PRACTICAL TIPS

FOR ASSEMBLING PANELS

AND FLOORS OF

REFRIGERATED CHAMBERS

TYPES OF CHAMBERS

Chambers for Positive Temperature

In this section, we cover chambers intended for preservation and refrigeration of products. For this type of enclosures, we use panels with a thickness of 40, 60, 80 and even 100 mm, depending on the transmission losses that we want to admit and the working thermal gap. The anchorage between panels is sufficient to ensure that the connection is sealed. This connection is created as follows:

The side folds of the plate form the tongue and groove connection so that the crest of the male side of the panel is the same measurement as the beginning of the female side. Thus, when we try to introduce the male into the female we will find some resistance in the latter, and once overcome, thanks to the elasticity of the material, we manage to give it greater sealing.

However, when assembling the refrigeration enclosure, it is advisable to seal all connections between panels with white silicone, to maximise waterproofness.

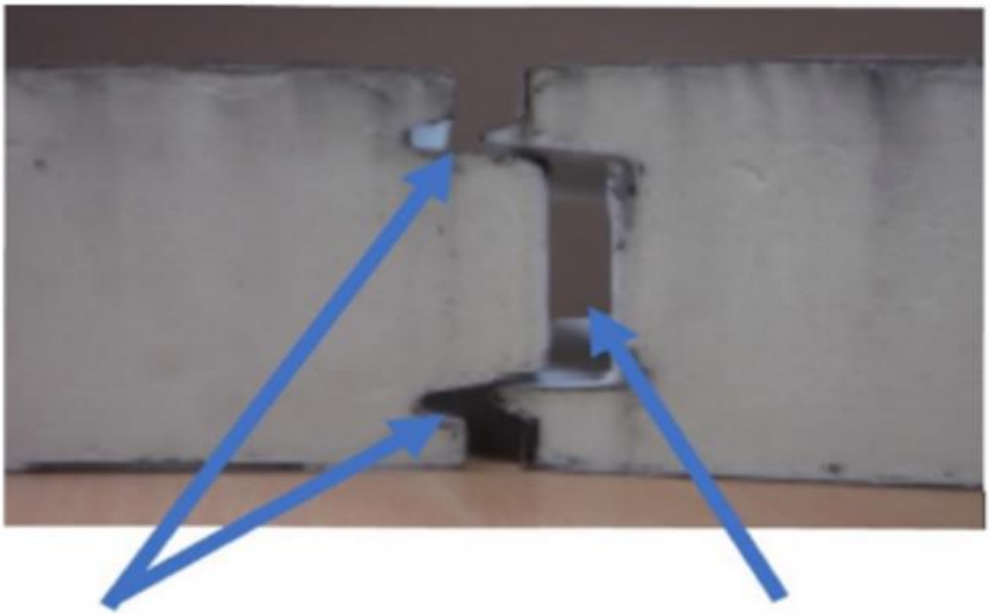
Chambers for Negative Temperature

We refer to all enclosures designed to work with negative temperatures and for which we use a thickness of 100, 120, 150, 180 and 200 mm.

The anchoring of the connection is basically the same as in the positive temperature chambers but taking into account one variant:
A polyurethane cord is applied on site immediately before assembly, thus materially welding the panels and making the connection joint completely watertight.

Option 1: Polyurethanecord

Option 2: Polyurethane cord



FLOORING PREPARATION

Generally speaking and for all cases in the assembly of refrigerated chambers, the floor must be fully level and smooth.

The way in which the chamber will be built and the use of it will determine the different ways of preparing the flooring for the assembly of chambers.
Chambers for positive temperature.
We will differentiate between chambers with panel flooring, chambers without panel flooring and chambers with floor isolation.

With panel flooring

The surface on which the chamber is located must be smooth and level, whether it is finished flooring, blinding concrete or sub-slab.

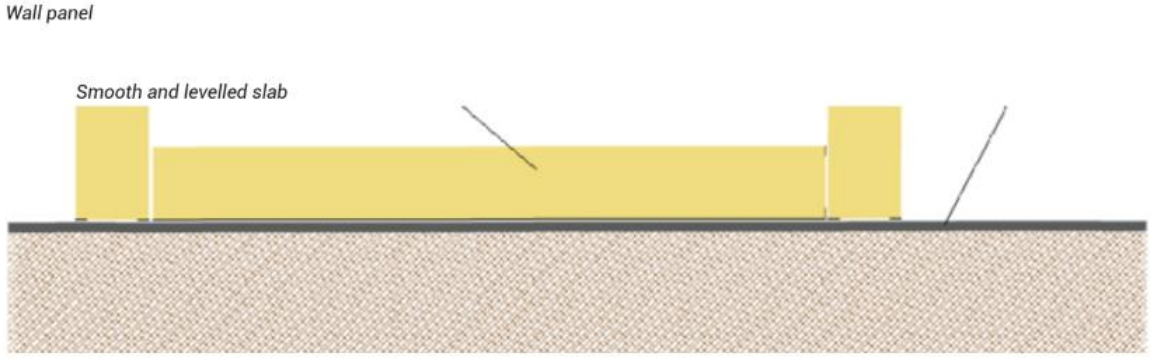
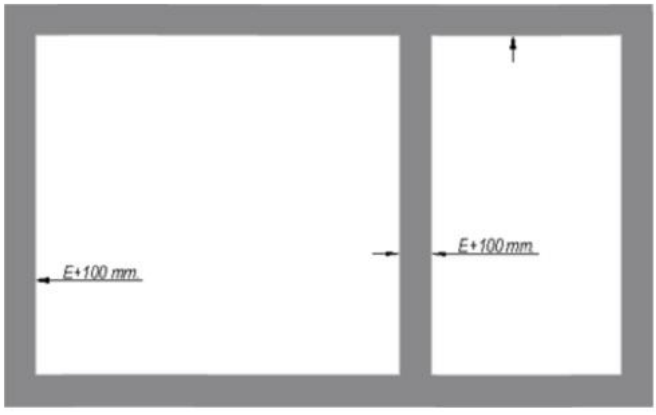


Fig. 8a

Without panel flooring

This is the most generic case. For this type of chambers, it must be smooth and levelled, at least the area where the vertical panels are located. It is highly recommended for the level area to have a minimum width of the panel thickness plus 100 mm.



Levelled area for panel placement - view from above

Fig. 8b

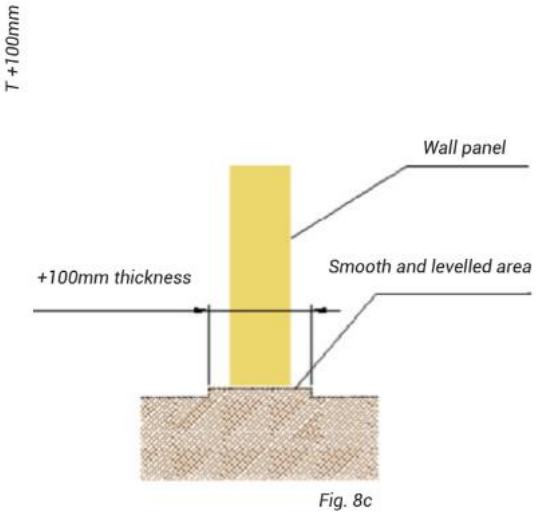
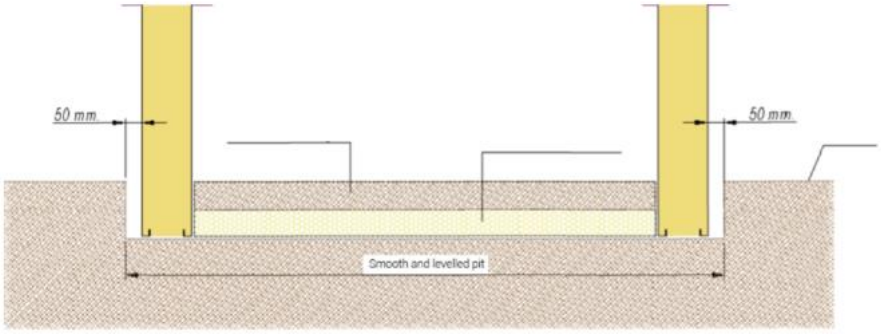


Fig. 8c

With floor insulation

Prior to the assembly to these chambers, a pit will have to be created on the civil works floors in which the chambers and insulation plates will be housed. Likewise, the pit area where the panels are placed must be smooth and levelled.



Chambers for Negative Temperature

In frozen product preservation and freezing chambers, the outer surface temperature in the flooring can be negative, causing the freezing of water vapour condensation on this surface. If there is no circulation of air that evacuates the cold crossing, the insulator placed as floor insulation. The execution of the chamber slab must be preceded by the construction of a sanitary vacuum which allows air to circulate, if the chamber is not built on a high floor of a building.

For air to circulate through the sanitary vacuum evacuating the refrigeration units passing through the insulator, a difference in height is necessary between the air inlet and outlet hole in the vacuum. In case this difference in heights is not possible, mechanical ventilation may be used.

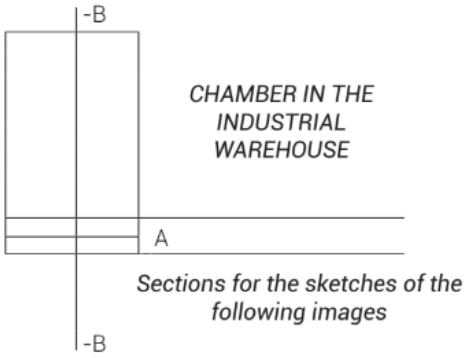
Insulation in the flooring can be:

* Metalpanel panels
* SUELOTHERM

The selection of one of these solutions will be conditioned by the requirements of the installation. We list below the advantages and disadvantages of the two possibilities.

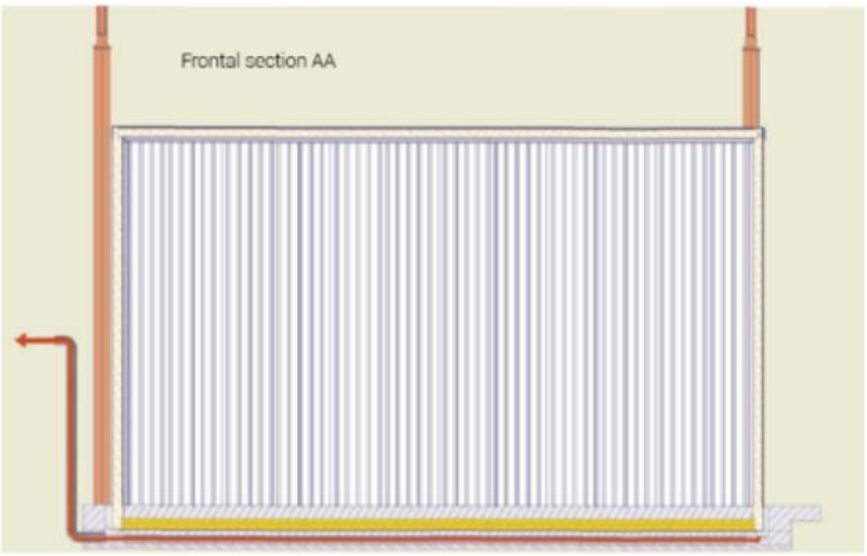
	Metalpanel Panels	SUELOTHERM
Advantages	No pit or civil works required Assembly and quick installation It can be dissembled and used elsewhere	FLOORS WITH A GREAT LOAD CAPACITY Allows mechanical transport Forklift way to access the enclosure
Disadvantages	Enclosure pass or overpass access ramp Little permissible load and floors Does not allow mechanical transport	Requires a pit and sanitary vacuum Coordinated assembly with civil works Floor cannot be used anywhere else

We show a detailed sketch of an example of any industrial warehouse. We reflect the correct arrangement of the elements involved in the assembly of the floors with polyurethane plates that require a sanitary vacuum.



Sections for the sketches of the following images

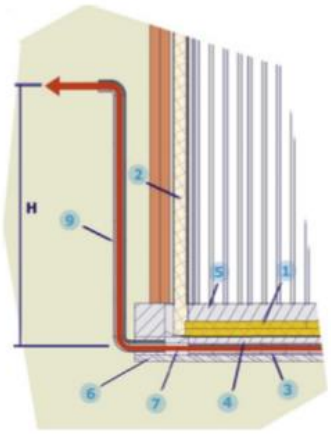
Assembly details:

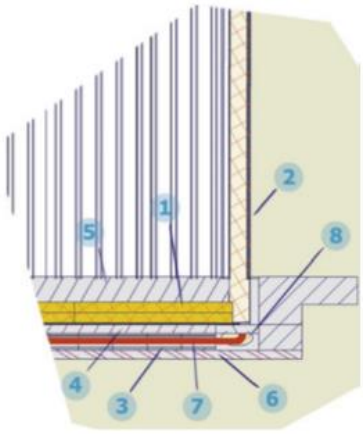


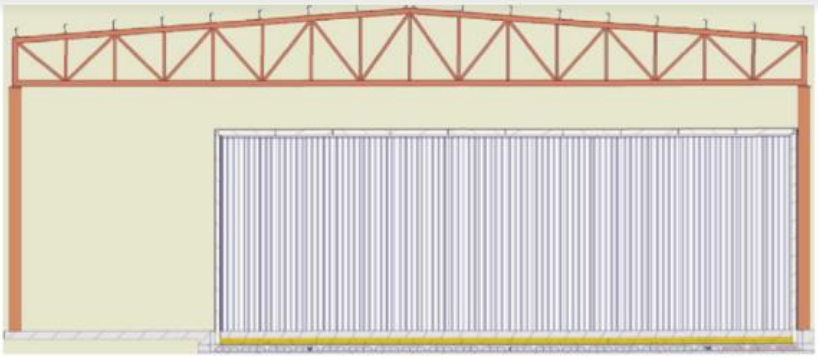
LEGEND:

1. SUELOTHERM
2. METALPANEL panels
3. Sanitary vacuum block
4. Concrete sub-slab
5. Concrete floor slab
6. Blinding concrete
7. Air in circulation
8. Air inlet into the sanitary vacuum
9. Air outlet into the sanitary vacuum

H – Height difference between the inlet and outlet air.





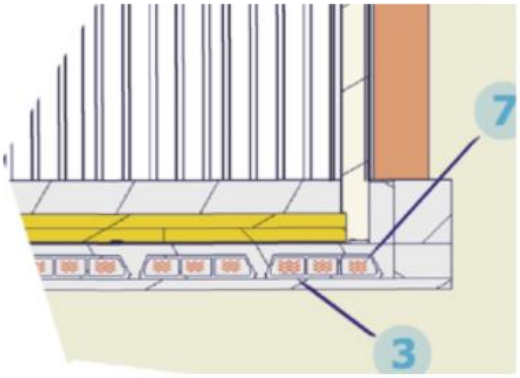


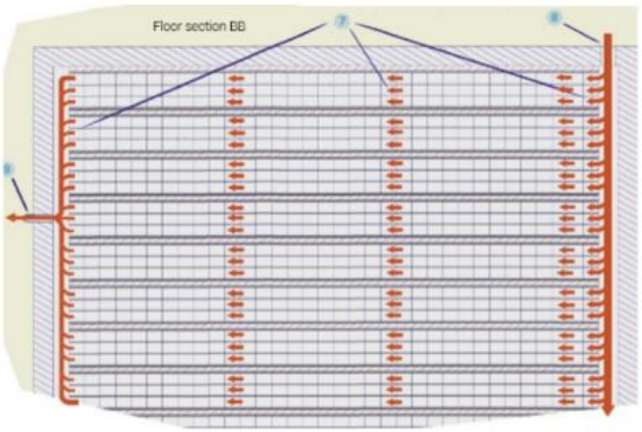
BB front section

Air circulation through the sanitary vacuum prevents the floor from freezing.

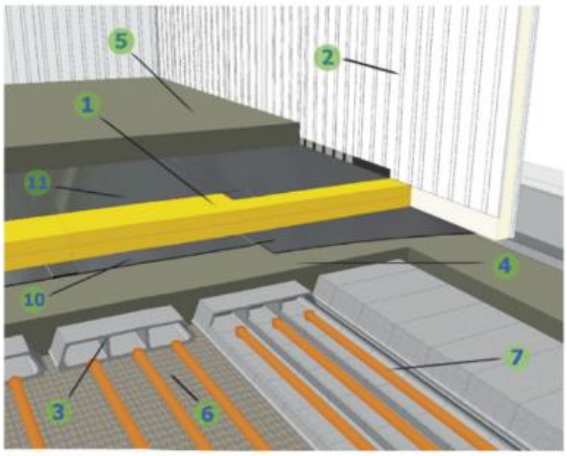
In this image on the right we can see the arrangement of the blocks, which may be fibre cement tubes or another system executed by civil works.

The image below shows the circulation of air from inlet to outlet as seen from a sectional view at the height of the sanitary vacuum.



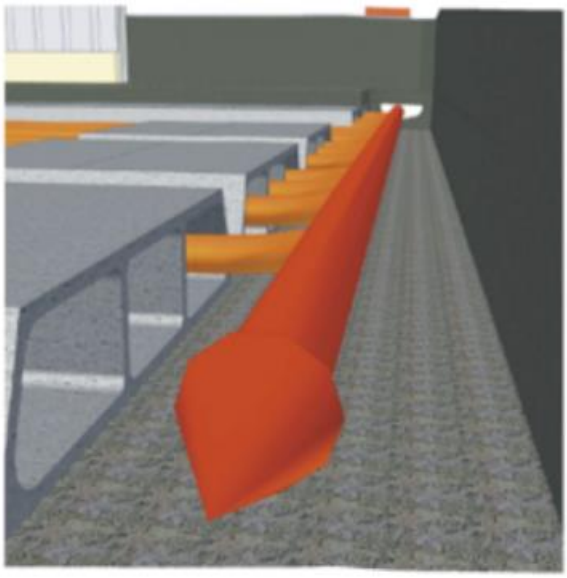


In the image on the left, we can see that in the sanitary vacuum, two longitudinal collectors are left in the chamber for the air inlet and outlet. Gaps of the block or fibre cement tubes are placed crosswise to allow the air circulate through the entire surface of the chamber floor circulation of air from inlet to outlet, as seen from a sectional view at the height of the sanitary vacuum.

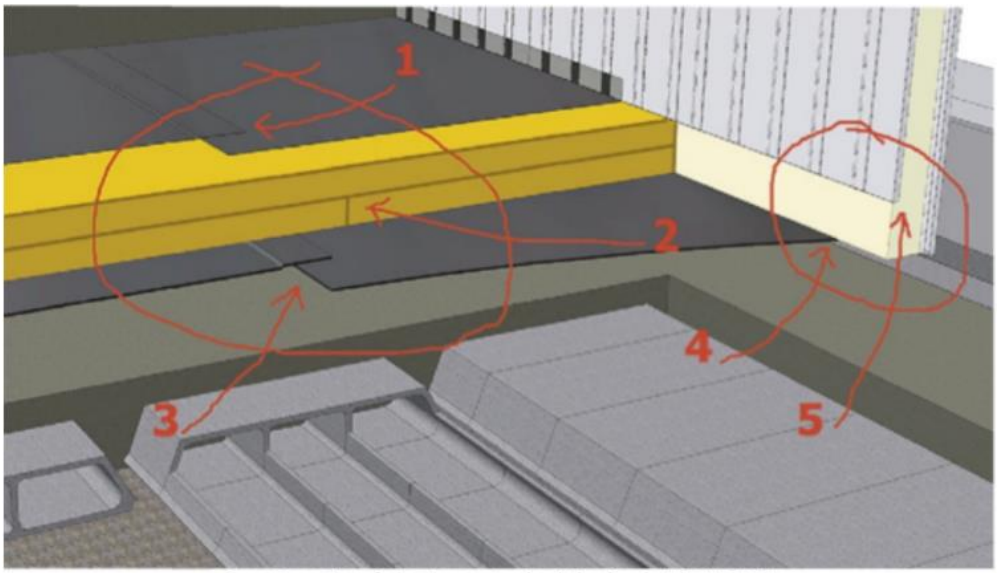


LEGEND:

1. SUELOTHERM
2. METALPANEL panels
3. Sanitary vacuum block
4. Concrete sub-slab
5. Concrete floor slab
6. Blinding concrete
7. Air in circulation
8. Air inlet into the sanitary vacuum
9. Air outlet into the sanitary vacuum
10. Asphaltic fabric
11. Polyethylene film



Air circulation through the inlet and distribution collector through the ducts that form the block.



Correct execution of a low temperature insulation floor by METALPANEL.

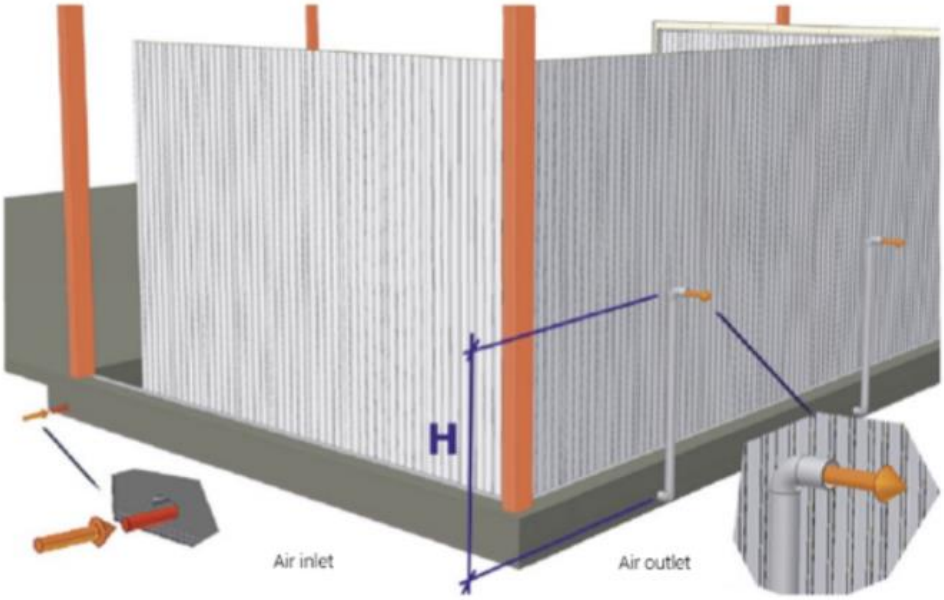
1. 10 cm overlap between 2 polyethylene strips to prevent moisture from entering the insulation when the slab concrete is poured.

2. SUELOTHERM plates shall be placed whenever possible in 2 layers (60+60=120) to avoid the connections between the inner plates matching with those of the upper plates.

3. 10 cm overlap between 2 strips of asphaltic fabric to ensure that it performs as a steam barrier properly.

4. Asphaltic fabric must be joined with the alignment angle of the wall panel, to guarantee the steam barrier on the insulator at the bottom part of these panels

5. Thermal bridge break at the bottom of the Metalpanel wall. A recess can be made on site; a cut, similar to the manual overlap, can be made in the manufacturing process.



Height difference between air inlet to the sanitary vacuum and the outlet. The difference in height difference cannot be made. Instead, mechanically forced circulation can be used.

PANEL CONNECTIONS. CONNECTION TO THE FLOOR.

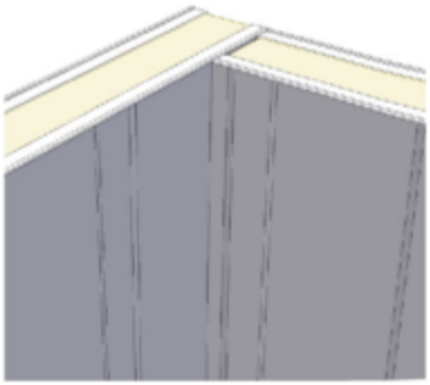
We call “Panel Connections” all connections between panels that are not keyed to each other. These are connections between panels that are joined by metal profiles.

In Metalpanel, we distinguish between three different types of panel connections:

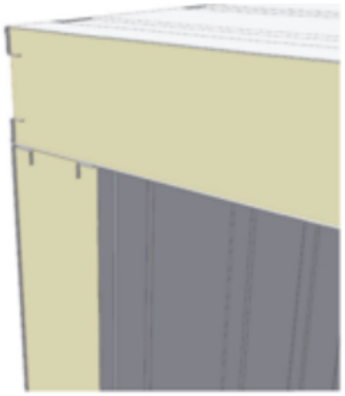
* By butt joint
* Keyed
* Halved joint.

By butt joint

In Fig. 9a and 9b, we see details of this type of connection. It is always used in thicknesses of 40 mm in a width of 1000 mm, and in 60, 80, 100 mm in a width of 1125 mm, which do not allow recesses to be made in their heads because of their reduced thickness. This is the standard joint of Metalpanel (thicknesses recommended for 0ºC).



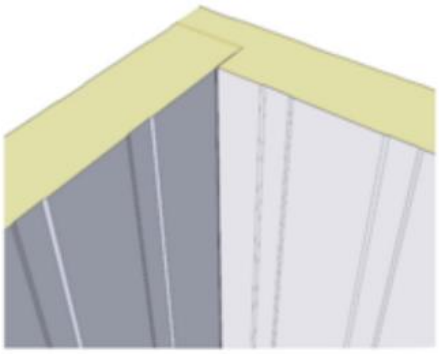
Wall-to-wall connection – Fig. 9a



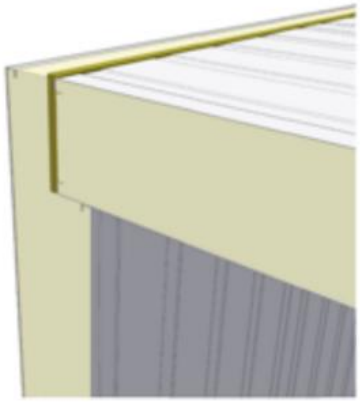
Ceiling-wall connection – Fig. 9b

Keyed

This type of connection is considered as standard in panels 120-150 mm thick.
In negative temperature chambers, it is advisable to inject the bonding joint with polyurethane to avoid possible cold leakage. The recesses that the vertical panels have on their heads, (figure 9d), which they present along their length are carried out at the site



Wall-to-wall connection – Fig. 9c



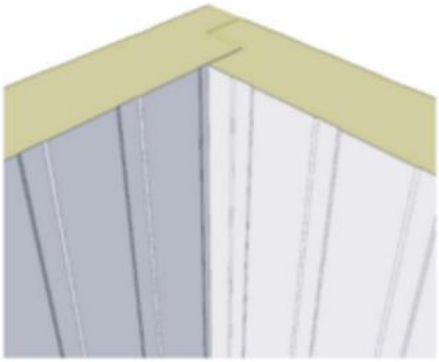
Ceiling-wall connection – Fig. 9d

Halved joint

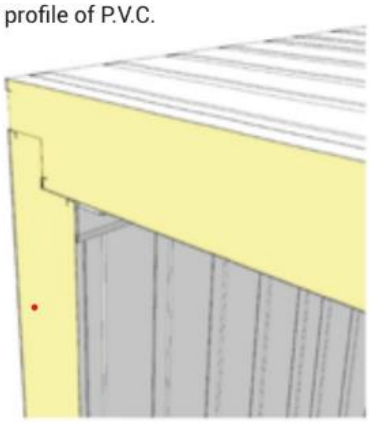
This solution provides the best sealing, therefore we recommend it especially for enclosures that use thicknesses of 180 and 200 mm. However, it can be used in any thickness except 40, 60 and 80 mm.
Its use increases the execution time of the work, as longitudinal joints of the ceilings with the walls require a cut on-site, and it is necessary to inject when it is assembled and not at the end.

UNION OF WALLS TO THE FLOOR (BUILT ON-SITE OR PANEL).

Panels joined to the floor using metal profiling, floor either built with panels or on-site. Its execution is different if the enclosure has a positive or negative temperature.
Optionally, the panel can be picked up on the site floor using a "U" profile of P.V.C.



Wall-to-wall connection – Fig. 9e



Ceiling-wall connection – Fig. 9f

Positive Temperature

As seen in the figures, the panel is completely flat at the bottom, therefore a thermal bridge occurs as the two panels are touching the same floor surface.
This connection is only recommended in positive temperature enclosures or for the realisation of divisions of enclosures with the same temperature.

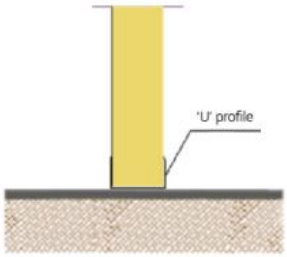


Figure 9g
Enclosure without panel flooring. Joined wall with "U" profile

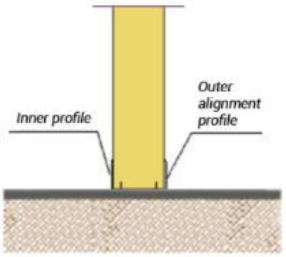


Figure 9h
Enclosure without panel flooring. Joined wall with "L" profile

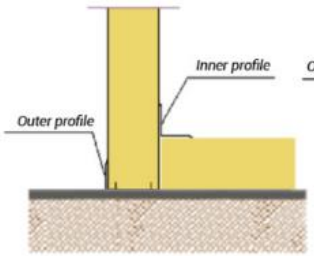


Figure 9i
Enclosure with panel flooring. Joined outer wall with "L" profile

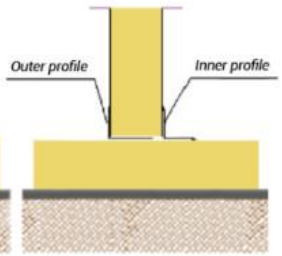


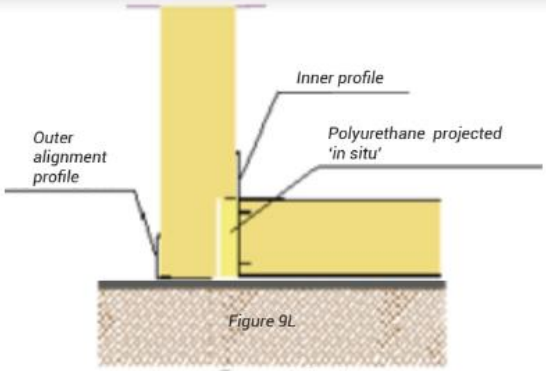
Figure 9j
Enclosure with panel flooring. Dividing wall attached with "L" profile

Negative Temperature

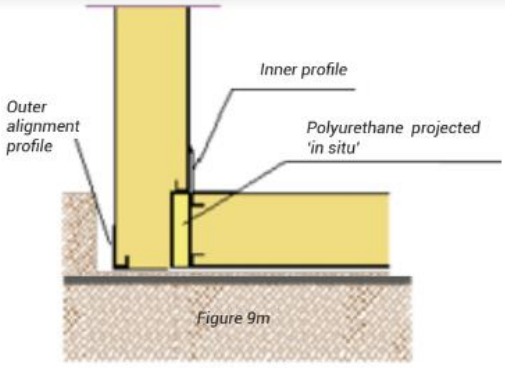
In this type of connection, panels at the bottom have a recess. This recess is made on the inner side of the panel. The depth of the recess is recommended to be 20 mm and the height (h) depending on the thickness of the panel:

* **In chambers without flooring:**
  h= 100 mm, for thicknesses up to 100 mm and h h> 120 mm for thicknesses of 120 mm onwards.

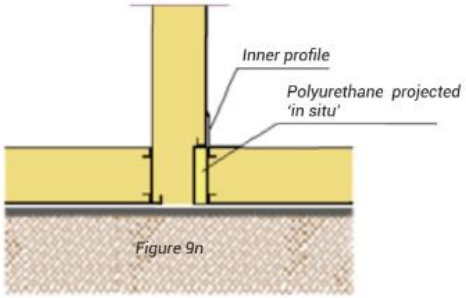
* **In chambers with flooring:**
  The height (h) of the recess is equal to the thickness of the panel.



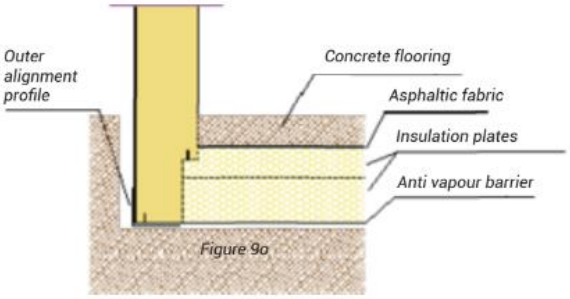
Enclosure with panel flooring without embedding. Outer wall



Enclosure with panel flooring with embedding. Outer wall



Enclosure with panel flooring without embedding. Dividing wall



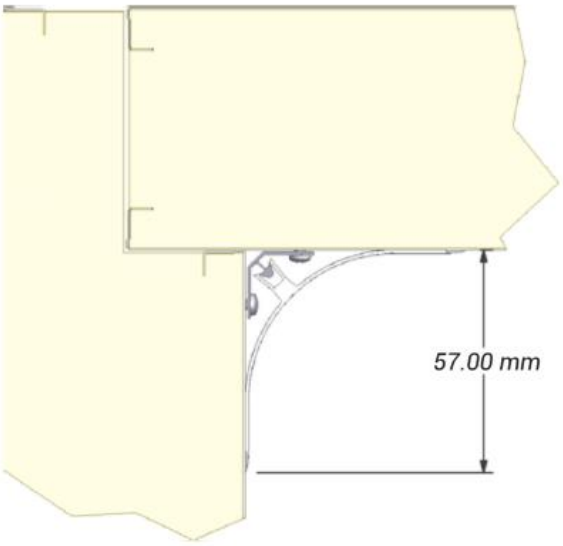
Enclosure without panel flooring with embedding. Outer wall

Figure 9p

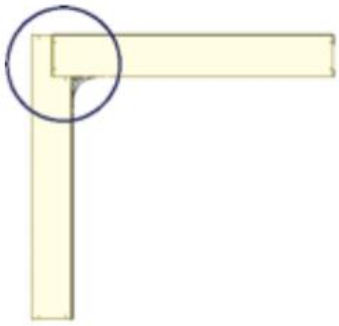
Enclosure without panel flooring with embedding. Dividing wall

Details of sanitary profile mounted on site in a recessed panel connection.

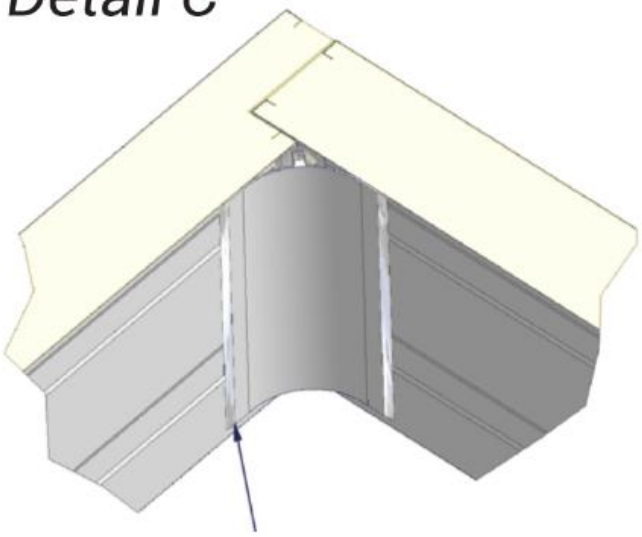
Detail B



B

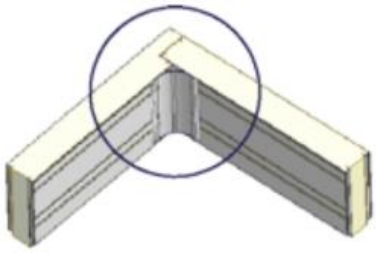


Detail C

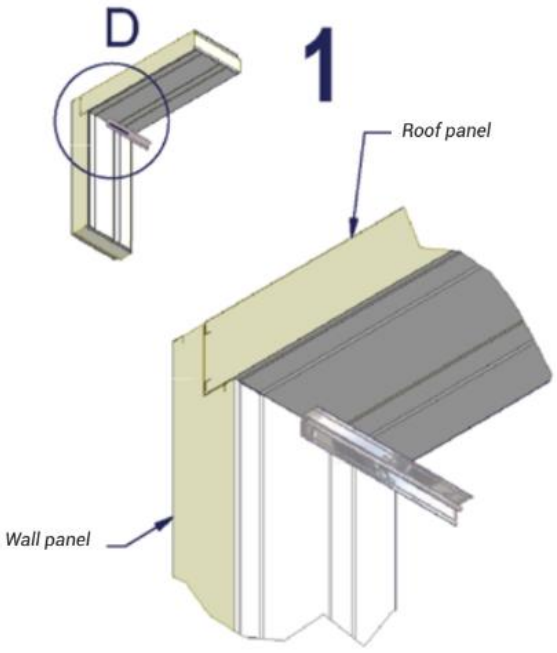


The flexible PVC part of the profile ensures a perfect and watertight fit to the surface of the enclosure.

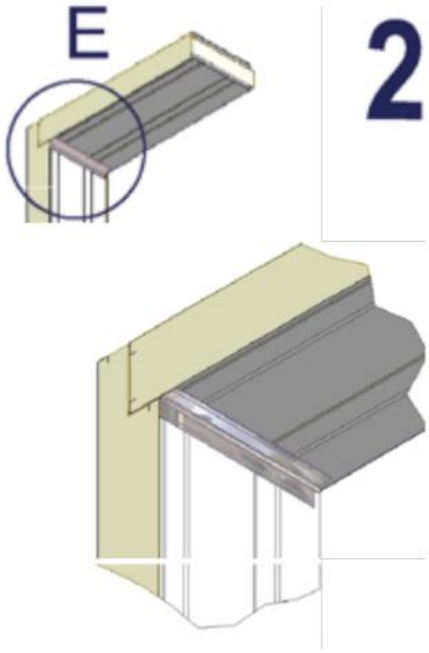
C



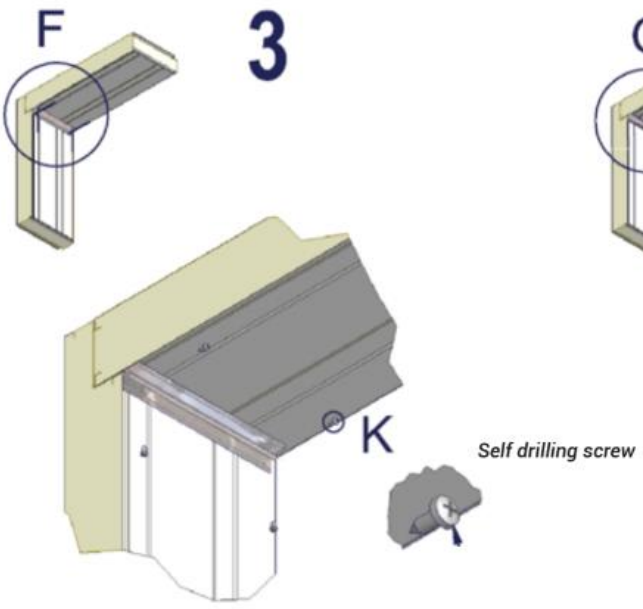
Assembly details:



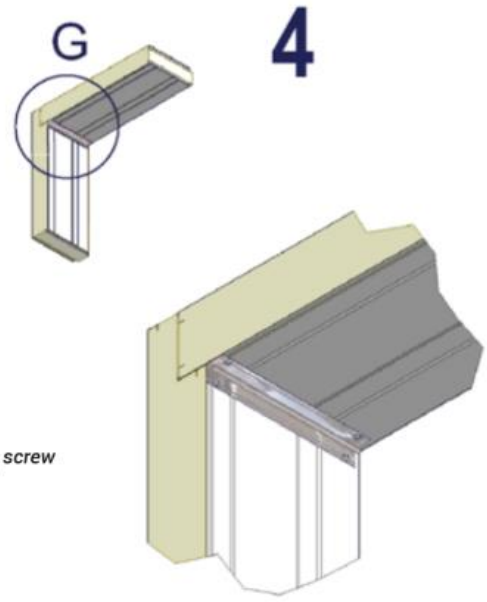
The aluminium angle could be cut to the required length, if necessary.



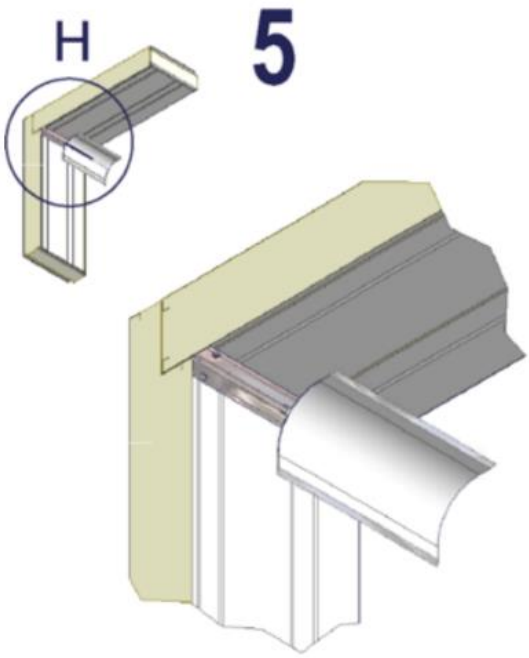
The angle is firmly supported in the corner formed by the joining of the panels or walls of the enclosure.



The angle is fixed in the desired position with 3.9 x 13 mm DIN-7504 self-drilling screws.

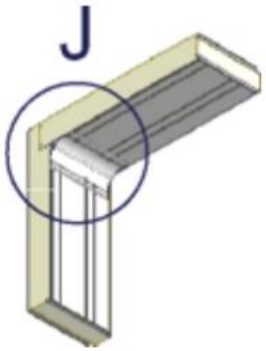


The self-drilling screw pierces the aluminium angle and panel plate without the need for pre-drilling. Screwdriver is needed.



PVC profile can be cut to the required length, if necessary.

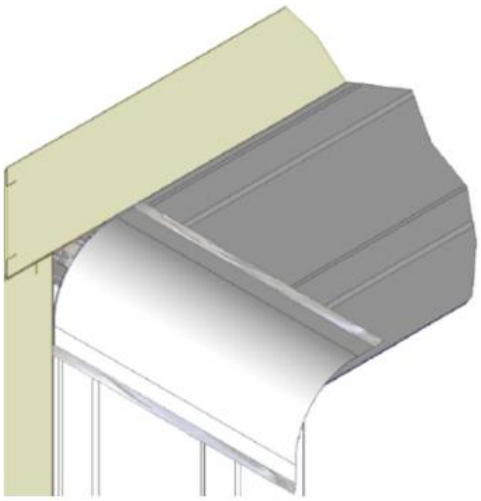
It is important to make the cut accurate.
Clipping of the PVC profile with the aluminium profile is quite strong, and if we have to remove the PVC profile because we have cut it incorrectly, we will have to do it with great care, because we-can break the secondary PVC profile.



PVC profile is presented at the desired position and it is verified at both ends that it is in the correct place.

We fit the profile into the aluminium angle, starting at one end and pressing the profile every 500 mm approximately to the other end to ensure that it is uniformly fixed throughout its length.

6



PANEL FASTENING TO AN AUXILIARY STRUCTURE OR STURDY POINT.

Fastening of the panels to an auxiliary structure is solved in any of the following ways:

Cable fastening

Fastening the roof panels to a sturdy structure or point using a steel cable is an easy and convenient solution to carry out. The minimum distance from the ceilings to the structure shall not be less than 500 mm, a measure necessary for the placement of hanging accessories (bearing, tensor, eyebolt...)

This solution should be used wherever is posible:

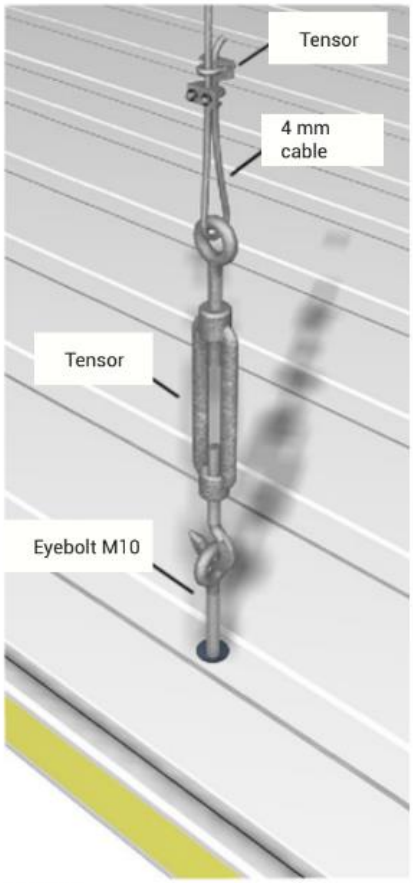


Figure 13a

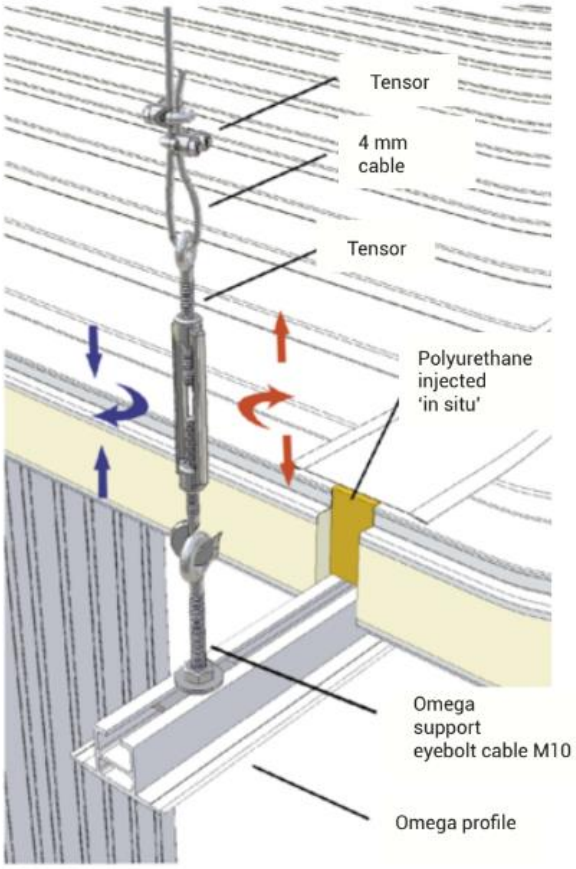


Figure 13b

In the figure 13c, we can see the support of two ceilings in an omega profile with several fastening straps.

Distance between straps shal never exceed:

Enclosures of 0°C = 1000 mm
Low-temperature enclosures = 600 mm

Figure 13c

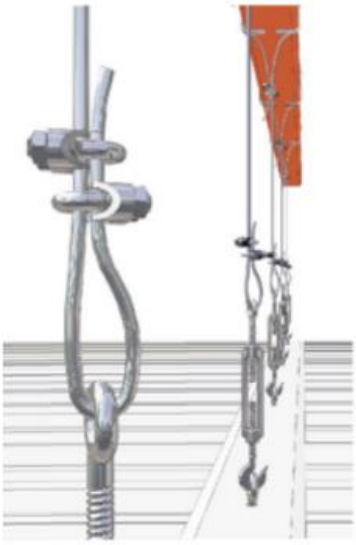


Figure 13d

Figure 13e

Figures 13d and 13e show how the cable is knotted to a structure and the omega support eyebolt. Whenever possible, we pull the cable in a perpendicular position to the ceiling panels.

Fastening by threaded rod

This solution is suitable when the sturdy structure or point is less than 500 mm away. The downside of it is that you have to match the omega or insert profile with the structure of the warehouse, and this is not always possible. When the distance to the structure makes it necessary, in addition to the omega rod support, a spacer will be sent to which we will thread a left threaded rod that is 1000 mm in length. If this is not enough to reach the structure, a second spacer will be sent with another rod, this time it will be a right threaded rod.

For distances requiring the placement of more than two rods, the cable attachment described in the previous paragraph is recommended.
Whenever the distance of the ceilings is more than 500 mm, it is highly recommended to attach using a cable.

Fastening by self-drilling screws

It is the solution used for attaching wall panels to a structure. As seen in the figures, the fastening is carried out from the outside of the panels leaving the inside of the enclosure free of fastening screws.

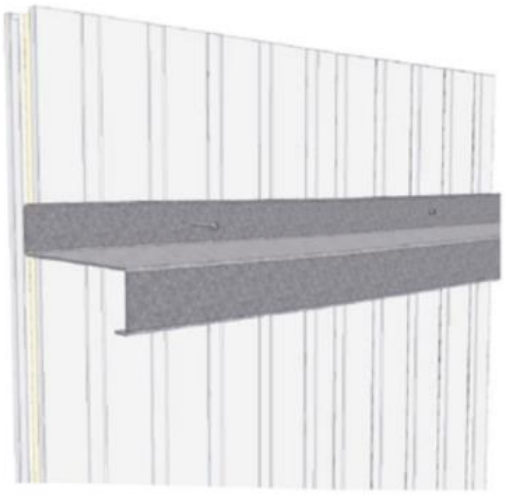


Fig. 13g - Panel-to-structure connection

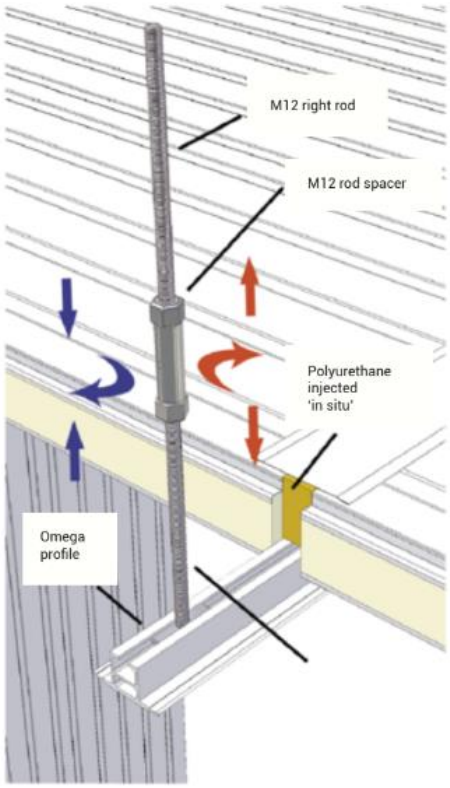


Fig. 13f

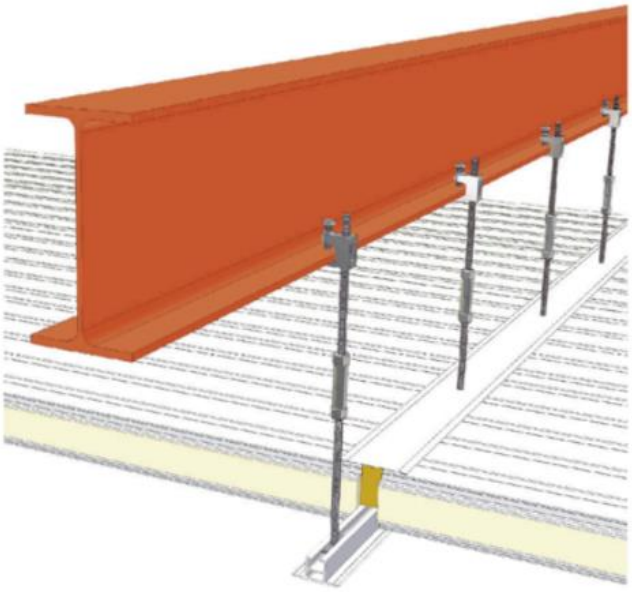
Other sturdy point fastening systems

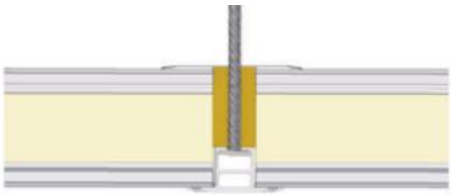
In addition to the ceiling and wall fastening systems seen so far, considered to be standard, there are other systems that are used in special situations and which we will describe below.
To set them apart, we will reference them differently:

Model A

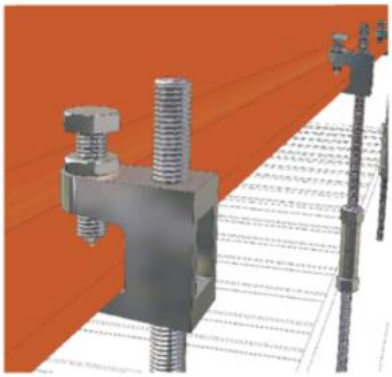
Elements that conforms Model A - Fig 13i

Detail of panoramic view of hangers - Fig 13j





Elements that conforms Model A - Fig 13i

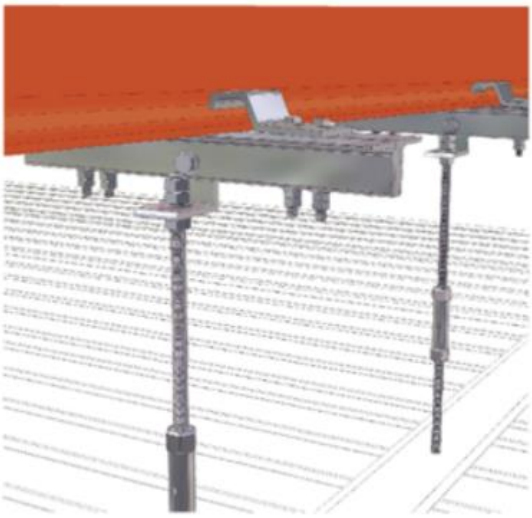


Detail of fastening of the clamp - Fig 13k

Model B

Different accessories that make up Model B
Fig. 131

Top views from above the hanging beam Model B
Fig. 13m

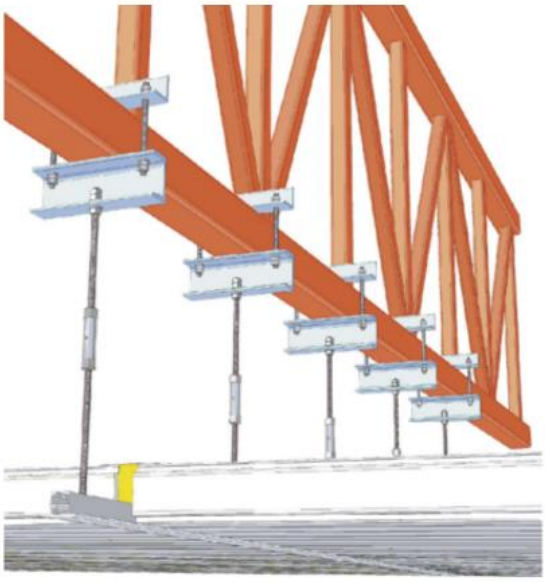


Detail of fastening of the clamp to the IPN
Fig. 13n

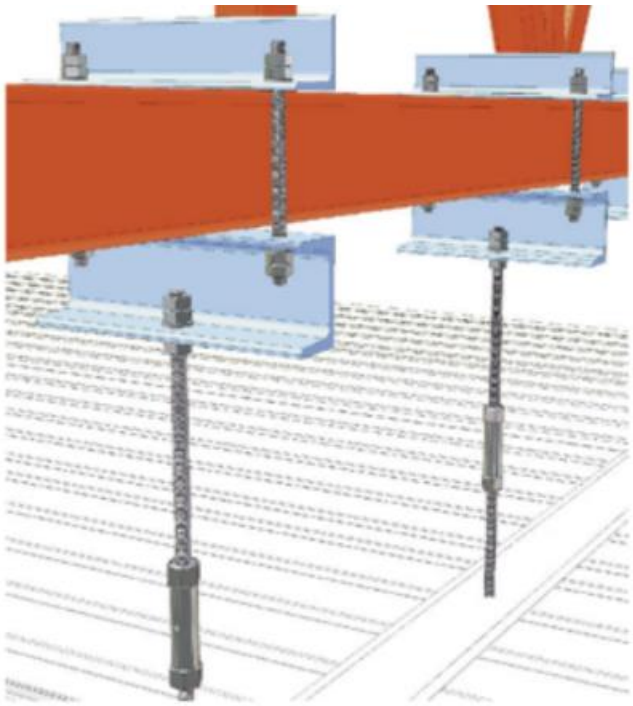
View from below the hanging beam model B
Fig. 13o

Model C

Fig. 13a - Fastening of ceiling panel with insert

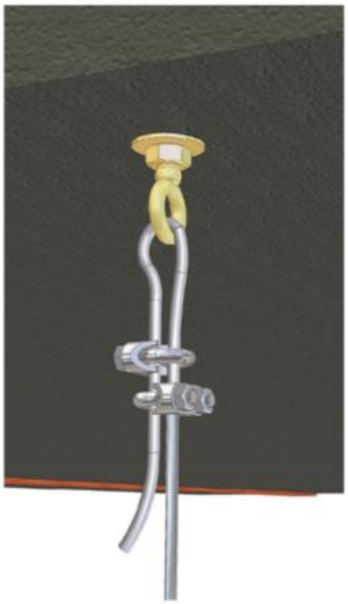


Detail of the fastening of the hanging beam to IPN Fig.13r

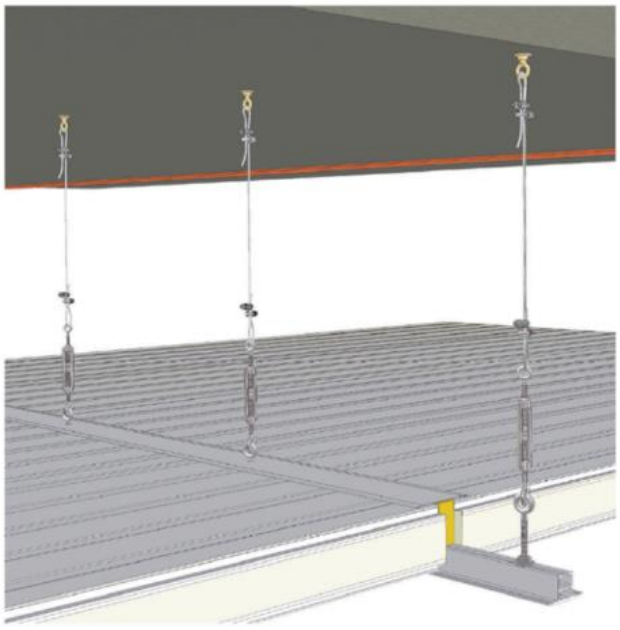


Detail of the fastening of the hanging beam to IPN Fig. 13s

Model D



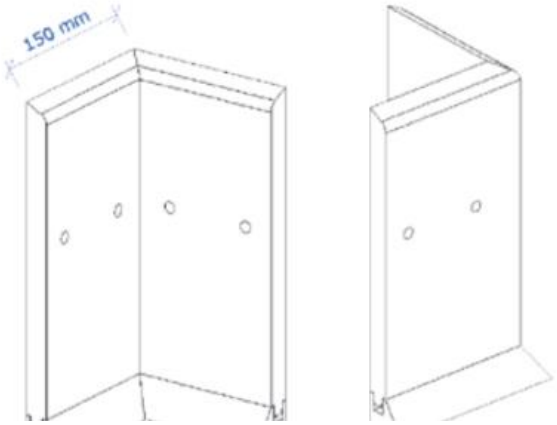
Different accessories from Model D - Fig, 13t

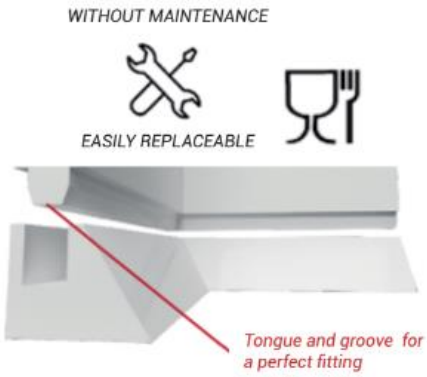


General detail of omega profile with expansion eyebolts - Fig. 13u

SANITARY WALL PROTECTOR

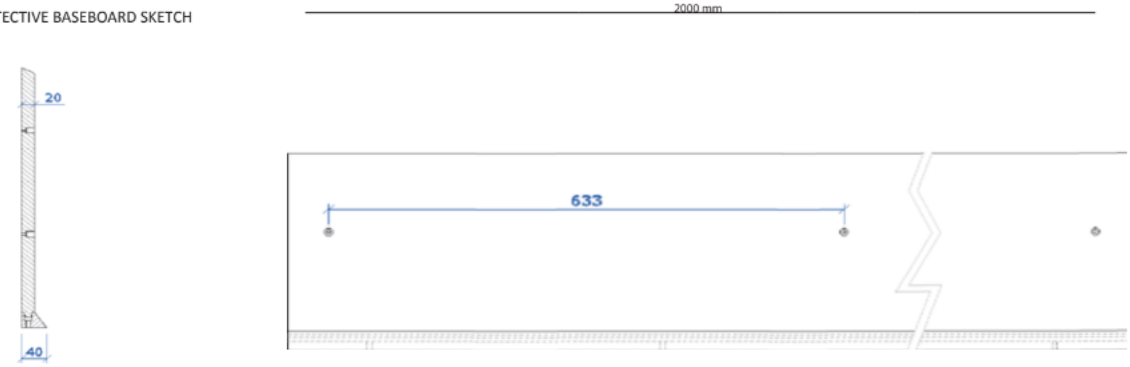
¤ Formed by high density pressed polyethylene and high molecular weight.
¤ Material with high impact resistance and high durability.
¤ Panel wall protector.
¤ Hygienic element for easy cleaning.
¤ Parts of different sizes, heights and needs are manufactured.
¤ White colour (for other colours, check)





	Length	Width	Thickness
PROTECTIVE BASEBOARD			
ZS 200	2000 mm	200	20 mm
ZS 300	2000 mm	300	20 mm
ZS 500	2000 mm	500	20 mm

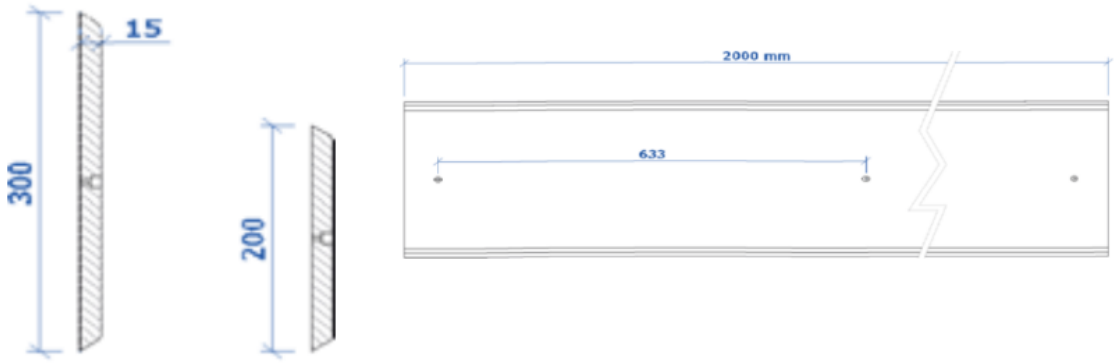
PROTECTIVE BASEBOARD SKETCH



Metalpanel

	Length	Width	Thickness
WALL PROTECTION			
PRP200	2000 mm	200	15 mm
PRP300	2000 mm	300	15 mm
PRP500	2000 mm	500	15 mm

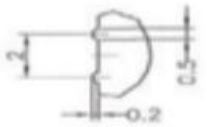
PROTECTIVE BASEBOARD SKETCH



Properties	Length	Width	Thickness
Density	g/cm3	ISO 1183-1	0.96
Mechanical Properties at 23 ºC			
Tensile stress in performance	MPa	ISO 527-1/-2	28
Tensile effort at elastic limit	%	ISO 527-1/-2	10
Elasticity module	MPa	ISO 527-1/-2	1300
Bending resistance	MPa	ISO 178	27
Charpy impact resistance without notches	KJ/m2	ISO 179-1/1eU	Does not break
Charpy impact resistance with notches	KJ/m2	ISO 179-1/1eA	105P
Shore D hardness (15 s)	-	ISO 2039-2	62
Thermal Properties			
Melting temperature (DSC, 10 ºC/min)	°C	ISO 11357-1/3	135
Thermal conductivity at 23 ºC	W/(K.m)	-	0.4
Mean linear thermal expansion coefficient between 23 and 100 ºC	m/(m.K)	-	150 X 106

TECHNICAL DATA SHEET SUSPENDED CEILING FASTENING SUPPORTS

CEILING SUPPORT PROFILE: Profile made of extruded aluminium and lacquered in white, with a unique design that allows the panels to be suspended and the length of the ceiling panels to be increased without exceeding the self-carrying limits.
The support allows tensors or rods to be assembled which connect the central area of the profile to the ceiling, and its side wings allow the panels to be supported. It is designed so that the rod can move inside the profile to the ideal position in order to connect to the outer structure.



Place the mark on the way and side as shown above