Technical File

Chapter 2 - Façades

2.3 - Panel without varnish or paint

Cement-bonded particleboards

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2. VENTILATED FAÇADES

Viroc panels can be used to clad the façade of buildings, forming a panel-ventilated façade.

Viroc panels have a heterogeneous appearance with differences in tone on the same face, between faces of the same panel or between different productions.

Surfaces may be uneven.

With exposure to the sunlight, the colour of the panels changes slightly, becoming lighter. This variation in tone varies from colour to colour.

The panels, when placed outdoors, are subject to dimensional variations of +1.5 mm to -5.0 mm per linear meter when the panel is sealed on both sides and tops. The panel fixing system must allow for this dimensional variation.

Ventilated façades are made up of:

- Viroc panels
- Support structure for the panels and their fixing elements;
- Screws or rivets for fixing the panels to the support structure;
- Thermal insulation;
- Ventilation air layer;
- Complementary profiles for the treatment of singular points.

2.3 VIROC PANEL ON FAÇADES WITHOUT VARNISHING OR PAINTING

In this system, the Viroc panels are applied raw without finishing and fixed to the structure using screws or rivets.

As the panel is not varnished, it will suffer greater dimensional variations, so the maximum panel size allowed is 1500x625 mm.

In order to allow for dimensional variations, without introducing force that could damage the panels, the fixing system must allow for dimensional variation.

For the panel peripheral fixings, the diameter of the holes to be drilled in the panels to install the screws is 10 mm larger than that of the body of the screw, thus allowing for shrinkage and expansion without introducing force.

When fixing the central area of the panel, the diameter of the holes is the same as that of the body of the screw, fixing the panel rigidly. Your task is to ensure proper positioning.

The panel is fixed from the fixed points in order to position the panel. The expansion points are only made later, in order to avoid introducing stresses as the panels sag.

Note:

The support structure for the Viroc panels that will clad the façade can be made from wooden profiles or galvanised steel. Due to the high expansion coefficient of aluminium profiles, this type of structure is not permitted in this application.

Because the Viroc panel is not varnished, it is possible that with the wetting and drying cycles resulting from rain, the salts that constitute the cement may migrate to the surface, forming efflorescence. These efflorescences can form oozes, streaks of salts on the panels as the water drips.

It is also possible for there to be greater deformation both in the direction of the panel and outwards from the plane of the panel.

No claims will be accepted due to the appearance of leaks or excessive deformations.

2.3.01 Wooden support structure

The wooden support structure consists of pine wood beams fixed to the load-bearing structure (wall) using galvanised steel or stainless steel supporting squares, with metal anchors or anchors made up of metal screws and plastic bushings.

The strength of the wood used to make up the uprights must be of at least class C18 according to EN 338 and durability of class 2, 3 or higher according to EN 335. Wood of durability of class 2 must be protected with a protective strip.

When assembled on site, wooden uprights must not have a moisture level of more than 18%, with a difference between consecutive elements of no more than 4%. The relative moisture of the wooden uprights is determined according to the method described in standard EN 13183-2, using a tip moisture metre.

The cross-section of the uprights is generally rectangular, with a minimum dimension of 40x50 mm (see figure 2.3.1).

These elements are dimensioned taking into account the deformations caused by climatic actions and other factors (temperature, humidity, wind, etc.), so that they do not jeopardise the normal functioning of the façade. The deformation resulting from wind loads (pressure or depression) must not exceed the L/200 limit of the span between support fixings.

The width of the uprights must be such that the fixings can be positioned correctly, with the capacity to absorb small positioning errors. The screws must not be less than 15 mm from the end of the upright.

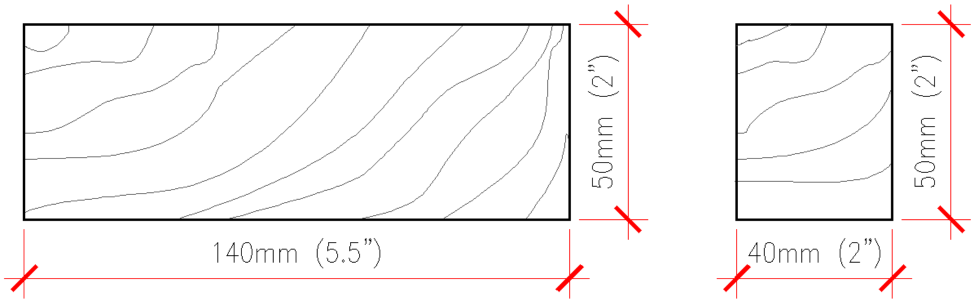


Figure 2.3.1 - Wooden structure

Minimum resistance of class C18 (EN 338) and durability of class 2 or 3 (EN335)

2.3.02 Galvanised steel support frame

The galvanised steel profiles are fixed to the load-bearing structure using galvanised or stainless steel supporting squares, with metal anchors or anchors made up of metal screws and plastic bushes.

The steel used in the upright profiles must be of minimum strength class S220GD+Z, in accordance with standard EN 10346.

The hot-dip zinc coating (Z) should be 275 g/m2 in coastal areas and 140 g/m2 in other areas.

The section of the profiles is generally Omega, U or L-shaped with a minimum thickness of 1.5 mm. Other profile shapes can be used, provided they have the same performance and durability (see figures 2.3.2 and 2.3.3).

The profiles used in plasterboard walls cannot be used as the steel thickness is less than 1.5 mm.

Omega profiles are used at the intersection of 2 panels. U and L sections are used as intermediate supports.

The sizing of these elements takes into account the deformations caused by climatic actions and other factors (temperature, humidity, wind, etc.), so that they do not jeopardise the normal functioning of the façade. The deformation resulting from wind loads (pressure or depression) must not exceed the L/200 limit of the span between support fixings.

The width of the profiles must be such that the fixings can be positioned correctly, with the capacity to absorb small positioning errors, and the screw must not be less than 10 mm from the end.

The distance between the profiles must respect the maximum distance between panel fixings. The alignment of the profiles between adjacent elements must be checked and must not differ by more than 2 mm.

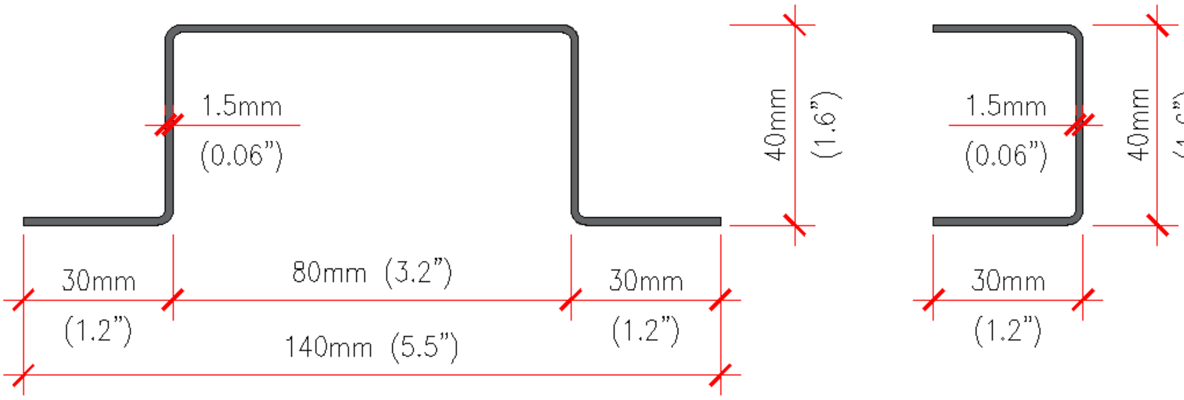


Figure 2.3.2 - Galvanised steel profiles

Minimum resistance of class S220GD (EN 10346)

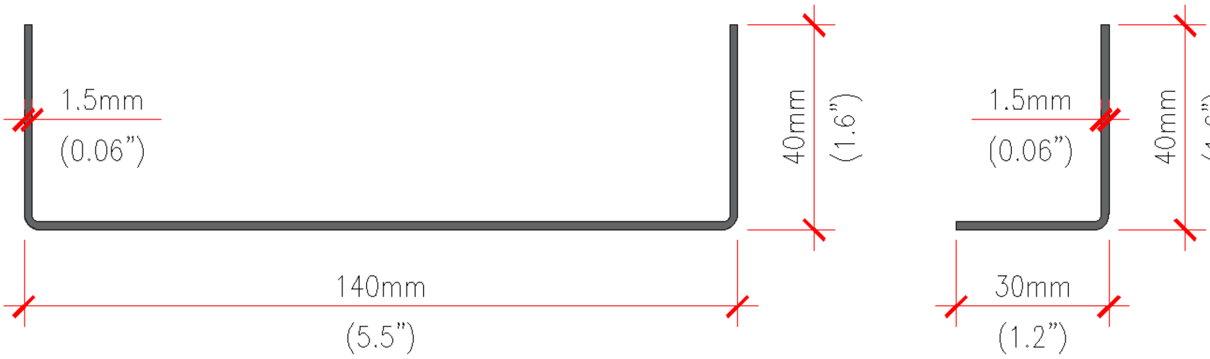


Figure 2.3.3 - Galvanised steel profiles (Alternative)

Minimum resistance of class S220GD (EN 10346)

2.3.03 Fixing supporting squares

The supporting squares for fixing the wooden or galvanised steel structure are made of a durable galvanised steel metal alloy of the minimum steel strength of class S220GD, according to EN 10147.

In coastal areas at a distance of 3 km from the sea, supporting squares must have special protection against corrosion, with a zinc weight of 275 g/m2 or more, and can be made of stainless steel.

Squares are generally L-shaped, with several holes and a minimum thickness of 2.5 mm (see figure 2.3.4).

The supporting squares are dimensioned taking into account the façade own weight, based on a partial security coefficient of 1.5. The vertical deformation of the bracket must not exceed 3 mm for the maximum vertical load.

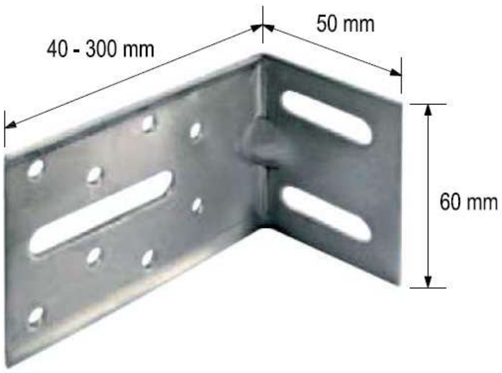


Figure 2.3.4 - Galvanised steel supporting squares

Minimum resistance of class S220GD. Minimum thickness: 2.5 mm

2.3.04 Anchors for fixing the supporting squares

The supporting squares are fixed to the support wall using anchors. The anchors can be metal bushes with a diameter of 8 mm or plastic bushes with a diameter of 10 mm and metal screws with a diameter of 7 mm (see figures 2.3.5 and 2.3.6).

With regard to the mechanical strength and stability of the anchors, they must be designed and built in such a way that the loads to which they will be subjected during their useful life do not involve one of the following consequences:

- Total or partial breakdown of the structure;
- Deformations that reach unacceptable proportions;
- Damage to other parts of structures, equipment or installations following excessive deformation of the supporting structure;
- Damage of great proportionality to the cause that originated it.

The anchorages must withstand shear loads, tensile loads and a combination of both during the expected life of the structure, ensuring:

- Adequate resistance to failure (Ultimate Strength Limits);
- Adequate resistance to displacement (Serviceability Limit States).

Anchorages must have an ETA (European Technical Assessment) certification with CE marking or, alternatively, a DH (Document of Homologation), containing the characteristic strength values and the respective security coefficients.

For anchorages without any type of ETA or DH certification, the resistance values must be proven through technical documents or load tests.

Metal bushings are generally suitable for concrete supports. Plastic bushings with metal screws are suitable for concrete supports and masonry with solid or hollow elements.

Figure 2.3.5 - Ø10 mm plastic anchor

Stainless steel or galvanised steel screw Ø7mm, minimum length 75 mm

Figure 2.3.6 - M8 metal anchor

Stainless or galvanised steel, minimum length 80 mm

2.3.05 Bushings for fixing thermal insulation

The thermal insulation is dimensioned in accordance with the thermal conditioning rules of the RCCTE - Regulation on the Thermal Behaviour Characteristics of Buildings *(RCCTE-Regulamento das Características do Comportamento Térmico dos Edifícios*).

It is fixed to the support using plastic bushings or similar material, normally with a wide head and the appropriate length for the thickness of the insulation (see figure 2.3.7).

Figure 2.3.7 - Bushings for fixing thermal insulation to the support structure

2.3.06 Wooden upright protection strips

When the structure consists of wooden uprights that are durability of class 2 according to EN 335, they must be protected from rainwater with a protective band across their entire height.

This strip must be waterproof and 10 mm wider than the uprights on each side.

The strips can be made of flexible PVC or EPDM (see figure 2.3.8).

Protection strips can also be used on metal profiles, as an option.

Figure 2.3.8 - Flexible PVC or EPDM protection strip

Mandatory installation in wooden uprights with durability of class 2

2.3.07 Screws for fixing the panels to a wooden frame

The screws must be at least class A2 stainless steel, with a body diameter of 4.8 mm and a head diameter of 16 mm. A neoprene washer can be fitted to control the clamping force (see figure 2.3.9).

Screws with a smaller head diameter can be used, as long as they are applied with a 16 mm diameter metal washer with neoprene. The screw pulling force (P_K) must be greater than 2.0 kN (± 200 Kgf) for a penetration depth of 22 mm into the wood.

SFS Intec, ETANCO and EJOT manufacture specific screws for façade and can supply them lacquered in the desired colour.

Screws from other manufacturers can be used as long as they have the same performance.

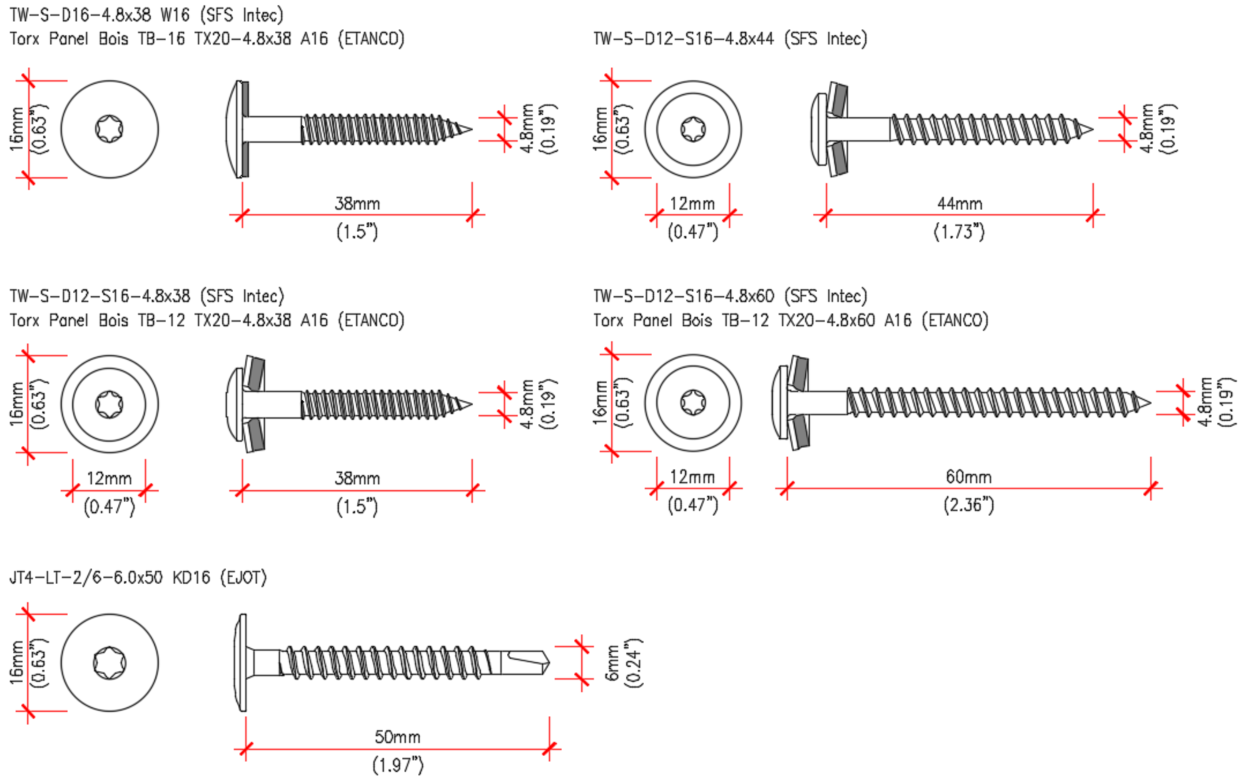


Figure 2.3.9 - Screws for wooden structures

2.3.08 Screws for fixing the panels supported on a galvanised steel frame

The screws for fixing the Viroc panels to the galvanised steel structure must be bimetallic, with a stainless steel body and a carbon steel drilling tip. The diameter of the head will be 16 mm and the body at least 5.5 mm. Screws with a smaller head diameter can be used as long as they are applied with a neoprene metal washer with a diameter of 16 mm. The length of the screw must be suitable for the connection between the thickness of the panel and that of the metal profile (see figure 2.3.10).

The pull-out force of the bolt (P_K) must be greater than 2.0 kN for any type of structure.

SFS Intec, ETANCO and EJOT manufacture specific rivets for façade and can supply them lacquered in the desired colour.

Screws from other manufacturers can be used as long as they have the same performance.

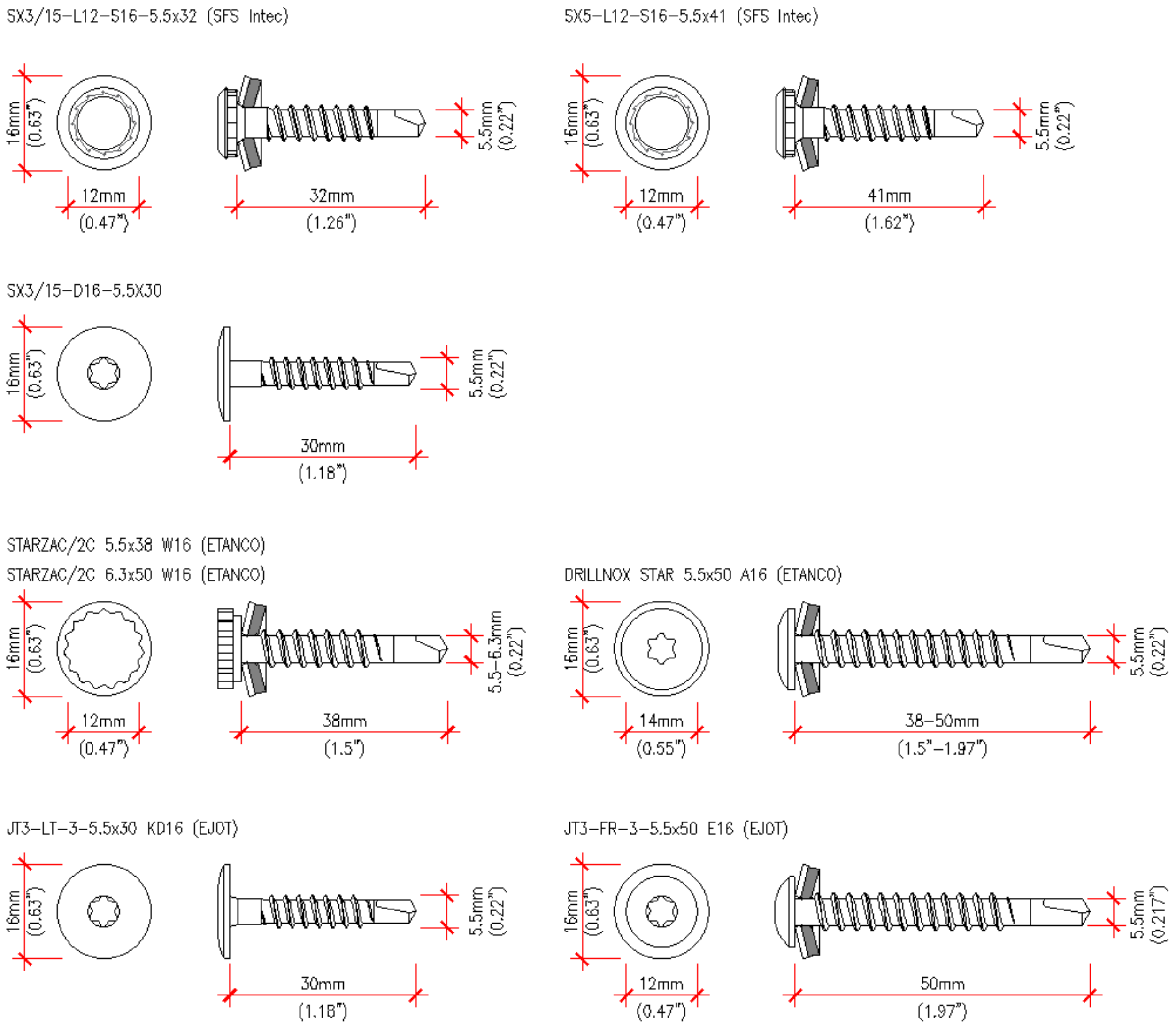


Figure 2.3.10 - Screws for metal structures

2.3.09 Rivets for fixing the panels supported on a frame made of galvanised steel

When the support structure is made of galvanised steel, rivets can be used to attach the Viroc panels. The rivets to be used consist of an aluminium body and a stainless steel pulling mandrel. The diameter of the rivet body must be at least 4.8 mm and the length must be suitable for attaching the panel to the structure (see figure 2.3.11).

The rivet pull-out force (PK) must be greater than 2.0 kN for any type of structure.

When panels are fixed with rivets, a tightening stop must be placed on the tip of the riveting tool, so as not to over-tighten and allow for normal shrinkage and expansion of the panel (see figure 2.3.12).

SFS Intec, ETANCO and EJOT manufacture specific rivets for façade and can supply them lacquered in the desired colour.

Rivets from other manufacturers can be used as long as they have the same performance.

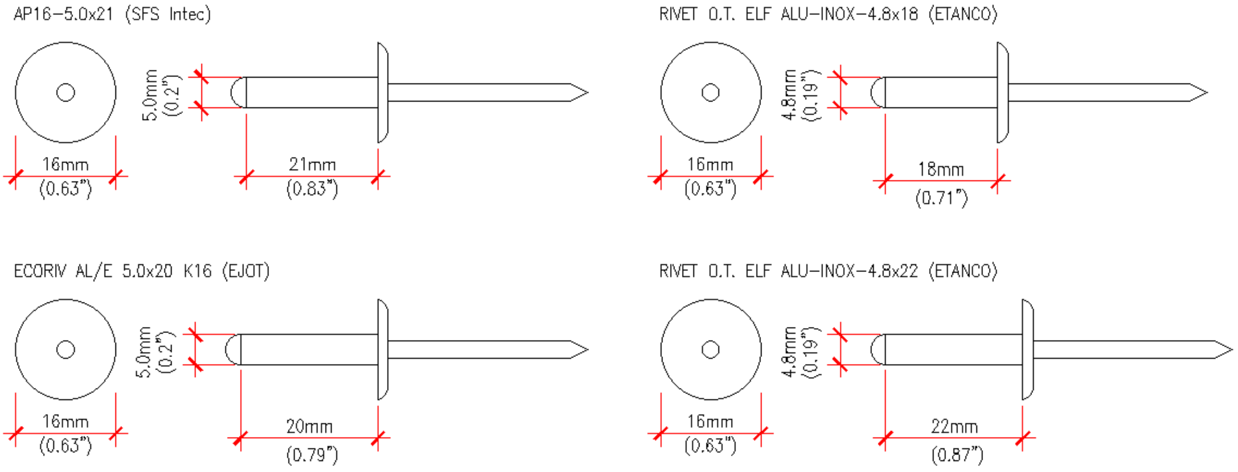


Figure 2.3.11 - Rivets for fixing Viroc panels to a metal structure

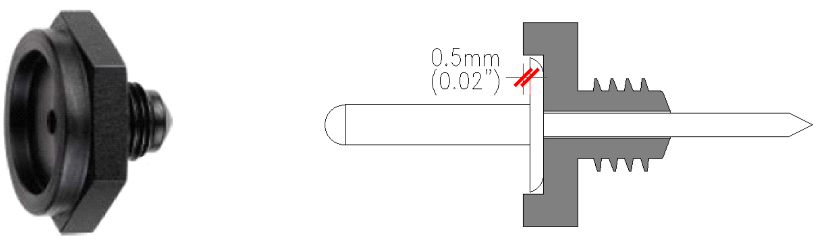


Figure 2.3.12 - Clamping nozzle, screwed into the riveting tool mouth

Mandatory use

2.3.10 Recommended thicknesses of Viroc façade panels and their tolerance

Thickness: 12 mm ± 1.0 mm; 16 mm ± 1.2 mm

See the Viroc panel technical data sheet for the range of thicknesses and colours available.

2.3.11 Panel weight

12 mm: 16.2 ± 1.2 kg/m^2;

16 mm: 21.6 ± 1.6 kg/m^2.

2.3.12 Viroc panel manufacturing dimensions and cutting tolerances

Dimensions: 2600x1250 mm and 3000x1250 mm

Tolerances: Length and width: ± 3 mm

Squaring: ≤ 2 mm/m

Edge straightness: ≤ 1.5 mm/m

Consult the Viroc panel's technical data sheet to see the range of sizes and colours available.

Any intermediate dimensions obtained by cutting the panels are possible.

2.3.13 Maximum format of panels applied to unvarnished façade

The largest dimension of the panel to be applied to a ventilated façade without varnish is 1500x625 mm.

2.3.14 Minimum format for façade panels

The smallest panel size to be applied to a ventilated façade is 300 mm.

Viroc Portugal does not recommend that the ratio between the length and width of the panel exceeds 3 (L/B≤3).

A panel that is too long and narrow tends to break easily.

2.3.15 Façade assembly operations

A façade is installed as follows:

a. Marking and identification of façade elements;

b. Mounting the supporting squares;

c. Installation of thermal insulation;

d. Assembly of the support profiles/mounts;

e. Fixing the panels;

f. Treatment of singular points.

2.3.16 Marking and identification of façade elements

There is no preferred assembly orientation. The system allows the assembly of all sizes and formats of intermediate dimensions. Viroc panels can be placed horizontally or vertically.

The aim is to follow the stereotomy defined by the architectural project.

2.3.17 Mounting the supporting squares

The location of these elements determines the final position of the support profiles, so they must be positioned precisely.

2.3.18 Fixing supporting squares to the supporting wall

The supporting squares are fixed to the support wall using anchors. The anchors can be metal bushes with a diameter of 8 mm or plastic bushes with a diameter of 10 mm and a metal screw with a diameter of 7 mm.

2.3.19 Angle plates

There are angle plates that make it easier to make corner angles. Its use is optional (see figure 2.3.13).

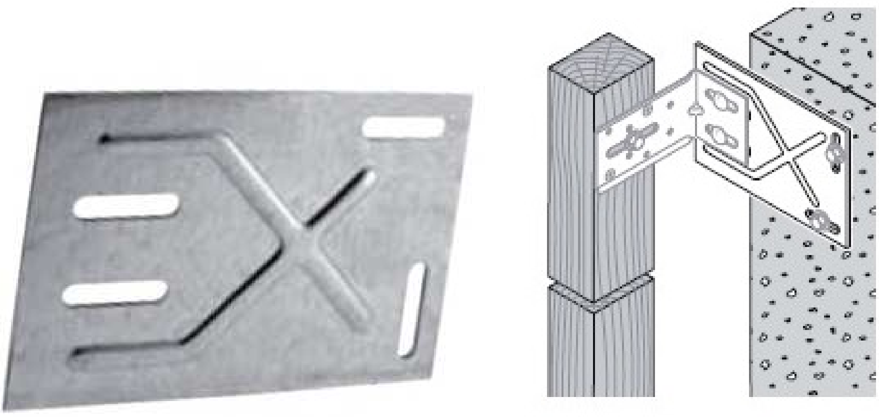


Figure 2.3.13 - Auxiliary angle plate, galvanised steel Z350. Thickness: 2.5 mm

2.3.20 Fitting the thermal insulation

The thermal insulation is dimensioned in accordance with the thermal conditioning rules of the RCCTE - Regulation on the Thermal Behaviour Characteristics of Buildings (RCCTE-Regulamento das Características do Comportamento Térmico dos

Edifícios). It is fixed to the support using plastic bushes or similar material, normally with a wide head and the appropriate length for the thickness of the insulation.

2.3.21 Mounting the support profiles

The support profiles are arranged vertically in accordance with the specifications and technical drawings presented in this document, duly adapted to the stereotomy of the architectural project.

The profiles can be laid horizontally as long as there is room for air ventilation and the profiles do not accumulate water, which can degrade them.

The distance between profiles/mounts must respect the maximum distance between the panel fixings, the alignment of the uprights between adjacent elements must be checked and must not differ by more than 2 mm.

2.3.22 Fixing the profiles to the supporting squares

Fixing the wooden uprights to the supporting squares

The wooden uprights are connected to the supporting squares using a Ø≥6.0 mm screw placed in the oval hole and a second Ø≥3.5 mm screw placed in one of the circular bolt holes to block movement (see figure 2.3.14).

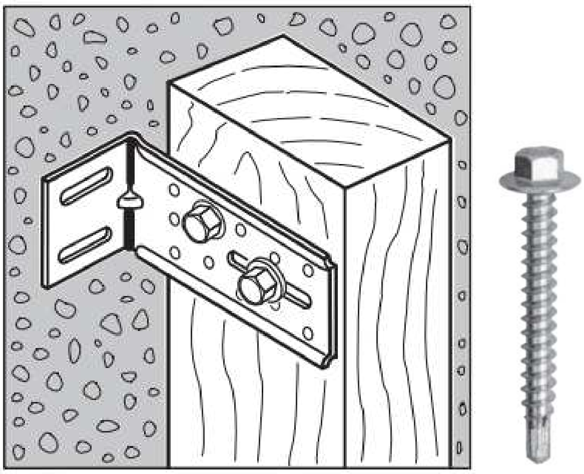


Figure 2.3.14 - Fixing the wooden uprights to the supporting squares (2 Ø≥6 screws)

Fixing the galvanised steel profiles to the supporting squares

The galvanised steel profiles are connected to the supporting squares using self-drilling screws or rivets placed in the oval bolt hole and another screw placed in one of the circular bolt holes to block movement. The connection can be made with self-drilling screws Ø≥5.5 mm or rivets Ø≥4.8 mm (see figure 2.3.15).

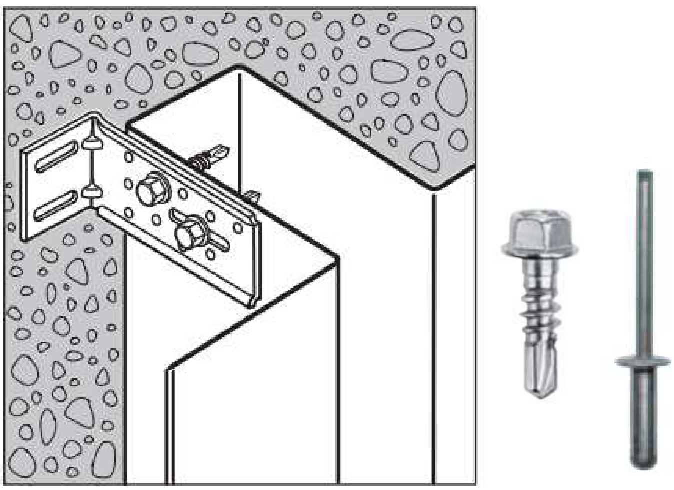


Figure 2.3.15 - Fixing the galvanised steel profiles to the supporting squares (Ø≥5.5 screws or Ø≥4.8 rivets)

2.3.23 Wooden upright protection strips

Whenever the structure is made of durability of class 2 wood (EN 335), it must be protected against rainwater with a flexible PVC or EPDM band over its entire height.

Protective strips can also be used on metal profiles, as an option.

2.3.24 Cutting Viroc panels

Cuts to be made in Viroc panels should be made using a portable circular saw with suitable cutting blades. The cutting edges of the disk must be made of hard metal, usually tungsten carbide inserts (see figure 2.3.16).

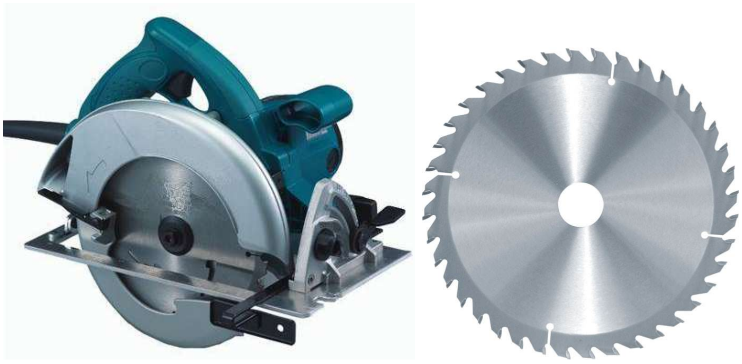


Figure 2.3.16 - Circular saw with tungsten cutting disc

2.3.25 Drilling Viroc panels

If holes need to be drilled in the Viroc panels, they must be drilled with HSS metal drills and the drill must be in drilling mode, without impact (see figure 2.3.17).

Figure 2.3.17 - HSS drill and bits (for drilling metal)

2.3.26 Preparing the surface of the Viroc panels

Viroc panels are supplied raw and unfinished. The surfaces show some irregularities and imperfections, such as small incrustations, stains, scratches, small wood chips and salts from chemical reactions.

Before a finishing varnish is applied, the surfaces must be completely clean and dry, with no grease, dust or surface salts. The surfaces that will be visible should be cleaned/polished with a cleaning disk or alternatively the surface can be sanded with fine 120 grit sandpaper or higher.

Cleaning/polishing does not alter the natural appearance of the panel; it maintains the stains and heterogeneities that characterise it, as well as some salts and incrustations that are embedded in the surface.

Video showing how Viroc panels are polished.

https://www.youtube.com/watch?v=HeQZNVNOZYI

2.3.27 Varnishing or painting Viroc panels

This chapter refers to the application of the Viroc panel on unvarnished façade.

2.3.28 Fixing Viroc panels

The Viroc panels that constitute the façade are fixed to a structure using screws.

The panels, when placed outdoors, are subject to dimensional variations of +1.5 mm to -5.0 mm per linear metre when the panel is not sealed.

In order to allow for dimensional variations in the panels, without introducing force that could damage the panels, the fixing system must allow for dimensional variation.

The diameter of the bolt holes to be drilled in the panels for fixing the screws located near the periphery is 10 mm larger than the body of the screw, thus allowing for shrinkage and expansion without introducing force.

When fixing the central area of the panel, the diameter of the bolt holes is the same as that of the body of the screw, fixing the panel rigidly. Its function is to ensure the proper positioning of the panel.

Fixing starts from the fixed points in order to position the panel. The expansion points will only be made later, in order to avoid introducing stresses as the panels sag.

The screws are positioned at a distance of 50 to 75 mm from the edges of the panels. The maximum distance between screws is 700 mm both horizontally and vertically, as shown in figure 2.3.18.

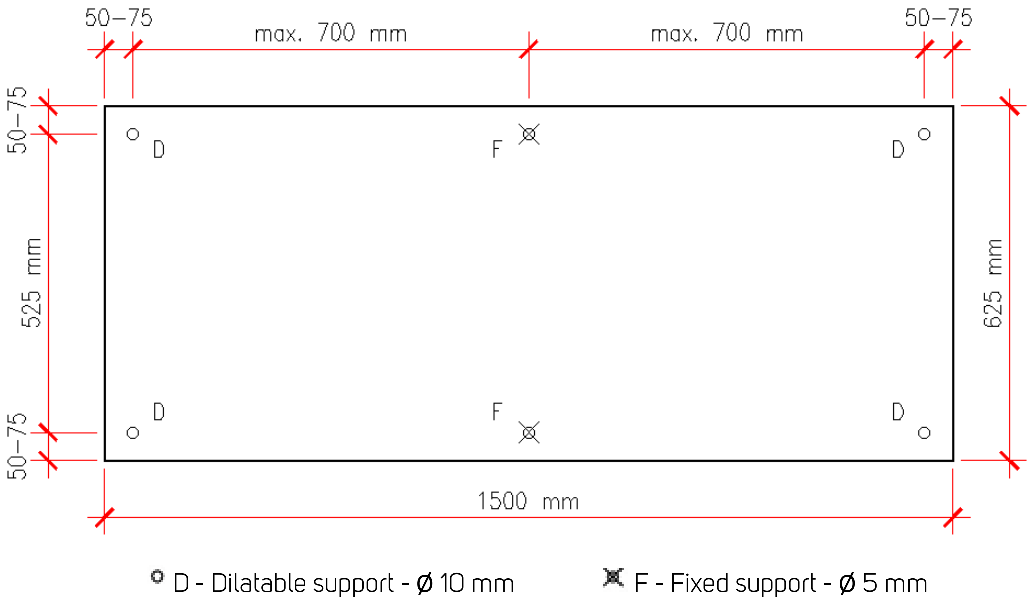


Figure 2.3.18 - Location of fixings and hole diameter

The positioning of the screws for fixing the façade panels must be perpendicular to the plane, with a maximum error of 2.5º and correctly tightened without crushing the neoprene washer (see figures 2.3.19 and 2.3.20).

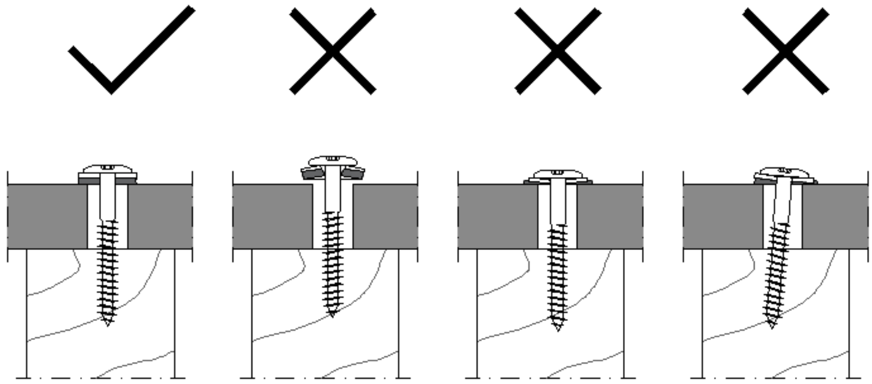


Figure 2.3.19 - Correct tightening and positioning of the screws

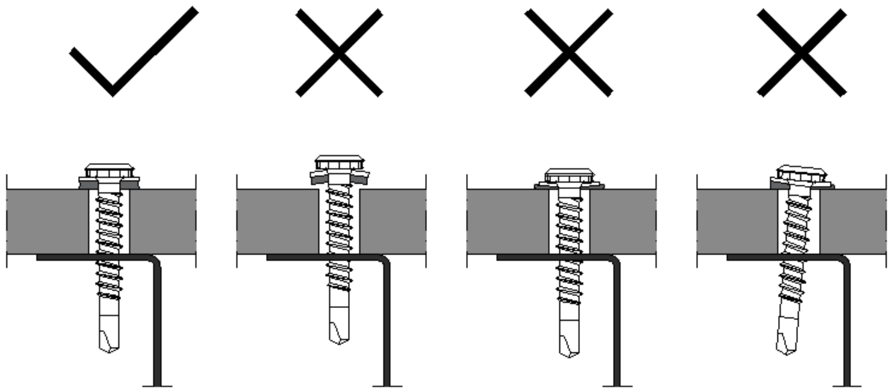


Figure 2.3.20 - Correct tightening and positioning of the screws

The location of the screws when fixed to a wooden structure must not be less than 15 mm from the edge of the wooden beam (see figure 2.3.21).

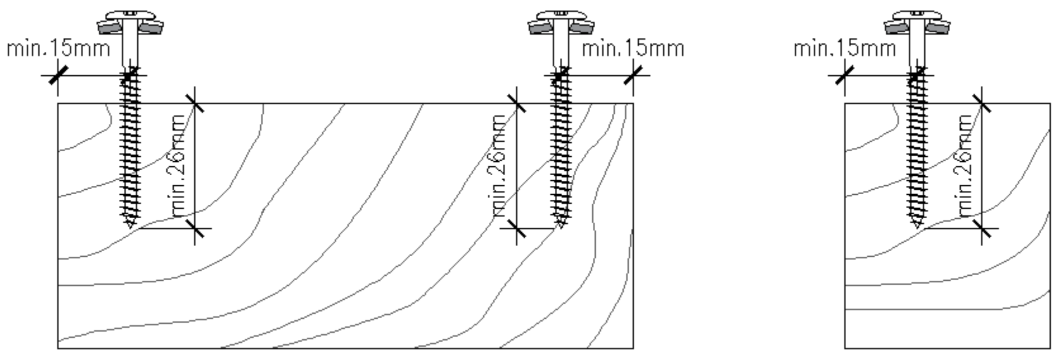


Figure 2.3.21 - Minimum distance from the screws to the edges of the beams

If the structure is made of galvanised steel, the distance to the edge must not be less than 10 mm (see figure 2.3.22)

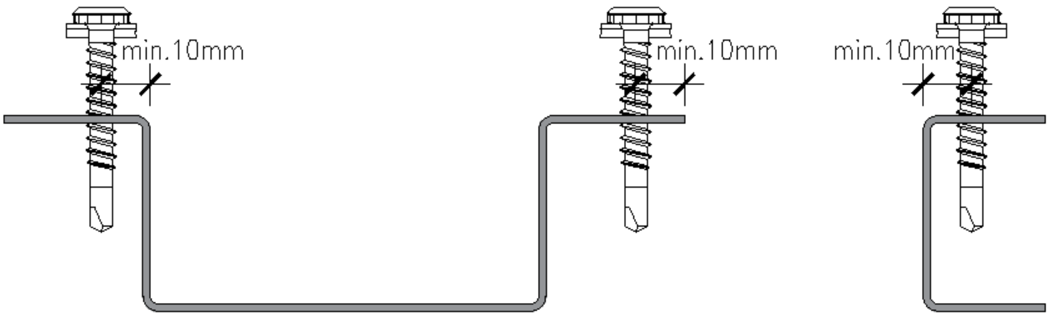


Figure 2.3.22 - Correct positioning of screws or rivets

2.3.29 Auxiliary assembly tools

There are various auxiliary tools that can be used to facilitate assembly work, such as spanners for centering bolt holes and screws (see figures 2.3.23, 2.3.24 and 2.3.25).

Figure 2.3.23 - Spanner for centering screws

Figure 2.3.24 - spanner for bolt hole-centering

Figure 2.3.25 – Bolt hole-centering tool

2.3.30 Treatment of the joints

Viroc panels are installed so that the joints between the panels, both vertical and horizontal, have a gap of between 5 and 8 mm. The joints can remain open or closed with a profile for aesthetic reasons.

2.3.31 Air foil ventilation

The ventilated façade, as recommended in this Technical File, forms a continuous sheet of air between the back of the panel and the thermal insulation.

The minimum opening for ventilation of the air foil is 20 mm thick. This distance must be respected even in areas where there may be obstructions.

At the base of the façade, the opening must be protected by a grille or perforated plate to prevent birds or rodents from entering (see figure 2.3.26).

Figure 2.3.26 - Perforated anti-rodent profile

The opening at the top of the façade is protected by a ruffle to prevent water from entering directly into the air gap.

The air gap must be compartmentalised, both vertically and horizontally, without impeding the free circulation of air.

The purpose of this compartmentalisation is to prevent the spread of fire between different floors or elevations in the event of a fire.

The air gap can be compartmentalised using galvanised steel sheet or aluminium. See general details.

2.3.32 Angle profiles

Some manufacturers of accessory elements for façade have auxiliary profiles for finishing the corners of the façade. The use of these profiles is optional (see figures 2.3.27 and 2.3.28).

Figure 2.3.27 - Corner angle profiles

Figure 2.3.28 - Corner angle profiles

2.3.33 Cleaning the panels after application

Panels can be cleaned during the life of the project by spraying them with water and a neutral detergent.

2.3.34 Replacing a panel

To replace a façade panel, the existing panel must first be removed.

Before starting to install a new panel, it is necessary to check that the supporting structure is in a position to receive and support the new façade panel.

It is necessary to check that the structure is aligned and level with the rest of the façade and that the area where the new screws are to be placed is intact; otherwise it needs to be repaired.

2.3.35 Impact resistance

Hard Body Impact Energy EN 1128

12 mm, E = 12.9 Joules, Burst Energy

16 mm, E = 12.8 Joules, Burst Energy

Impact test according to ETAG 034

12mm thick panel

Type of Impact	Energy	Results
Hard Body	1 J	No damage (Pass)
	3 J	No damage (Pass)
Soft Body	20 J	No damage (Pass)
	60 J	No damage (Pass)
	100 J	No damage (Pass)
	130 J	No damage (Pass)
	300 J	Fail

2.3.36 Wind action

Exposure to wind action perpendicular to the plane of the panel corresponds to a pressure or depression (in kN/m^2) whose design resistance value is given in Tables 1, 2 and 3.

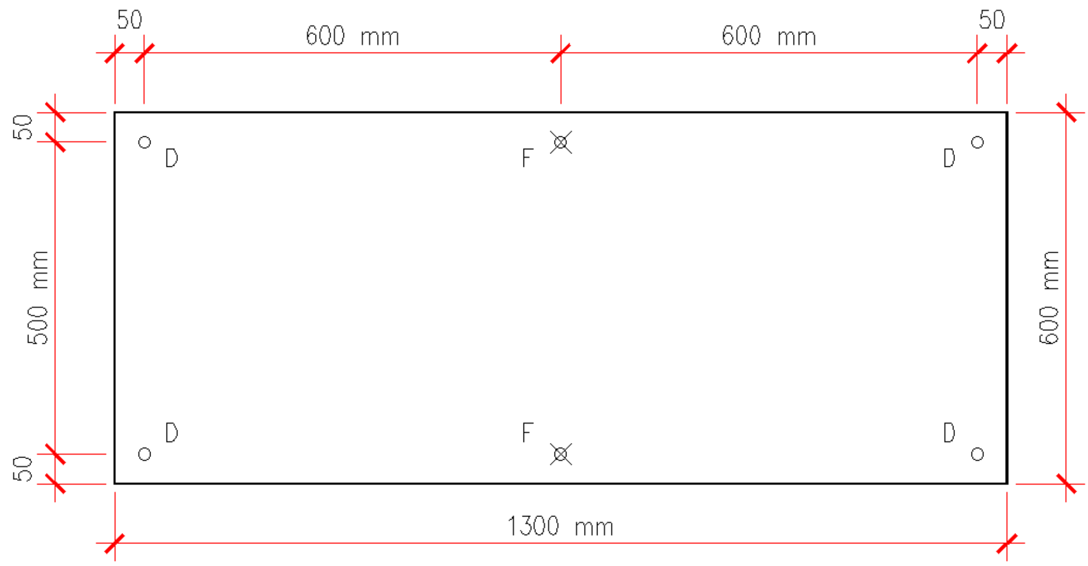
2.3.37 Wind safety check

Wind loads are quantified in accordance with the National Annex of Eurocode 1 (RSA).

The wind resistance load tables were drawn up on the basis of experimental tests for the situation that most affects a panel resistance to wind loads: suction.

2.3.38 Example of Safety check of a Viroc panel to wind loads

For a 12 mm thick Viroc panel with the configuration shown below, what is the maximum wind load the panel can withstand?



Number of screws horizontally: 3

Number of vertical screws: 2

Configuration: 3x2, we use the 3x2 table

Distance between screws horizontally: 600 mm => See Table 4

Distance between screws vertically: 500 mm

Horizontal distance between screws 600 mm (24")											
Thickness	(H x V)	Vertical distance between screws									
of		300 mm	12"	400 mm	16"	500 mm	20"	600 mm	24"	700 mm	28"
panel		kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf
12 mm 1/2"	2 x 2	1,4	29	1,4	29	1,4	29	1,2	25	1,0	21
	2 x 3	1,4	29	1,4	29	1,2	24	1,0	20	0,8	17
	2 x N	1,4	29	1,4	29	1,2	24	1,0	20	0,8	17
	3 x 2	1,7	36	1,4	28	1,1	24	1,0	20	0,9	18
	N x 2	1,7	36	1,4	28	1,1	24	1,0	20	0,9	18
	3 x 3	1,5	32	1,2	24	0,9	19	0,8	16	0,7	14
	3 x N	1,5	32	1,2	24	0,9	19	0,8	16	0,7	14
	N x 3	1,5	32	1,2	24	0,9	19	0,8	16	0,7	14
16 mm 5/8"	2 x 2	3,3	69	3,3	69	3,0	62	2,5	53	2,2	46
	2 x 3	3,3	69	3,1	64	2,5	52	2,1	43	1,8	37
	2 x N	3,3	69	3,1	64	2,5	52	2,1	43	1,8	37
	3 x 2	3,6	75	2,9	60	2,4	50	2,1	43	1,8	38
	N x 2	3,6	75	2,9	60	2,4	50	2,1	43	1,8	38
	3 x 3	1,7	35	1,3	27	1,0	21	0,8	18	0,7	15
	3 x N	1,7	35	1,3	27	1,0	21	0,8	18	0,7	15
	N x 3	1,7	35	1,3	27	1,0	21	0,8	18	0,7	15

Table 4 - Allowable pressure, 600 mm spacing between screws horizontally

The design resistance value of the Viroc panel to wind pressure (w_{Rd}) is 1.1 KN/m2 (24 psf)

Note: The action of the wind exerts a pressure or depression on the panel. This is a constraint when it acts as a depression, since the panel is fixed only by the head of the screws and breakage occurs by cutting/punching the panel in these areas.

2.3.39 Run-off

With the wetting and drying cycles of the panels, due to the action of rain, there is the possibility that the salts that constitute the cement migrate to the surface, forming efflorescence. These efflorescences can form oozes, streaks of salts on the panels as the water drips. This salt run-off on the surface of the panels can be minimised if the panels are polished when they are applied.

2.3.40 Surface warping

As the panel is not sealed, it may suffer greater dimensional variation, which will occur both in the plane of the façade and outside the plane of the façade.

2.3.41 Details, wooden structure

Figures 2.3.29 to 2.3.43 show examples of various details and unique areas of the façade.

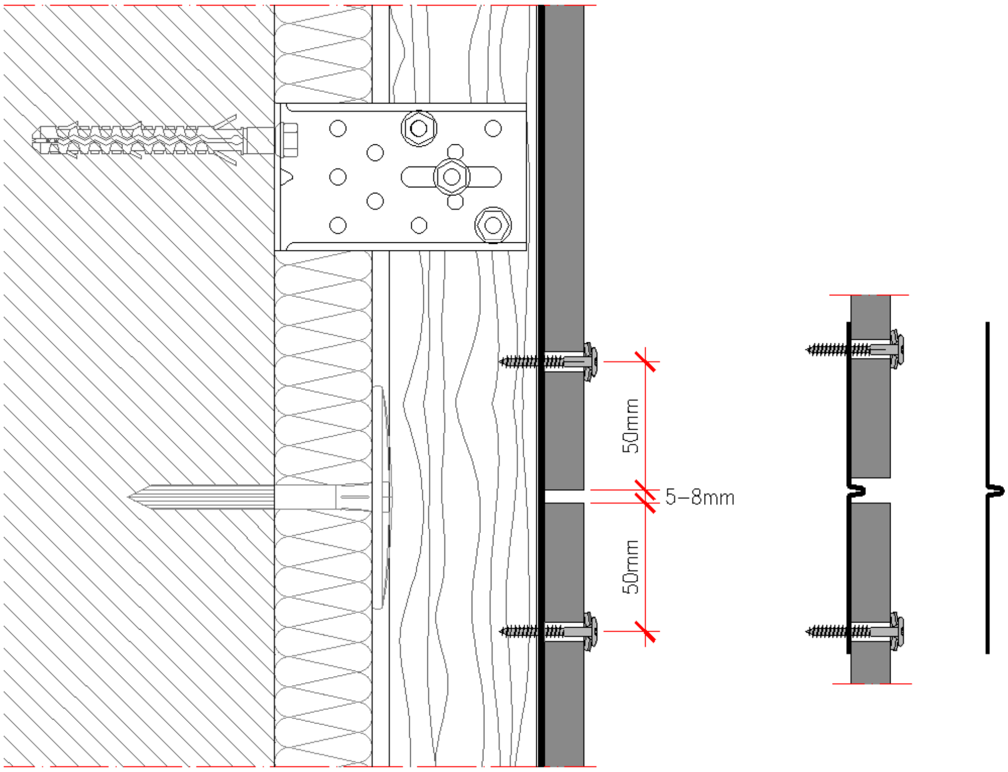


Figure 2.3.29 - Vertical section, joint between panels

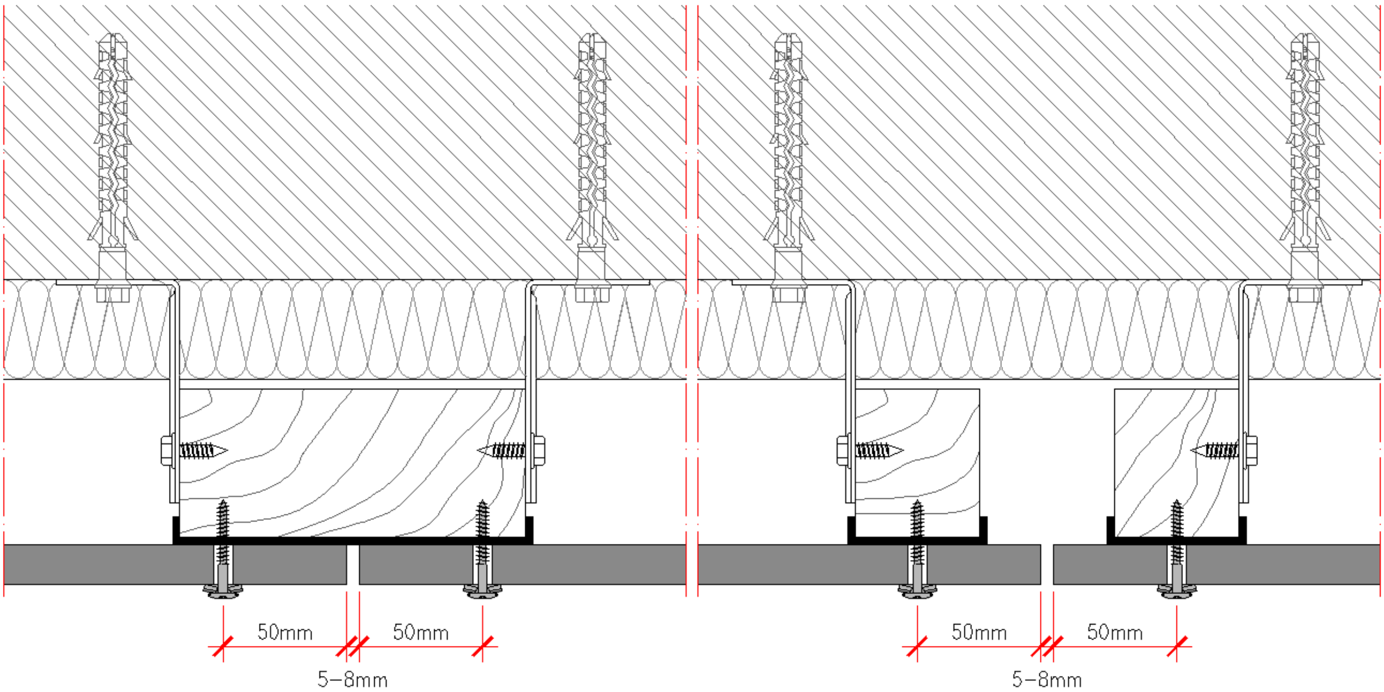


Figure 2.3.30 - Horizontal section, joint between panels

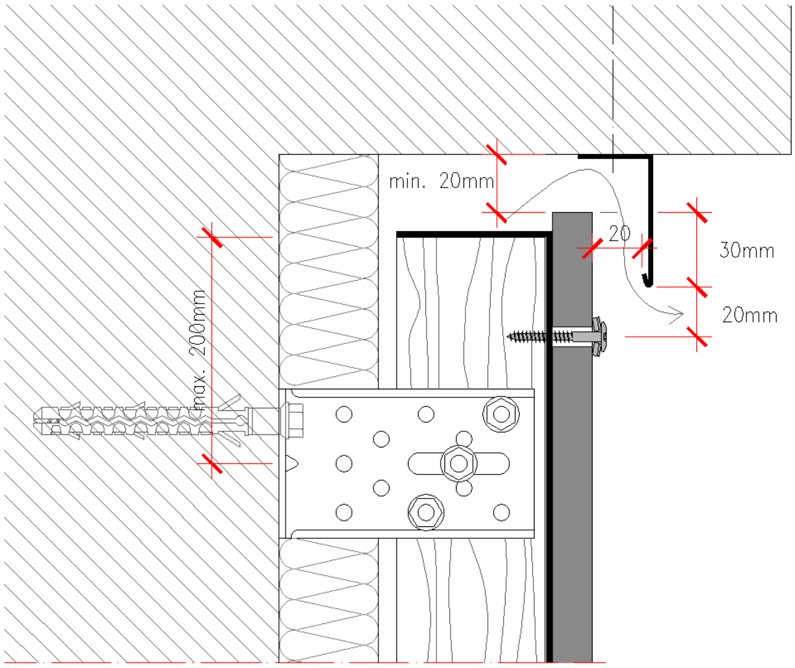


Figure 2.3.31 - Balcony finish

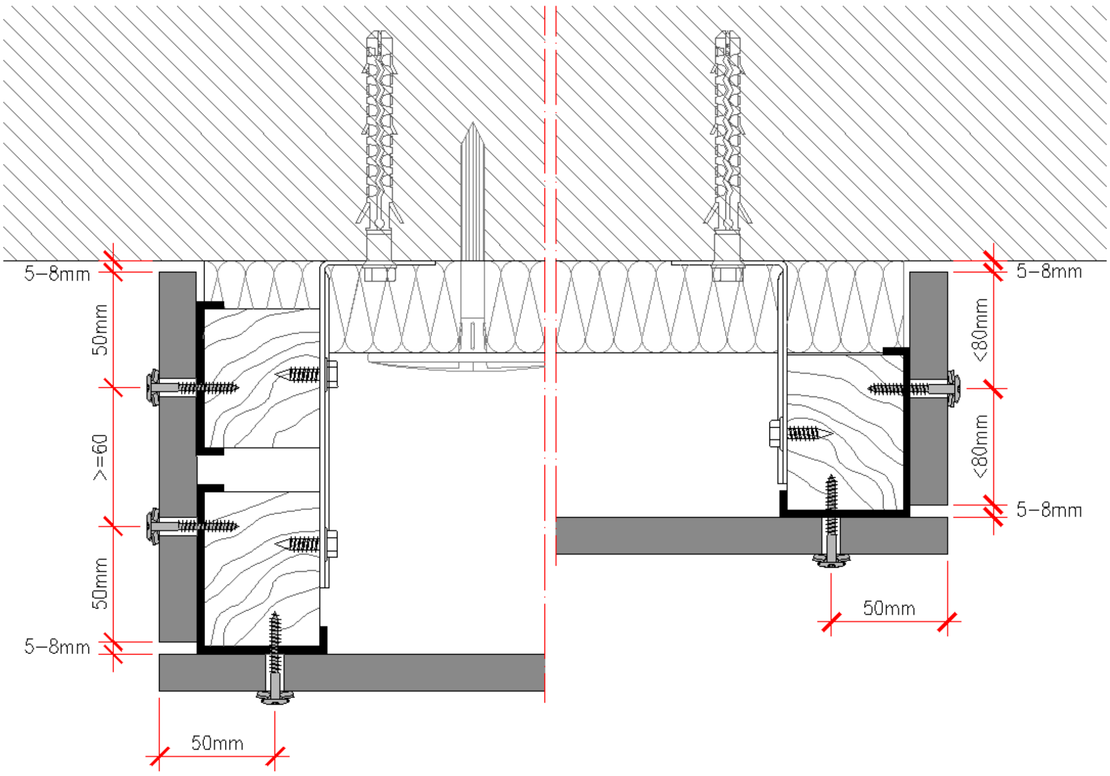


Figure 2.3.32 - Side finish

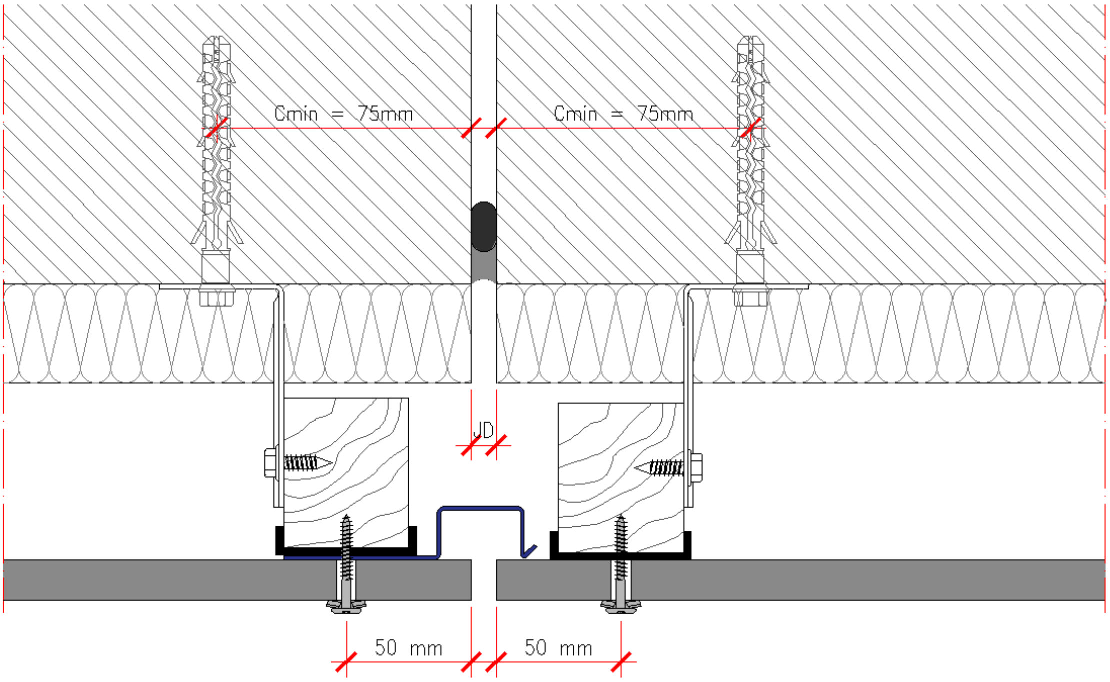


Figure 2.3.33 - JD-Expansion joint

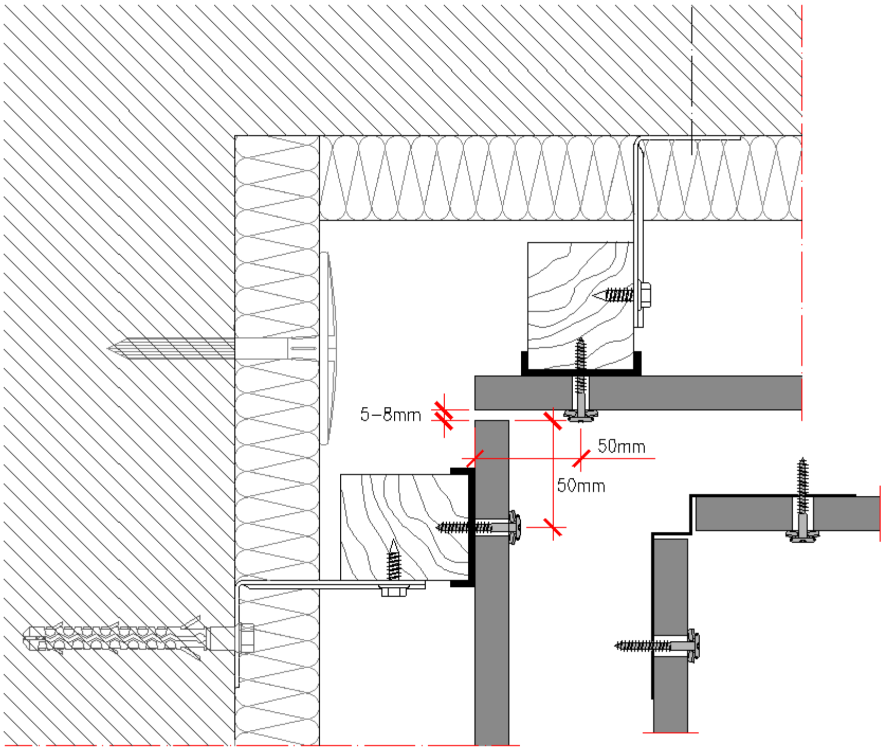
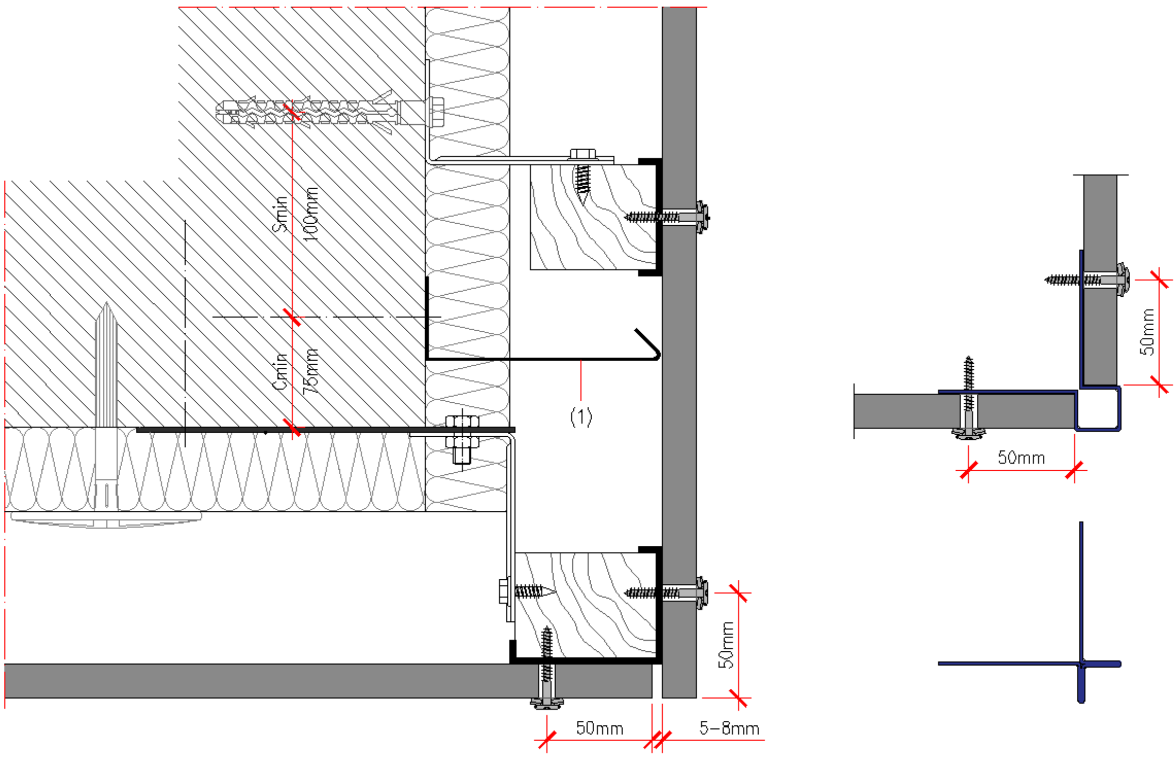


Figure 2.3.34 - Corner angle



(1) Compartmentalisation of the air foil

Figure 2.3.35 - Corner angle

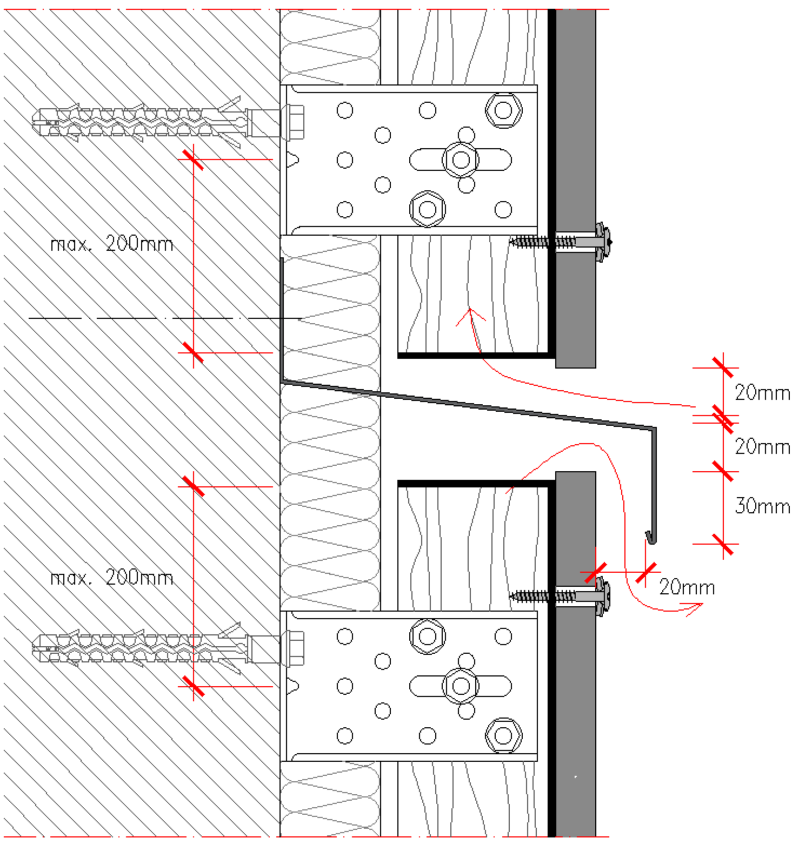


Figure 2.3.36 - Horizontal compartmentalisation of the air gap

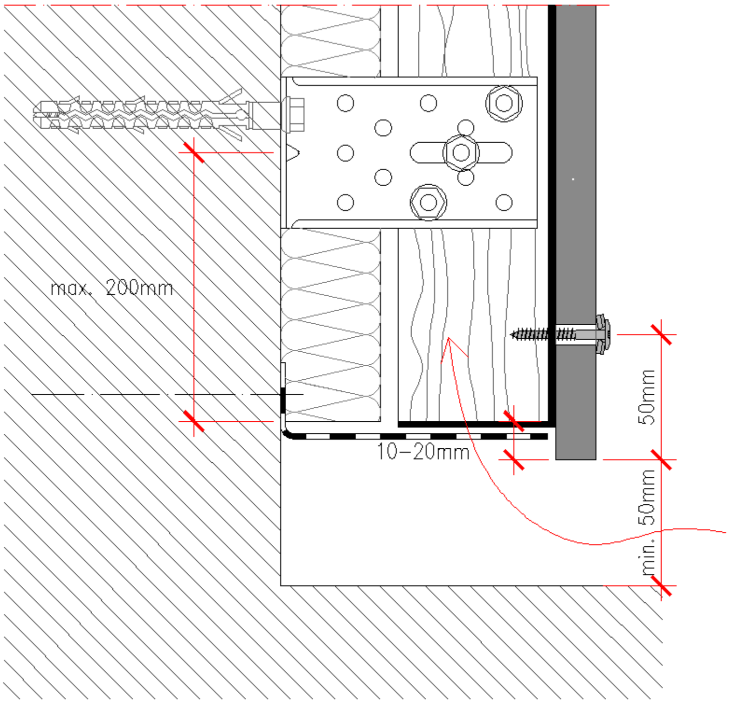


Figure 2.3.37 - Detail of the base, anti-rodent grid

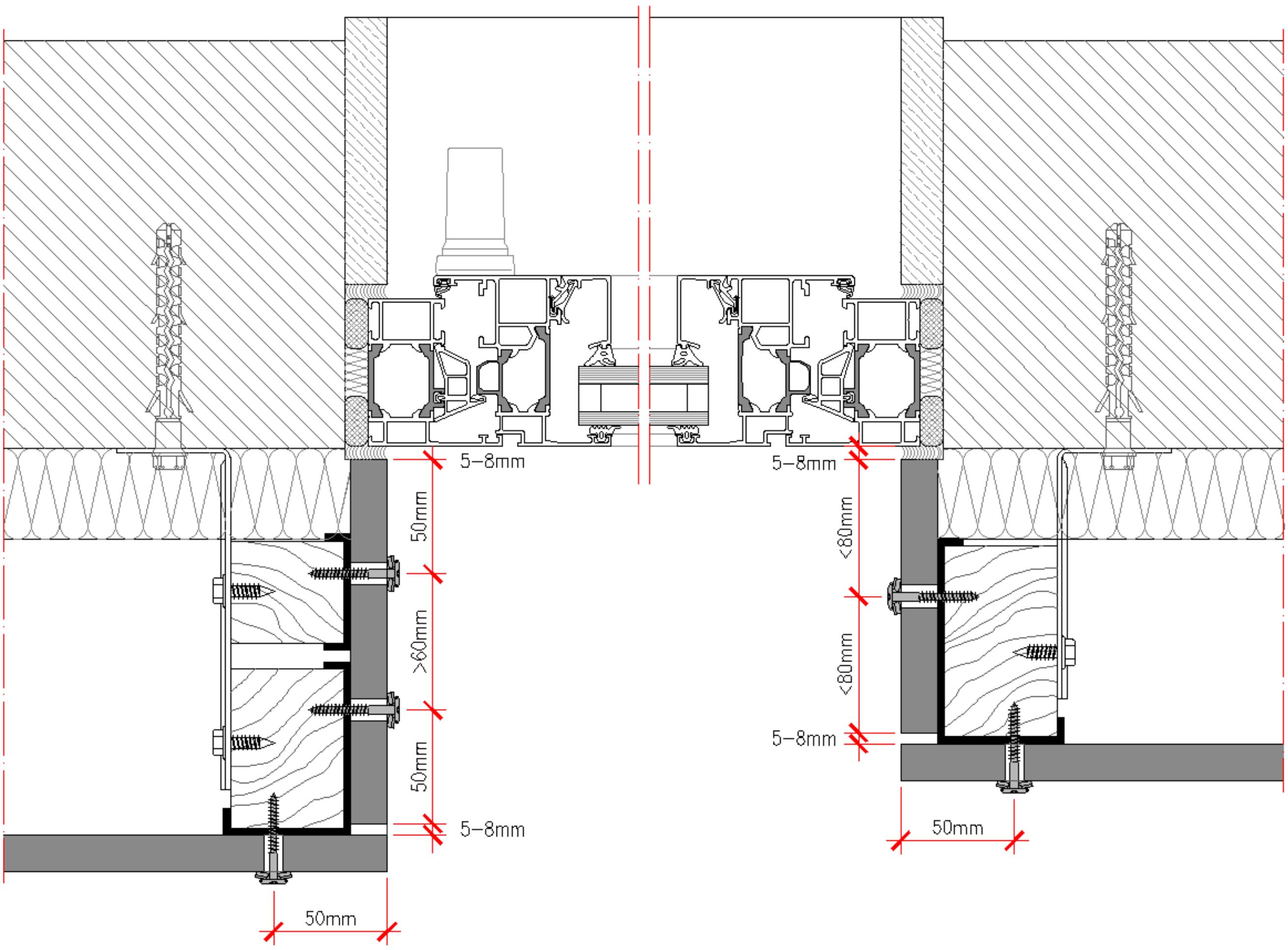


Figure 2.3.38 - Horizontal section, window opening

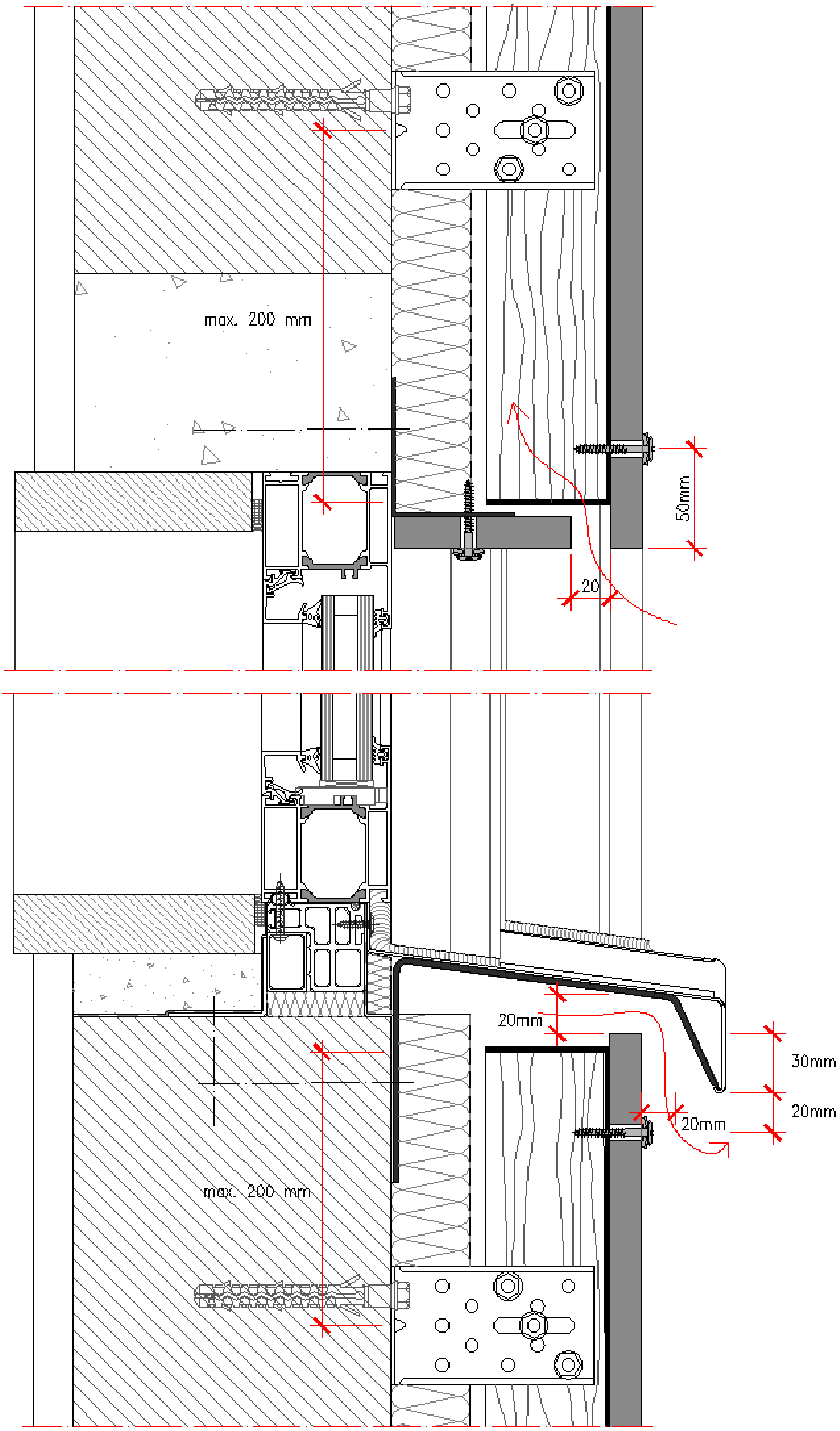


Figure 2.3.39 - Vertical section, window opening

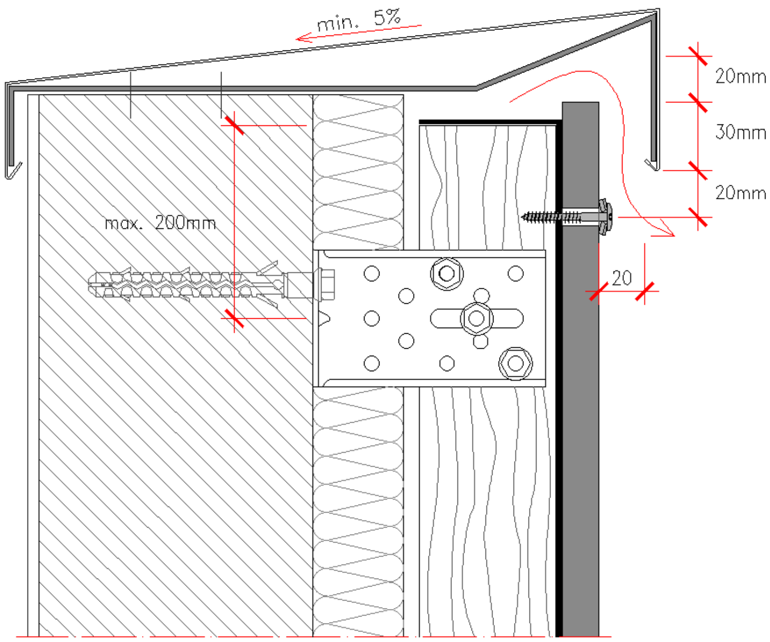


Figure 2.3.40 - Detail of the top

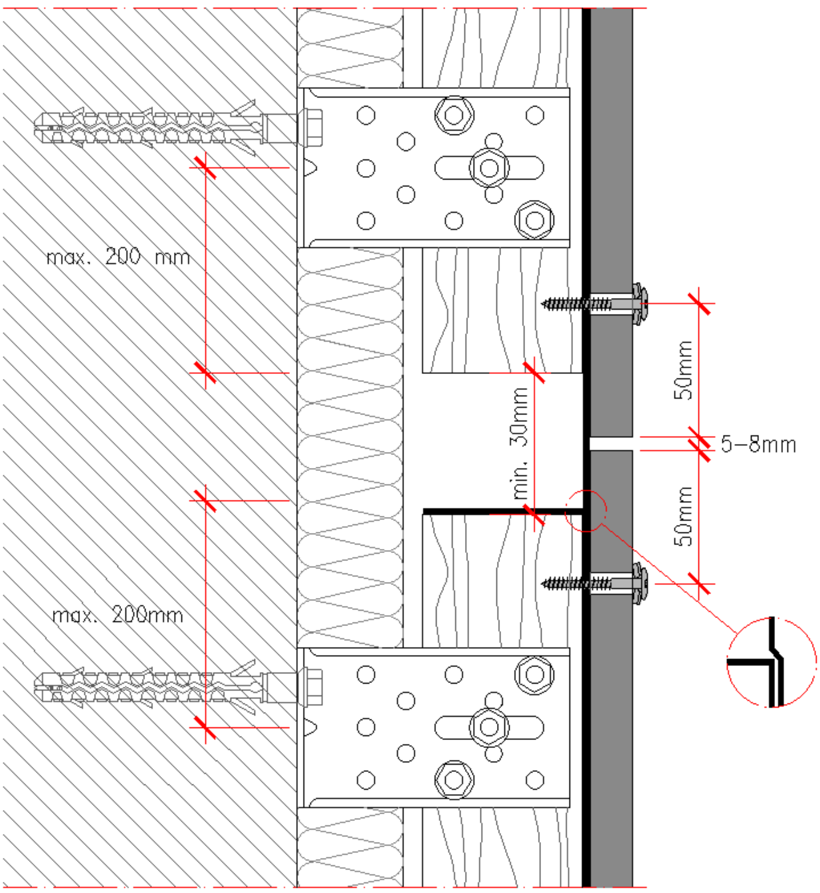


Figure 2.3.41 - Fractionation of the structure: Profiles with length ≤ 6 m

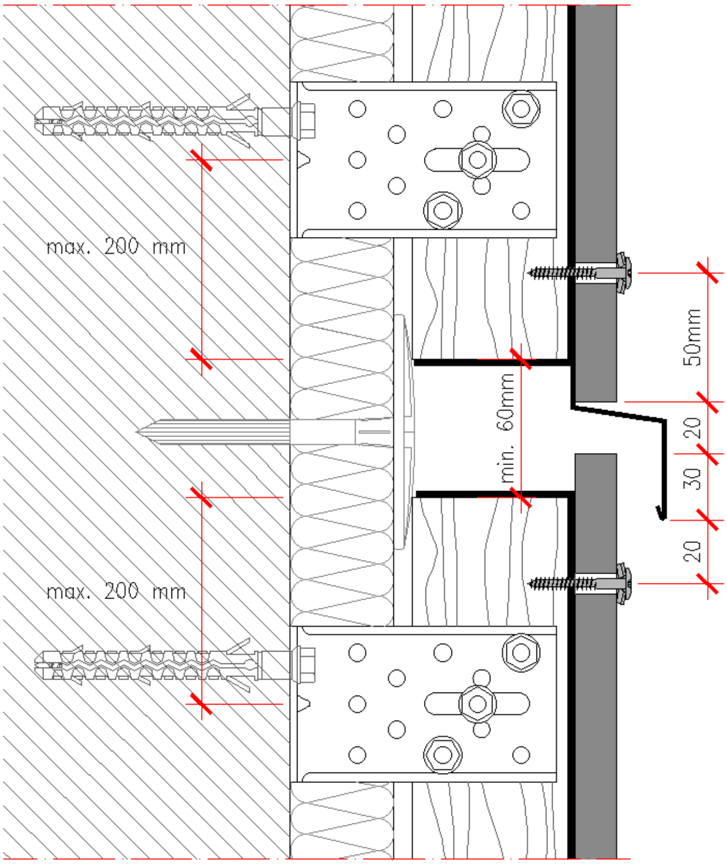
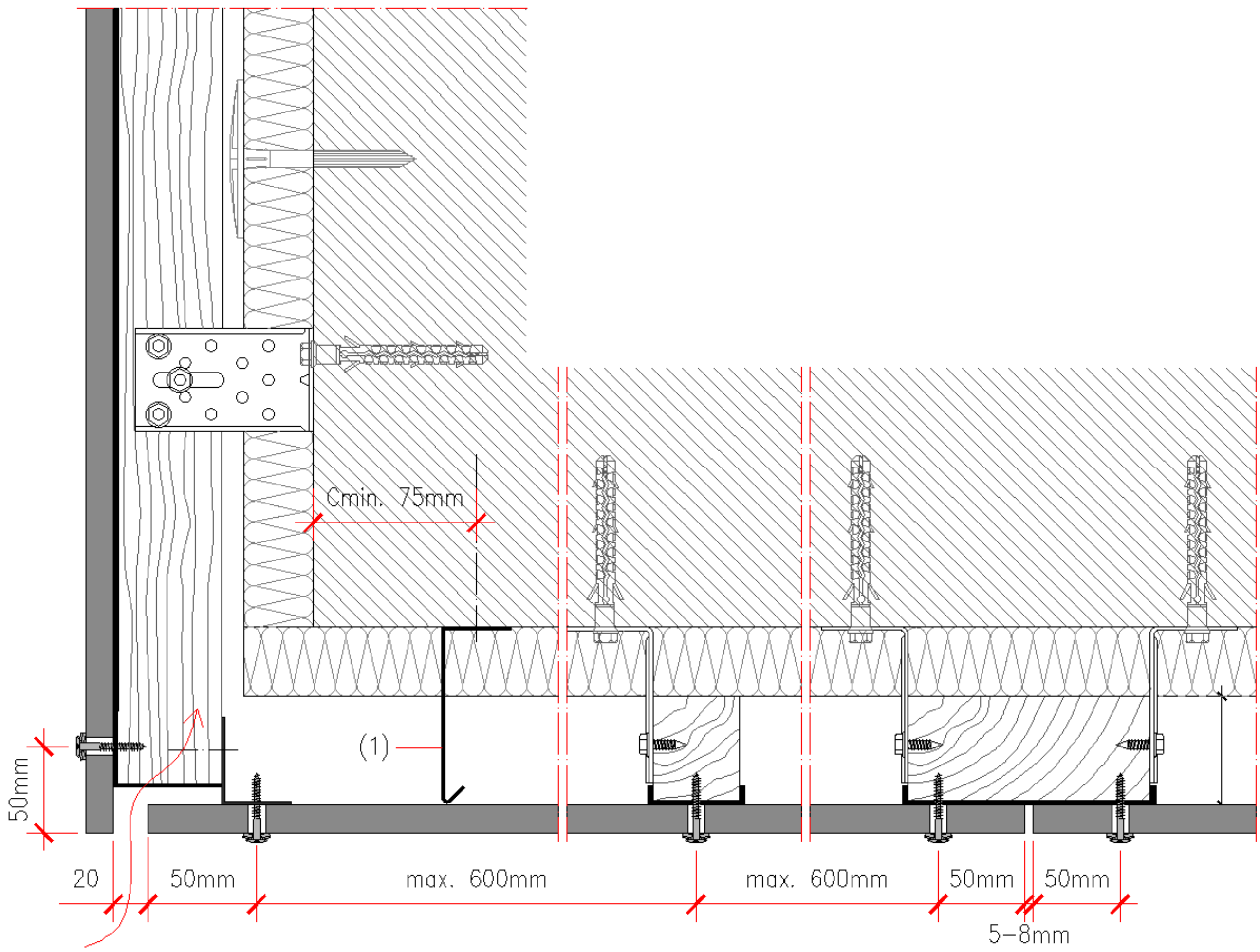


Figure 2.3.42 - Fractionation of the structure: Profiles with length > 6 m



(1) Compartmentalization of the air foil

Figure 2.3.43 - Detail of the façade - false ceiling connection

2.1.42 Details, galvanised steel frame

Figures 2.3.44 to 2.3.59 show examples of various details and unique areas of the façade.

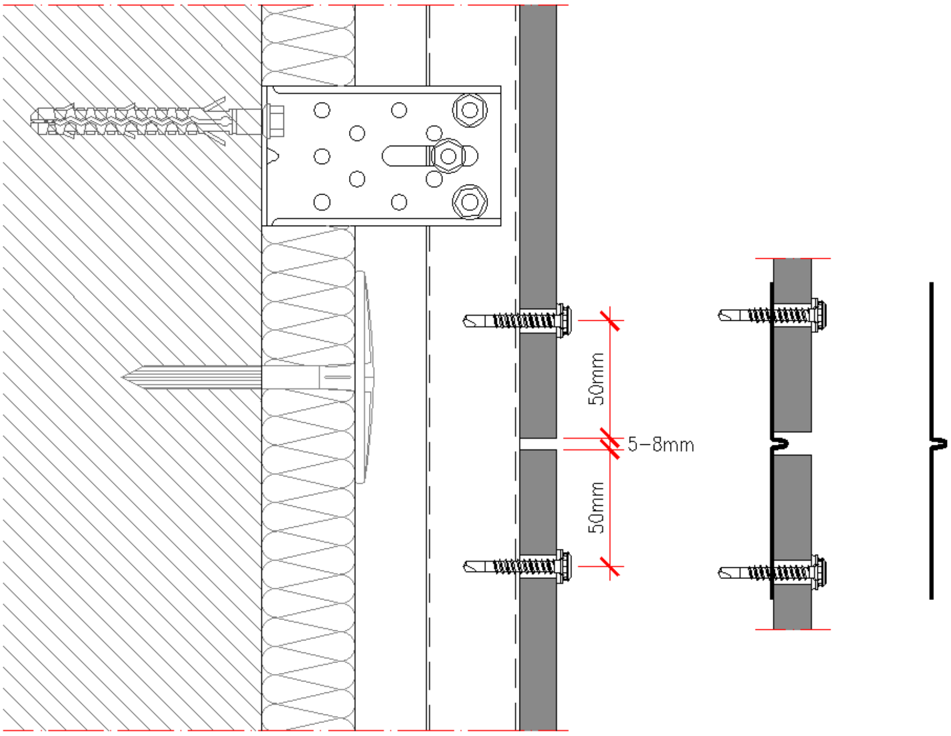


Figure 2.3.44 - Vertical section, joint between panels

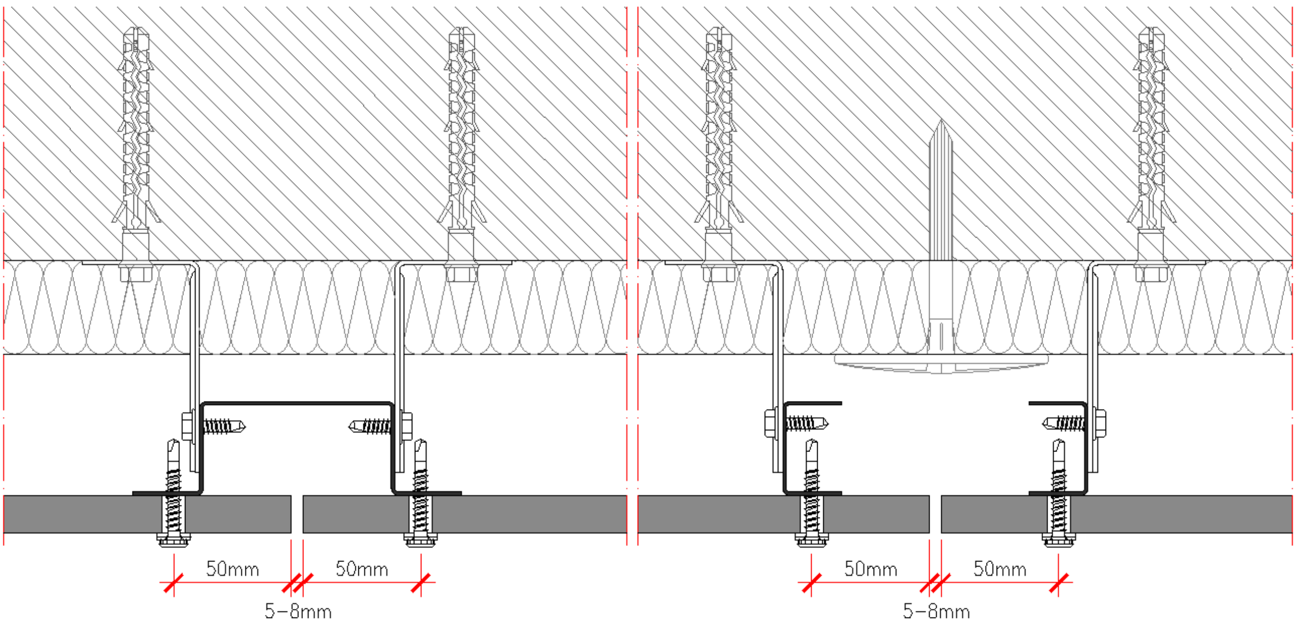


Figure 2.3.45 - Horizontal section, joint between panels

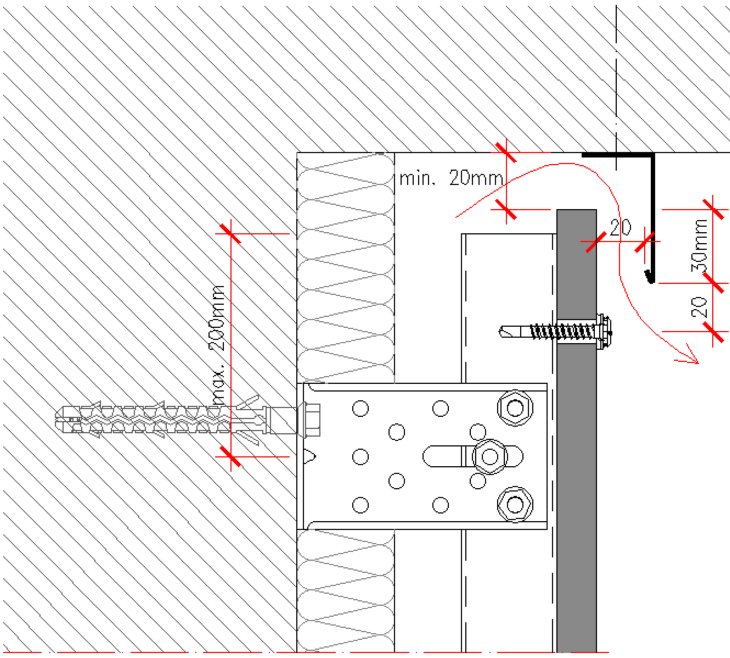


Figure 2.3.46 - Balcony finish

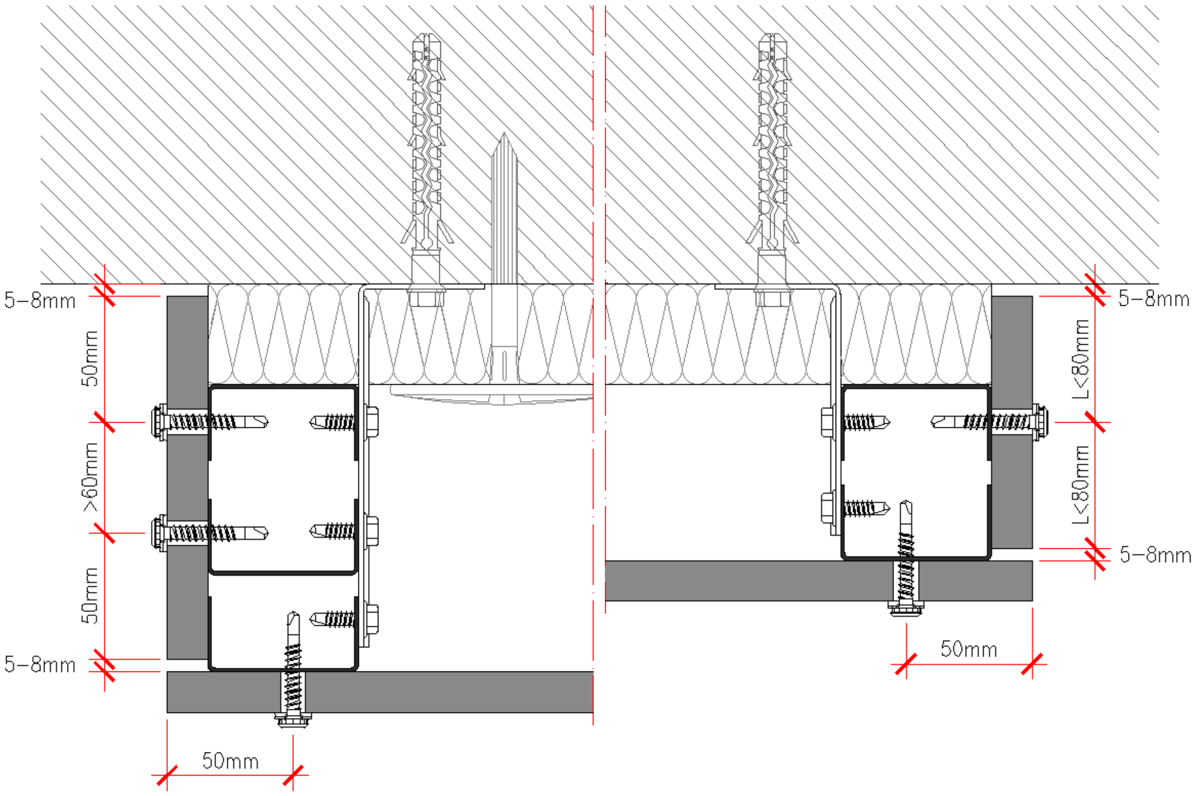


Figure 2.3.47 - Side finish

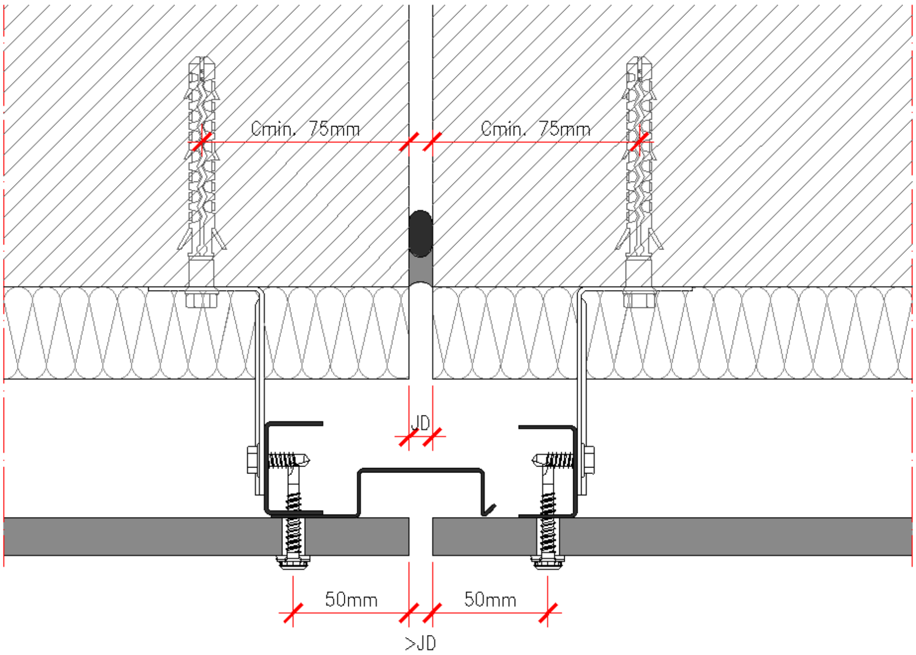


Figure 2.3.48 - JD-Expansion joint

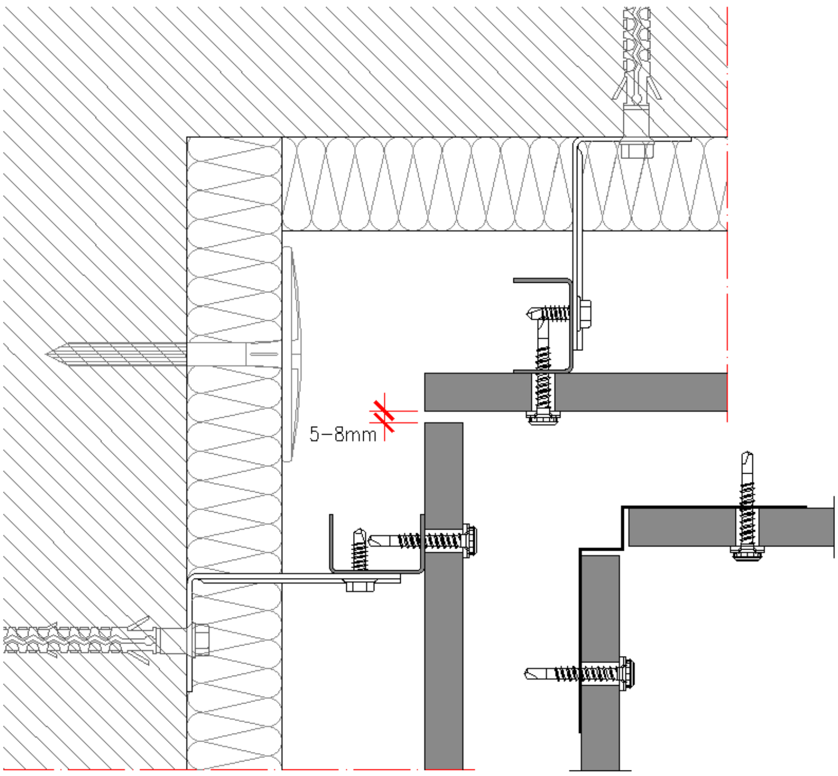
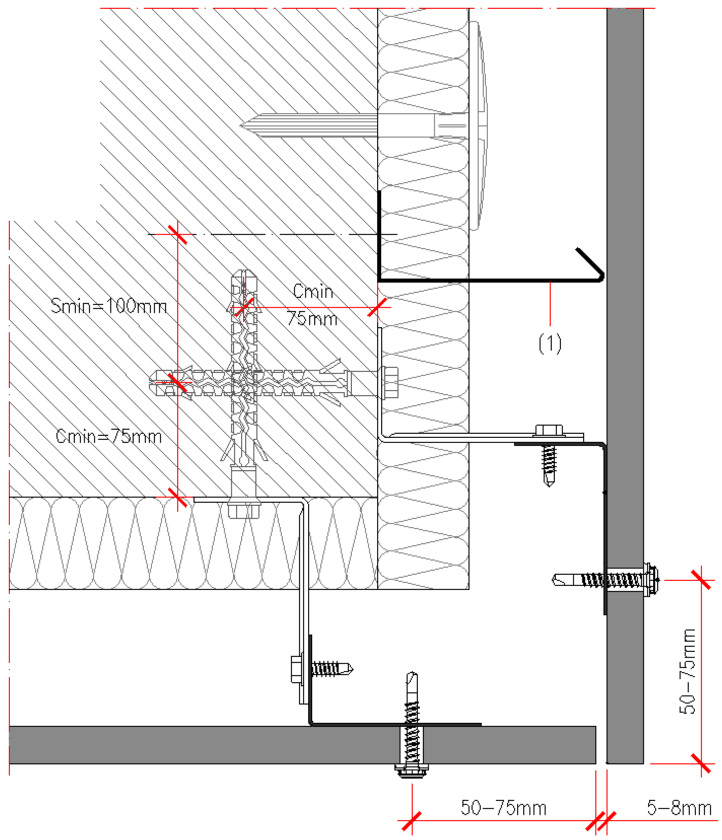
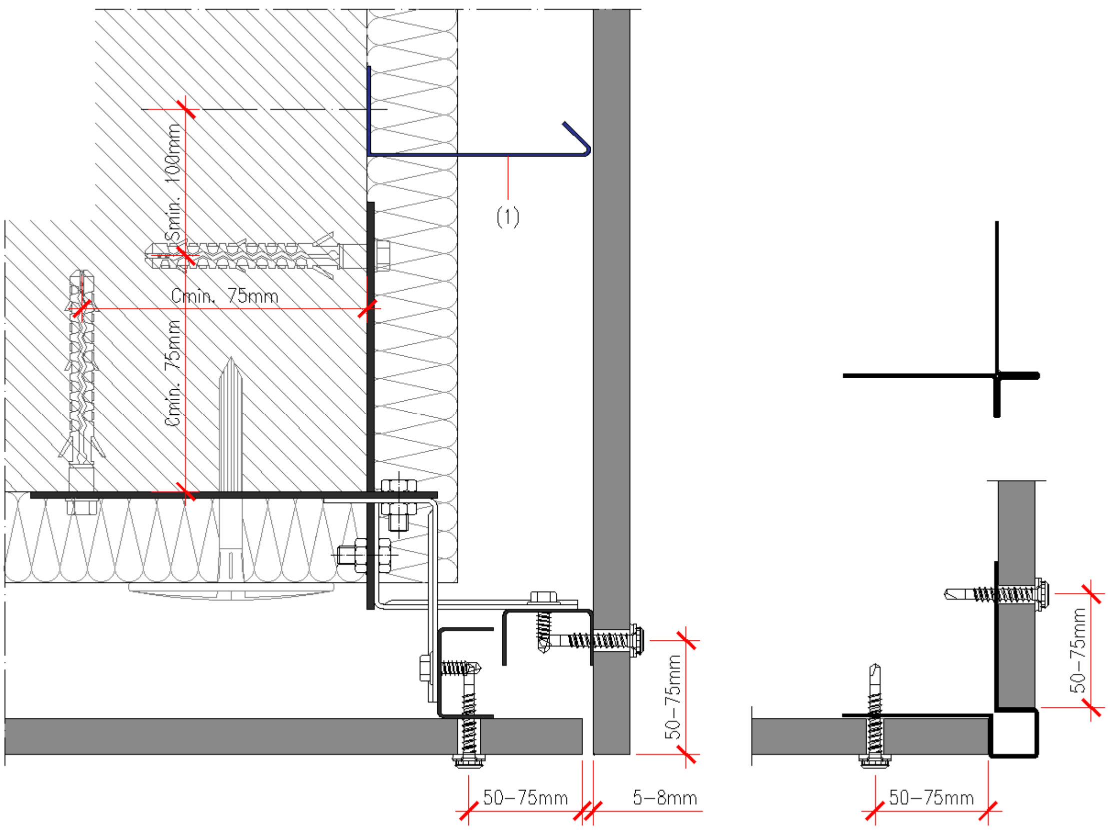


Figure 2.3.49 - Corner angle



(1) Compartmentalisation of the air foil
Figure 2.3.50 - Corner angle



(1) Compartmentalisation of the air foil
Figure 2.3.51 - Corner angle, variant

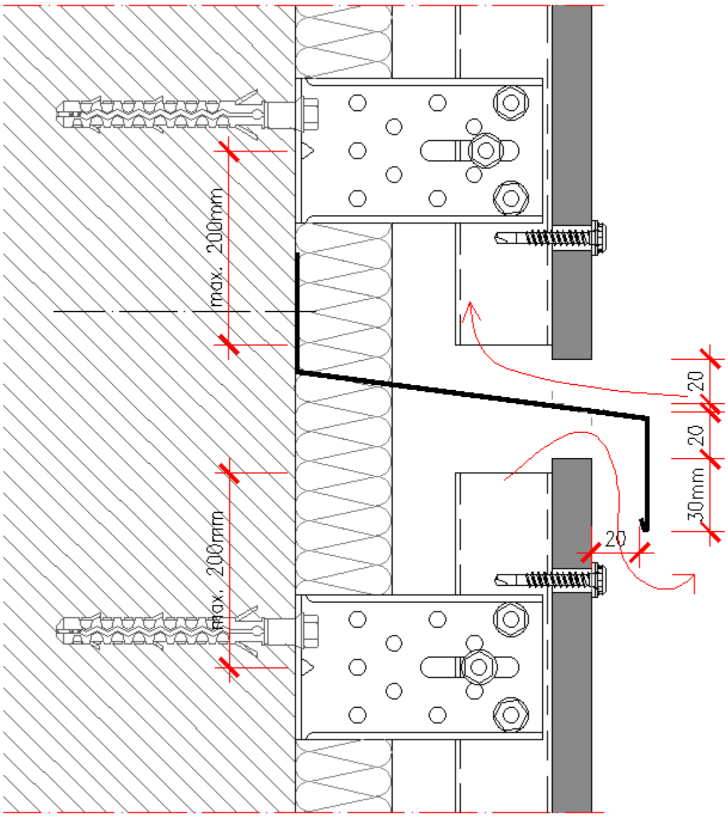


Figure 2.3.52 - Horizontal compartmentalisation of the air gap

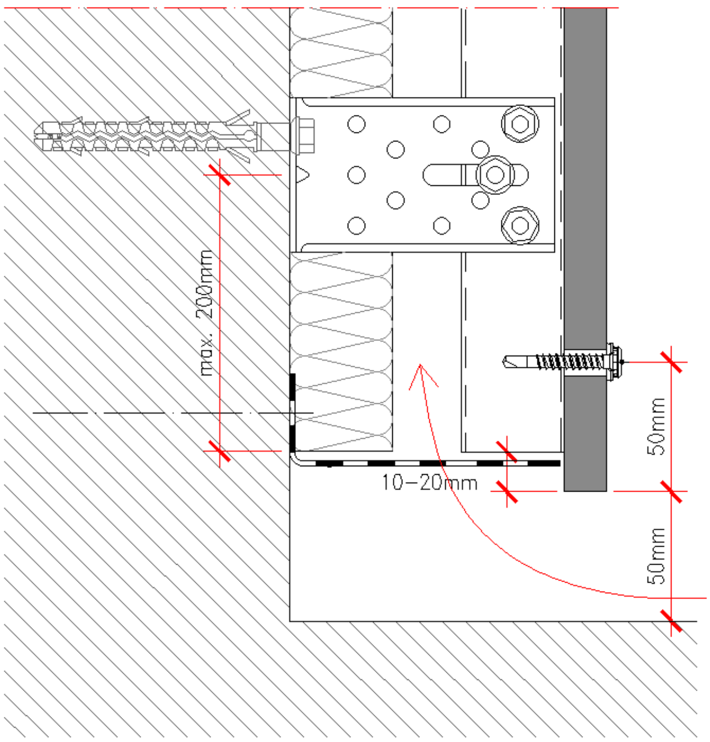


Figure 2.3.53 - Detail of the base, anti-rodent grid

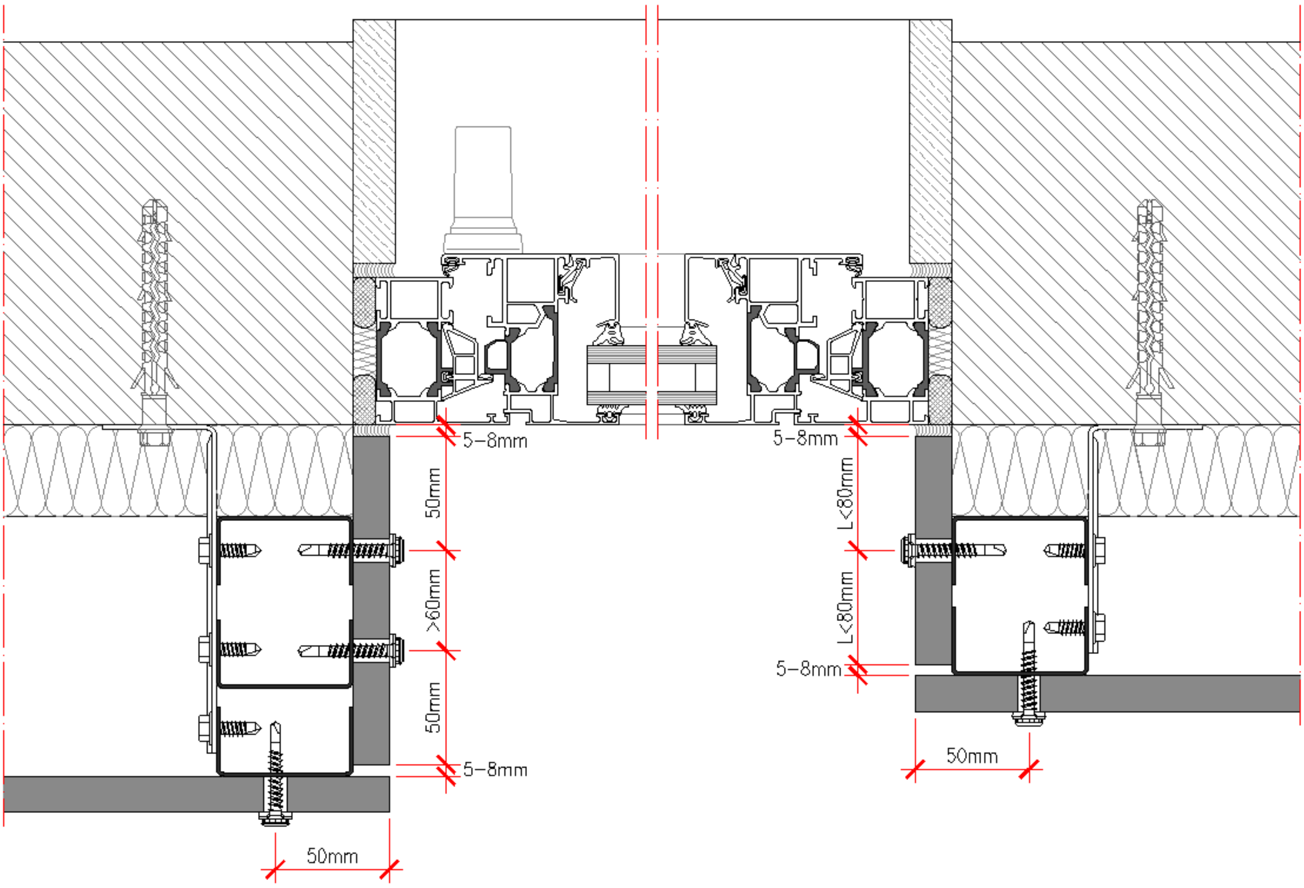


Figure 2.3.54 - Horizontal section, window opening

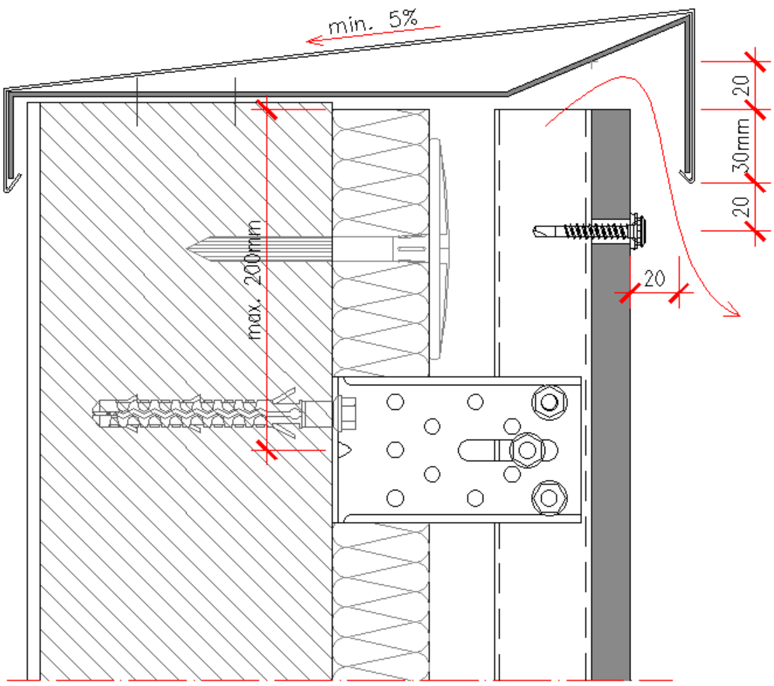


Figure 2.3.55 - Detail of the top

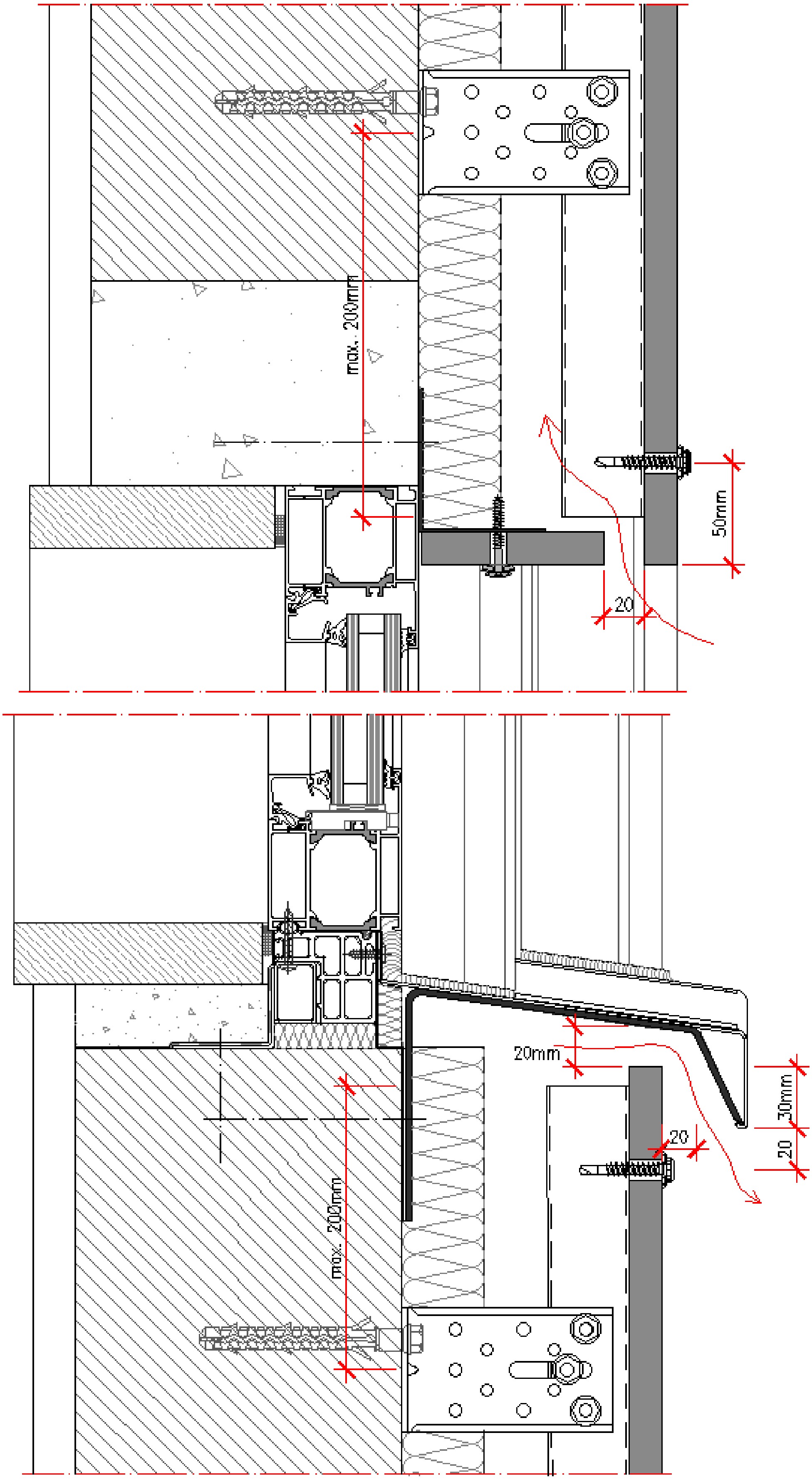


Figure 2.3.56 - Vertical section, window opening

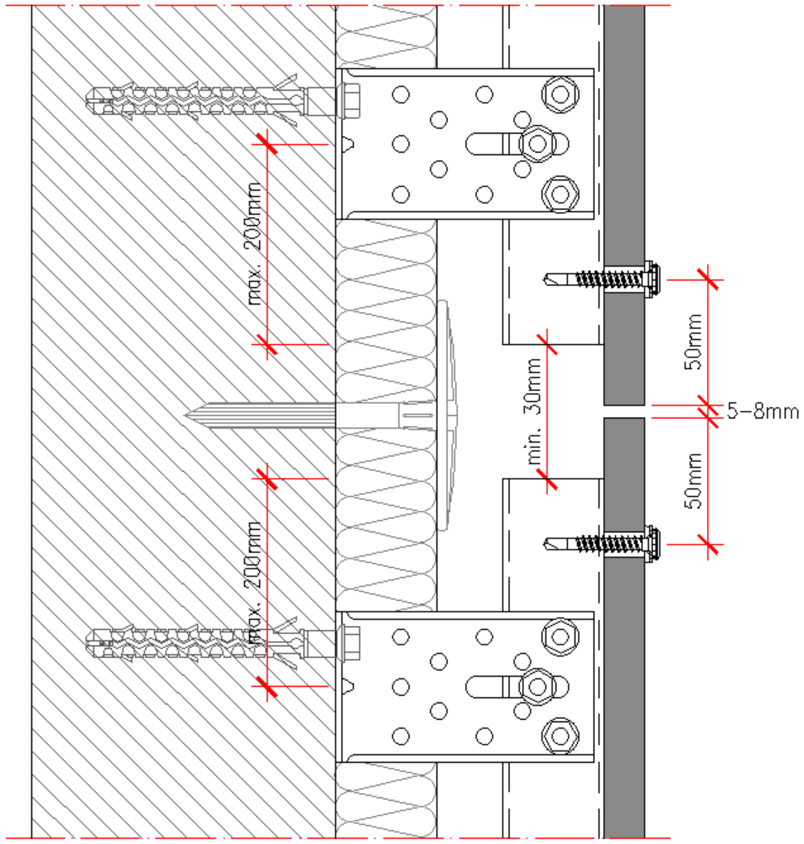


Figure 2.3.57 - Fractioning the structure: Profiles with length ≤ 6 m

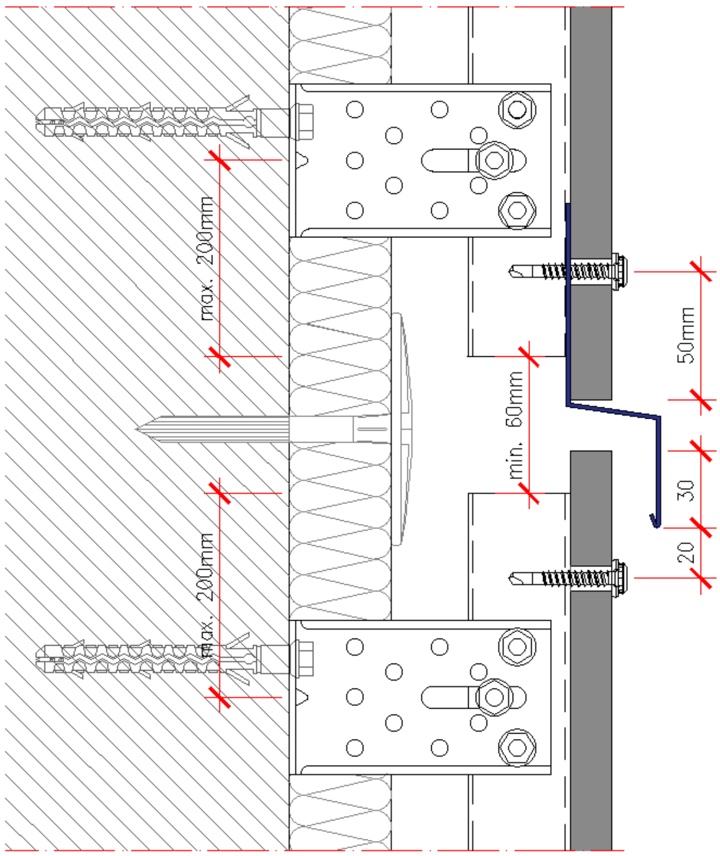
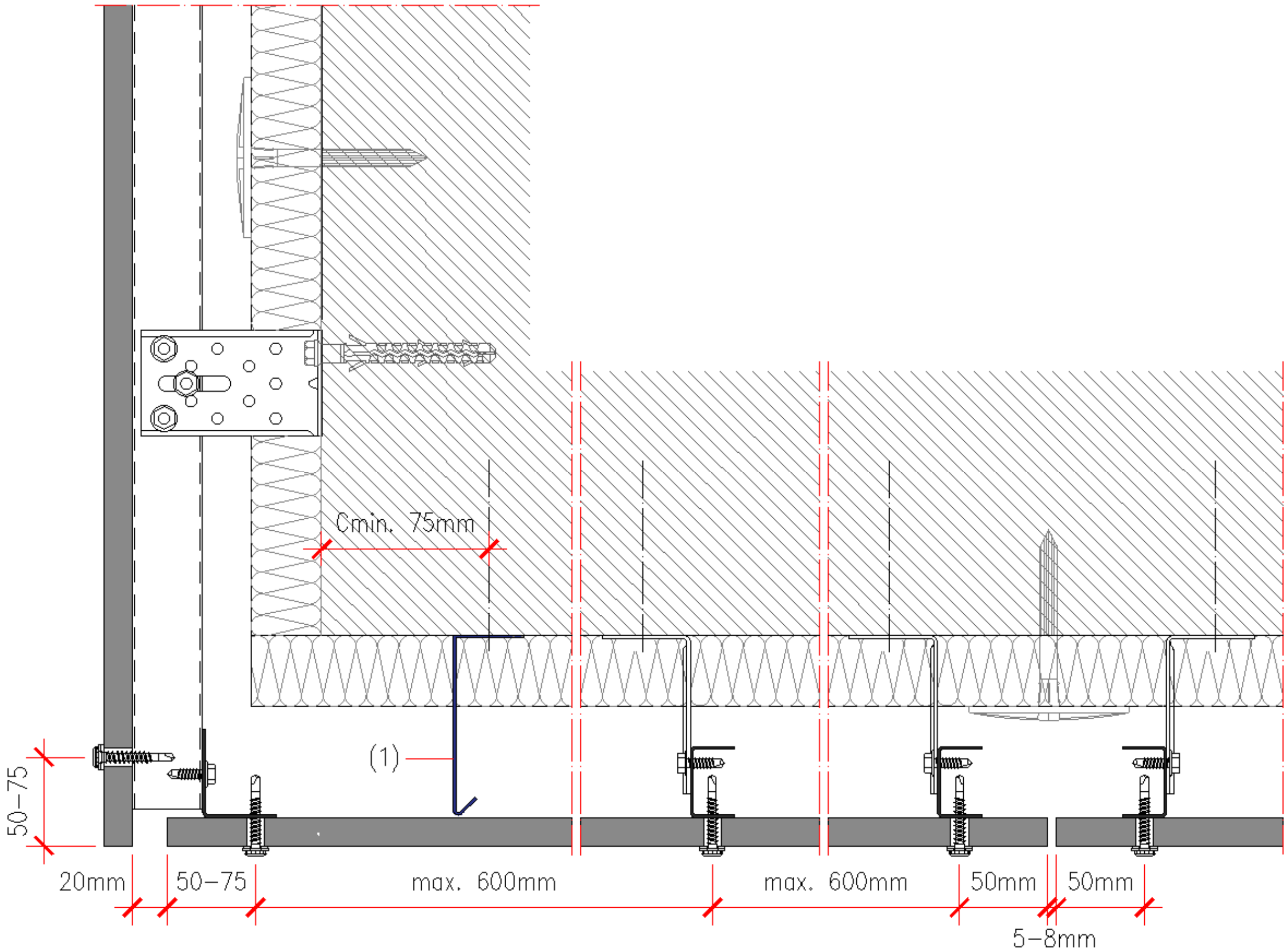


Figure 2.3.58 – Fractionation of the structure: Profiles with length > 6 m



(1) Compartmentalisation of the air foil

Figure 2.3.59 - Detail of the façade - false ceiling connection

viroc

WIND LOAD TABLES

Maximum pressure on the panels when subjected to wind action (suction), N>3

Horizontal distance between screws 300 mm (12")											
Thickness of panel	(H x V)	Vertical distance between screws									
		300 mm	12"	400 mm	16"	500 mm	20"	600 mm	24"	700 mm	28"
		kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf
12 mm 1/2"	2 x 2	3,7	78	3,0	62	2,0	42	1,4	29	1,0	21
	2 x 3	3,4	71	2,6	53	2,0	43	1,7	36	1,5	30
	2 x N	3,4	71	2,6	53	2,0	43	1,7	36	1,5	30
	3 x 2	3,4	71	2,7	57	2,0	42	1,4	29	1,0	21
	N x 2	3,4	71	2,7	57	2,0	42	1,4	29	1,0	21
	3 x 3	3,1	64	2,3	48	1,8	39	1,5	32	1,3	28
	3 x N	3,1	64	2,3	48	1,8	39	1,5	32	1,3	28
	N x 3	3,1	64	2,3	48	1,8	39	1,5	32	1,3	28
16 mm 5/8"	2 x 2	7,8	163	6,2	130	4,7	99	3,3	69	2,4	50
	2 x 3	7,2	150	5,4	113	4,3	90	3,6	75	3,1	64
	2 x N	7,2	150	5,4	113	4,3	90	3,6	75	3,1	64
	3 x 2	7,2	150	5,8	120	4,7	99	3,3	69	2,4	50
	N x 2	7,2	150	5,8	120	4,7	99	3,3	69	2,4	50
	3 x 3	3,4	71	2,5	53	2,0	43	1,7	35	1,5	30
	3 x N	3,4	71	2,5	53	2,0	43	1,7	35	1,5	30
	N x 3	3,4	71	2,5	53	2,0	43	1,7	35	1,5	30

Table 1 – Maximum pressure, 300 mm spacing between screws horizontally

Horizontal distance between screws 400 mm (16")											
Thickness of panel	(H x V)	Vertical distance between screws									
		300 mm	12"	400 mm	16"	500 mm	20"	600 mm	24"	700 mm	28"
		kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf
12 mm 1/2"	2 x 2	3,0	62	2,4	50	2,0	42	1,4	29	1,0	21
	2 x 3	2,7	57	2,0	43	1,6	34	1,4	28	1,2	24
	2 x N	2,7	57	2,0	43	1,6	34	1,4	28	1,2	24
	3 x 2	2,6	53	2,0	43	1,7	36	1,4	29	1,0	21
	N x 2	2,6	53	2,0	43	1,7	36	1,4	29	1,0	21
	3 x 3	2,3	48	1,7	36	1,4	29	1,2	24	1,0	21
	3 x N	2,3	48	1,7	36	1,4	29	1,2	24	1,0	21
	N x 3	2,3	48	1,7	36	1,4	29	1,2	24	1,0	21
16 mm 5/8"	2 x 2	6,2	130	5,0	104	4,2	87	3,3	69	2,4	50
	2 x 3	5,8	120	4,3	90	3,5	72	2,9	60	2,5	52
	2 x N	5,8	120	4,3	90	3,5	72	2,9	60	2,5	52
	3 x 2	5,4	113	4,3	90	3,6	75	3,1	64	2,4	50
	N x 2	5,4	113	4,3	90	3,6	75	3,1	64	2,4	50
	3 x 3	2,5	53	1,9	40	1,5	32	1,3	27	1,1	23
	3 x N	2,5	53	1,9	40	1,5	32	1,3	27	1,1	23
	N x 3	2,5	53	1,9	40	1,5	32	1,3	27	1,1	23

Table 2 - Maximum pressure, 400 mm spacing between screws horizontally

Horizontal distance between screws 500 mm (20")											
Thickness of panel	(H x V)	Vertical distance between screws									
		300 mm	12"	400 mm	16"	500 mm	20"	600 mm	24"	700 mm	28"
		kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf
12 mm 1/2"	2 x 2	2,0	42	2,0	42	1,7	35	1,4	29	1,0	21
	2 x 3	2,0	42	1,7	36	1,4	28	1,1	24	1,0	20
	2 x N	2,0	42	1,7	36	1,4	28	1,1	24	1,0	20
	3 x 2	2,0	43	1,6	34	1,4	28	1,2	24	1,0	21
	N x 2	2,0	43	1,6	34	1,4	28	1,2	24	1,0	21
	3 x 3	1,8	39	1,4	29	1,1	23	0,9	19	0,8	17
	3 x N	1,8	39	1,4	29	1,1	23	0,9	19	0,8	17
	N x 3	1,8	39	1,4	29	1,1	23	0,9	19	0,8	17
16 mm 5/8"	2 x 2	4,7	99	4,2	87	3,5	72	3,0	62	2,4	50
	2 x 3	4,7	99	3,6	75	2,9	60	2,4	50	2,1	43
	2 x N	4,7	99	3,6	75	2,9	60	2,4	50	2,1	43
	3 x 2	4,3	90	3,5	72	2,9	60	2,5	52	2,2	45
	N x 2	4,3	90	3,5	72	2,9	60	2,5	52	2,2	45
	3 x 3	2,0	43	1,5	32	1,2	26	1,0	21	0,9	18
	3 x N	2,0	43	1,5	32	1,2	26	1,0	21	0,9	18
	N x 3	2,0	43	1,5	32	1,2	26	1,0	21	0,9	18

Table 3 - Maximum pressure, 500 mm spacing between screws horizontally

Horizontal distance between screws 600 mm (24")											
Thickness of panel	(H x V)	Vertical distance between screws									
		300 mm	12"	400 mm	16"	500 mm	20"	600 mm	24"	700 mm	28"
		kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf
12 mm 1/2"	2 x 2	1,4	29	1,4	29	1,4	29	1,2	25	1,0	21
	2 x 3	1,4	29	1,4	29	1,2	24	1,0	20	0,8	17
	2 x N	1,4	29	1,4	29	1,2	24	1,0	20	0,8	17
	3 x 2	1,7	36	1,4	28	1,1	24	1,0	20	0,9	18
	N x 2	1,7	36	1,4	28	1,1	24	1,0	20	0,9	18
	3 x 3	1,5	32	1,2	24	0,9	19	0,8	16	0,7	14
	3 x N	1,5	32	1,2	24	0,9	19	0,8	16	0,7	14
	N x 3	1,5	32	1,2	24	0,9	19	0,8	16	0,7	14
16 mm 5/8"	2 x 2	3,3	69	3,3	69	3,0	62	2,5	53	2,2	46
	2 x 3	3,3	69	3,1	64	2,5	52	2,1	43	1,8	37
	2 x N	3,3	69	3,1	64	2,5	52	2,1	43	1,8	37
	3 x 2	3,6	75	2,9	60	2,4	50	2,1	43	1,8	38
	N x 2	3,6	75	2,9	60	2,4	50	2,1	43	1,8	38
	3 x 3	1,7	35	1,3	27	1,0	21	0,8	18	0,7	15
	3 x N	1,7	35	1,3	27	1,0	21	0,8	18	0,7	15
	N x 3	1,7	35	1,3	27	1,0	21	0,8	18	0,7	15

Table 4 - Maximum pressure, 600 mm spacing between screws horizontally

Horizontal distance between screws 700 mm (28")											
Thickness of panel	(H x V)	Vertical distance between screws									
		300 mm	12"	400 mm	16"	500 mm	20"	600 mm	24"	700 mm	28"
		kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf	kN/m2	psf
12 mm 1/2"	2 x 2	1,0	21	1,0	21	1,0	21	1,0	21	0,9	20
	2 x 3	1,0	21	1,0	21	1,0	21	0,9	18	0,7	15
	2 x N	1,0	21	1,0	21	1,0	21	0,9	18	0,7	15
	3 x 2	1,5	30	1,2	24	1,0	20	0,8	17	0,7	15
	N x 2	1,5	30	1,2	24	1,0	20	0,8	17	0,7	15
	3 x 3	1,3	28	1,0	21	0,8	17	0,7	14	0,6	12
	3 x N	1,3	28	1,0	21	0,8	17	0,7	14	0,6	12
	N x 3	1,3	28	1,0	21	0,8	17	0,7	14	0,6	12
16 mm 5/8"	2 x 2	2,4	50	2,4	50	2,4	50	2,2	46	1,9	41
	2 x 3	2,4	50	2,4	50	2,2	45	1,8	38	1,5	32
	2 x N	2,4	50	2,4	50	2,2	45	1,8	38	1,5	32
	3 x 2	3,1	64	2,5	52	2,1	43	1,8	37	1,5	32
	N x 2	3,1	64	2,5	52	2,1	43	1,8	37	1,5	32
	3 x 3	1,5	30	1,1	23	0,9	18	0,7	15	0,6	13
	3 x N	1,5	30	1,1	23	0,9	18	0,7	15	0,6	13
	N x 3	1,5	30	1,1	23	0,9	18	0,7	15	0,6	13

Table 5 - Maximum pressure, 700 mm spacing between screws horizontally