- Pay special attention to the contact points between the support sheets and the panel support plates to avoid electrochemical corrosion if non-compatible metals are coupled. This is why elastomer or expanded resin strips can be applied as separators.
- Ensure that the site area has a suitable 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 damage to the product.

Using acetic silicones is prohibited as they tend to attack the pre-painted galvanised sheet 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, as they do not contain solvents, they do not attack the paint.

### **Assembly**

- Pulling the panels at a height
- Panel installation
- Checking the linearity of the panels installed in relation to the structure and tracing the positioning of the fastenings
- Preliminary panel fastening on two points (e.g. head and tail)
- Performing the remaining fastenings on the tracing previously carried out
- Performing the sealing. In order to provide proper adhesion, the surfaces of the PVC/TPO membrane must be cleaned and dry before sealing. Membranes subjected to long periods of contact with water, snow or ice must be dried before sealing.

**Note: the panel is supplied with a protective film on the flat side of the panel; Isopan recommends not removing the film until the fastening and sealing operations are completed, lifting it only in the parts involved in the above operations.**

### **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	120	150
No. of panels per package	16	12	10	8	6	6	4	4

Package compositions and types of packaging other than standard must be explicitly requested at the time of order.

### **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 lift 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 the integrity of the load. Pay special attention to ensure the weight bearing on the bottom package and 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 with other materials or that do not have a suitable loading platform.

The customer picking up the material must instruct drivers in this regard.

#### **Lorry unloading with crane**

- Use any type of crane equipped with a spreader beam and equipped straps. Isopan can advise customers on the choice of lifting 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 by using a forklift, the length of the packages and their possible bending should be taken into account in order to prevent damage 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 the accumulation of moisture and allow for 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 the knowledge acquired, in order to maintain the original performance of the product, it is advisable not to exceed six months of continuous storage, from the production date, in a closed and ventilated environment, while outdoor storage must never exceed sixty days from the date of production; these terms refer to the correctly stored product, as indicated in the “storage” chapter of annex A. However, the materials must always be protected against direct sunlight, as this may cause alterations.
- In case of transport in containers, the products must be removed from the containers as soon as possible and, in any case, no later than 15 days from the loading date, to prevent deterioration of the metal facings 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 document “**Packaging and Services**” on [www.isopan.com](http://www.isopan.com).

## **DURABILITY**

Product durability depends on the intrinsic features of the panel used in relation to its final use. The panel, including the features of the metal sheets, must be chosen after a proper design of the roof.

In this regard we recommend, if necessary, using the Isopan documentation, also available online ([www.isopan.com](http://www.isopan.com)), and/or the reference standards.

We recommend using accessories like ridge flashing, caps and gaskets supplied by Isopan, as they are appropriately designed for the specific use of the 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 outer facing; in any case, we recommend periodically inspecting the building (at least once a year), in order to assess its conditions and the sealing of the welds.

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 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. by restoring the welding).

At the customer's request, Isopan can provide useful information to solve problems in this regard.

## **SAFETY AND DISPOSAL**

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

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

The 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](http://www.isopan.com). For anything 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 have a CE marking.

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# Annex A

Lorry unloading with crane

Lorry unloading with forklifts

Storage

Painted supports

Panel handling

Installation

Protective film

Maintenance

## ANNEX A

### LORRY UNLOADING WITH CRANE

For lifting purposes, the packages must always be attached in at least two points. The distance between them must not be less than half the length of the packages.

Lifting should be carried out by 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)

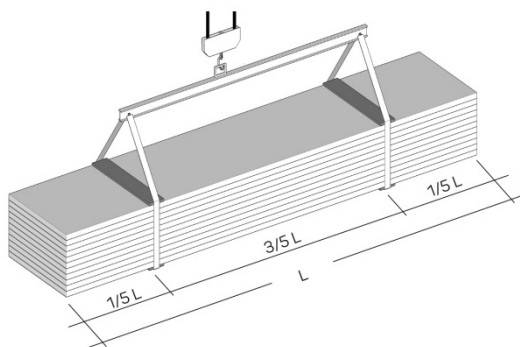


Figure 1

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 damage to 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 the 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 secured to the structure.

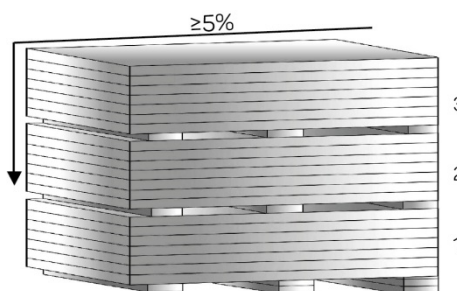


Figure 2

### 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 recommend to wait for more than two weeks

from when the products were stored at the site.

In case of transport in a container, 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 by using adequate protective 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 its length, keeping the element on its side (see Figure 3).

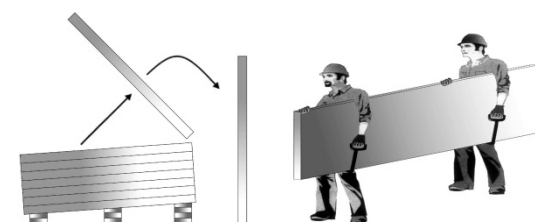


Figure 3

Handling equipment, as well as gloves, must be clean and not damage the items.

### INSTALLATION

The panel installation personnel must be qualified and know the correct technique to perform the work to a professional standard.

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 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 smaller slopes, adopt the requirements of the seller.

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.

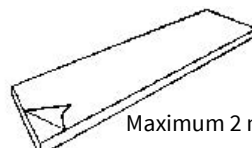
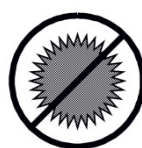
During panel assembly and, in particular, in roofs, it is necessary to immediately remove all residual materials paying special attention to metal ones that may cause early deterioration of the metal faces by oxidising.

### 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 by a 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 that does not affect 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

TD\_F01- Roof detail with slight slope and ridge detail

TD\_F02 - Waterspout detail on roof with slight slope

TD\_F03 - Gutter detail on roof with slight slope

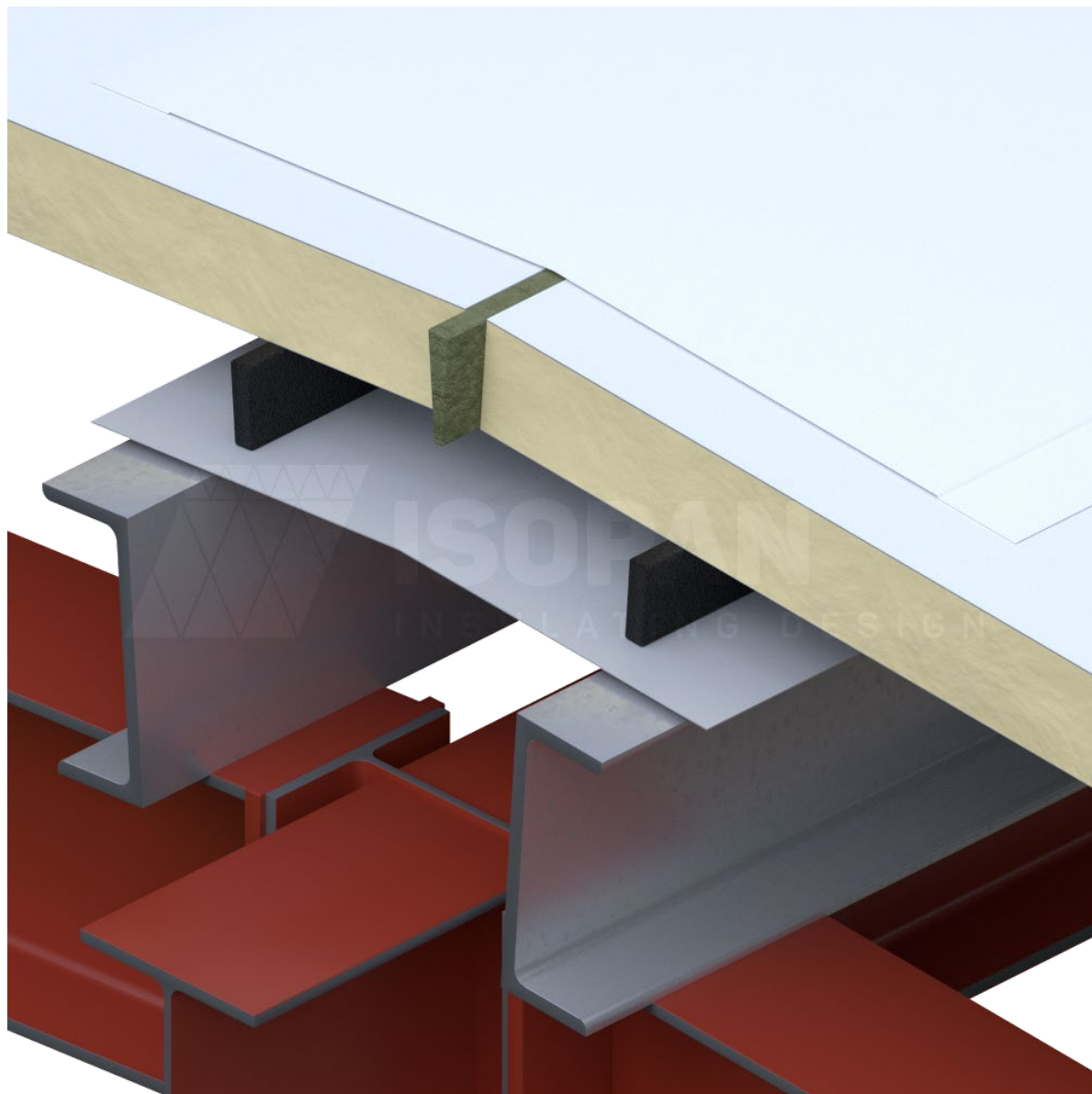
TD\_F04 – Ridge detail for roofing with slight slope single pitch


TD\_F14 - Head to head joint detail - Screw and plate

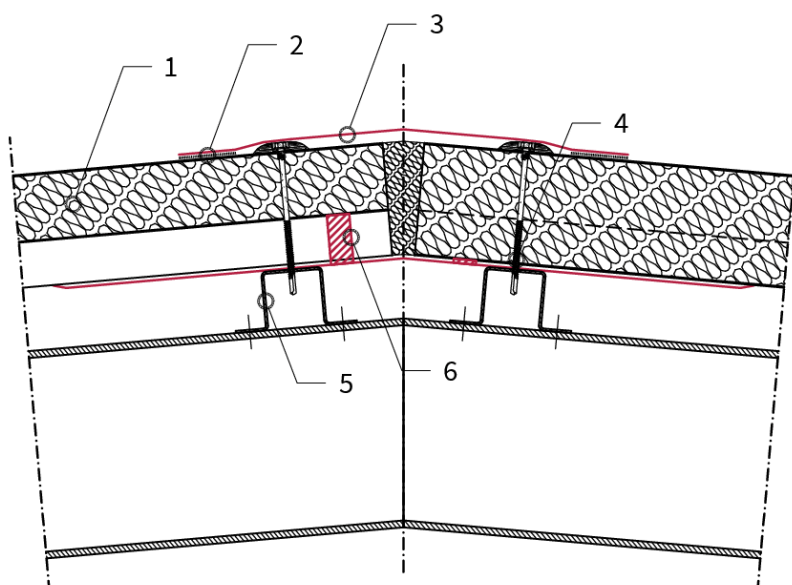
TD\_F14 - Head to head joint detail - Self-locking screw (only Isodeck Synth)

TD\_F05 - Detail of the side corner for natural green roof

## ROOF DETAIL WITH SLIGHT SLOPE AND RIDGE DETAIL



Description <b>PVC FLAT ROOF PANELS DETAIL</b> Vertical Section Roof ridge		 <b>ISOPAN</b>	
Scale	Drawing code	Date	Rev. date
1:5	TD_F01	16.05.2016	03.12.2018
		Drawn by	Rev.
		ISOPAN	1

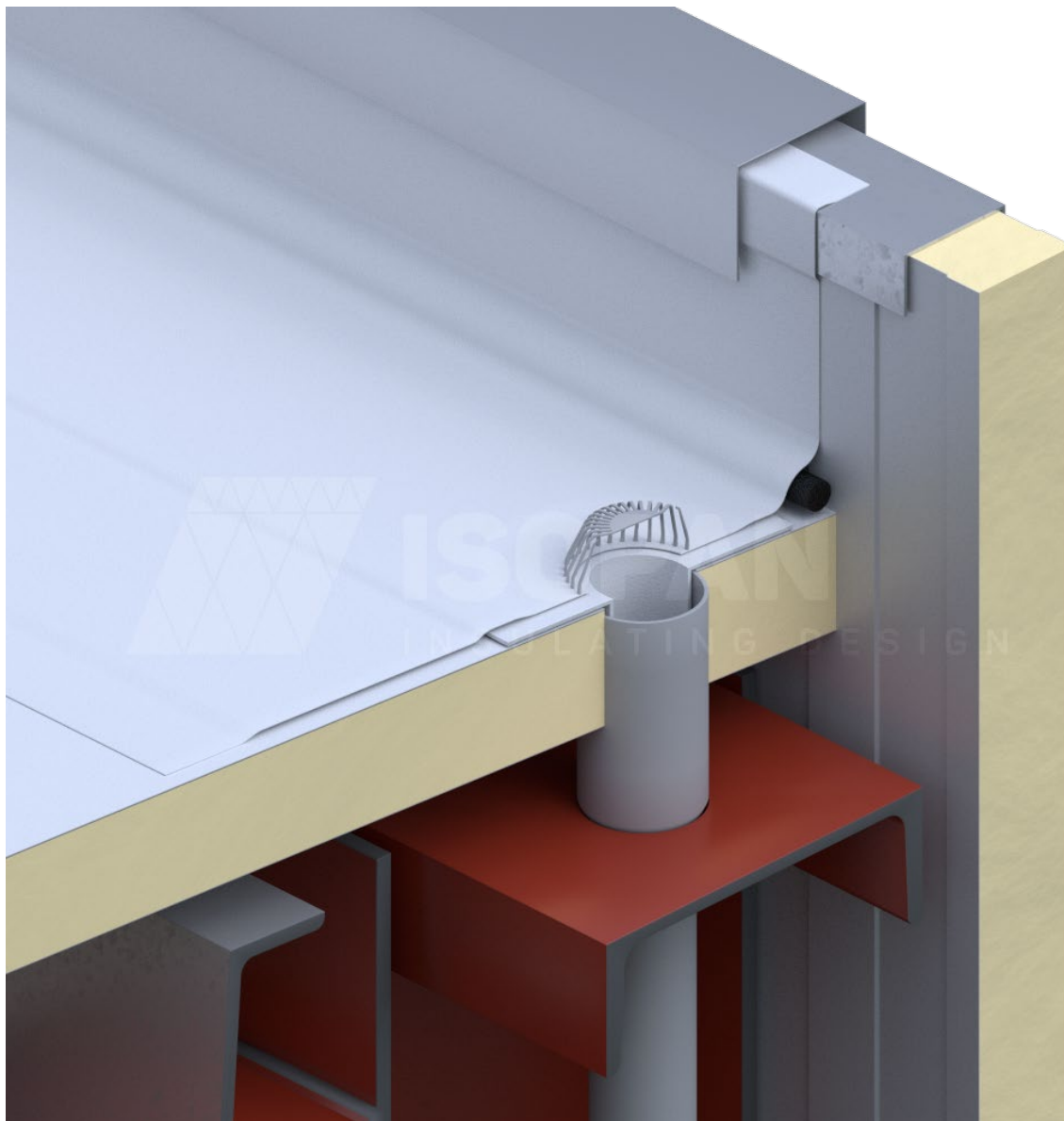


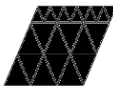
#### Legend

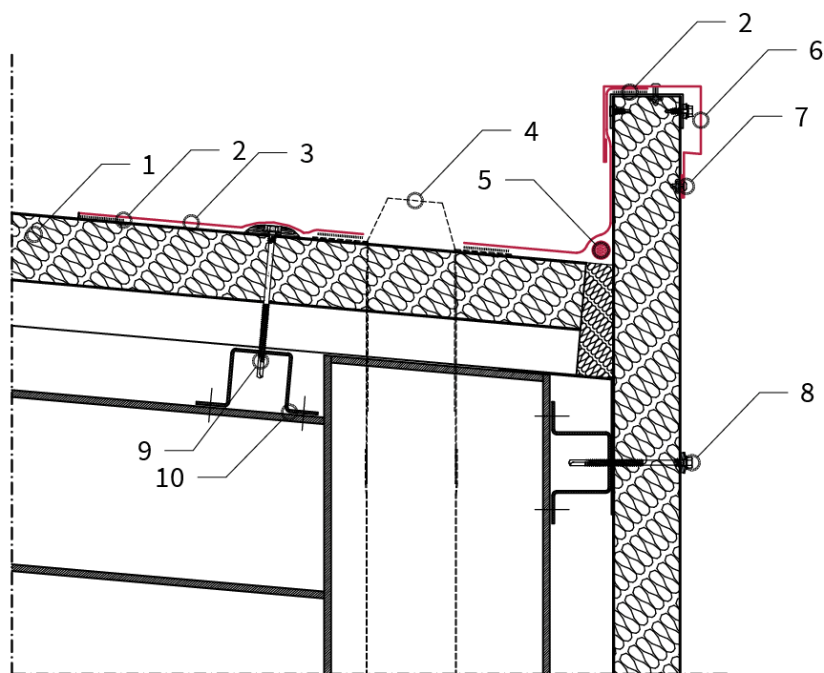
01 ISOPAN PVC Flat Roof Panel	09
02 5 cm welding	10
03 PVC pontage layer	11
04 Fastening screw with plate	12
05 Steel support	13
06 Giuntoplast gasket	14
07	15
08	16

ATTENTION: the proposed solution does not constitute the project, and must be firstly assessed and evaluated by the designer and construction supervision. The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.  
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## WATERSPOUT DETAIL ON ROOF WITH SLIGHT SLOPE



Description <b>PVC FLAT ROOF PANELS DETAIL</b> Vertical Section Roof connection with wall panel		 <b>ISOPAN</b>	
Scale	Drawing code	Date	Rev. date
1:5	TD_F02	16.05.2016	03.12.2018
		Drawn by	Rev.
		ISOPAN	1

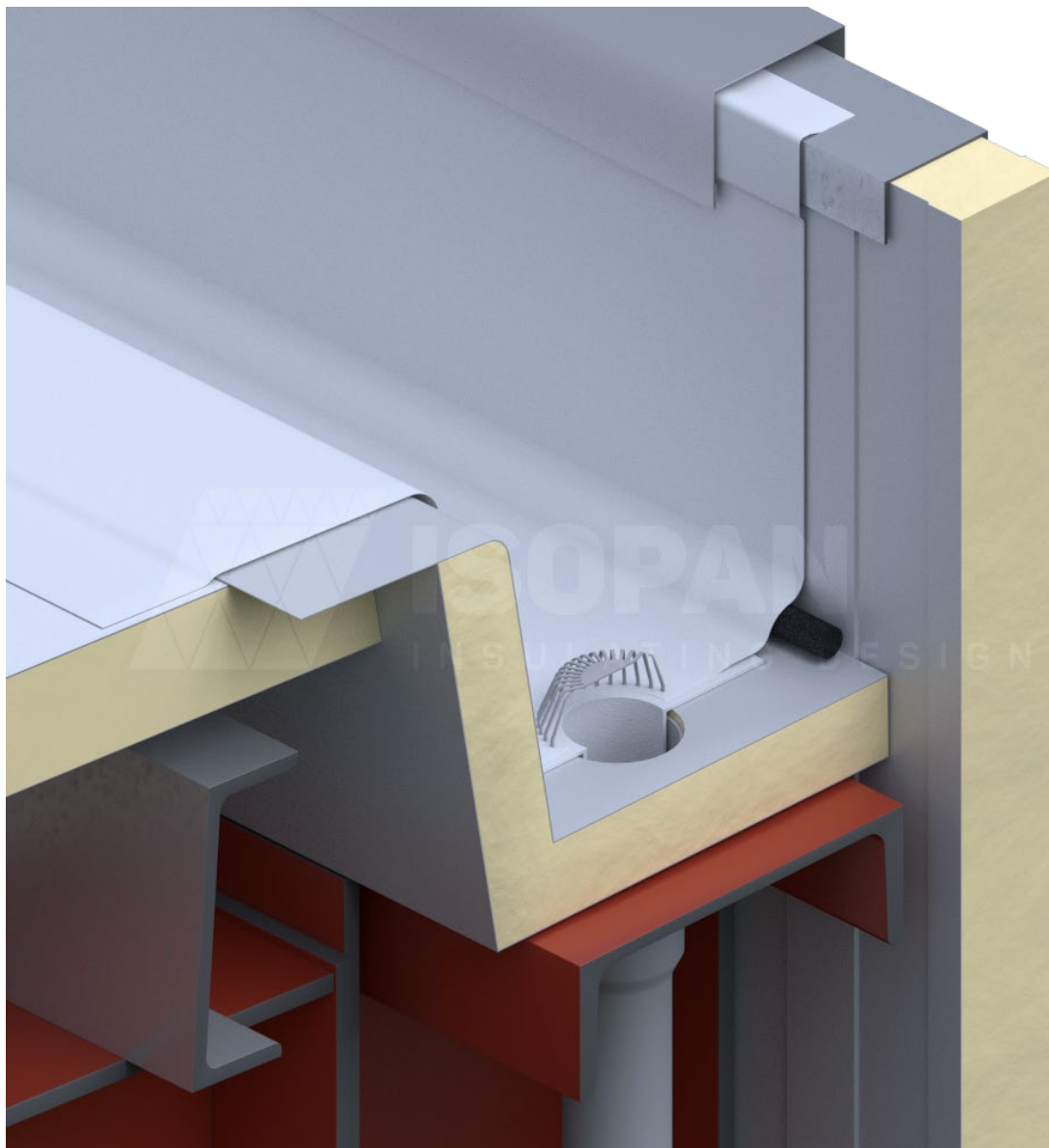



#### Legend

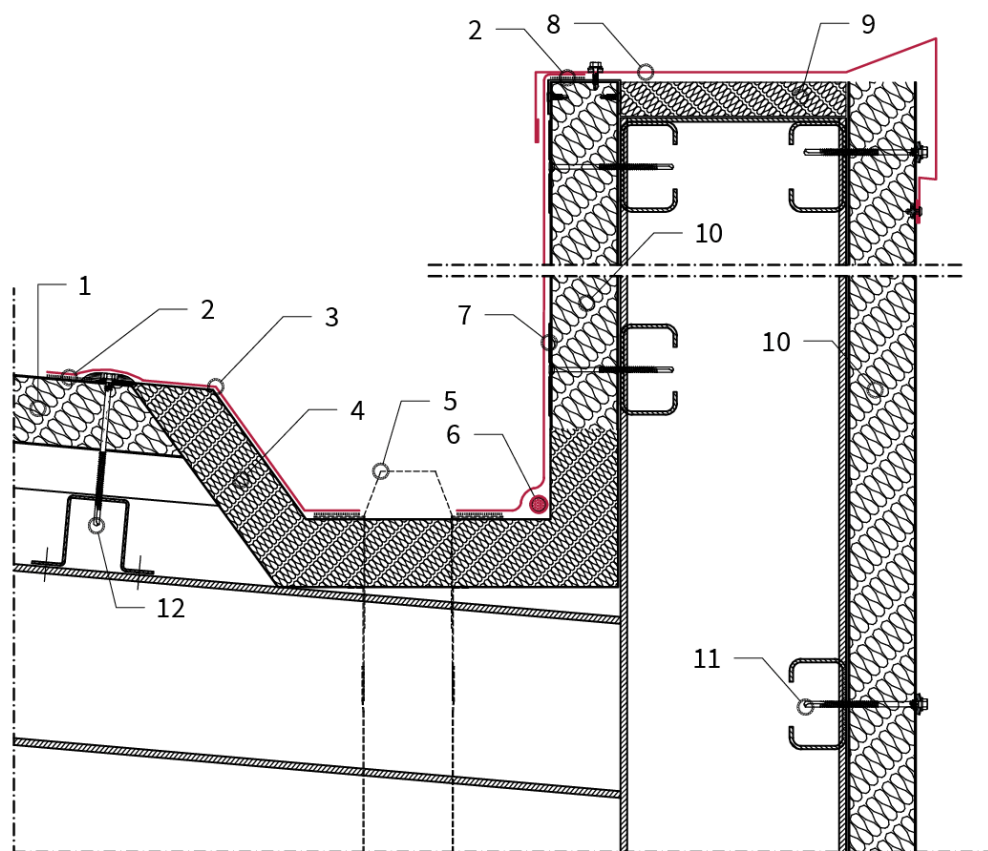
01 ISOPAN PVC Flat Roof Panel	09 Fastening screw with plate
02 5 cm welding	10 Steel support
03 PVC layer	11
04 Gutter	12
05 Compressible curb	13
06 Custom flashing	14
07 Rivet	15
08 Fixing screw	16

ATTENTION: the proposed solution does not constitute the project, and must be firstly assessed and evaluated by the designer and construction supervision. The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.  
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## GUTTER DETAIL ON ROOF WITH SLIGHT SLOPE



Description <b>PVC FLAT ROOF PANELS DETAIL</b> Vertical Section Roof connection with wall and inside gutter		 <b>ISOPAN</b>	
Scale	Drawing code	Date	Rev. date
1:5	TD_F03	16.05.2016	03.12.2018
		Drawn by	Rev.
		ISOPAN	1



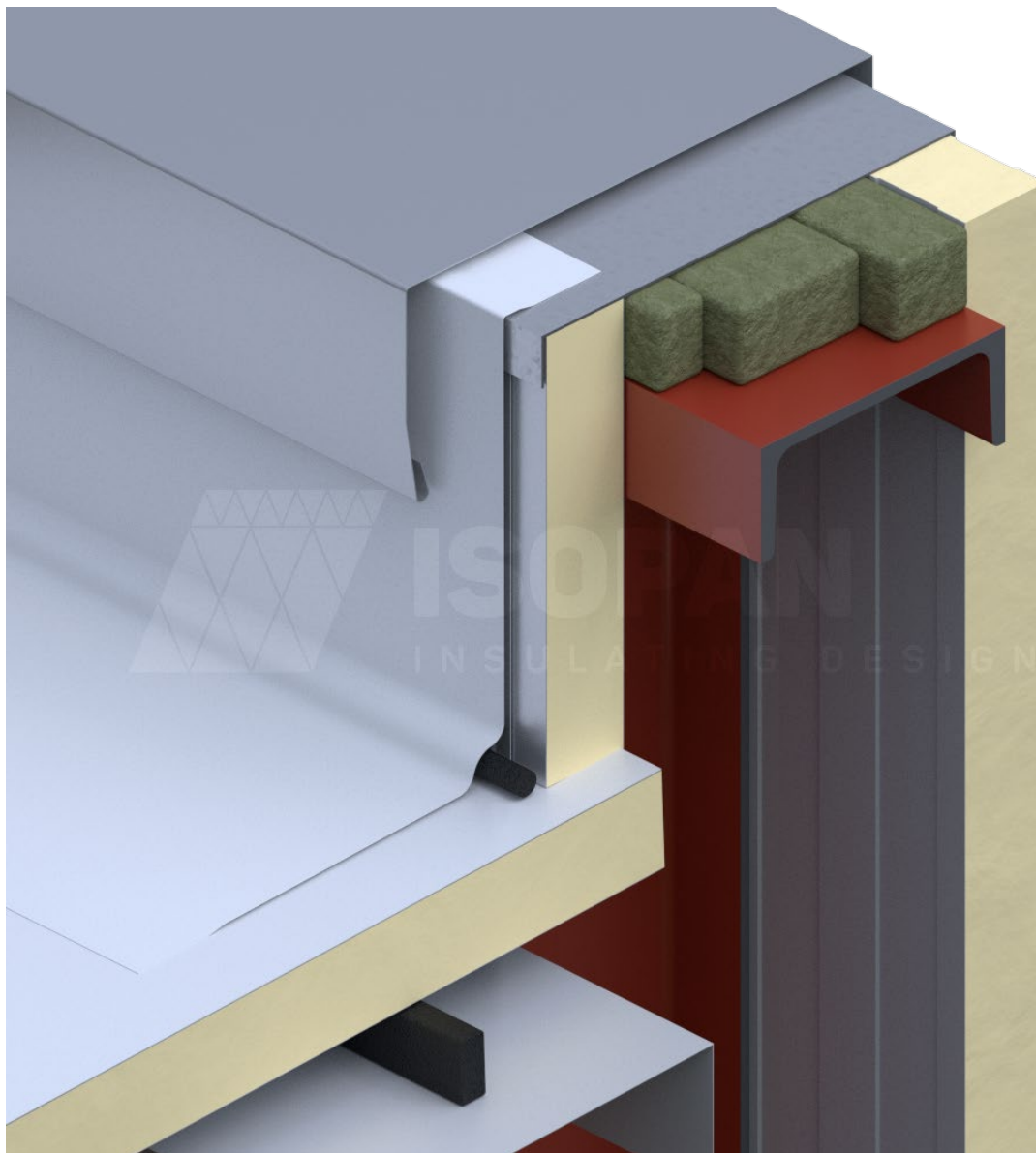
#### Legend

01 ISOPAN PVC Flat Roof Panel	09 Proper on site insulation
02 5 cm welding	10 ISOPAN Walls Panel
03 PVC layer	11 Fixing screw
04 Custom insulated drain with proper insulation	12 Fastening screw with plate
05 Gutter	13
06 Compressible curb	14
07 Stress plate with flat head screw	15
08 Custom flashing	16


ATTENTION: the proposed solution does not constitute the project, and must be firstly assessed and evaluated by the designer and construction supervision. The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.  
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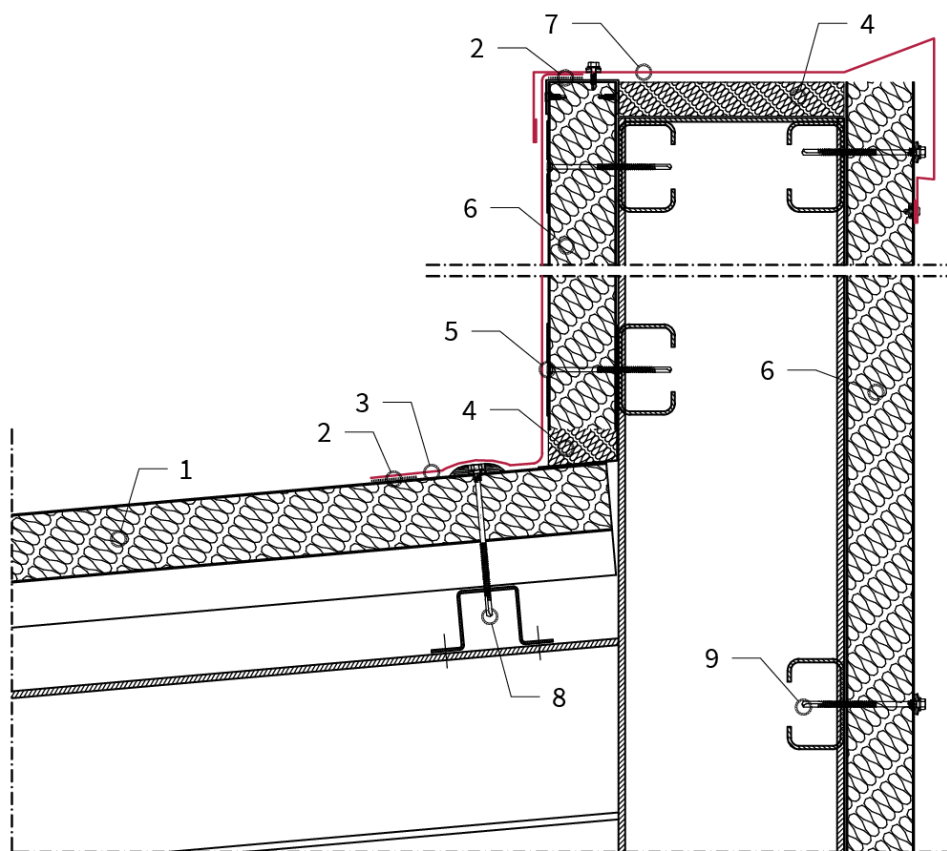


## RIDGE DETAIL FOR ROOFING WITH SLIGHT SLOPE SINGLE PITCH





Description <b>PVC FLAT ROOF PANELS DETAIL</b> Vertical Section Roof connection with wall on ridge side		 <b>ISOPAN</b>	
Scale <b>1:5</b>	Drawing code <b>TD_F04</b>	Date 16.05.2016	Rev. date 03.12.2018
		Drawn by ISOPAN	Rev. 1

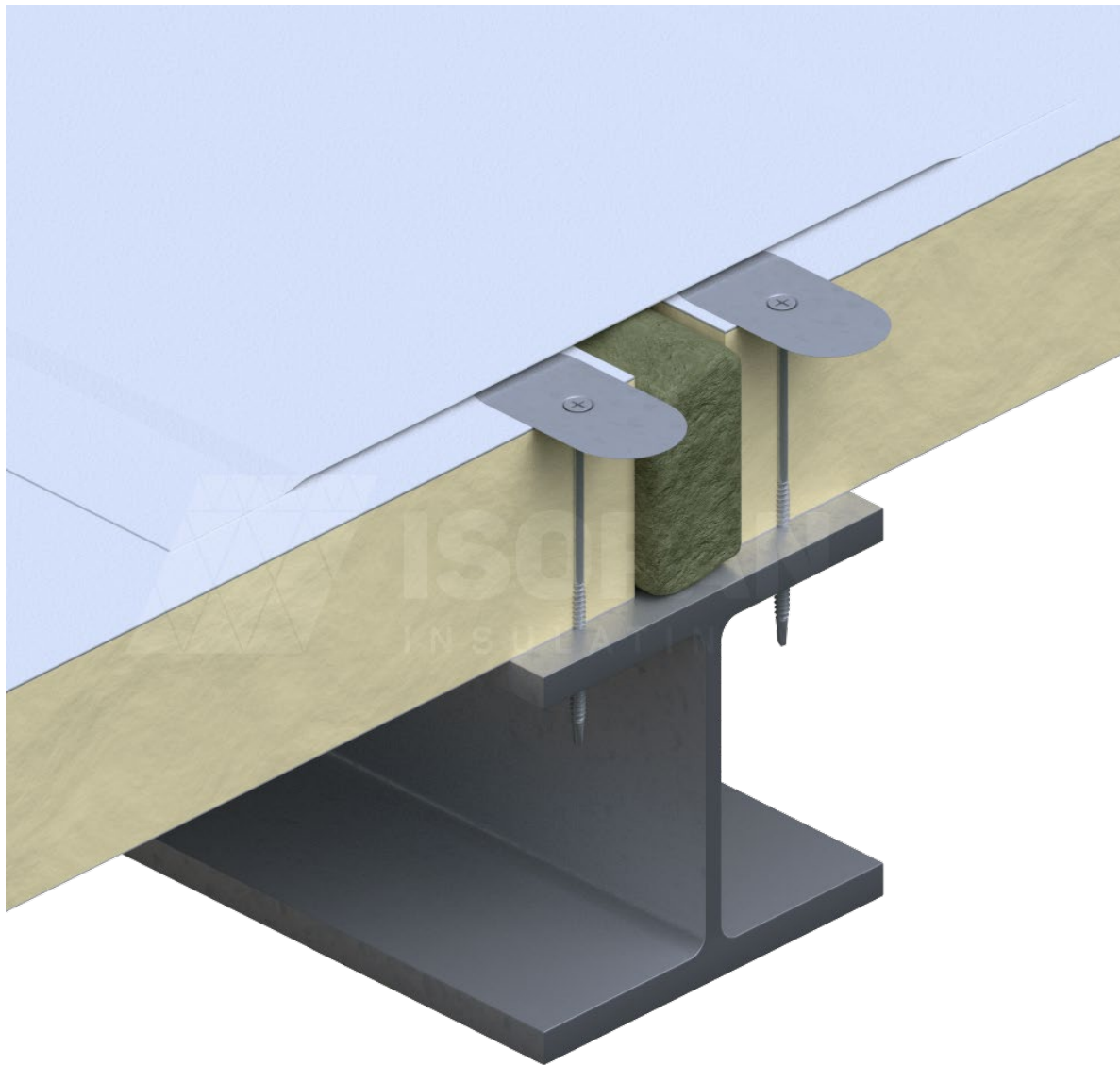



#### Legend

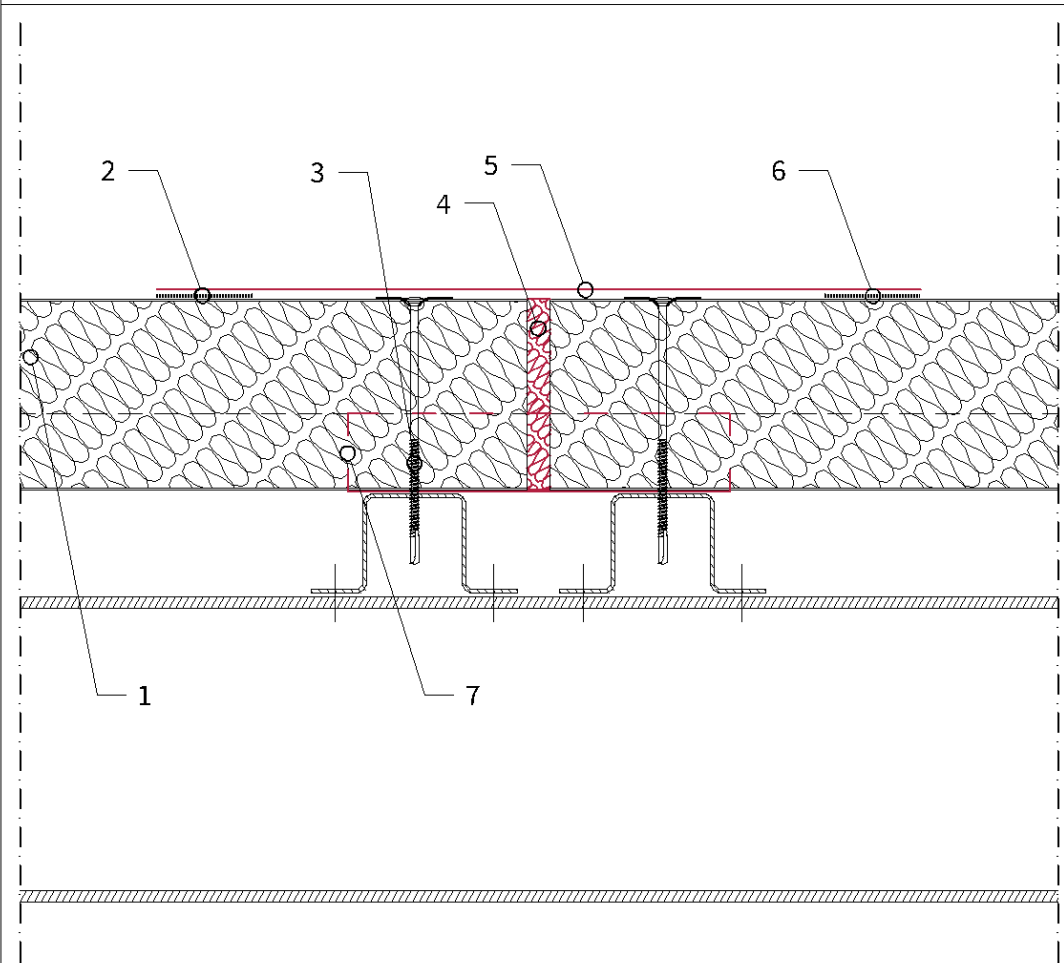
01 ISOPAN PVC Flat Roof Panel	09 Fixing screw
02 5 cm welding	10
03 PVC layer	11
04 Proper on site insulation	12
05 Stress plate with flat head screw	13
06 ISOPAN Walls Panel	14
07 Custom flashing	15
08 Fastening screw with plate	16

ATTENTION: the proposed solution does not constitute the project, and must be firstly assessed and evaluated by the designer and construction supervision. The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.  
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## HEAD TO HEAD JOINT DETAIL - SCREW AND PLATE



Description <b>PVC FLAT ROOF PANELS DETAIL</b> Vertical Section Panel joint			
Scale <b>1:3</b>	Drawing code <b>TD_F14</b>	Date 16.05.2016	Rev. date 03.12.2018
		Drawn by ISOPAN	Rev. 1

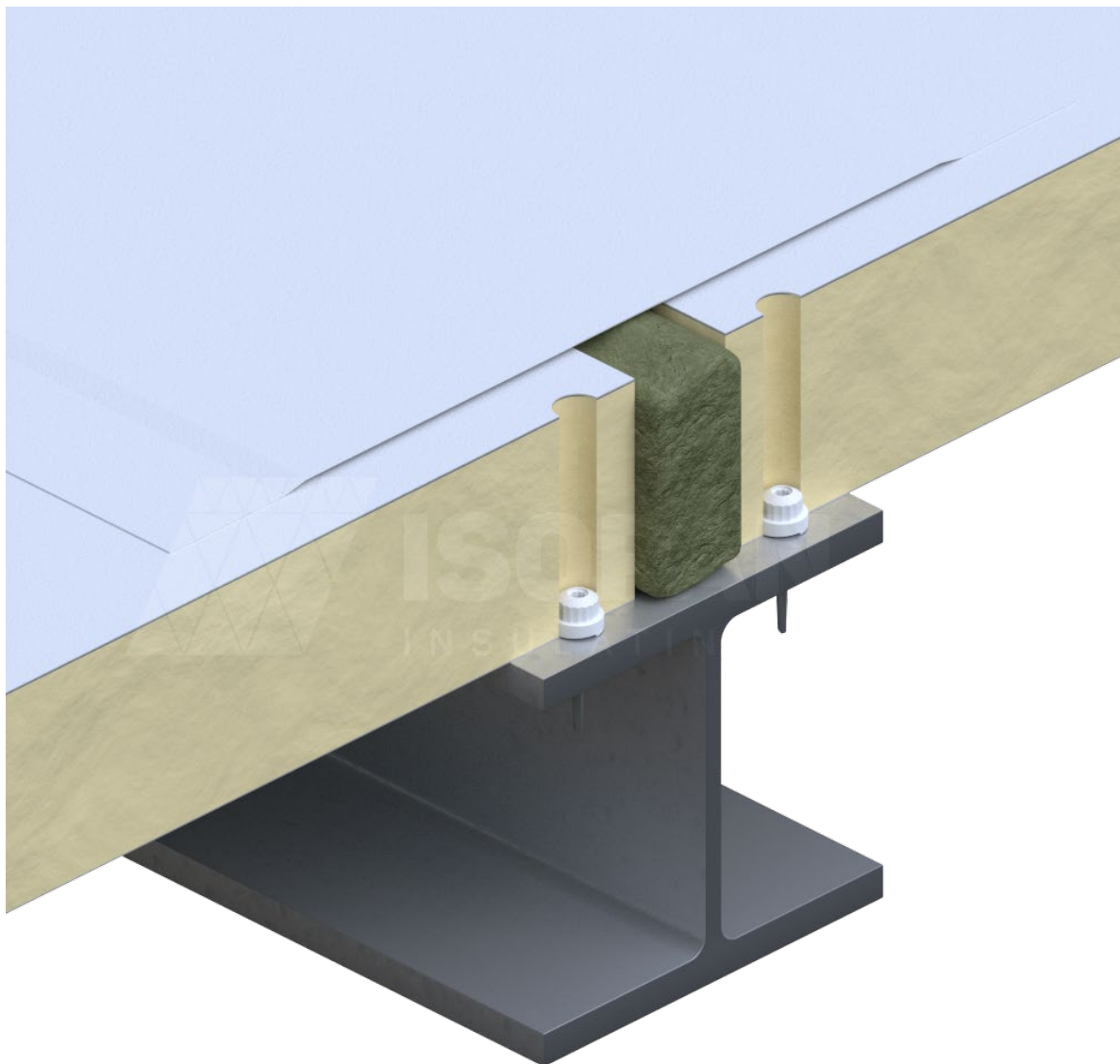



#### Legend

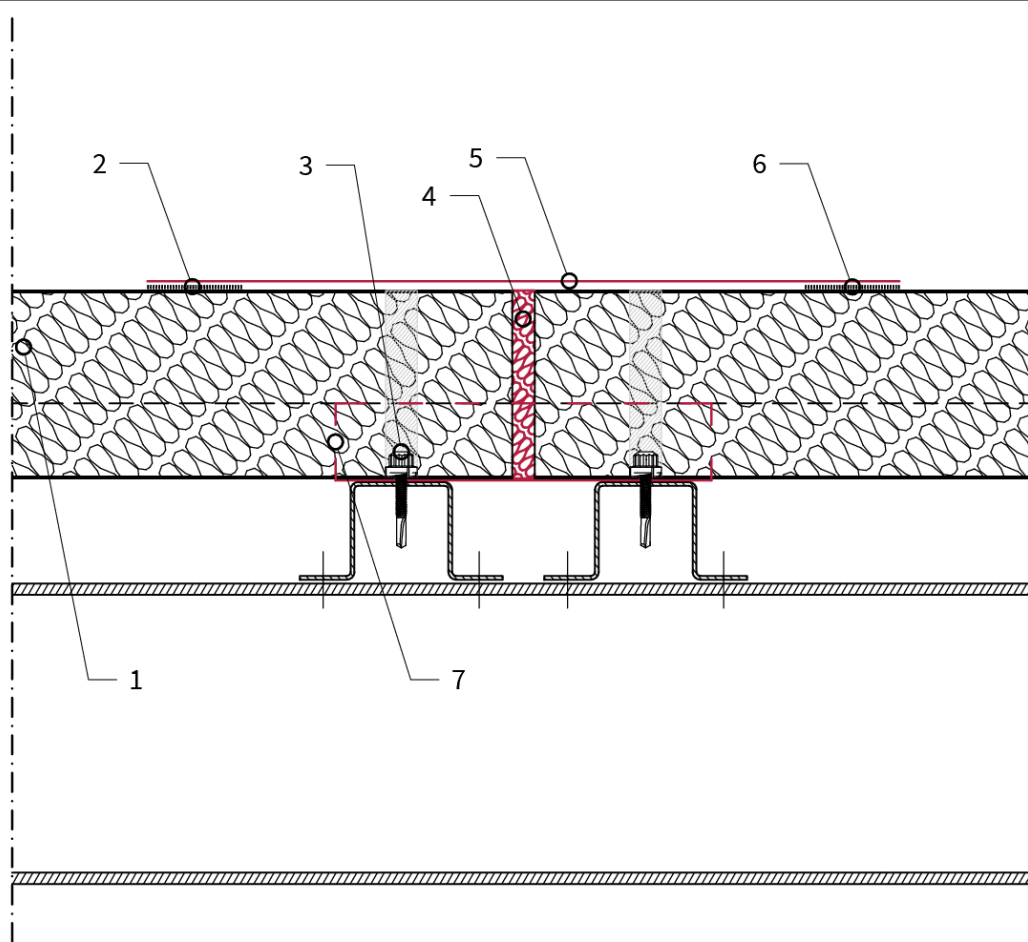
01 ISOPAN PVC Flat Roof Panel	09
02 5 cm welding	10
03 Fastening screw with plate	11
04 Proper on site insulation	12
05 40 cm PVC pontage layer	13
06 5 cm welding	14
07 LG40 metal sheet	15
08	16

ATTENTION: the proposed solution does not constitute the project, and must be firstly assessed and evaluated by the designer and construction supervision. The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.  
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**HEAD TO HEAD JOINT DETAIL - SELF-LOCKING SCREW (ONLY ISODECK SYNTH)**



Description <b>PVC FLAT ROOF PANELS DETAIL</b> Vertical Section Panel joint			
Scale	Drawing code	Date	Rev. date
1:3	TD_F14	16.05.2016	
		Drawn by	Rev.
		ISOPAN	-

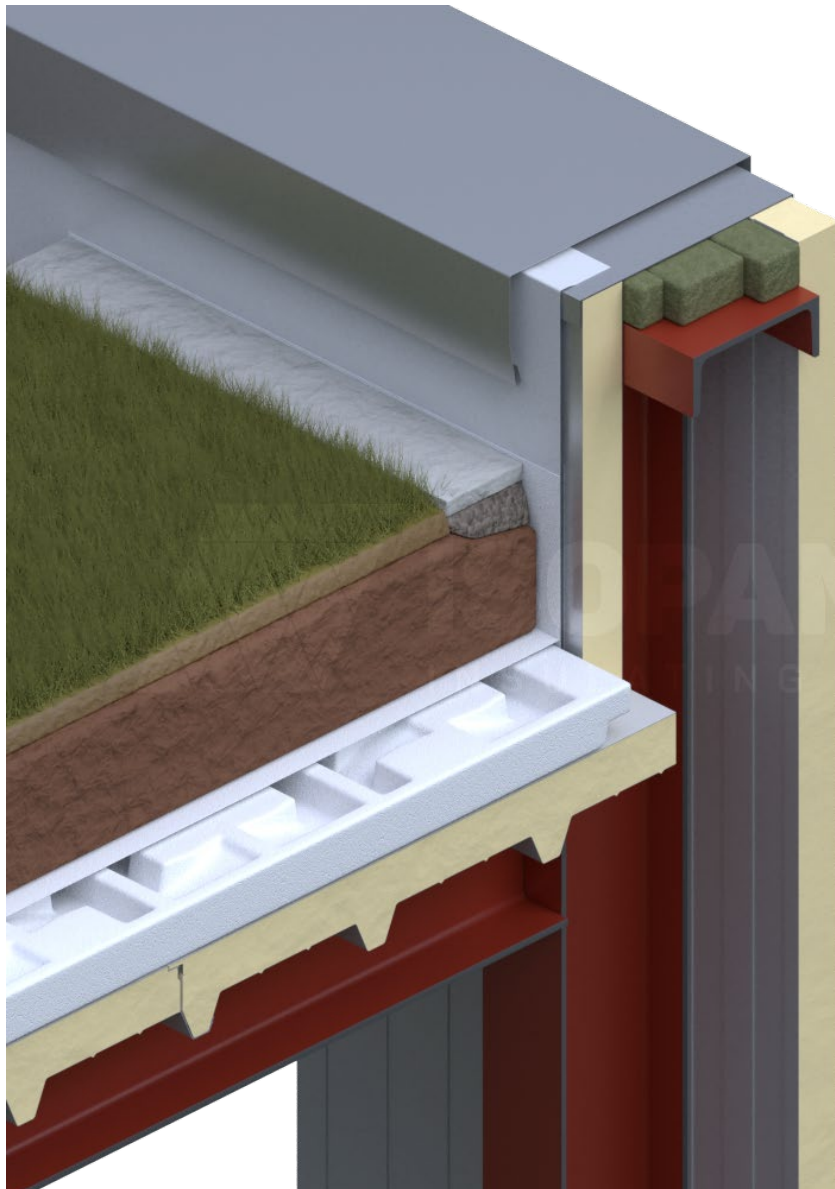


#### Legend


01 ISOPAN PVC Flat Roof Panel	09
02 5 cm welding	10
03 Core-drill fastener	11
04 Proper on site insulation	12
05 40 cm PVC pontage layer	13
06 5 cm welding	14
07 LG40 metal sheet	15
08	16

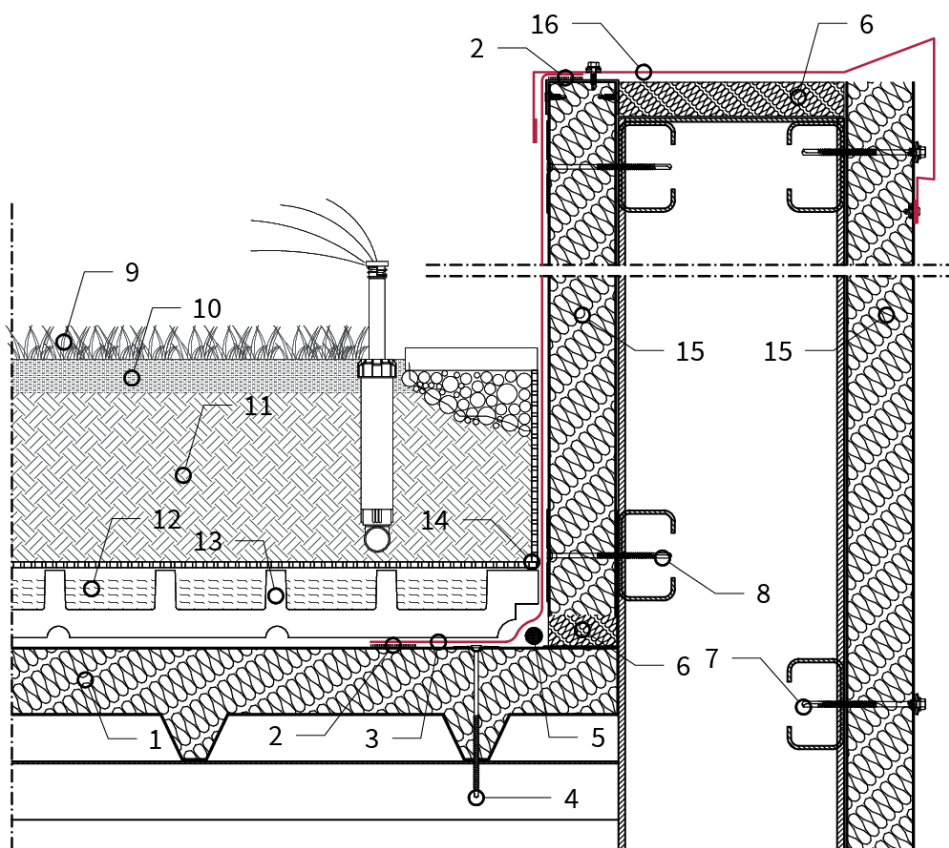
ATTENTION: the proposed solution does not constitute the project, and must be firstly assessed and evaluated by the designer and construction supervision. The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.  
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## DETAIL OF THE SIDE CORNER FOR NATURAL GREEN ROOF





Description <b>PVC FLAT ROOF PANELS DETAIL</b> Vertical Section Green roof system			
Scale	Drawing code	Date	Rev. date
1:5	TD_F05	16.05.2016	03.12.2018
		Drawn by	Rev.
		ISOPAN	1



#### Legend

01 ISOPAN PVC Flat Roof Panel	09 Grass
02 5 cm welding	10 Sowing soil
03 PVC layer	11 Soil
04 Fastening screw with plate	12 Water containment
05 Compressible curb	13 Polystyrene panel for soli and water containment
06 Proper on site insulation	14 Stabilizing filter
07 Fixing screw	15 ISOPAN Walls Panel
08 Stress plate with flat head screw	16 Custom flashing

ATTENTION: the proposed solution does not constitute the project, and must be firstly assessed and evaluated by the designer and construction supervision. The designer is responsible for assessing the need to insert additional gasket and/or closing elements, even when not indicated in the drawing details.  
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# **Annex C - PVC/TPO membrane installation manual**

PVC/TPO membrane installation manual

Use, control and maintenance manual

## Contents

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## FOREWORD

The instructions contained in this manual are to be considered only as general guidelines. Verify that products to be installed are indicated for the correct use and application for the case in question. In any case, the only person responsible for the installation of the products and any potential consequences is the installer and Isopan.

Contact Isopan's Technical Office for any information.

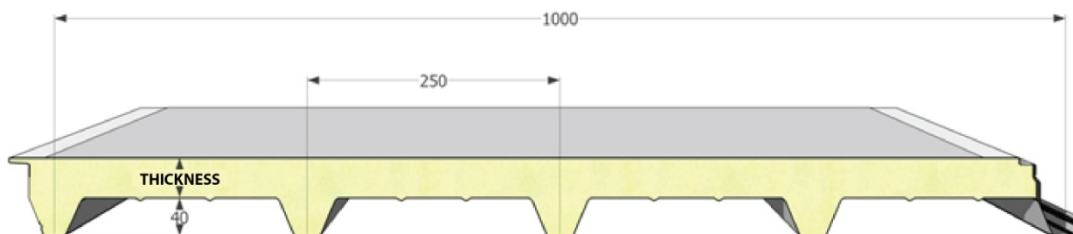
## INTRODUCTION

This manual is intended to provide operating instructions and general guidelines for the correct installation of PVC/TPO membranes covering the flat roof sandwich panels of the Isopan Flat Roof range. Namely, the construction of the **pontage**, i.e. the PVC/TPO membrane strip at the joining of two adjacent panels, is covered. Furthermore, the ways to perform the fittings of the roof panels with elements typical of roof applications are described.

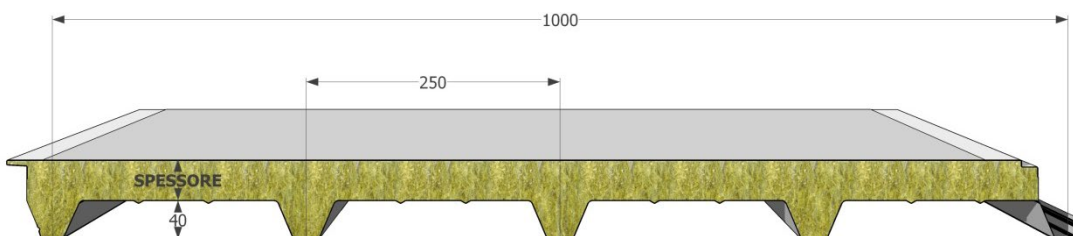
Flat roof panels of the Isopan **Flat Roof** range, with polyurethane or rock wool insulation, have a pre-glued PVC/TPO membrane on the external sheet. By means of the pontage it is possible to create perfectly waterproof flat roofs, provided that this operation is carried out to a professional standard, as it aims to create continuity between the watertight membranes, thus managing to prevent infiltration through the support joints between the various panels.

### **Isopan Flat Roof Range**

#### **- PU - Polyurethane**

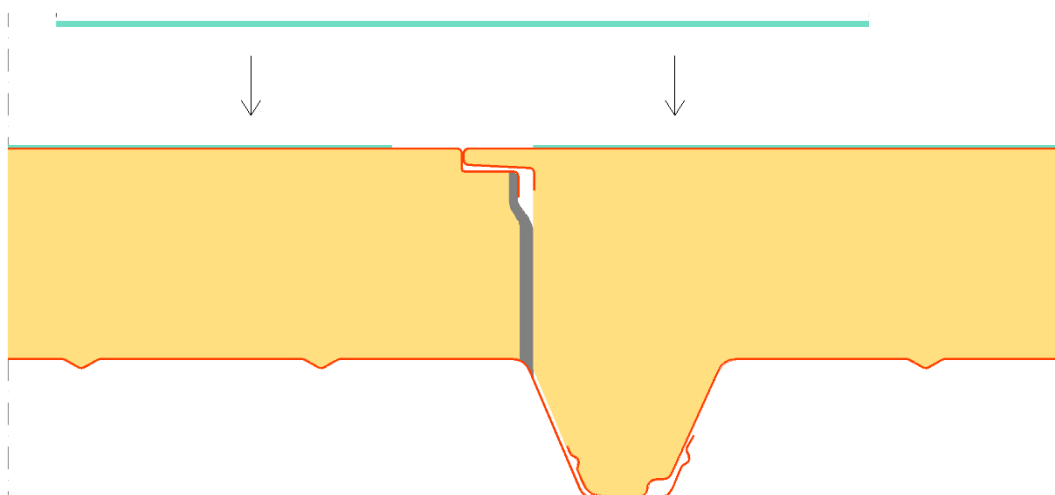


#### **- MW - Mineral Wool**



The pontage operation is therefore crucial for the correct construction of the flat roof, as the reduced slopes of the roof pitch do not allow a rapid water flow.

In the same way, attention must be paid when executing the various construction details of the roof, such as the joints of the waterproof membrane with vertical facings (in sandwich or concrete panels), with waterspouts, gutters, ridge caps, tinworks, etc.



Detail of the pontage between two panels of the Isopan Flat Roof range placed side by side

## EQUIPMENT

The following equipment is required for the correct installation of the overlaps and PVC/TPO membranes:

<ul style="list-style-type: none"> <li>- Hot air manual welder (recommended model with temperature indicator)</li> </ul>	
<ul style="list-style-type: none"> <li>- 40 mm nozzle: main welds</li> <li>- 20 mm nozzle: detail welds</li> <li>- 20 mm elbow nozzle: detail welds</li> </ul>	
<ul style="list-style-type: none"> <li>- Silicone roller for PVC, width 28 mm</li> <li>- Teflon roller for TPO, width 28mm</li> <li>- Brass roller, width 6 mm</li> </ul>	
<ul style="list-style-type: none"> <li>- Chamfering tool, automatic Dremel or a manual one</li> </ul>	
<ul style="list-style-type: none"> <li>- Spark tester for non-destructive welding tests</li> <li>- Hook for non-destructive welding tests</li> <li>- Shears</li> </ul>	
<ul style="list-style-type: none"> <li>- Single nozzle hot air automatic welder</li> <li>- Dual nozzle hot air automatic welder</li> </ul>	
<ul style="list-style-type: none"> <li>- Synthetic membrane cutter</li> <li>- Nozzle cleaning brush</li> </ul>	

## OVERLAP CLEANING AND PREPARATION PROCEDURE

In order to perform a correct welding, the PVC/TPO overlapping membrane section must be clean and dry. Cleaning must be carried out as follows:

- Remove dust with a broom
- Clean with water and a brush
- Clean with a suitable non-aggressive solvent for PVC/TPO
- Wait for the complete drying and then proceed with the welding.

Do not rub or introduce dust or dirt inside the overlapping, as this may affect the continuity and strength of the weld. Apply the cleaning liquid to the surface and overlapping, remove dirt with a clean white cloth or paper.

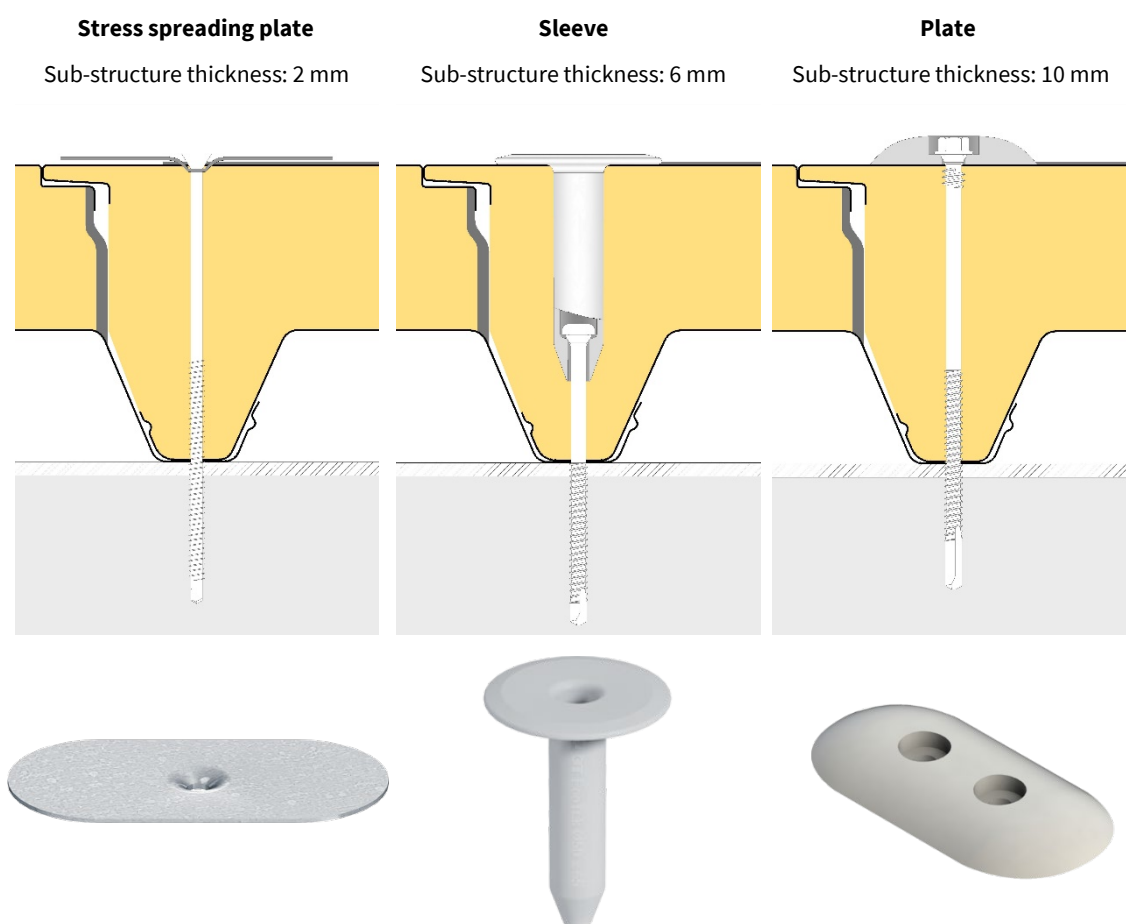
The solvent-based detergent for cleaning the membranes must be suitable for application on PVC/TPO, to avoid potential damage to the waterproof surface. We recommend using the detergent indicated by Isopan's Technical Office.



## PONTAGE

The application of the pontage aims to create continuity between the waterproof membranes of two panels placed side by side. This operation consists in positioning a PVC/TPO strip of appropriate thickness and variable width to cover the overlap, at the level of the external sheet, of the tongue-and-groove joint of the panels, see figure on page 44.

During this operation, care must also be taken to cover the **mechanical fastenings** of the panels, which will be applied at the ends of the panel. The fastenings must be made only with systems that cannot damage the pontage. Fastening methods approved by Isopan's Technical Office are provided below:



These mechanical fastening methods of the flat roof panels have been specifically developed to avoid damaging the PVC/TPO strip covering them, forming the pontage, and therefore are the most suitable ones for this type of application.

## OVERLAP WELDING

### *Manual welding*

Before welding, make sure the overlaps are clean and dry.

The minimum welding **width** of the covering strip on the pre-glued membrane of the Isopan Flat Roof range must be 20 mm.



Make sure that the welding **nozzle** is clean and that the leakage section is constant throughout its width.



The welding **temperature** must be suitable to the operating and application conditions.

**PVC:** the base welding temperature is **400/450 °C**, with a speed of **1 m/min**.

**TPO:** the base welding temperature is **350 °C** with 40 mm nozzle and **300°C** with 20 mm nozzle, with a speed of **0.5 m/min**.

Carry out a welding test to identify the correct temperature with reference to the actual environmental and site conditions.

Use the 20 mm nozzle for both the main linear welds and details.

Make sure that the power cables are suitable in terms of diameter and length, in order to avoid voltage losses or safety risks and to maintain an ideal welding temperature.





The **welding sequence** consists of:

- Spot welding
- Pre-welding
- Welding

### Spot welding

It consists of spot welding, required to install the membrane.

Perform spot welding on the overlaps approx. every 400 mm. Spot welding must be carried out in the most internal part of the overlapping at no less than 80 mm from the edge of the upper membrane. After welding the first end, pretension the pontage strip and proceed with its spot welding.



### Pre-welding

This is a linear welding, backward in relation to the edge of the upper membrane.

Weld the internal part of the overlapping along its entire length, leaving a free width towards the edge of the membrane of 20 mm for the final welding. Use the silicone (for PVC) or Teflon (for TPO) roller in a position parallel to that of the welding, with the welding machine nozzle in an orthogonal position.



The pressing roller must be fully resting on its entire width, and not placed at an angle.

Check the continuity of the pre-welding before proceeding with the final welding.

### Final welding

It consists of welding of the edge of the upper membrane on the lower one.

Position the nozzle at an angle of 45° in relation to the welding line. Use the pressure roller at an angle of 45° in the direction opposite the nozzle, positioned 10 mm further ahead than the current welding position. By using the roller, apply a light pressure on the upper part of the overlapping in a continuous and fluid manner, with an alternating forward-backward movement.



### ***Automatic welding***

For automatic welding, it is possible to use the single nozzle automatic welder, or the dual nozzle one, that permits to simultaneously weld both sides of the pontage strip.

The **minimum welding width** of the covering strip on the pre-glued PVC/TPO membrane of the Isopan Flat Roof range panel must be **20 mm**.

When using the automatic welder, make sure that it is positioned correctly and that the temperature is adjusted appropriately for welding the PVC/TPO membrane. Check that the standard nozzle is clean and that the air flow is not obstructed.

**PVC:** the base welding temperature is **500/550°C**, with a speed of **2÷3 m/min**.

**TPO:** the base welding temperature is **450°C**, with a speed of **2 m/min**.

The base temperature and speed are affected by the environmental and climatic conditions on site, by the surface temperature of the membrane, by the degree of humidity and the wind. Before starting welding operations, it is advisable to carry out a welding test by using two membrane strips 2 m x 30 cm long. Check the quality of the welding thus carried out via the destructive method on page 65 and correct if required.

To ensure the correct sealing of the weld, prevent the automatic welding machine from moving on the fastenings.



## TYPICAL CASES

In order to achieve a flat roof with panels from the Isopan Flat Roof range in a workmanlike manner, it is required to pay attention not only to their assembly, but also to other construction details. In this case continuity of the waterproof membrane must be ensured, to guarantee the water tightness in all points where infiltrations may occur. This translates into the positioning of PVC/TPO sheaths covering the various elements that are located on the roof and welding them to the panels of the Isopan Flat Roof range.

These elements can be positioned by mechanical fastenings (screw and small plate) or via gluing.

The width of the weld between adjacent PVC/TPO membranes must be at least 20 mm for glued or weighted systems

- 11 cm for mechanical fastening systems (risers and spandrels)



### ***T-joint welding***

T-joints are formed when the membrane overlaps more than once.

On membranes 1.5 mm thick or more, **chamfer** the step along the edge of the overlapping where the membranes are welded together. This process prevents any risk of capillarity through the overlapping, allowing for the correct application of the outer membrane. This procedure is carried out by using a specific automatic chamfering scraper (of the Dremel type) or a manual one.

Once the welding is completed, soften the cutting edge of the pontage strip by using the **brass roller**.



### ***Mechanical fastening system for vertical surfaces***

For details such as vertical welts of external and internal perimeter walls of height over 50 cm, skylights, dormers, fan stands, etc. a mechanical fastening must be made to anchor the waterproof membrane.

The quantity and centre distance of the fastenings must be defined according to their height from the ground, the location, the topography of the building and the surrounding area (wind calculation).



In any case the centre distance between the fastenings must not exceed 25 cm. The fastening lines must be placed 6 cm from the edge of the tarp. The overlap of the tarps must ensure the coverage of the fastenings, with a minimum width of 11 cm.



Manual welding must be carried out according to the procedure previously described: spot welding, pre-welding, final welding.

### ***Perimeter fastening***

The membranes must be mechanically fastened along all perimeters and openings with pre-drilled bars or small metal plates. The welts must be fixed to the base, on the horizontal or vertical surface.

Application of perimeter fastening is recommended along all perimeters and at all the interruptions and openings present in the roof, e.g. drain outlets, fans, chimneys, skylights, etc.

Leave 1 cm between the pre-drilled metal bars to ensure free thermal expansion. To protect the membrane from any mechanical damage, the terminals of the metal profiles must be covered with a piece of membrane.

Fixing with small plates is recommended around small elements, such as exhaust outlets, fans, pipe fittings, etc.



### ***Vertical surface gluing***

On internal and external perimeter welts, skylights, chimneys, plant footings, etc. the membranes must be glued via a specific solvent-based contact adhesive.

The adhesive must be applied with a roller on the surface of the welts and of the membranes. Once the solvents have evaporated, join the two surfaces to be glued together from the bottom to the top, taking care to avoid the formation of folds or bubbles on the waterproof membrane, pressing with a suitably sized rubber roller, in order to obtain uniform adhesion.

Supports suitable for gluing: cement, wood, sheets (with previous thorough surface cleaning), tiles, etc. Do not glue on surfaces that tend to cause leakage of binders with consequent material chalking, such as expanded and extruded polystyrene, cellular concrete, bituminous membranes in general, panels containing perlite, exposed rock wool, non-solvent-resistant materials, fibrous or wet surfaces, etc.

Do not apply the adhesive on the areas of the membrane that must be welded. Should this happen accidentally, immediately remove the adhesive by using a suitable product, to prevent the welding from being carried out afterwards.

Fastening with adhesive is not suitable for a height greater than 300 mm. Beyond that, a mechanical fastening is recommended.



### ***Prefabricated internal corner***

Mechanically fasten the end of the roof membrane with pre-punched metal profiles or small plates. The membrane must be fixed to the welt base, on the horizontal or vertical surface.

Apply the profiles or small plates at a distance of 15 cm from the corner, to allow for easier corner welding.

Fold the excess membrane in the corner at 45°, forming a pocket and weld the flaps together.

Weld the pocket to the roof membrane.

glue or mechanically fasten the membrane to the vertical welt.

To facilitate this operation, it may be useful to fold the membrane beforehand in order to give it the required shape via the hot air welder and the roller, before applying the welt.

Fold the membrane and cut the top up to 2 cm from the corner.

Place one flap of the membrane below the other

Cut the edge, rounding it with the scissors, and flat weld it.

(continues...)





**(...continues) Prefabricated internal corner**

Perform pre-welding and check it before completing with the final welding.

Position the upper flap so that the edge has an inclination of about 45°, round the edge by using a pair of scissors.

Flat weld the upper flap.

Perform pre-welding and check it before completing with the final welding.

Position the prefabricated internal corner.

Starting from the centre of the corner towards the outside, perform spot welding and pre-welding, before completing with the final welding. Perform welding on both horizontal and vertical surfaces of the prefabricated corner.

Use the 20 mm nozzle and the small brass roller for uncomfortable positions.

Before welding, make sure that the membrane and the prefabricated corner are clean.

If required, treat with a specific product, applied with a clean white cloth.



### ***Inside corner with upward fold***

Mechanically fasten the end of the roof membrane with pre-punched metal profiles or small plates. The membrane must be fixed to the welt base, on the horizontal or vertical surface.

Apply the profiles or small plates at a distance of 105 cm from the corner, to allow for easier welding.

Fold the excess membrane in the corner at 45°, forming a pocket and weld the flaps together. Weld the pocket to the roof membrane.

Cut the membrane for a length sufficient for the vertical welt, fold the membrane on the lower edge beforehand to give it the required shape and facilitate installation, using the hot air welder and the roller.

Apply the contact adhesive on the vertical welt support and on the waterproof membrane, taking care not to soil the surfaces to be welded with the adhesive.

Wait for the solvent to evaporate before joining the two surfaces to be glued together, taking care to avoid the formation of folds or bubbles on the waterproof membrane.

Weld the vertical welt to the roofing membrane. Perform spot-welding and pre-welding before completing the operation with the final welding.

Cut, round and apply the adjacent welt as previously described. On membranes 1.5 mm thick and thicker, chamfer the step along the edge of the overlapping where the membranes are welded together. This procedure is carried out by using a specific automatic chamfering scraper (e.g. Dremel) or a manual one.



Fold the excess membrane and form a fold; weld the flaps together.



Fold the membrane behind the opposite side. Draw a vertical line along the edge of the fold in line with the welded bottom corner, cut the excess material by using a pair of scissors, before welding in place.



Complete the corner with the thermal welding of the flap.



Do not apply the adhesive to the areas that must be welded. Should this happen accidentally, the adhesive must be immediately removed by using a suitable product, otherwise it will no longer be possible to carry out the welding.



### ***External corner***

Mechanically fasten the end of the roof membrane with pre-punched metal profiles or small plates. The membrane must be fixed to the welt base, on the horizontal or vertical surface. Apply the profiles or small plates at a distance of 150 cm from the corner, to allow for easier welding.

Cut the vertical welt of the membrane to adapt it to the shape of the support. Cut the lower flap of the welt and open it at 90°.

Glue or mechanically fasten the membrane on the vertical welt, fold the membrane on the lower edge beforehand to give it the required shape and facilitate installation, using the hot air welder and the roller. Weld the vertical welt to the roof membrane, perform spot welding and pre-welding, before completing the operation with the final welding.

Place a sufficiently wide membrane section to cover the corner. Starting from the centre of the corner towards the outside, perform spot welding and pre-welding, before completing the operation with the final welding.

Use the 20 mm nozzle and the small brass roller for uncomfortable positions.



### ***Pipe and waterspout facing***

Cut a hole in the roof membrane and insert the membrane on the pipe.

If this operation is not possible, cut a suitably wide membrane section, cut a hole in the centre having a diameter slightly smaller than that of the pipe in order to have sufficient material to perform the welding; round the corners by using a pair of scissors.

Heat the hole via the hot air welder, spread it with your hands and insert the piece on the pipe.



### ***Prefabricated facing***

Insert the prefabricated facing onto the pipe, weld the base flange to the roof membrane with hot air. Using the 20 mm nozzle, aim the facing as close as possible to the pipe, proceeding outwards to make the pre-welding and the final welding to the roof membrane.

If upper access is not allowed or the pipe has a particular size, use a prefabricated facing of a larger diameter, cut it on one side and wrap it around the pipe and then close it again by welding with hot air. Weld the flange to the roof membrane.

Apply a silicone mastic on top of the facing to seal the upper part. Complete the detail by applying a stainless steel hose clamp.



### ***Drain outlets***

Cut the roof membrane at the drain waterspout.



Apply fixing plates to prevent movements due to the wind in the mechanically fastened systems.



Insert the prefabricated inlet into the waterspout.



Using the 20 mm nozzle, aim the facing as close as possible to the waterspout, proceeding outwards to make the pre-welding and the final welding to the roof membrane.



### ***Existing membrane welding***

When applying a new membrane to an existing one, e.g. for expansion operations, make sure that the existing membrane is free of dirt and dust. This can be ensured by a washing it with pressurised water followed by a cleaning and preparation treatment, as indicated on page 46.



Once the membrane is dry, use an automatic welding machine to weld the new membrane to the existing one.



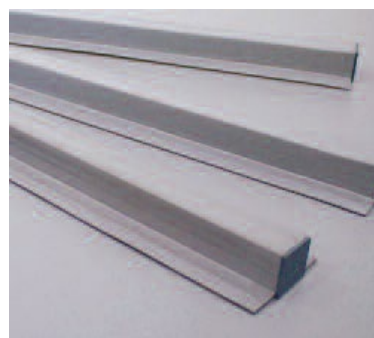
### ***Roof accessories fixing bar (exclusive for PVC)***

In cases where the installation of walkways, photovoltaic systems and any other type of system above the flat roofs made with panels from the Isopan Flat Roof range is required, we recommend using the roof accessories fixing bar.

This is made of an aluminium core coated with a thick layer of PVC/TPO, thus combining the mechanical capacity properties to the waterproof membrane protection on which it is placed.

This roof accessories fixing bar is a multi-purpose connecting bar that creates a fastening base for a wide range of systems which can be installed above it via screws.

This system makes it possible to avoid puncturing the waterproof membrane, as it is fastened to it by means of hot air welding, thus joining the base of the bar to the membrane itself. This way the tightness of the roof is ensured by means of a simple but resistant fastening type.



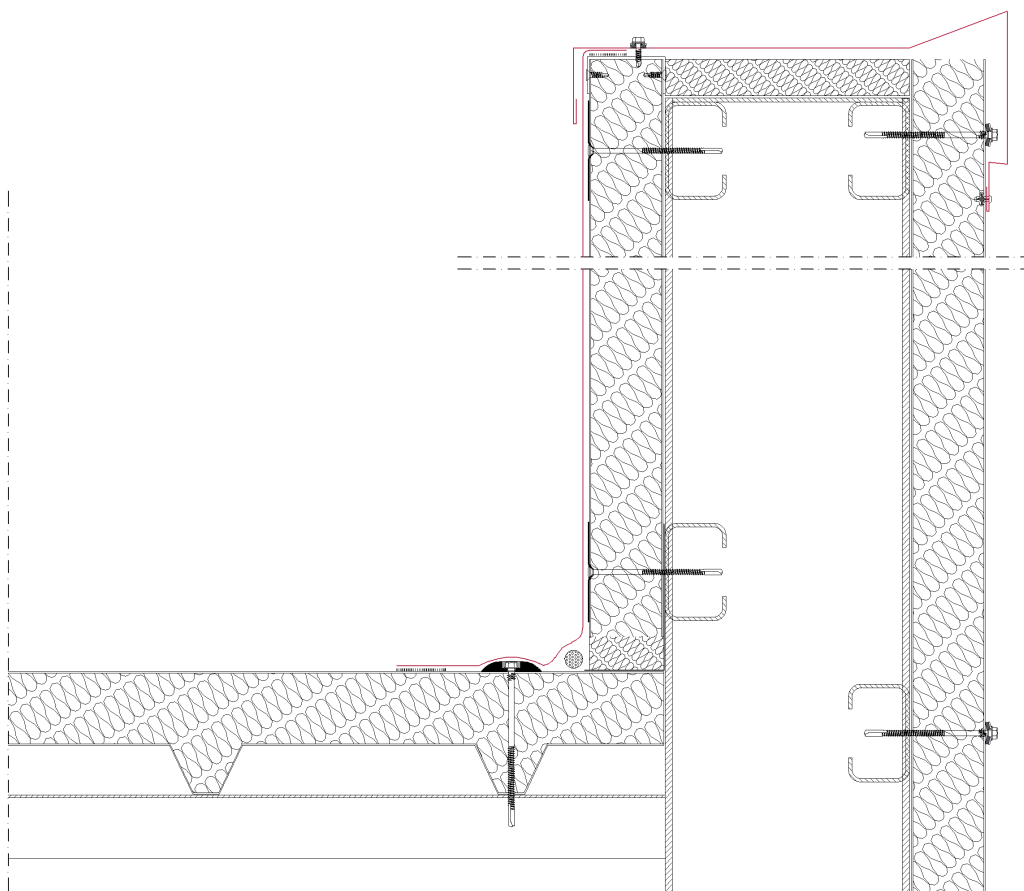
### **Roof panel fitting – Vertical spandrel**

The vertical spandrel on the roof can be made up of Isopan wall panels, concrete structure, etc.

Waterproofing of the joining node between the roof panel and the spandrel must be ensured by applying a section of PVC/TPO membrane. This must be fixed to the spandrel, along its vertical length, by means of mechanical fastenings or gluing and must be welded in its lower flap to the panel of the Isopan Flat Roof range and to the spandrel at the top. If the spandrel is made of concrete, this last welding cannot be carried out directly, but a pre-coupled flashing must be prepared, suitably anchored to the spandrel, on which the PVC/TPO membrane can be welded.

When carrying out the connection, it is important to avoid excessively tight curvatures of the PVC/TPO membrane, to prevent it from being damaged: in the case of perpendicular joining between the roof and the spandrel, place a **strip of compressible material** at the corner formed by the two, fasten it with spot gluing and place the PVC/TPO membrane over it, which can then be installed with a softer curvature when forming the connection.

If other elements, such as drainage channels, gutters, waterspouts, pipes, etc. are placed between the roof panel and the spandrel, extend the PVC/TPO membrane covering them, in order to obtain a continuous water seal through any unevenness encountered. Make sure that the PVC/TPO membrane is always adherent to the surfaces to be covered, securing it via gluing or mechanical fastenings.





## WELDING CHECK

### *Non-destructive testing method*

The highest standard required that **all the welds** carried out are checked via the non-destructive testing method.

The check must be carried out when the welding has cooled, using a specific **test hook**. The hook is passed at the edge of the welded overlapping, applying a sufficient pressure, searching for any welding imperfections/unevenness.

If an imperfect weld is identified, follow the cleaning and preparation instructions on page 46 before resuming welding with the manual hot air welder. In extreme cases it may be required to apply a strip of new waterproof membrane on the faulty weld. Overlap cleaning and preparation is also required in this case.

After cooling, carry out the check again with the test hook. To avoid mechanical damage to the waterproof membrane, the test hook must have a rounded tip.

A further welding checking non-destructive method is spark test. This test is carried out by using an instrument (Spark Tester) that, when moved along the welding line, shows the possible presence of points of discontinuity by the emission of a small electric spark.



### ***Destructive testing method***

Cut a strip of width 10 mm and length 150 mm from the welded overlapping. Pull both edges of the weld (peeling test) by applying a suitable force.



The welding is correct if the breakage occurs outside it, as indeed the weld must not yield.



When setting the daily welding parameters, it is recommended to perform test welds on strips at least 2000 mm long, to be checked with the destructive method as indicated above.



### ***Damage repair***

It is easy to verify if the upper side of the membrane, of a light grey colour, is damaged, since the lower side, being black (signal layer), is evident in case of damage.



The repair operation consists in applying a piece of membrane that fully covers the damaged area. Mark the outline of the piece on the damaged roof membrane.



Thoroughly clean the surface of the membrane by using a clean white cloth and a specific cleaning product. Wait for the complete evaporation of the solvents and for the membrane to fully dry.

Then proceed with welding of the new piece starting from the centre outwards, gradually checking the quality and continuity of the welding.



Do not rub/transport dust/dirt in the overlapping. Apply the cleaning liquid and remove dirt by using a clean cloth. Wait for the solvents to fully evaporate before carrying out the welding.



# Use, control and maintenance manual

## ***Roof access***

Roof access must be allowed only to authorised personnel, trained and adequately informed on the hazards and risks present in the roof.

Roof access must always be carried out in complete safety, in compliance with all the accident prevention regulations required for by current legislation. To prevent falls from above, it is required to provide adequate collective protection devices (parapets, scaffolding, etc.) and/or personal protective equipment (PPE), such as anchorage points, lifelines, harnesses, etc.

All employees accessing the roof must be equipped with appropriate PPE in accordance with the operations to be carried out.

## ***Practicability and walkability***

Roofs made with panels from the Isopan Flat Roof range can be used and walked on only for the maintenance of the same or any systems present on the roof.

If systems that require periodic maintenance or cleaning are present on the roof, it is recommended to create walkways, in order to provide a safe and guided preferential path for all operators.

To walk directly on the waterproof membrane it is required to be equipped with suitable footwear, for your own safety and to avoid damage to the membrane itself. If using heavy-duty sole shoes we recommend, before walking on the membrane, to always check the absence of gravel or other abrasive material accidentally present in the tread, in order to avoid the risk of abrasion or puncturing of the membrane itself.

Pay the utmost attention and caution if accessing the roof in the presence of standing water, frost, or heavy rain, to avoid slipping.

Do not place anything heavy or sharp directly on the waterproof membrane before setting up a special protection, support and distribution of the load, for example by means of wooden planks.

In case of ballasted roofs, the walkability/practicability depends on the type of ballast used, as shown below:

- gravel ballast: accessible only for maintenance of the roof and/or any machinery and systems present
- ballast in squares on supports (floating floor): accessible and walkable
- walkable flooring (cement substrate and finned tiles): accessible and walkable
- ballast with green roof: accessible, with both extensive and intensive green roofs.

### ***Roof cleaning***

If required, the waterproof membrane can be washed with water and a non-aggressive, non-foaming household detergent. Apply the cleaning solution by using abrasive sponges, brushes, soft brooms, then rinse with running water. Do not use solvents or other aggressive products.

### ***Systems and machinery***

Technological systems and the machinery present in the roof must be suitably positioned on the roof and connected with the waterproof membrane (bases, support beams, etc.).

The systems and the machinery must not be directly placed on the waterproof membrane but on the bases with a support surface suitable for the correct distribution of the load, moreover they must be made of materials and shapes suitable for not damaging the waterproof membrane and the panel itself.

Technological systems and machinery must not release or leak aggressive, polluting and harmful substances (liquids, solids or fumes), which may compromise the functionality of the insulating membrane.

In case of maintenance on technological systems and machinery, all operations carried out on the roof must be performed with the utmost care not to damage the waterproof membrane, suitable temporary protective operations must be conducted. Avoid spreading substances or materials that may damage the waterproof membrane on the roof. In case of accidental spillage or spreading, all the waste materials and/or percolation must be removed promptly and the waterproof membrane must be properly cleaned. Use running water if required, always in compliance with the environmental safety regulations in force.

In case of doubt, contact the Installer Company, which will be able to provide information and support based on the needs of the case.

### ***Presence of snow on the roof***

The waterproof membranes pre-glued to the panels of the Isopan Flat Roof range and the correctly made pontage strips have an excellent resistance to low temperatures, therefore, in general, the presence of snow directly above the roof does not cause any damage and does not require specific operations.

In special cases, however, it may be required to access the roof to free outlets, in order to promote the flow of water due to the melting of snow, or to verify that the thickness of the snow is not too high and reaches the upper level of skylights, aerators, chimneys and any other openings present on the roof, with the risk of overflow and infiltration, or if overload problems due to the capacity of the structure are present. In these situations it may be required to reduce the thickness of the snow layer on specific points or areas of the roof.

Access to the roof must always be carried out with the utmost care and caution, using appropriate personal and collective PPE, taking into account the greater difficulty due to the presence of snow.

Snow removal must be carried out with manual tools that cannot damage the waterproof membrane and/or the layers of ballast and the flooring. Do not use spades and metal shovels, rather use plastic blades with rounded edges. Remove the surface layers of snow, avoiding removing the lower layers directly in contact with the waterproof membrane and/or the ballast layers and the flooring, in order to avoid accidental mechanical damage.

***Repair and/or modification operations of the waterproof membrane***

In case of accidental damage to the waterproof membrane, do not perform improper repairs, always contact the Specialised waterproofing Company. Do not apply bitumen-based membrane pieces (improper repair) on waterproofing membranes.

In case of extreme necessity and urgency it is possible to carry out simple and fast repairs by using mono-adhesive butyl tape with aluminium laminate, after cleaning the waterproof membrane with water. These operations are to be considered an emergency and temporary, of limited duration over time, subsequently it will be required to always contact the Specialised waterproofing Company that can carry out a compliant and lasting repair operation. In case of modification or expansion of the waterproof membrane (e.g. new chimneys, modification of systems, etc.), do not carry out improper operations, always contact the Specialised waterproofing Company beforehand.

### ***Periodic checking and cleaning operations on the waterproof membrane***

In order to ensure the full functionality and performance maintenance of the waterproof system over time, periodic checks and cleaning of the roof are required. These operations are summarised in the list below, divided between:

- General checks
- Specific checks

It is possible that, depending on the specific case, other types of check and cleaning/maintenance, or a higher frequency, may also be useful and required; The Designer and the specialist must therefore adequately integrate our suggestions.

General checking operations must be carried out by the owner of the building, or by the specialised company through the stipulation of a control and maintenance contract.

General checks	Frequency	Notes
Cleaning of the leaf guards and outlets	Half yearly	To prevent clogging and limiting or compromising the functionality of the drains
Cleaning and removing any dirt (earth, sand, etc.) on the roof and on the waterproof membrane	Half yearly	To avoid creating a breeding ground for vegetation or micro-organisms
Cleaning and removing any debris or waste on the roof	As required	To prevent improper materials and waste from damaging the waterproof membrane
General visual check of the roof and of the elements installed above in search of any obvious anomalies (waterproofing, skylights, systems, etc.)	Half yearly	To ensure timely reporting of any anomalies to the relevant figures
Cleaning and removal of any vegetation grown on the roof	Half yearly	PVC/TPO membranes are resistant to roots, but it is good practice to prevent the growth and proliferation of vegetation

Specialised checking operations must be delegated to a specialised company through the stipulation of a checking and maintenance contract.

Specific checks	Frequency	Notes
Visual inspection of ridges and metal tinworks	Yearly	Checking the fastenings, the sealing, the presence of corrosion
Visual inspection of silicone seals	Yearly	Checking the sealing and adhesion
Visual inspection of the waterproof membrane, details and accessories connected to it	Yearly	Searching for any anomalies that may limit or compromise its functionality
Visual check on the intrados of the roof floor	Yearly	Searching for any traces of infiltration or other anomalies

The checks carried out must be recorded on appropriate forms, showing the result, the date of the inspection and that of the next planned inspection.

# Annex D - Fastenings

The data and indications contained in this annex regarding the various types of fastenings are strictly without prejudice to the need for the customer to evaluate, independently, under their own exclusive responsibility and through a duly qualified designer, the number and type of fastenings gradually required based on the specific characteristics of the project and of the building on which the products of the Flat Roof Range must be installed



## DISTRIBUTION PLATE

### HTV 82/40 TK with DABO TKR - 4.8xL

No. EJOT 3-009-070013-2013

Washer with drill screws for fastening roof membranes

#### Characteristic Values of Axial Load Resistance

Metal sheet, S280GD – EN 10346  $t_{min} = 0.75 \text{ mm} = 1.06 \text{ kN}$

Structural timber, EN 338/ C24,  $t \geq 25 \text{ mm} = 1.42 \text{ kN}$

Plywood, EN 12369-2,  $t \geq 21 \text{ mm} = 1.70 \text{ kN}$

OSB/3, EN12369-1,  $t \geq 18 \text{ mm} = 1.08 \text{ kN}$

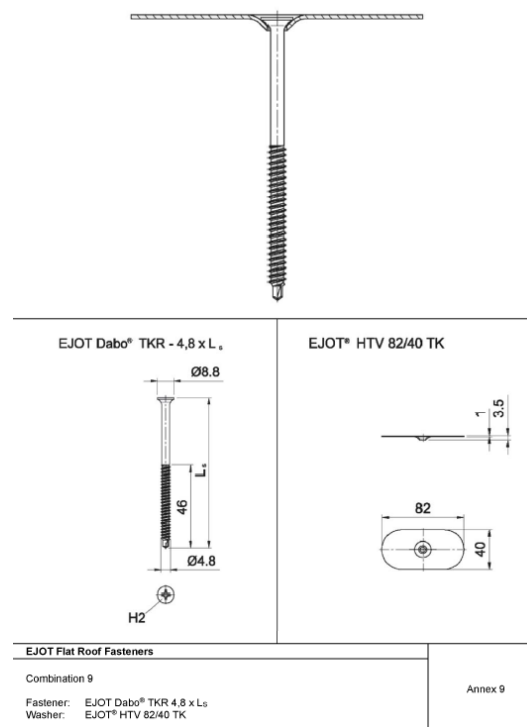
#### Mean Values of Axial Load Resistance

Metal sheet, S280GD – EN 10346  $t_{min} = 0.75 \text{ mm} = 1.28 \text{ kN}$

Structural timber, EN 338/ C24,  $t \geq 25 \text{ mm} = 3.07 \text{ kN}$

Plywood, EN 12369-2,  $t \geq 21 \text{ mm} = 3.14 \text{ kN}$

OSB/3, EN12369-1,  $t \geq 18 \text{ mm} = 2.04 \text{ kN}$



### HTV 82/40 TK with DABO TKE - 4.8xL

No. EJOT 3-010-070013-2013

Washer with drill screws for fastening roof membranes

#### Characteristic Values of Axial Load Resistance

Metal sheet, S280GD – EN 10346  $t_{min} = 0.75 \text{ mm} = 1.06 \text{ kN}$

Structural timber, EN 338/ C24,  $t \geq 25 \text{ mm} = 1.42 \text{ kN}$

Plywood, EN 12369-2,  $t \geq 21 \text{ mm} = 1.70 \text{ kN}$

OSB/3, EN12369-1,  $t \geq 18 \text{ mm} = 1.08 \text{ kN}$

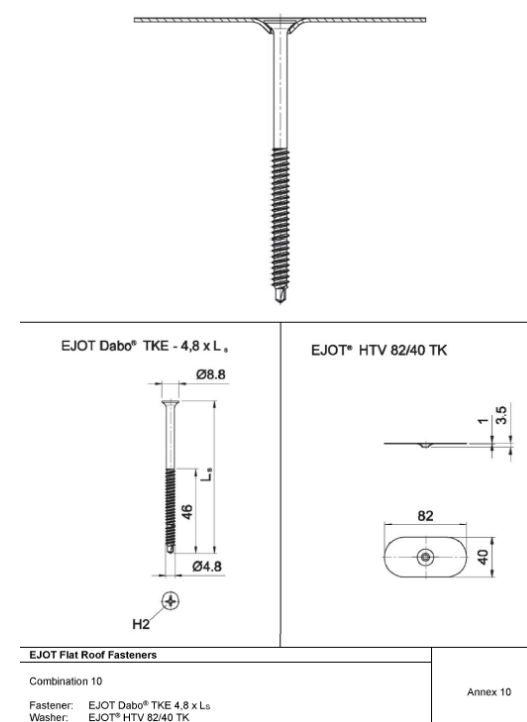
#### Mean Values of Axial Load Resistance

Metal sheet, S280GD – EN 10346  $t_{min} = 0.75 \text{ mm} = 1.28 \text{ kN}$

Structural timber, EN 338/ C24,  $t \geq 25 \text{ mm} = 3.07 \text{ kN}$

Plywood, EN 12369-2,  $t \geq 21 \text{ mm} = 3.14 \text{ kN}$

OSB/3, EN12369-1,  $t \geq 18 \text{ mm} = 2.04 \text{ kN}$



## SLEEVE

### EcoTek 50xL with FBS-R 6.3xL

No. EJOT 3-023-070013-2013

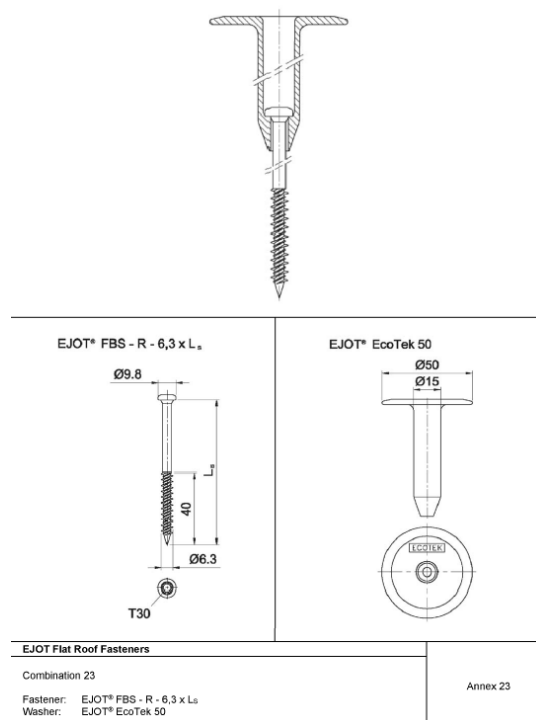
Washer with concrete screw for fastening roof membranes

### Characteristic Values of Axial Load Resistance

Concrete, C 12/15 EN 206, effective anchorage depth  $\geq 30$  mm = 1.58 kN

### Mean Values of Axial Load Resistance

Concrete, C 12/15 EN 206, effective anchorage depth  $\geq 30$  mm = 1.61 kN



### EcoTek 50xL with DABO TKR – 4.8xL

### EcoTek 50xL with DABO TKR - 4.8xL

### EcoTek 50xL with DABO TKE - 4.8xL

### Characteristic Values of Axial Load Resistance

Metal sheet, S280GD – EN 10346  $t_{min} = 0.75$  mm = 1.06 kN

Structural timber, EN 338/ C24,  $t \geq 25$  mm = 1.42 kN

Plywood, EN 12369-2,  $t \geq 21$  mm = 1.58 kN

OSB/3, EN12369-1,  $t \geq 18$  mm = 1.08 kN

### Mean Values of Axial Load Resistance

Metal sheet, S280GD – EN 10346  $t_{min} = 0.75$  mm = 1.28 kN

Structural timber, EN 338/ C24,  $t \geq 25$  mm = 1.61 kN

Plywood, EN 12369-2,  $t \geq 21$  mm = 1.61 kN

OSB/3, EN12369-1,  $t \geq 18$  mm = 1.61 kN

### EcoTek 50xL with DABO TKE – 4.8xL





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