Technical File

Chapter 2 - Façades

2.1 - Fixing with screws

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 show some irregularities and incrustations.

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

When applied to ventilated façades, Viroc panels must be varnished or painted, unless they are applied under the conditions described in Chapter 2.3.

The panels, when placed outdoors, are subject to dimensional variations of +1.0 mm to -3.0 mm per linear metre, 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.

2.1 FIXING SYSTEM WITH SCREWS OR RIVETS

In this system, the Viroc panels that constitute the façade are fixed to a structure using screws or rivets.

In order to allow for dimensional variations in the panels without introducing stresses that could damage them, the fixing system must allow for dimensional variation with this in mind.

The panels must be pre-drilled and, in the peripheral fixings of the panel, the diameter of the bolt holes to be drilled for the installation of the screws must be 10 mm larger than the ones of the body of the screw, thus enabling shrinkage and expansion without introducing stress, creating expandable supports.

When fixing the central area of the panel, the diameter of the bolt holes must be the same as that of the body of the screw, fixing the panel rigidly by creating Fix supports. Your task is to ensure proper positioning.

The panel is fixed from the Fix supports in order to position the panel. Expansion supports should only be built later to avoid introducing stresses as the panels sag.

The screw fastening system consists of the following elements:

a) Support structure made of wood, galvanised steel or aluminium and its fixing elements;
b) Support brackets and their fixing elements;
c) Thermal insulation;
d) Screws for fixing the panels;
e) Viroc panels

Support Structure

The support structure for the Viroc panels that will clad the façade can be made from wood, galvanised steel or aluminium profiles.

2.1.01 Wooden support structure

The wooden support structure is made up of pine wood beams, fixed to the load-bearing structure (wall) using galvanised or stainless steel support brackets, 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 at least of class C18 according to EN 338, and its durability of class 2 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 2.1.1).

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, so the screws must not be less than 15 mm from the end of the upright.

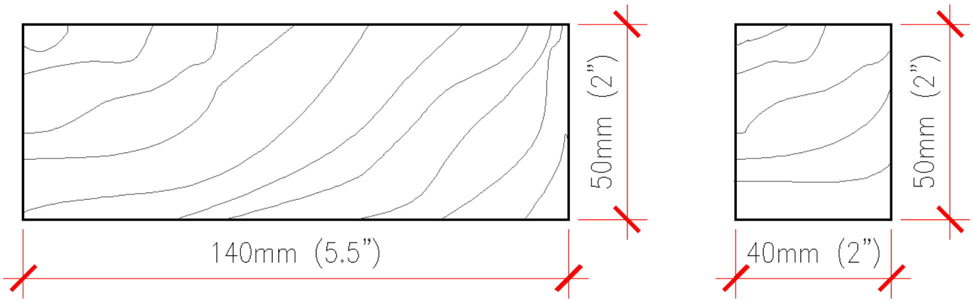


Figure 2.1.1 - Wooden structure

Minimum resistance of class C18 (EN 338) and durability of class 2 or higher (EN 335)

2.1.02 Galvanised steel support frame

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

The strength of the steel used in the upright profiles must be minimum of 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 2.1.2 and 2.1.3).

Note: 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 or L profiles are used as intermediate supports.

The sizing of these elements must take into account the deformations caused by climatic actions and other factors (temperature, hygrometry, 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 profiles must be such as to respect the maximum distance between panel fixings and the alignment of the profiles must be checked between adjacent elements and must not differ by more than 2 mm.

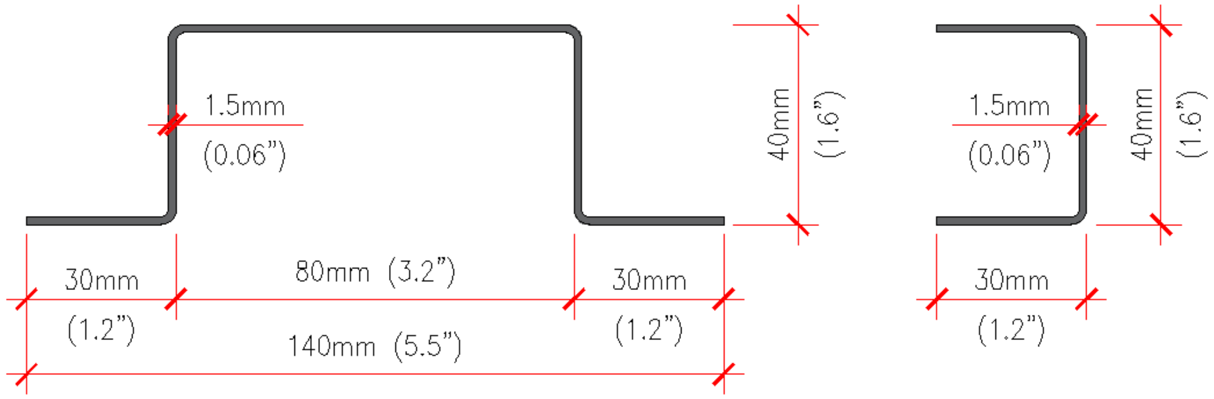


Figure 2.1.2 - Galvanised steel profiles

Minimum resistance of class S220GD (EN 10346)

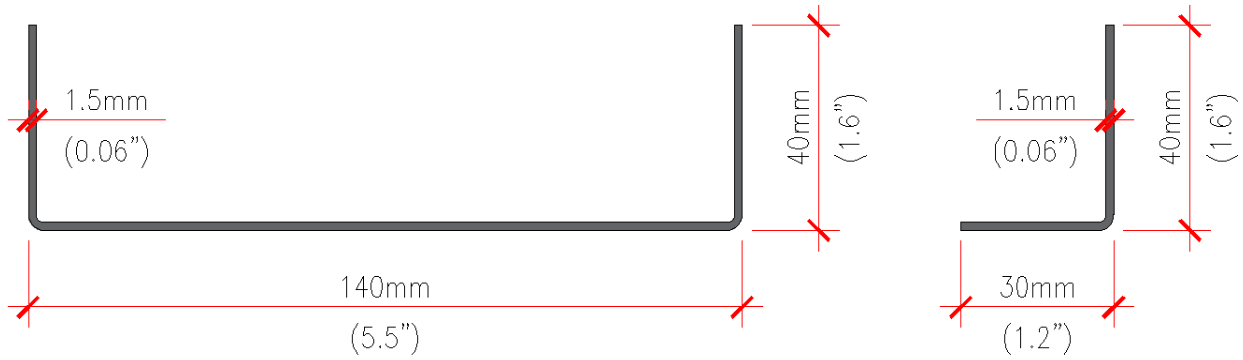


Figure 2.1.3 - Galvanised steel profiles (Alternative)

Minimum resistance of class S220GD (EN 10346)

2.1.03 Aluminium support frame

The aluminium profiles are fixed to the load-bearing structure using aluminium support brackets, with metal anchors or anchors made up of metal screws and plastic bushings.

The aluminium used in the profiles must be at least a 6000 series alloy, with a yield strength Rp0.2 greater than 180 MPa.

The section of the profiles is generally T or L-shaped with a minimum thickness of 2 mm. Other section shapes can be used, provided they have the same performance and durability.

T-shaped profiles are used at the intersection of 2 panels. L-sections are used as intermediate supports and are also used to create singular points in the façade (see figure 2.1.4).

The sizing of these elements must take into account the deformations caused by climatic actions and other factors (temperature, hygrometry, 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 as to allow the fixings to 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 profiles must be such as to respect the maximum distance between panel fixings, and the alignment of the profiles must be checked between adjacent elements and must not differ by more than 2 mm.

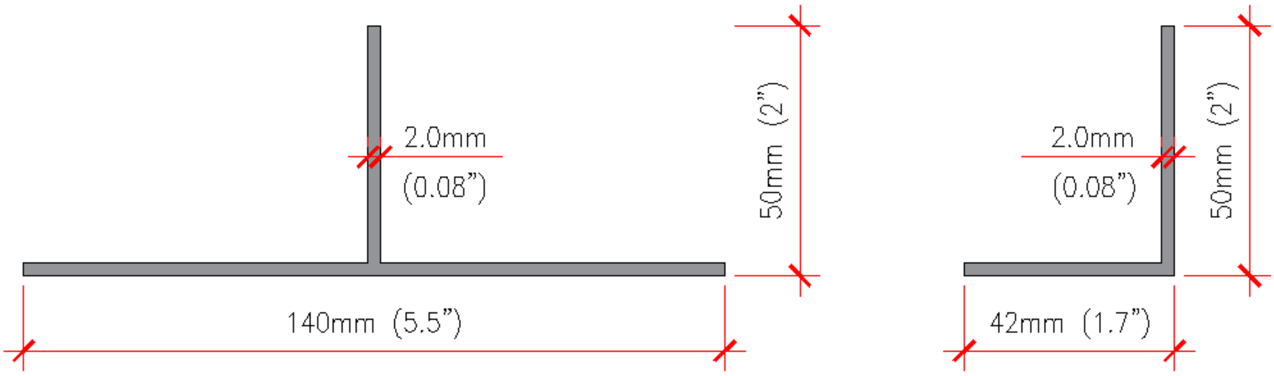


Figure 2.1.4 - Aluminium structure

6000 series alloy with Rp0.2 ≥ 180 MPa

2.1.04 Galvanised steel support brackets

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

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

Support brackets are generally L-shaped, with several holes and a minimum thickness of 2.5 mm (see figure 2.1.5).

The support brackets 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.

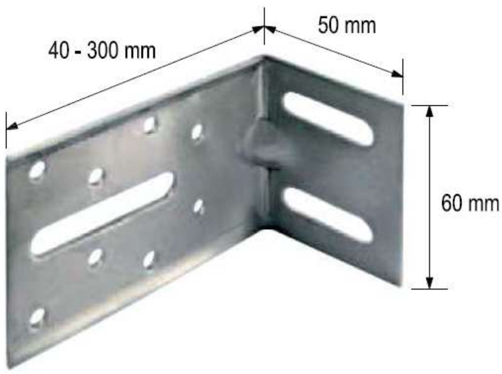


Figure 2.1.5 - Galvanised steel support brackets

Minimum resistance of class S220GD. Minimum thickness: 2.5 mm

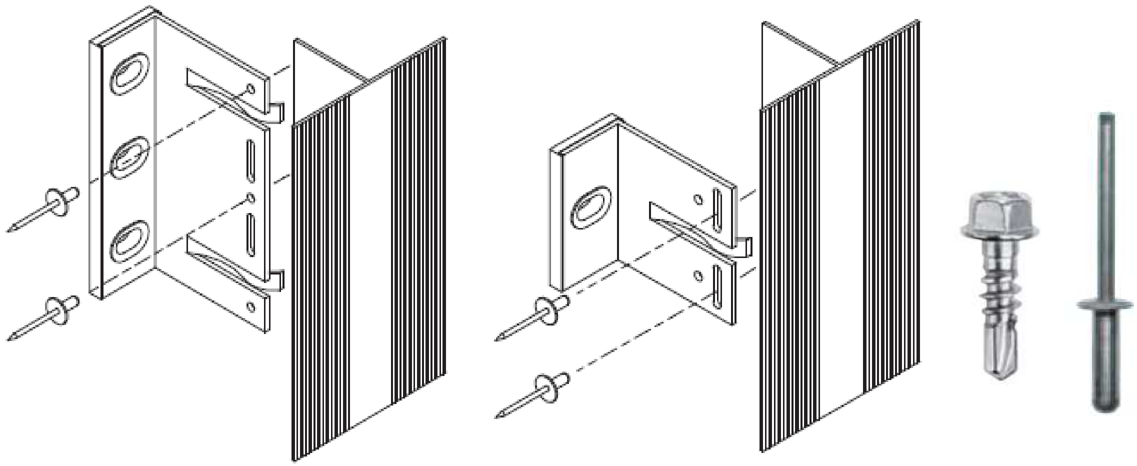
2.1.05 Aluminium support brackets

The support brackets for fixing the aluminium structure are made of an aluminium alloy, which must be equal to or greater than 6060 T5. Support brackets are generally L-shaped, with several holes and a minimum thickness of 3 mm (see figure 2.1.6).

The support brackets 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.

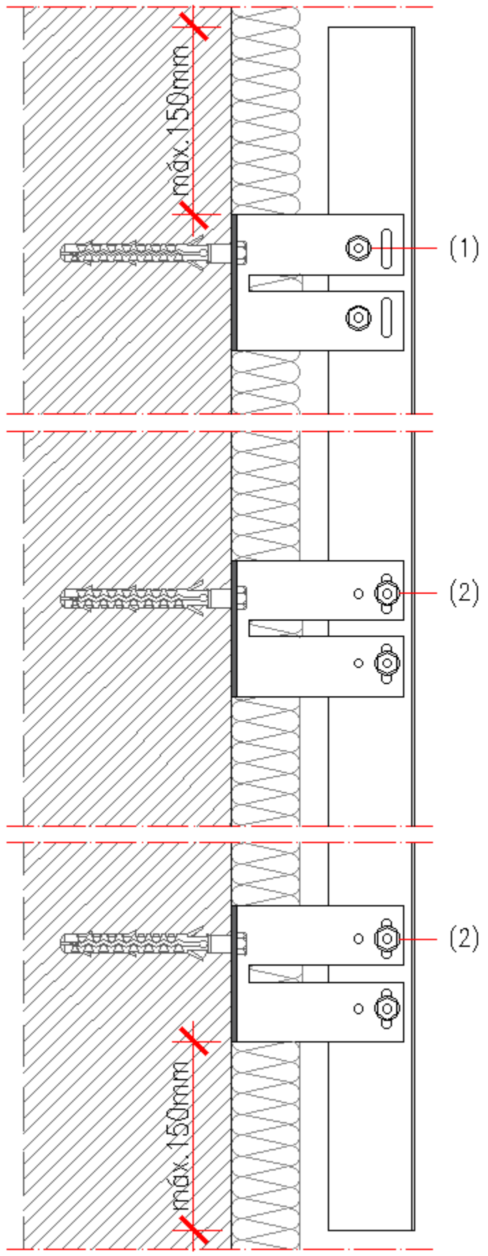
Figure 2.1.6 - Aluminium support brackets
Alloy: 6060 T5, minimum thickness: 3 mm

Because aluminium has a high coefficient of expansion, the design of the structure must allow for the expansion of the profiles. In this sense, the aluminium profiles should not be longer than 6 m and there is only one point of attachment to the support brackets with restricted expansion movements, near the top end of the profile. The other fixings must allow the profiles to expand (see figures 2.1.7 and 2.1.8).



Fix support Expansive support

Figure 2.1.7 - Fixing the aluminium profiles to the support brackets



(1) Fix support; (2) Expansive support

Figure 2.1.8 - Fixing the aluminium profiles to the support brackets

Due to the high coefficient of thermal transmission, the support brackets can be insulated from the supporting wall with bases for thermal cutting (see figure 2.1.9).

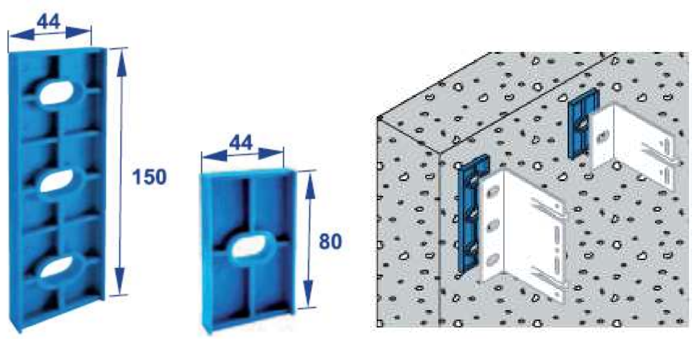


Figure 2.1.9 - Thermal cutting device for support brackets

2.1.06 Anchors for fixing the support brackets

The supporting squares are fixed to the support wall using anchors which can be metal plug holes with a diameter of 8 mm or plastic plug holes with a diameter of 10 mm, with a metal screw with a diameter of 7 mm (see figures 2.1.10 and 2.1.11).

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 that do not have any type of ETA or DH certification, the resistance values must be proven through technical documents or load tests.

Figure 2.1.10 - Plastic anchor of Ø10 mm

Stainless steel or galvanised steel screw of Ø7 mm, minimum length: 75 mm

Figure 2.1.11 - M8 Metal anchor

Stainless or galvanised steel, minimum length: 80 mm

2.1.07 Bushings for fixing thermal insulation

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

It must be 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 2.1.12).

Figure 2.1.12 - Bushing for fixing thermal insulation to the support structure

2.1.08 Wooden upright protection strips

When the structure consists of wooden uprights which durability is of class 2 according to EN 335, they must be protected from rainwater with a protective strip over 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 2.1.13).

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

Figure 2.1.13 - Flexible PVC or EPDM protection strip

Mandatory installation of wooden uprights with a durability of class 2

2.1.09 Screws for fixing the panels to a wooden structure

The screws must be at least of 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 2.1.14).

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 façades and can supply them lacquered in the desired colour.

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

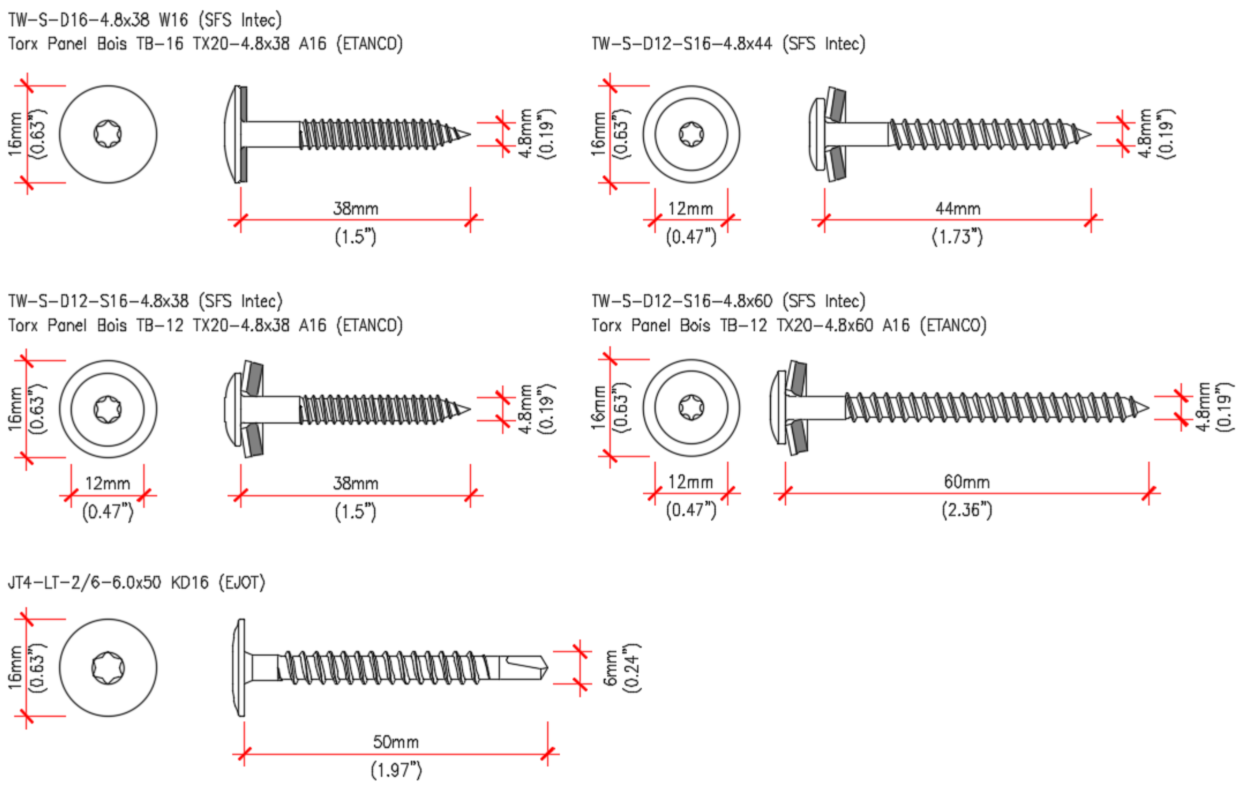


Figure 2.1.14 - Screws for wooden structure

2.1.10 Screws for fixing the panels supported on a galvanised steel structure

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 must be at least 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 2.1.15).

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 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.

2.1.11 Screws for fixing the panels supported on an aluminium structure

The screws for fixing the Viroc panels to the aluminium structure must be stainless steel or bimetallic. The diameter of the head must be at least 16 mm and the body at least 5.5 mm. Smaller head diameter screws can be used, provided they are applied with a 16 mm diameter neoprene metal washer. 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 2.1.15).

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

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

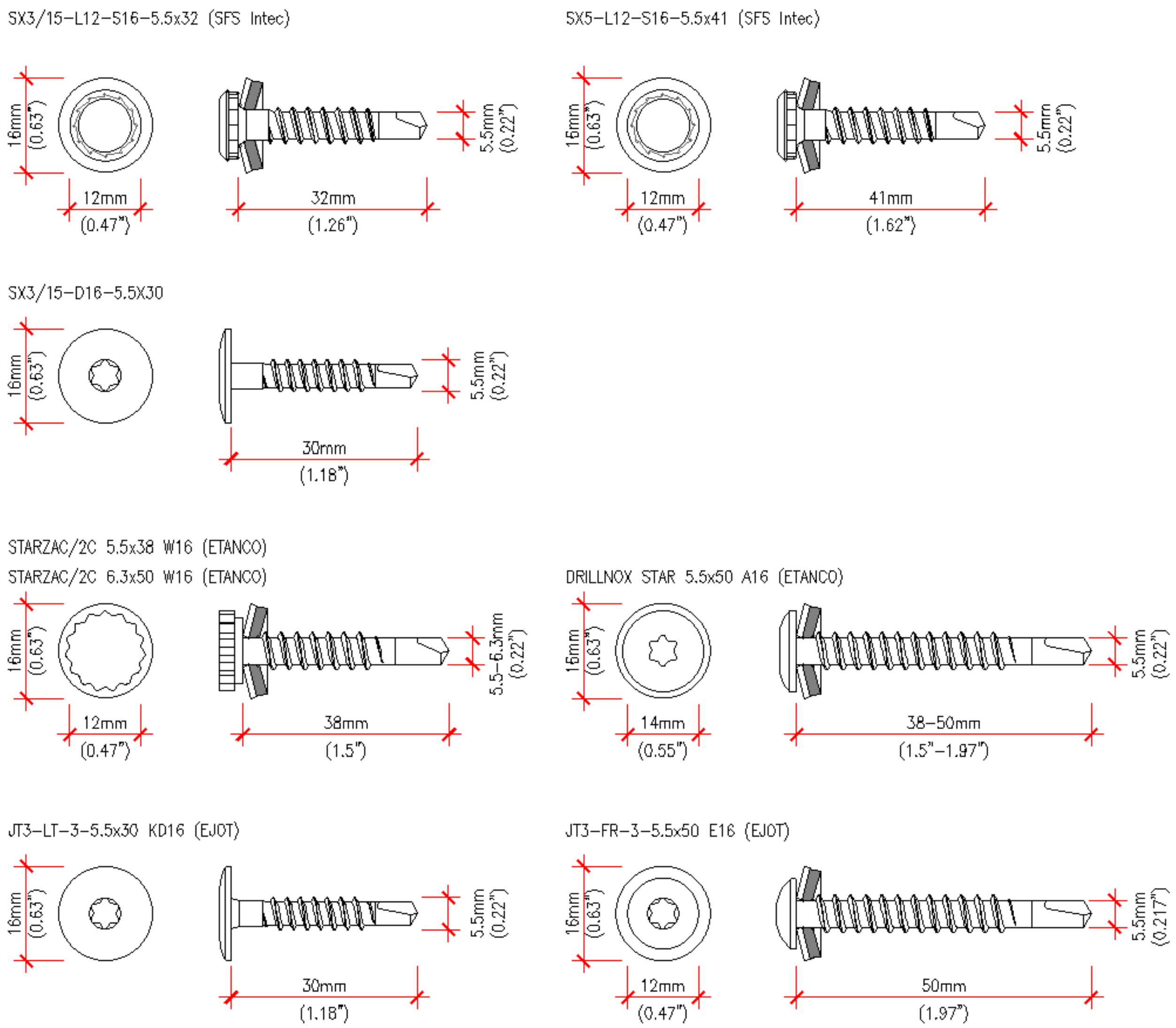


Figure 2.1.15 - Screws for metal structures

2.1.12 Rivets for fixing panels supported on a metal structure

When the support structure is made of galvanised steel or aluminium, rivets can be used to attach the Viroc panels. The rivets to be used must have 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 2.1.16).

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

When the 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 2.1.17).

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.

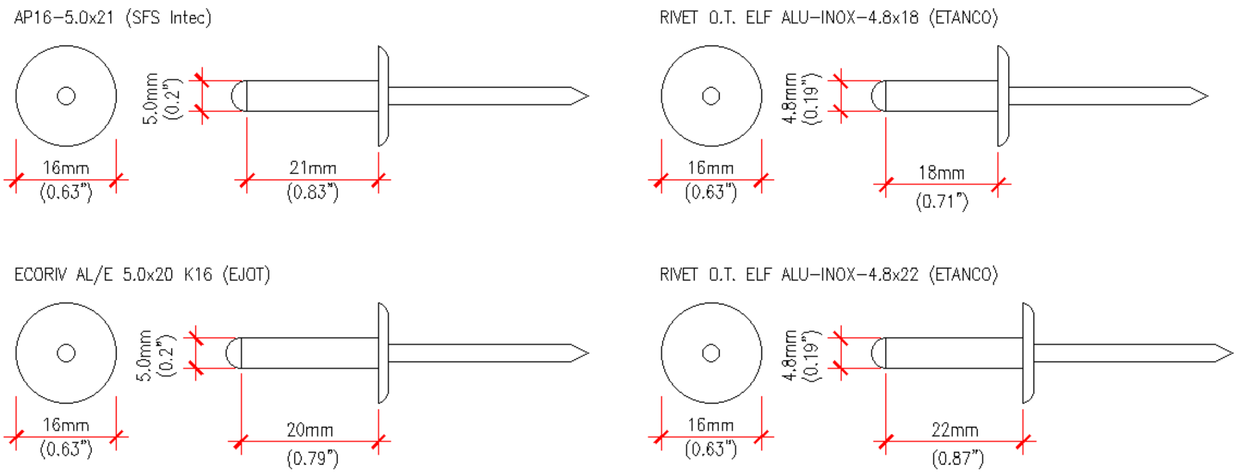


Figure 2.1.16 - Rivets for fixing Viroc panels to a metal structure

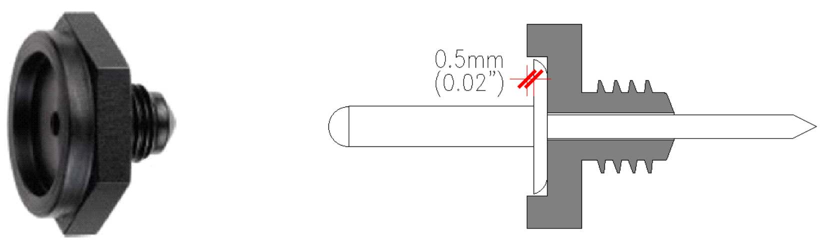


Figure 2.1.17 - Constricting nozzle, to be screwed into the riveting tool mouth

Mandatory use

2.1.13 Recommended thicknesses of the Viroc façade panels and their tolerance

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

See the Viroc panel technical data file for the available thicknesses and colours.

2.1.14 Weight of panels

12 mm: 16.2 ± 1.2 kg/m^2;

16 mm: 21.6 ± 1.6 kg/m^2.

2.1.15 Viroc panel manufacturing dimensions and cutting tolerances

Dimensions: 2600x1250 mm and 3000x1250 mm

Tolerances: Length and width: ± 3 mm

Squarness: ≤ 2 mm/m

Edge straightness: ≤ 1.5 mm/m

See the Viroc panel technical data file for available dimensions and colours.

Any intermediate dimensions obtained by cutting the panels are possible.

2.1.16 Maximum format of panels applied to a façade

The largest size of panel to be applied to a ventilated façade depends on the type of structure to be used.

Wooden frame: 3000x1250 mm.

Galvanised steel or aluminium frame: 1500x1250 mm

2.1.17 Minimum format of panels applied to a façade

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.

2.1.18 Façade Assembly operations

The installation of a façade is carried out as follows:

a. Marking and identification of the façade elements;

b. Mounting the support brackets;

c. Installation of thermal insulation;

d. Assembly of the support profiles/mounts;

e. Varnishing of the Viroc panels on both sides and tops;

f. Fixing the panels;

g. Treatment of singular points.

2.1.19 Marking and identification of the 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.

2.1.20 Mounting the support brackets

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

2.1.21 Fixing the squares to the supporting wall

The support brackets are fixed to the support wall using anchors, which can be metal plugs with a diameter of 8 mm or plastic plugs with a diameter of 10 mm, with a metal screw with a diameter of 7 mm.

2.1.22 Angle plates

There are angle plates that make it easier to make corner angles. Its use is optional (see figure 2.1.18).

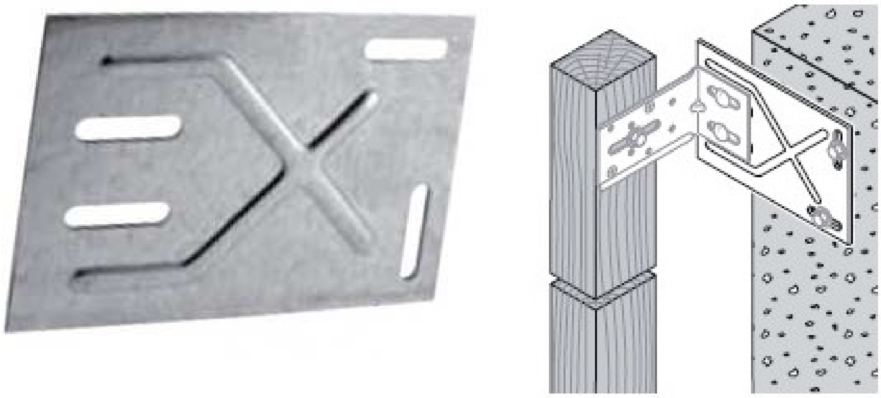


Figure 2.1.18 - Auxiliary angle plate, galvanised steel Z350. Thickness: 2.5 mm

2.1.23 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 bushings or similar material, normally with a wide head and the appropriate length for the thickness of the insulation.

2.1.24 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 arranged horizontally as long as there is room for air ventilation and the profiles do not accumulate water that could degrade them.

The distance between profiles/mounts must be such as to respect the 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.

2.1.25 Fixing the profiles to the support brackets

Fixing the wooden uprights to the support brackets

The wooden uprights are connected to the support brackets 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 holes to block movement (see figure 2.1.19).

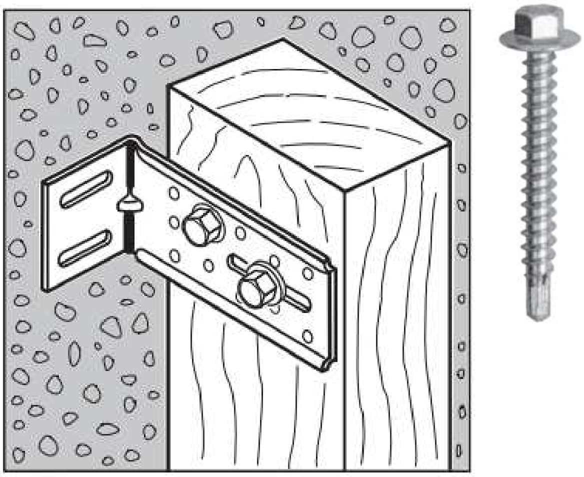


Figure 2.1.19 - Fixing the wooden uprights to the support brackets *(2 screws of Ø≥6)*

Fixing the galvanised steel profiles to the support brackets

The galvanised steel profiles are connected to the support brackets using self-drilling screws or rivets placed in the oval hole, and another screw placed in one of the circular holes to block movement. The connection can be made with self-drilling screws of Ø≥5.5 mm or rivets of Ø≥4.8 mm (see figure 2.1.20).

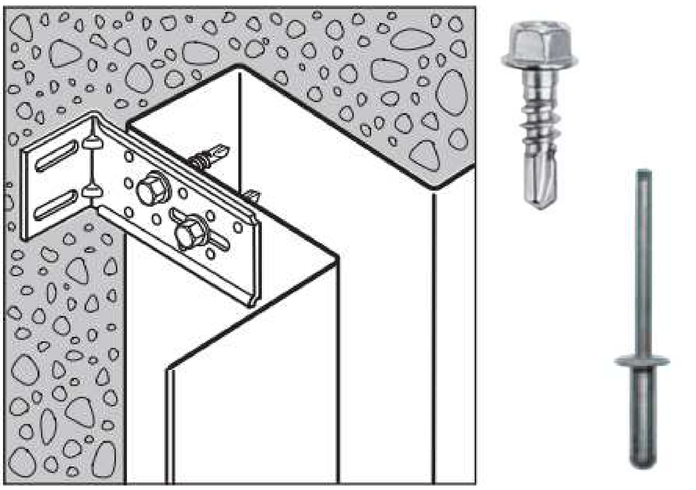


Figure 2.1.20 - Fixing the galvanised steel profiles to the support brackets
(screws of Ø≥5.5 or rivets of Ø≥4.8)

Fixing the aluminium profiles to the support brackets

Due to the high expansion coefficient of aluminium profiles, the structure must be designed in such a way as to allow the upright profiles to expand.

The fixed connections are made with 2 screws/rivets placed in the circular bolt holes, blocking movement, located at the top of the profiles.

The expandable connections are made using 2 screws/rivets placed in the vertically oval shaped bolt holes. The connection can be made with Ø≥5.5 mm stainless steel self-drilling screws or with Ø≥4.8 mm rivets (see figure 2.1.21).

Figure 2.1.21 - Fixing the aluminium profiles to the support brackets

2.1.26 Protection strips of the wooden uprights

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

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

2.1.27 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 2.1.22).

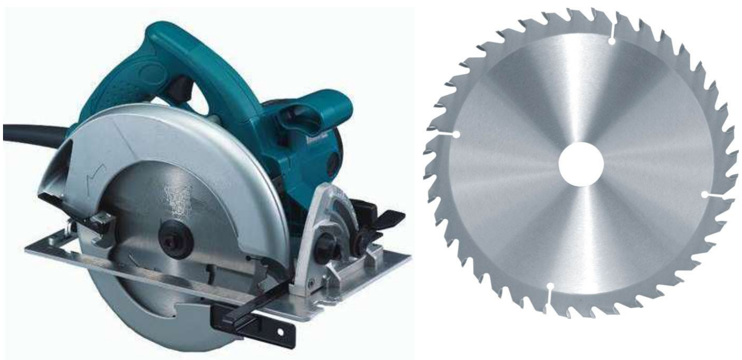


Figure 2.1.22 - Circular saw with tungsten cutting disc

2.1.28 Drilling Viroc panels

If bolt 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 2.1.23).

Figure 2.1.23 - HSS drill and bits (for drilling metal)

2.1.29 Surface preparation of Viroc panels

Viroc panels are supplied raw, 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. Any visible surfaces should be cleaned/polished using an abrasive cleaning disc or, alternatively, the surface should 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.

The link below shows a video screening how Viroc panels are polished.

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

2.1.30 Varnishing or painting Viroc panels

When used on ventilated façade, Viroc panels must be varnished. Exceptionally, they can be applied without varnish or paint, if they are installed under the conditions detailed in Chapter 2.3.

The purpose of applying varnish to the Viroc panel is to protect it from the aggressions of the environment in which it is located, due to exposure to sunlight and the elements, increasing its durability, making it easier to clean and maintaining its appearance over time. Applying a varnish changes the tone of the Viroc panel natural colour, giving it a "wet" appearance with some shine. After drying, the wet look is softened.

There are no specific paints or varnishes to be applied to Viroc. The panel has a surface alkalinity (PH) of 11 to 13, so paints and varnishes suitable for concrete and wood surfaces at the same time are usually the best when applied to Viroc panel. Paints and varnishes made from acrylic resins or aliphatic polyurethane resins are suitable as they do not turn yellow on exposure to UV rays. Solvent-based varnishes are the ones that have shown the best performance, but water-based varnishes are the ones that least alter the original colour of the panel.

Generally speaking, varnishes are easy to apply, but it is very important to bear in mind that the application must be continuous and constant, to guarantee the homogeneity of the finish on the panel and so that the surface doesn't become stained and have different shades. Panels must always be painted/varnished on both sides and tops. The application procedures provided by the respective manufacturers must always be followed for the recommended coats.

When paints and varnishes are applied on site, they should be applied in a dry, clean place away from the sunlight.

2.1.31 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 in the order of +1.0 mm to -3.0 mm per linear metre when the panel is sealed on both sides and tops.

In order to allow for dimensional variations of the panels without introducing stresses that could damage the panels, the fixing system must allow for dimensional variation with this in mind.

For the panel peripheral fixings, the diameter of the bolt holes to be drilled in the panels to install the screws should be 10 mm larger than that of the body of the screw, to allow for shrinkage and expansion without introducing stress.

When fixing the central area of the panel, the diameter of the bolt holes must be 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 Fix supports in order to position the panel. The expansion supports will only be built later, in order to avoid introducing stresses as the panels sag.

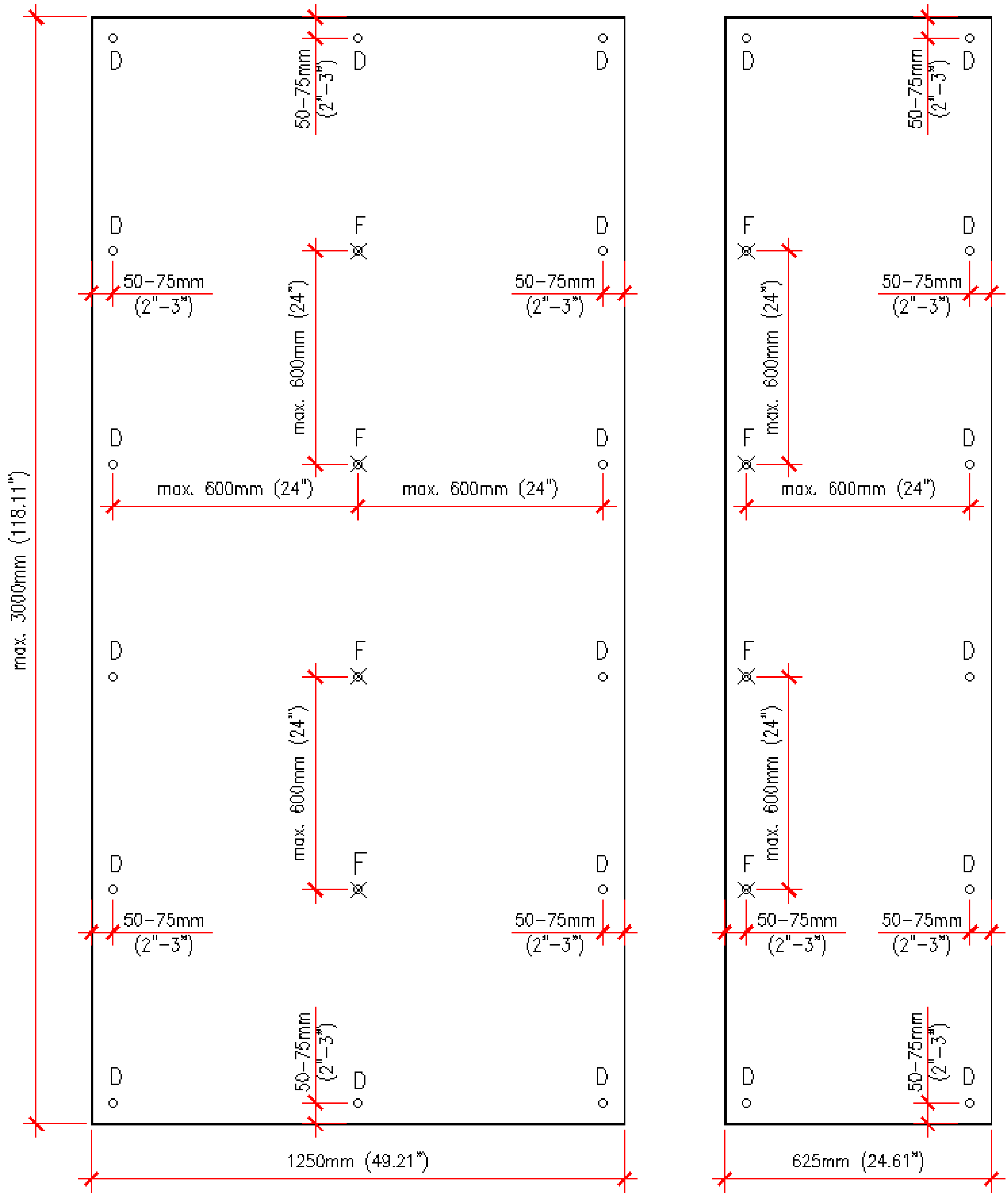
The screws should be placed at a distance of 50 to 75 mm from the edges of the panels. The maximum distance between screws is 600 mm both horizontally and vertically.

Video of the installation of a Viroc façade, fixed with screws.

https://www.youtube.com/watch?v=PbhJI-ta5rA&t=56s

Wooden structure

The panels must be glued and screwed together as shown in figure 2.1.24.



D - Expansion support, hole in the panel with a diameter of Ø 10 mm, to allow the panels to expand and contract

F - Fix support, hole in the panel with a diameter of Ø 5 mm, to rigidly fix the movements

Figure 2.1.24 - 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 with a correct tightening, without crushing the neoprene washer (see figure 2.1.25) and must not be less than 15 mm from the edge of the wooden beam (see figure 2.1.26).

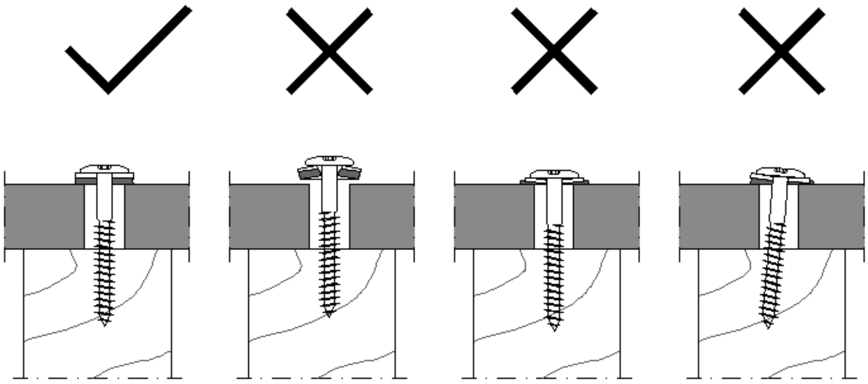


Figure 2.1.25 - Correct tightening and positioning of the screws

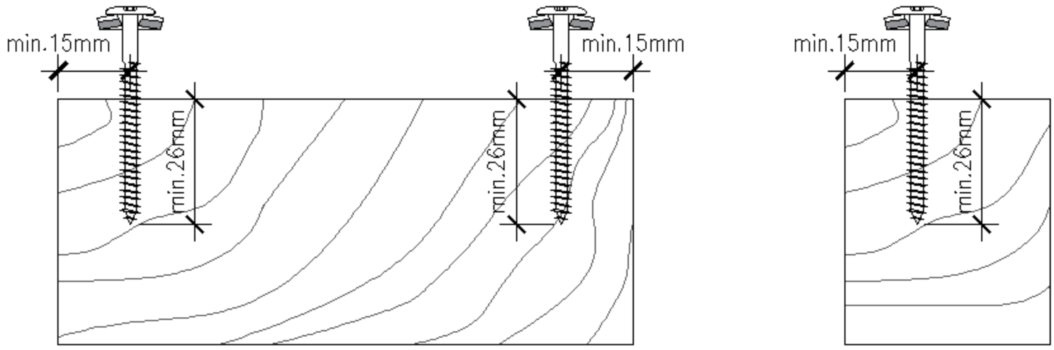
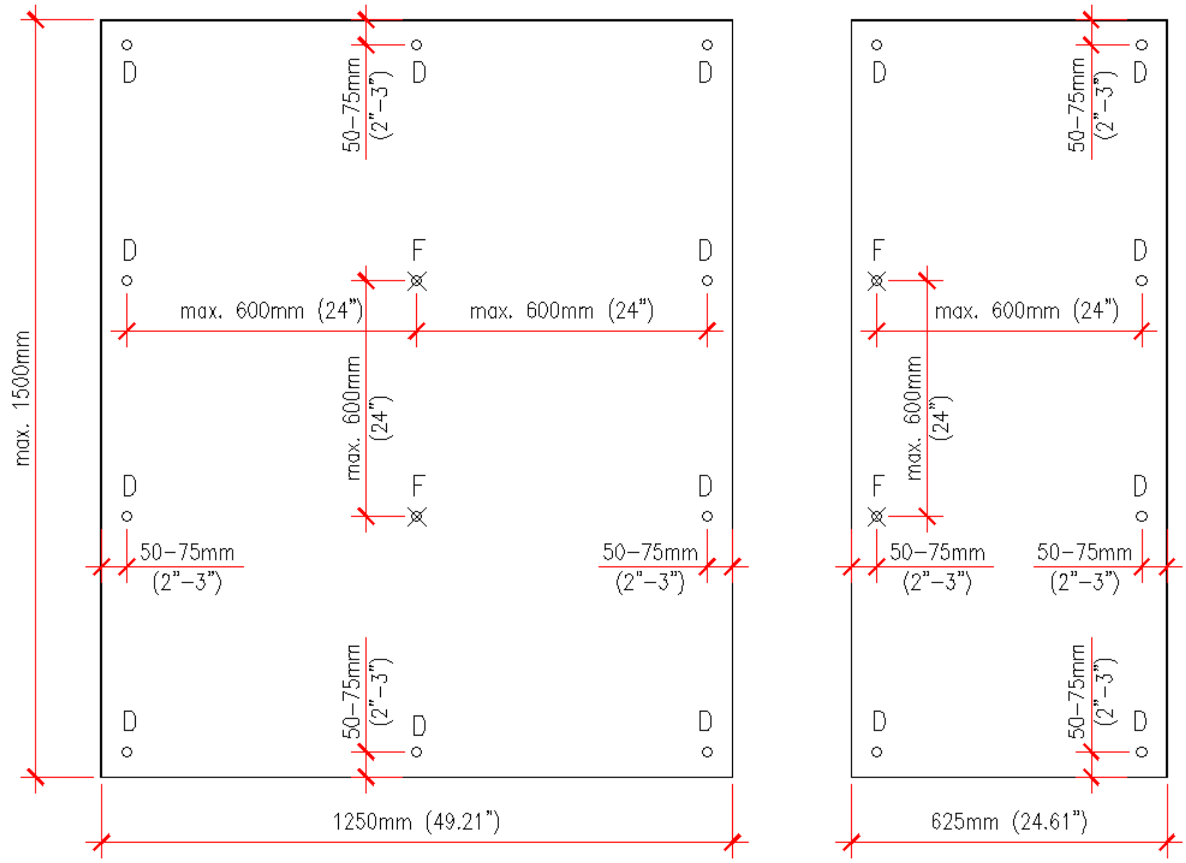


Figure 2.1.26 - Minimum distance from the screws to the edges of the beams

Galvanised steel and aluminium frame

The panels must be glued and screwed together according to figure 2.1.27

Please note that the maximum size allowed is 1500x1250 mm.



D - Expansion support, hole in the panel with a diameter of Ø 10 mm, to allow the panels to expand and contract

F - Fix support, hole in the panel with a diameter of Ø 5.5 mm, to rigidly fix the movements

Figure 2.1.27 - Maximum panel size and location of fixings

The positioning of the screws for fixing the façade panels must be perpendicular to the plane, with a maximum error of 2.5º and with a correct tightening, without crushing the neoprene washer (see figure 2.1.28) and must not be less than 10 mm from the edge of the profile (see figure 2.1.29).

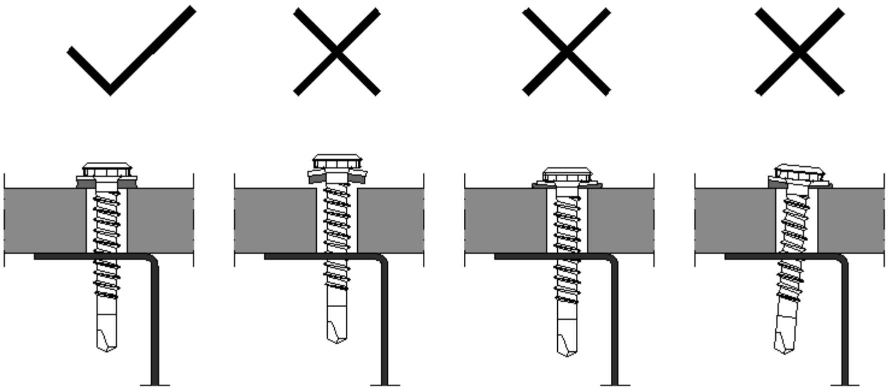


Figure 2.1.28 - Correct tightening and positioning of the screws

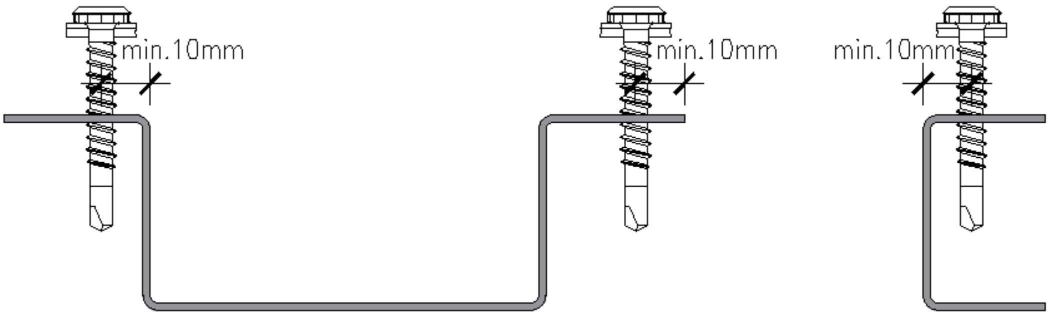


Figure 2.1.29 - Correct positioning of screws or rivets

(minimum distance from edge of profile 10 mm)

2.1.32 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 2.1.30, 2.1.31 and 2.1.32).

Figure 2.1.30 - Spanners for centering screws

Figure 2.1.31 - spanners for bolt holes-centering

Figure 2.1.32 - Tool for bolt holes-centering

2.1.33 Treatment of the joints

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

2.1.34 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 2.1.33).

Figure 2.1.33 - 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 fire from spreading 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.

2.1.35 Angle profiles

Some manufacturers of accessory elements for façades have auxiliary profiles for finishing the corners of the façade. The use of these profiles is optional (see figures 2.1.34 and 2.1.35).

Figure 2.1.34 - Corner angle profiles

Figure 2.1.35 - Corner angle profiles

2.1.36 Cleaning the panels after application

The panels can be cleaned throughout the lifespan of the project by spraying them with water and a neutral detergent.

2.1.37 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 levelled with the rest of the façade, that the area where the new screws are to be placed is intact; otherwise it needs to be repaired.

2.1.38 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

12 mm 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

2.1.39 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.

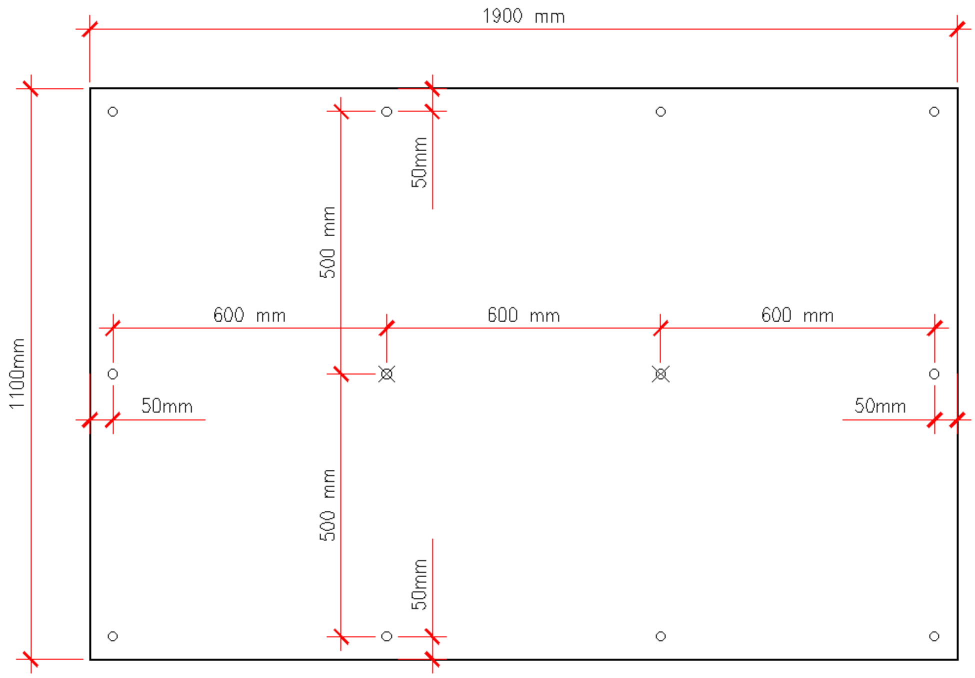
2.1.40 Wind safety check

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.

2.1.41 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: 4

Number of vertical screws: 3,

Configuration: 4x3, we use the Nx3 table

Horizontal distance between screws: 600 mm, => See Table 3

Vertical distance between screws: 500 mm

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 - Permissible pressure, distance of 600 mm between screws horizontally

The design resistance value of the Viroc panel to wind pressure (w_{Rd}) is 0.9 KN/m2 (19 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.

2.1.42 Details, wooden structure

Figures 2.1.36 to 2.1.50 show examples of various details and unique areas of the façade.

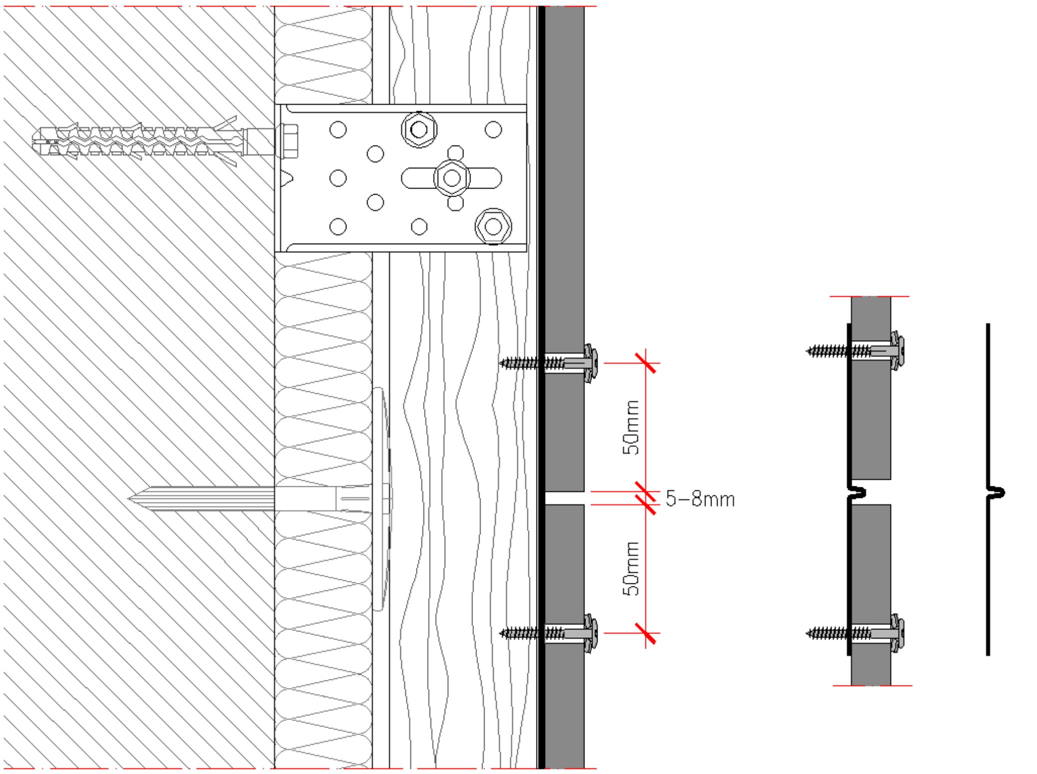


Figure 2.1.36 - Vertical section, joint between panels

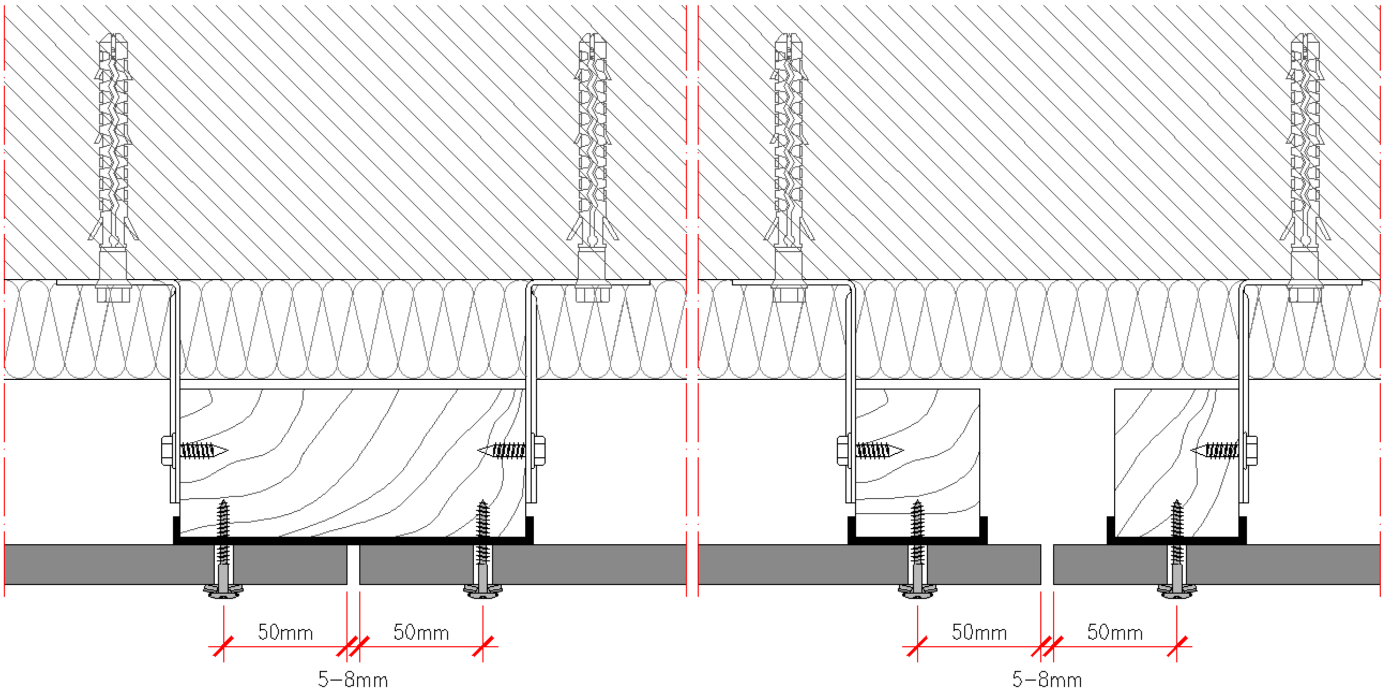


Figure 2.1.37 - Horizontal section, joint between panels

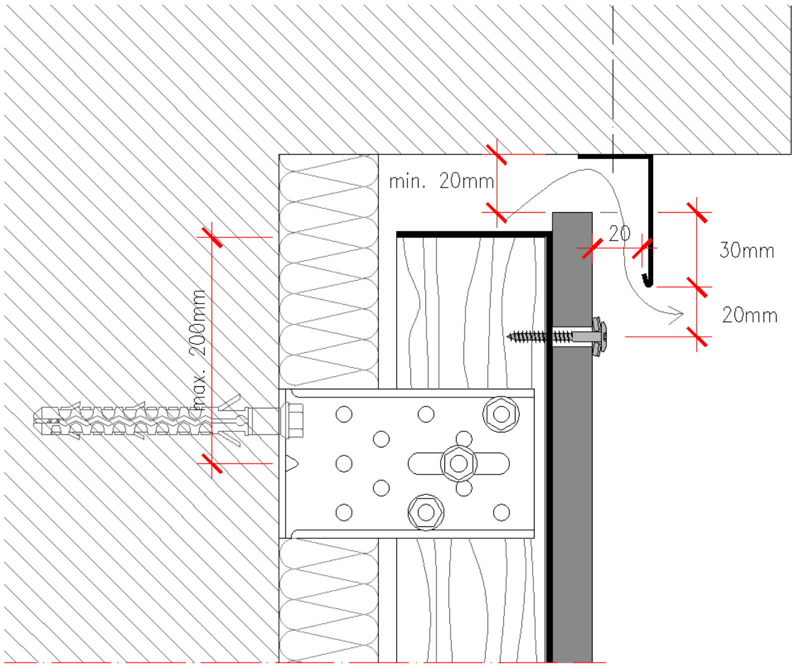


Figure 2.1.38 - Balcony finish

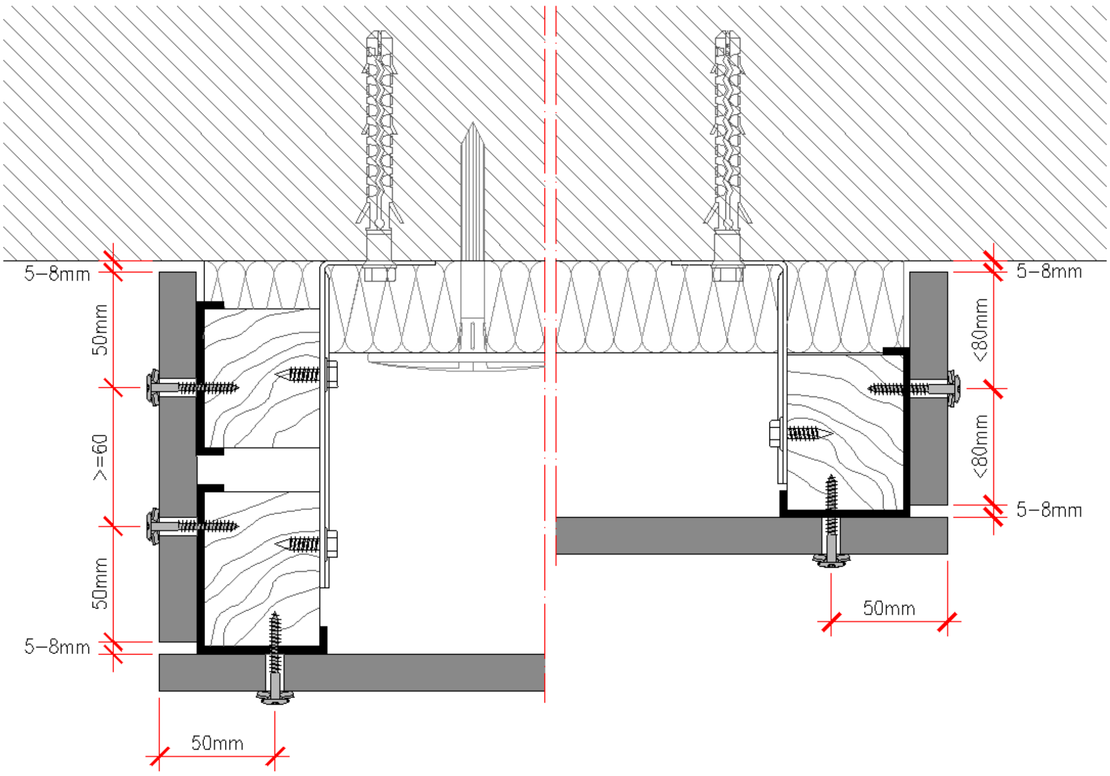


Figure 2.1.39 - Side finish

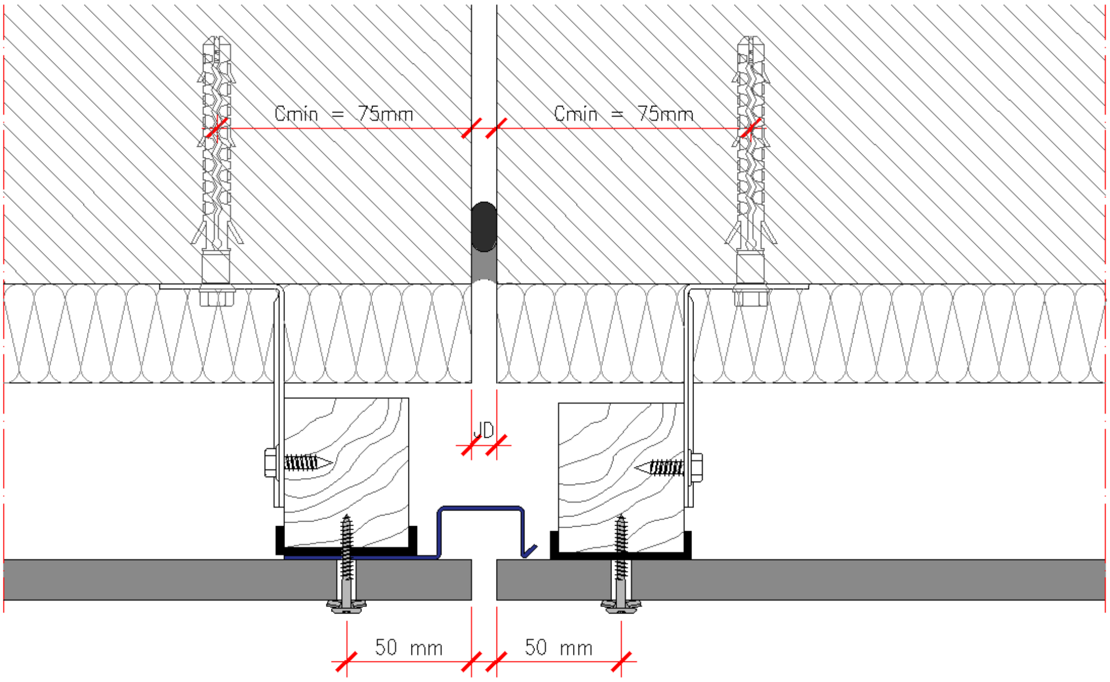


Figure 2.1.40 - Expansion joint

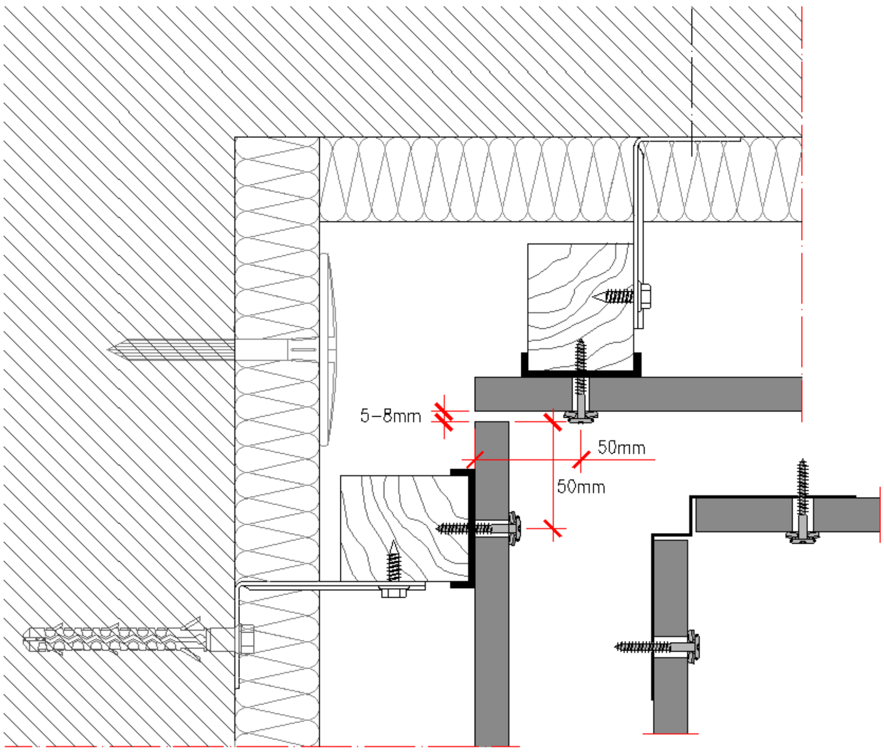
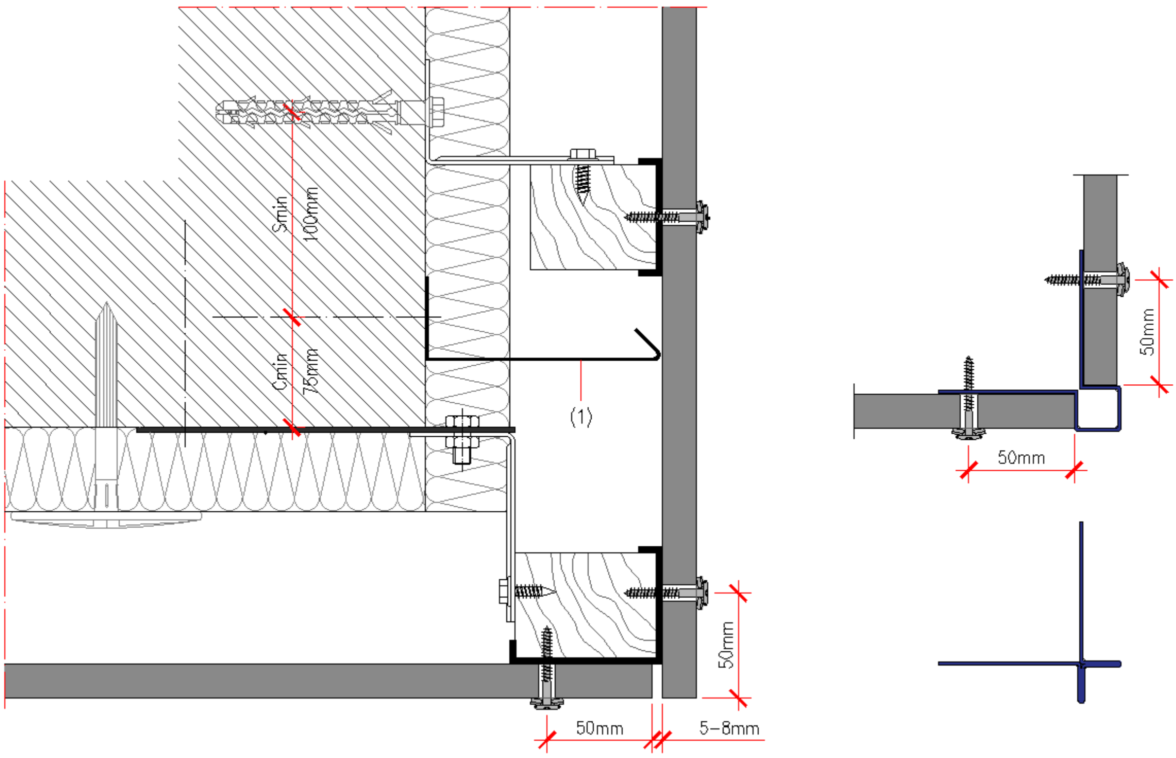


Figure 2.1.41 - Corner angle



(1) Compartmentalisation of the air foil

Figure 2.1.42 - Corner angle

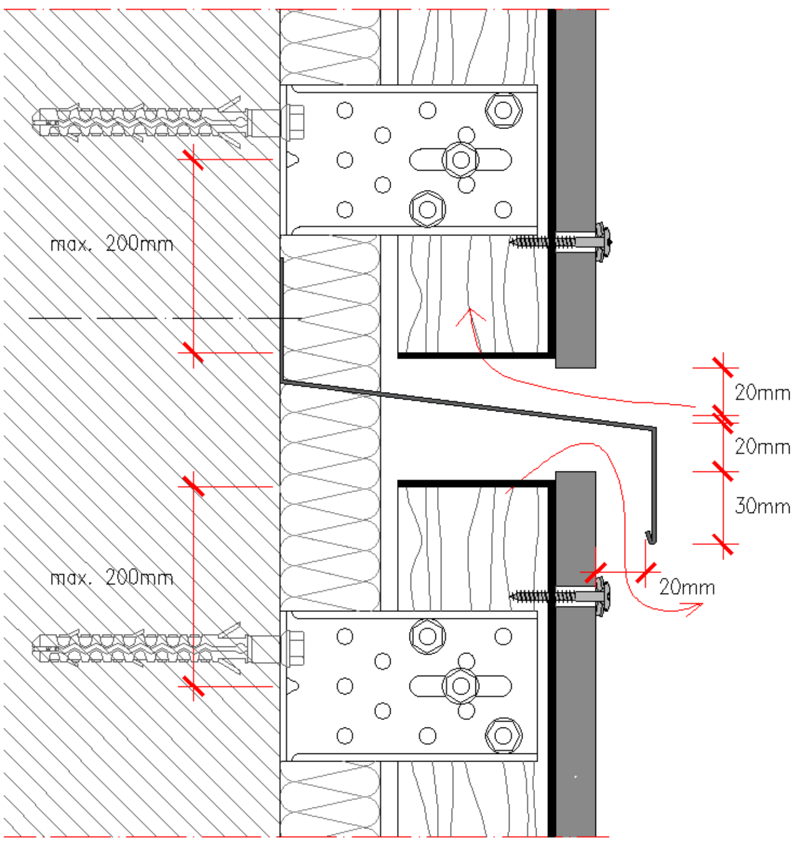


Figure 2.1.43 - Horizontal compartmentalisation of the air gap

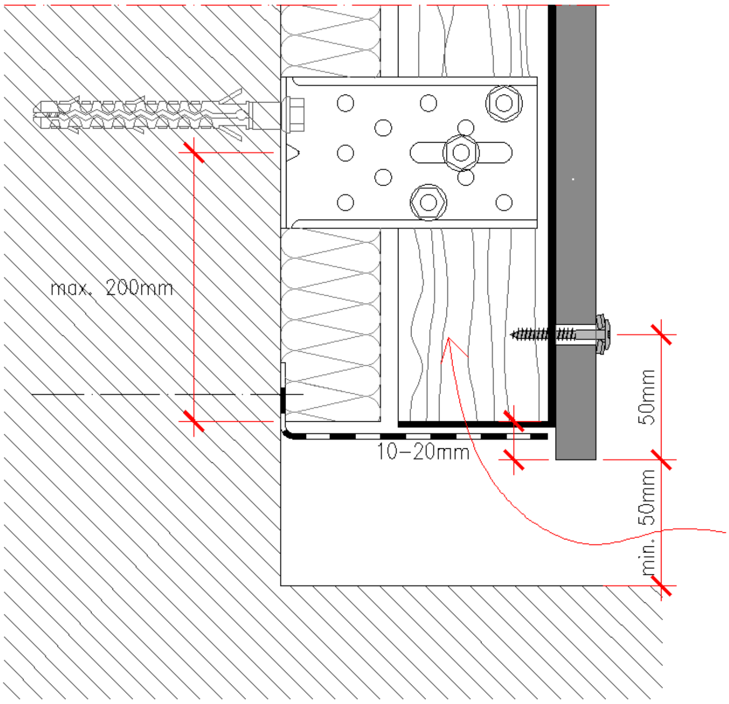


Figure 2.1.44 - Detail of the base, anti-rodent grid

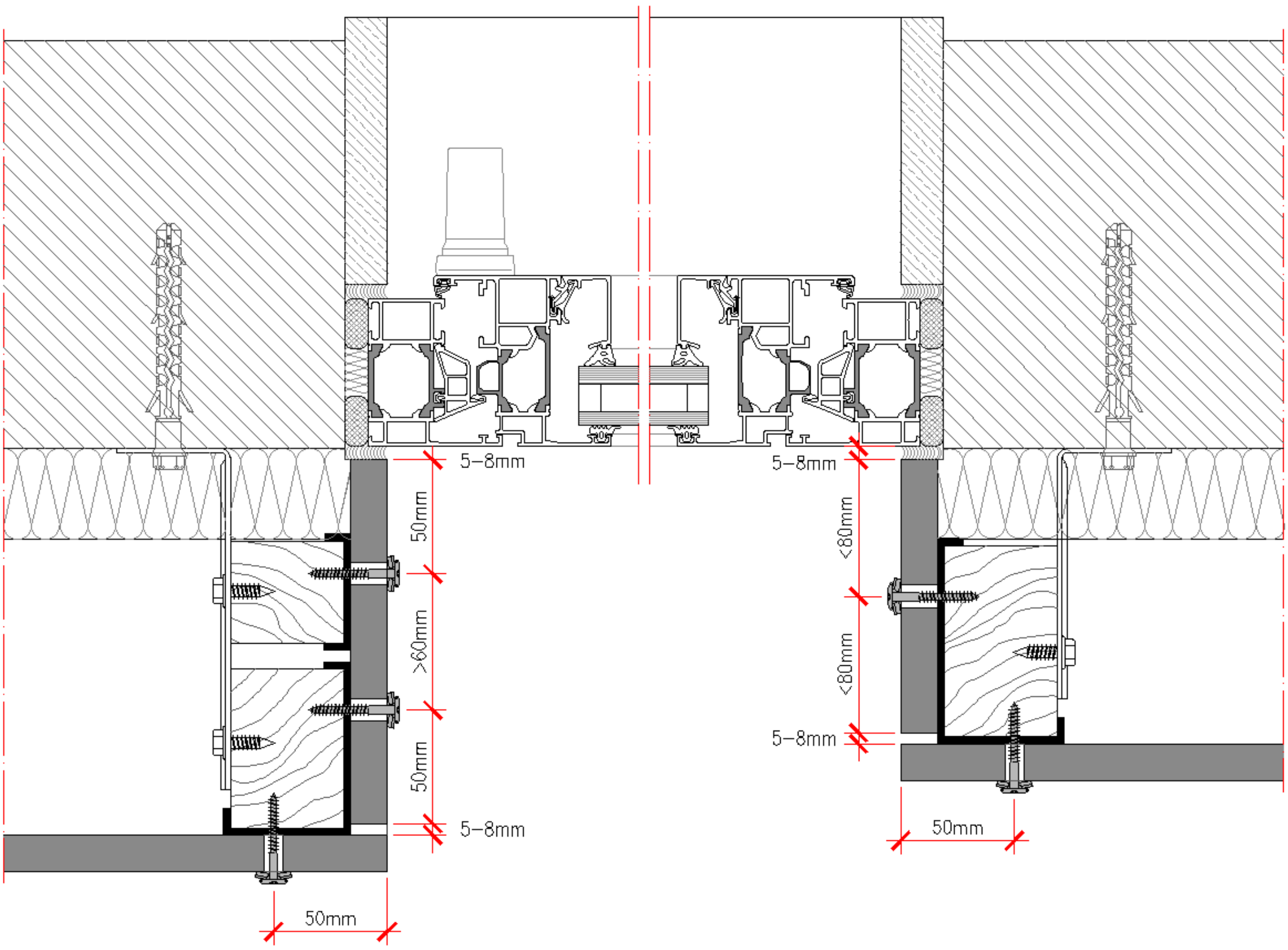


Figure 2.1.45 - Horizontal section, window opening

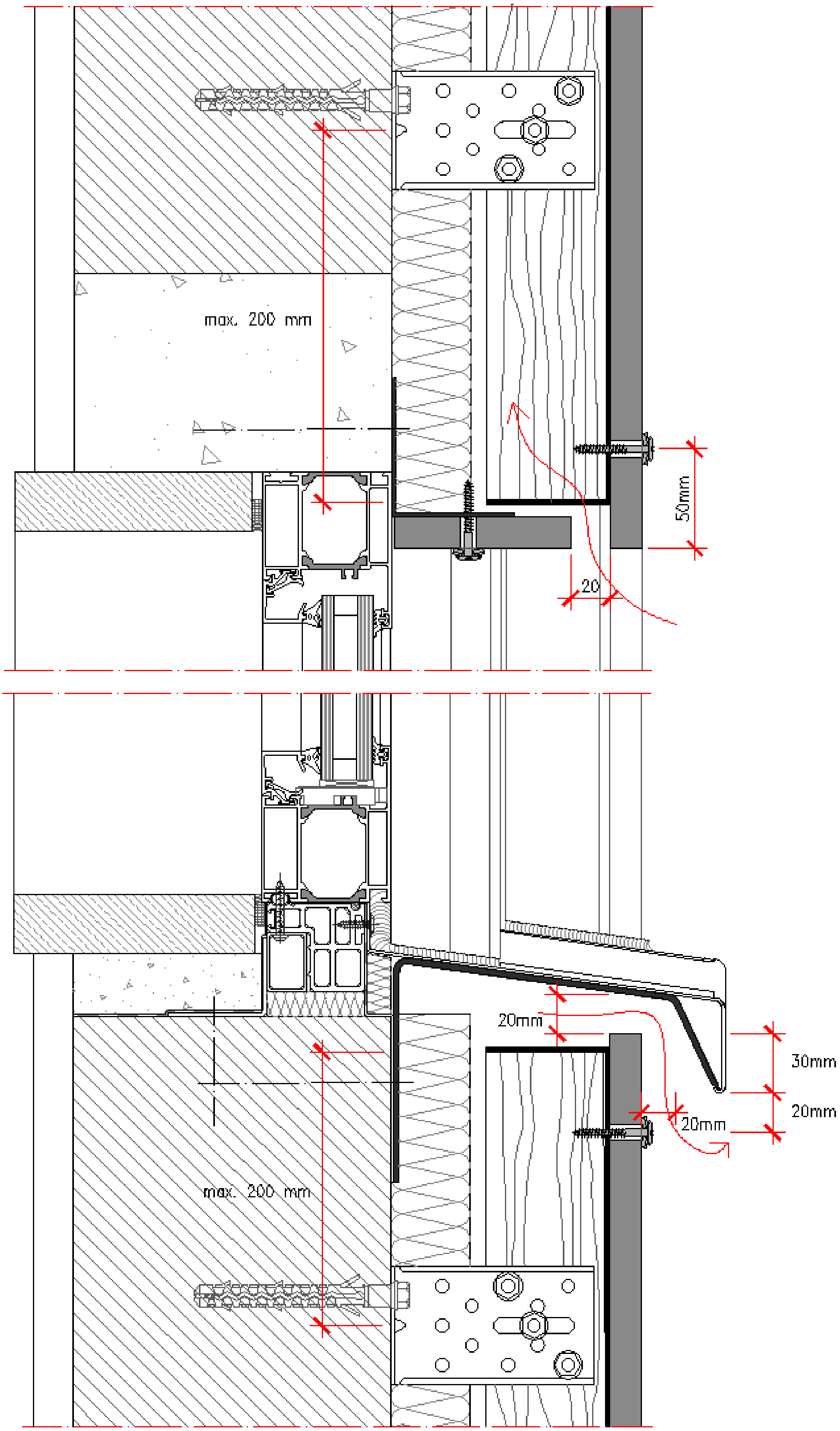


Figure 2.1.46 - Vertical section, window opening

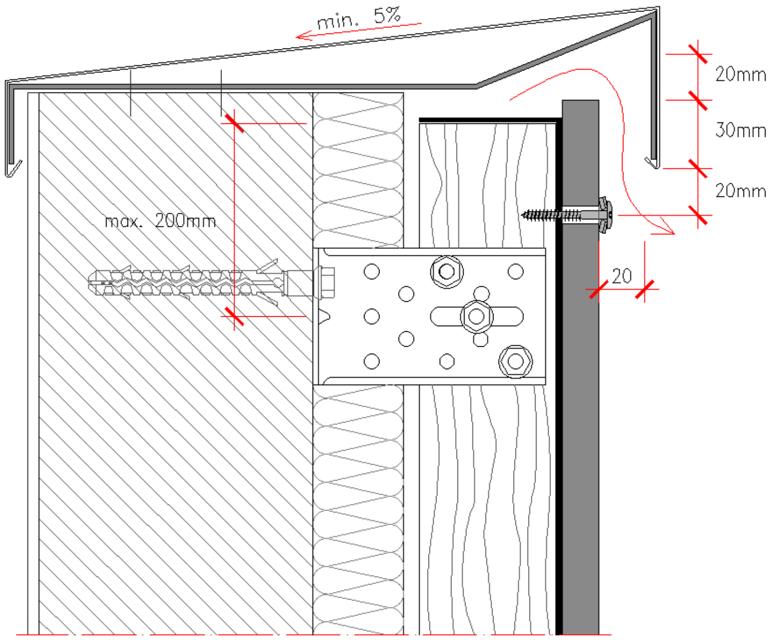


Figure 2.1.47 - Detail of the top

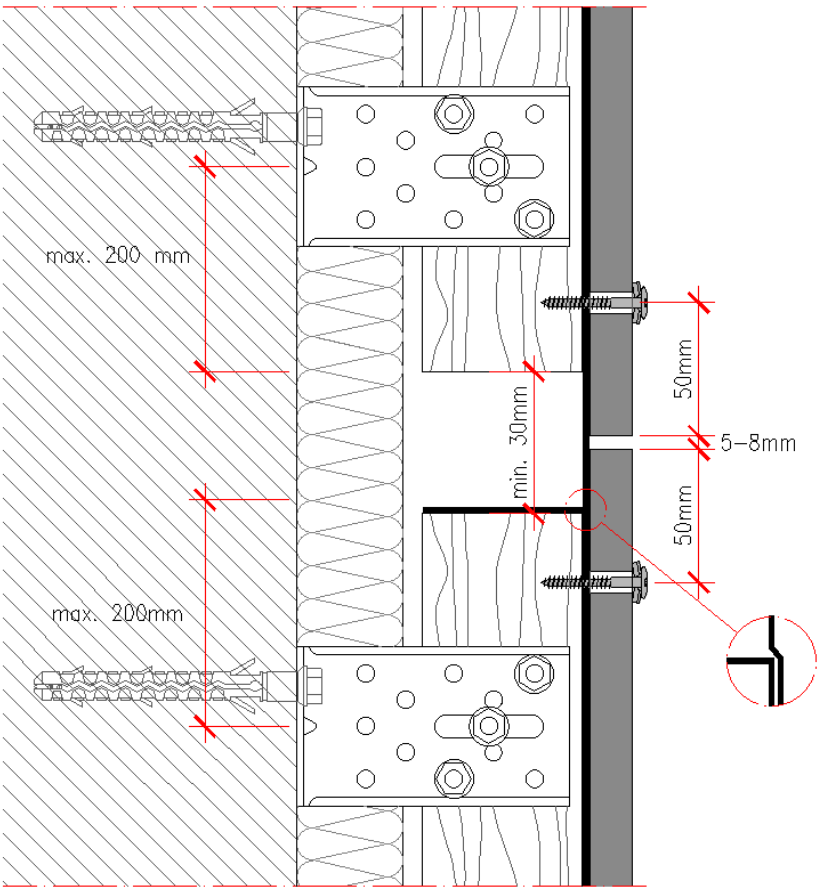


Figure 2.1.48 - Fractionation of the structure: Profiles length ≤ 6 m

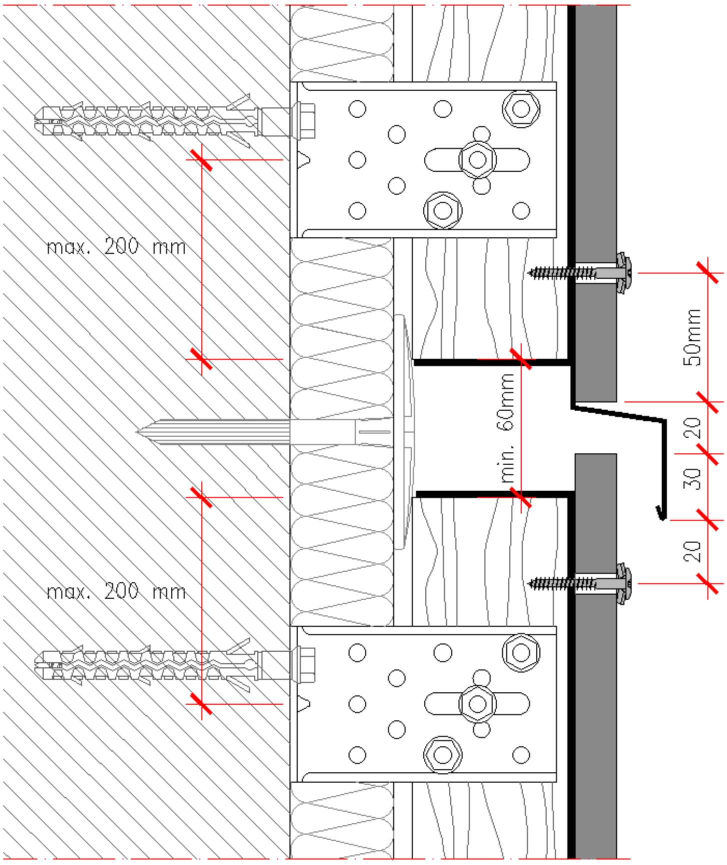
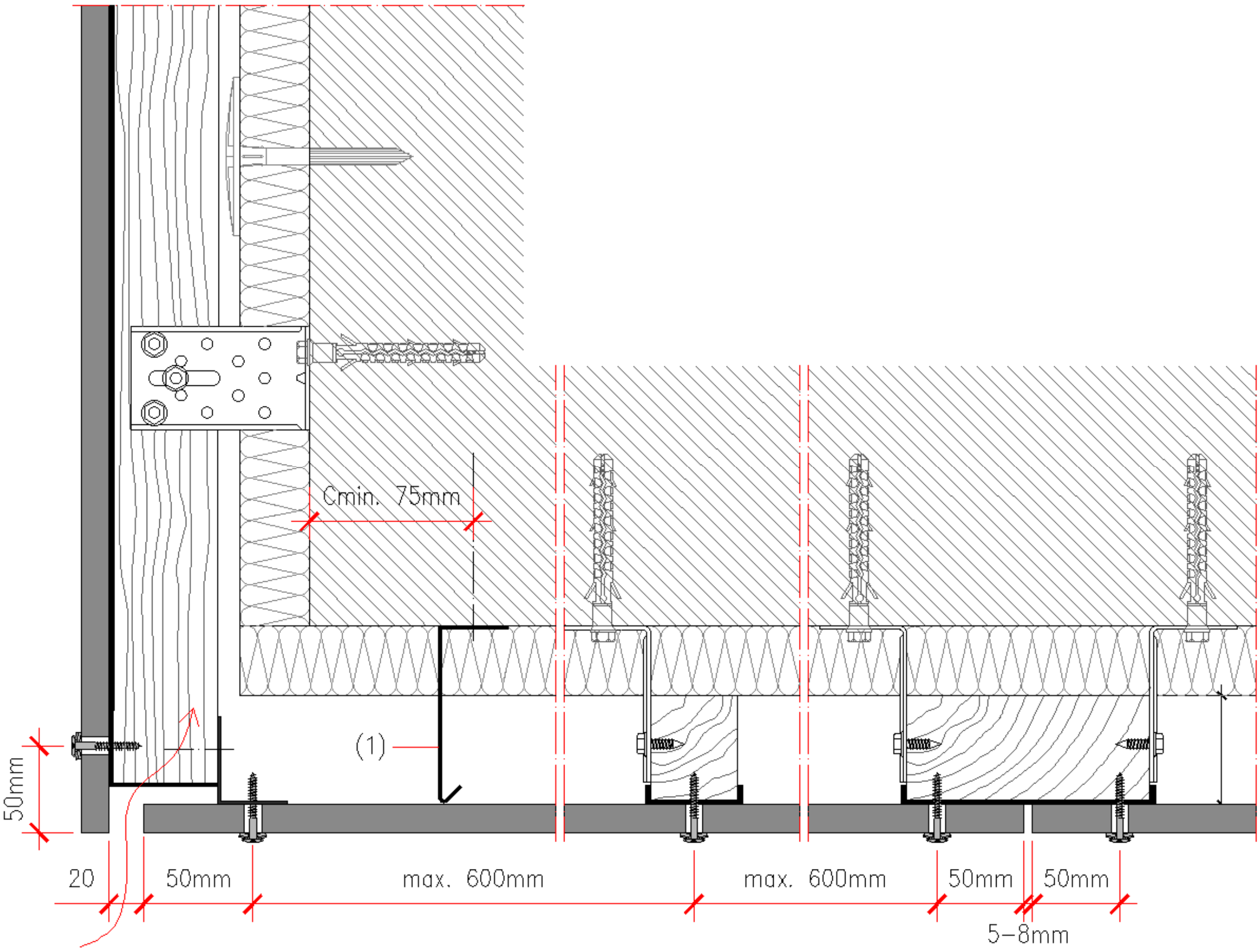


Figure 2.1.49 - Fractionation of the structure: Profiles length > 6 m



(1) Compartmentalisation of the air foil

(2)

Figure 2.1.50 - Detail of the façade - false ceiling connection

2.1.43 Details, galvanised steel frame

Figures 2.1.51 to 2.1.66 show examples of various details and unique areas of the façade.

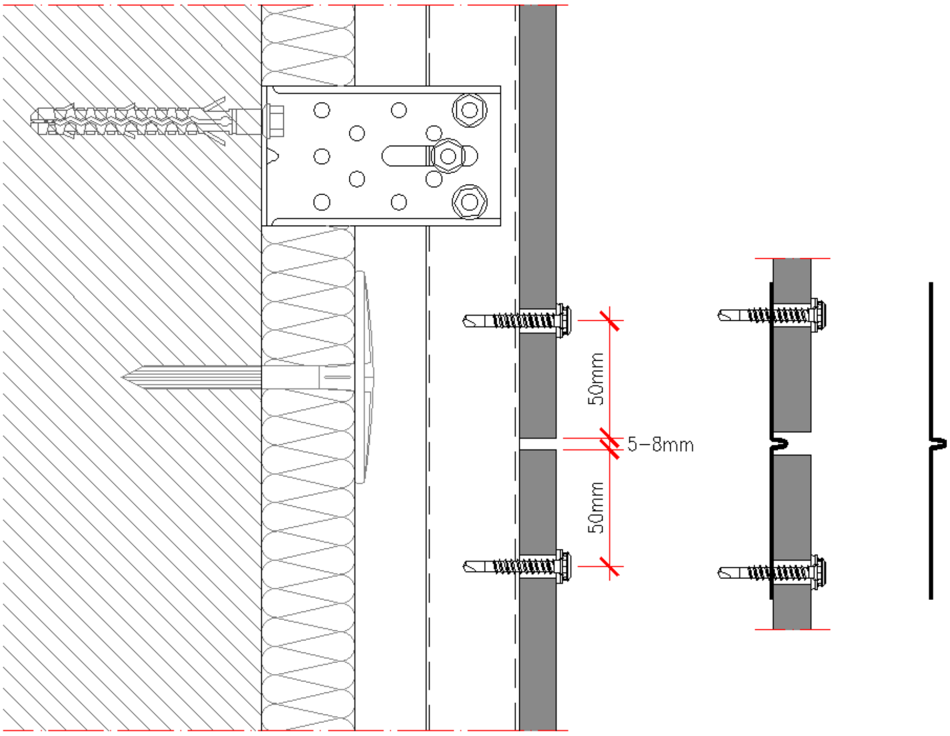


Figure 2.1.51 - Vertical section, joint between panels

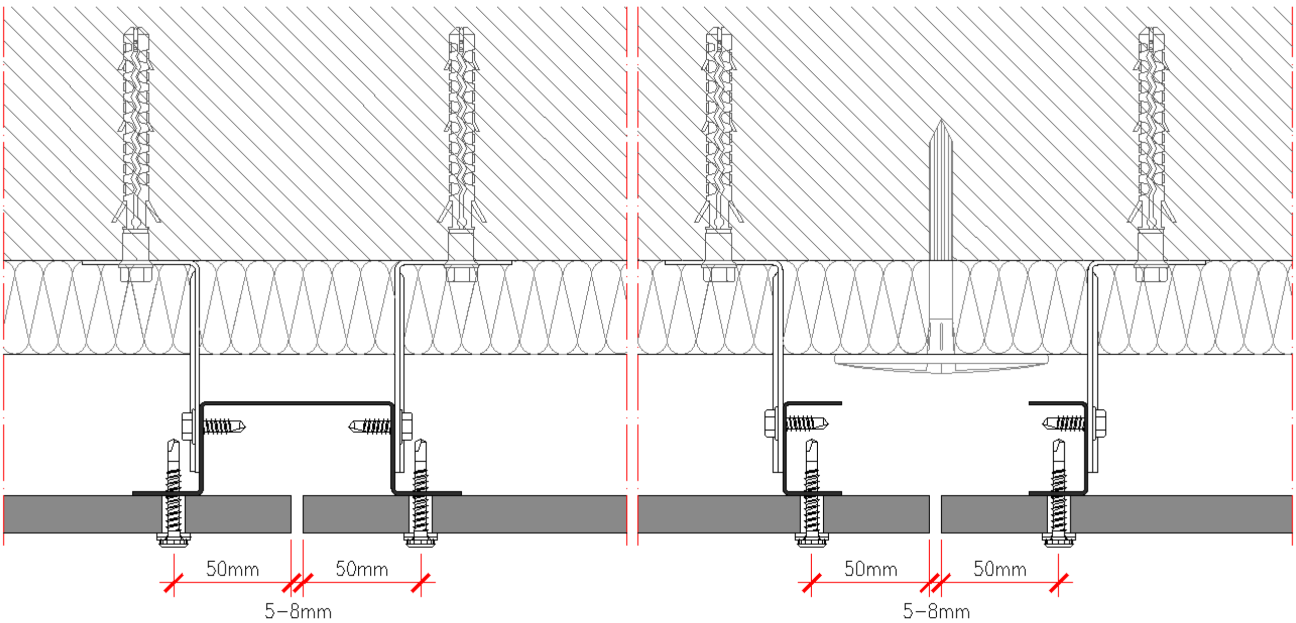


Figure 2.1.52 - Horizontal section, joint between panels

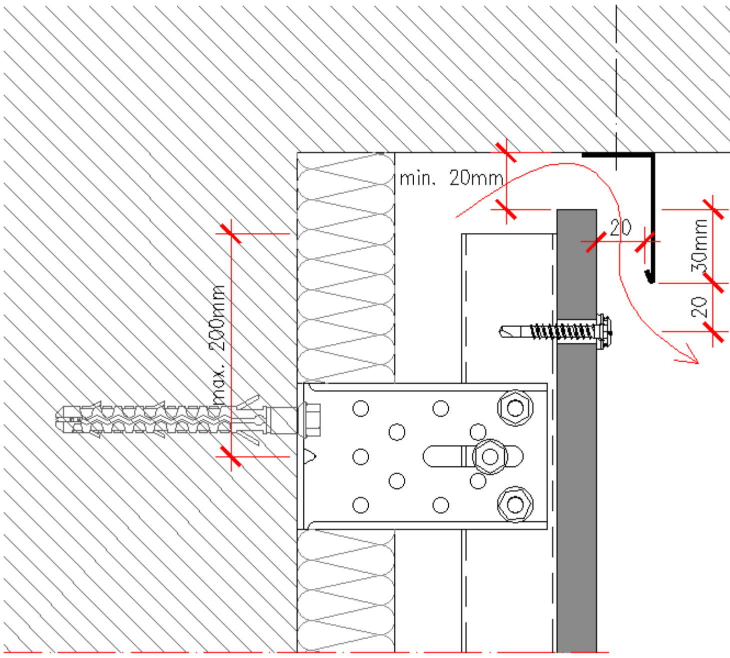


Figure 2.1.53 - Balcony finish

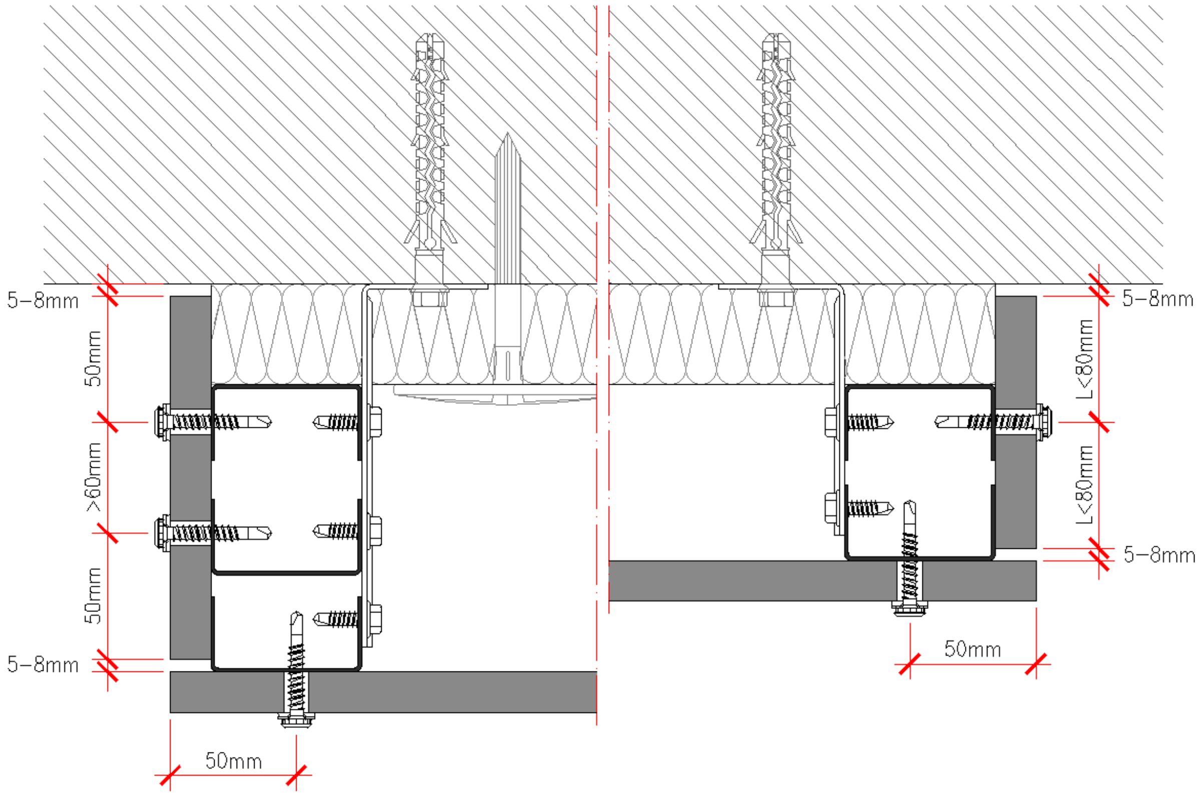


Figure 2.1.54 - Side finish

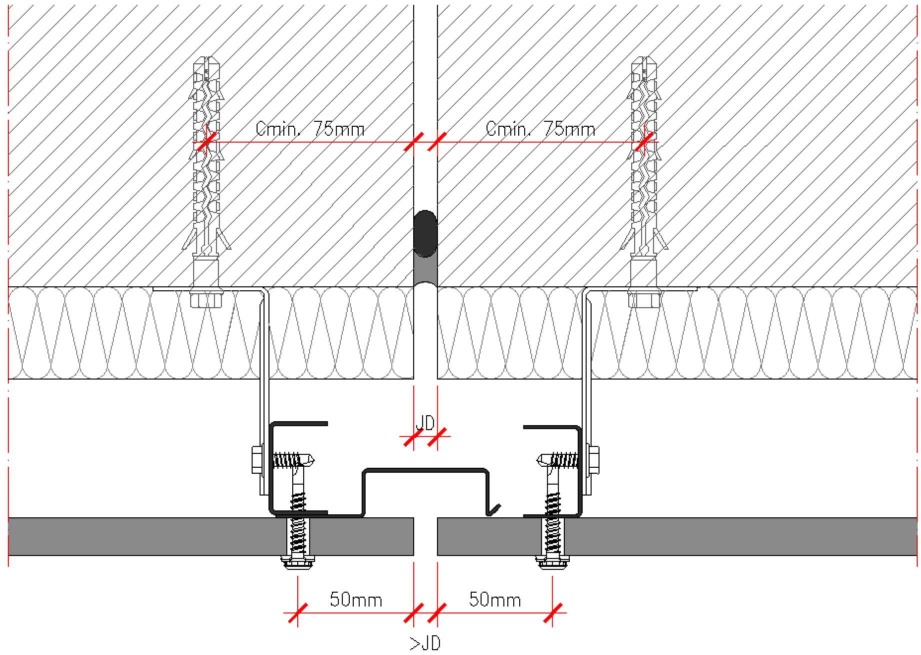


Figure 2.1.55 - Expansion joint

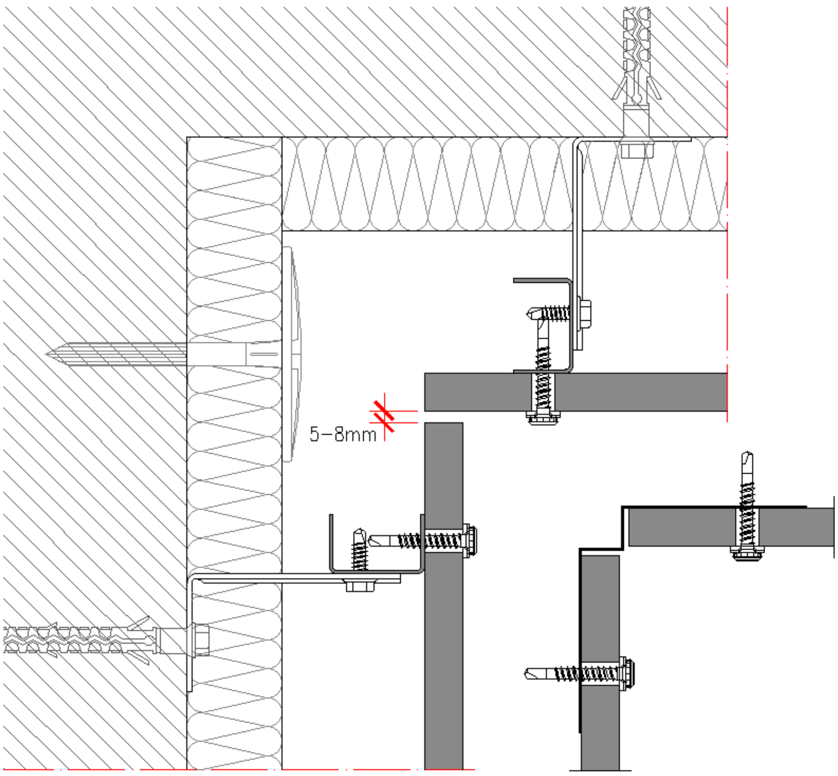
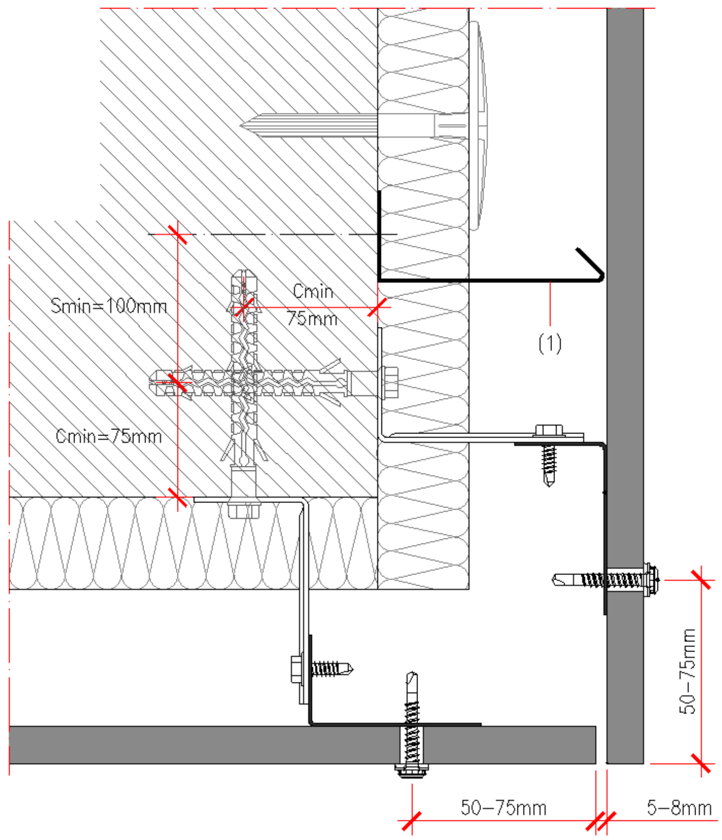
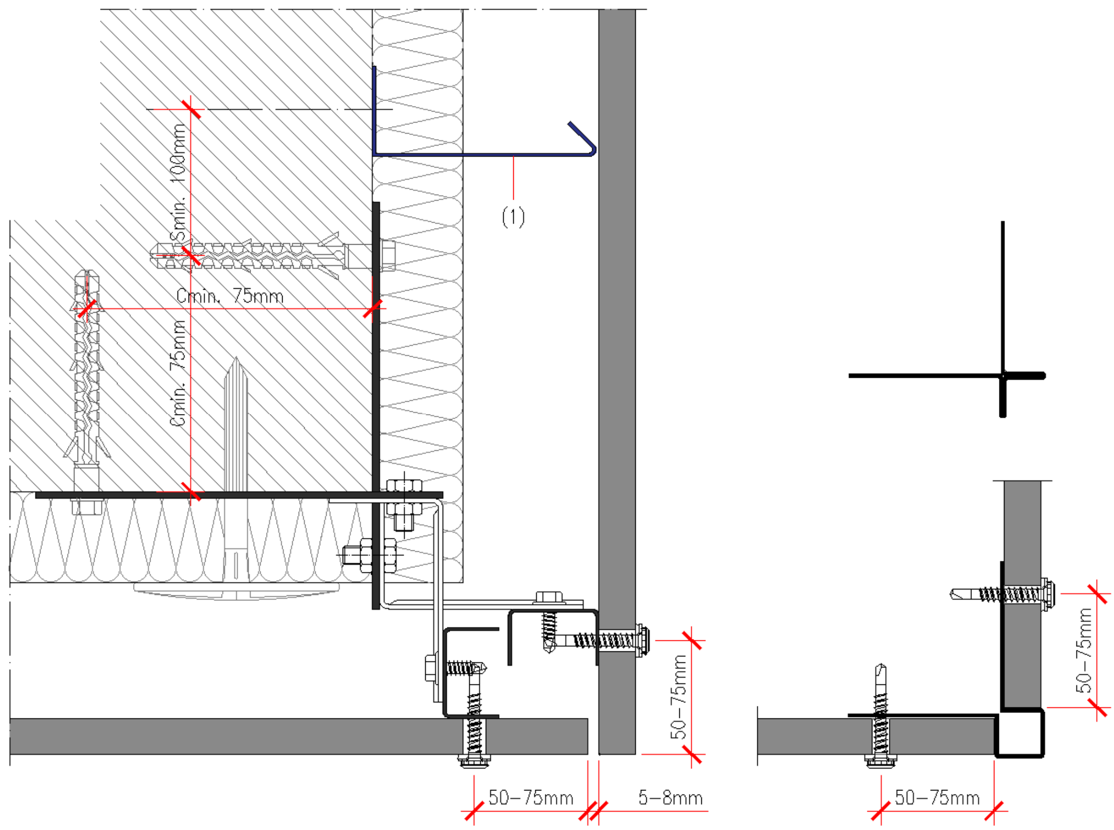


Figure 2.1.56 - Corner angle



(1) Compartmentalisation of the air foil

Figure 2.1.57 - Corner angle



(1) Compartmentalisation of the air foil

Figure 2.1.58 - Corner angle, variant

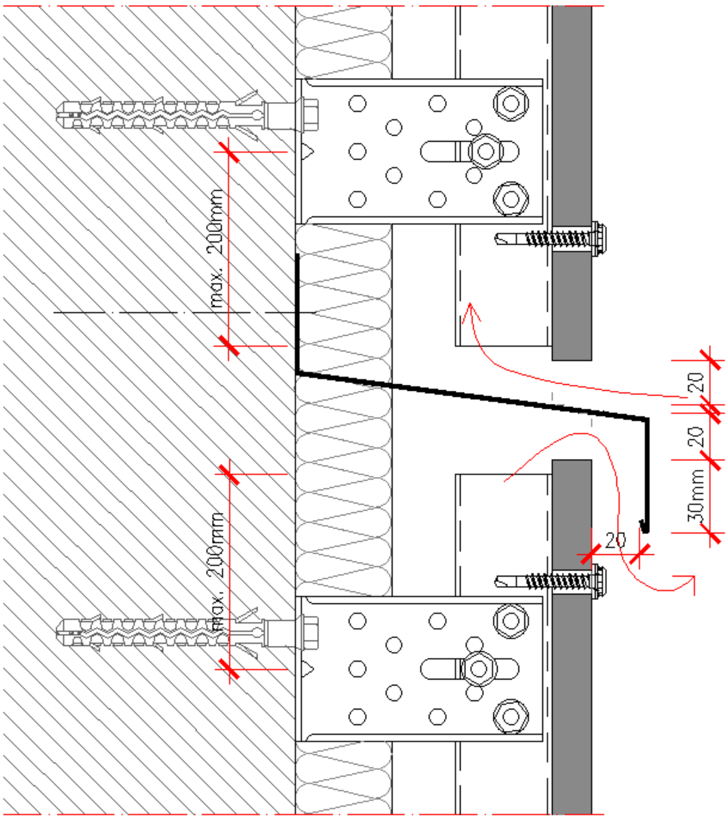


Figure 2.1.59 - Horizontal compartmentalisation of the air gap

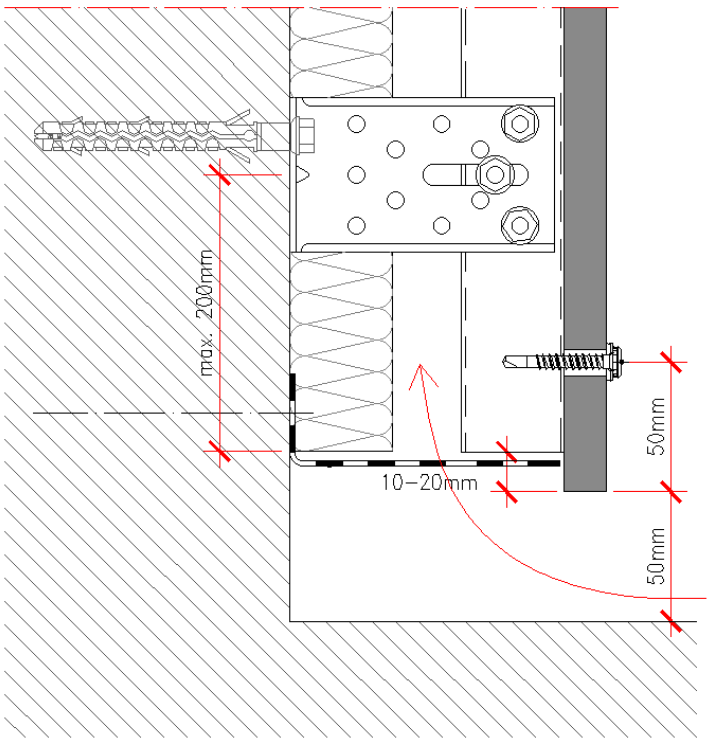


Figure 2.1.60 - Detail of the base, anti-rodent grid

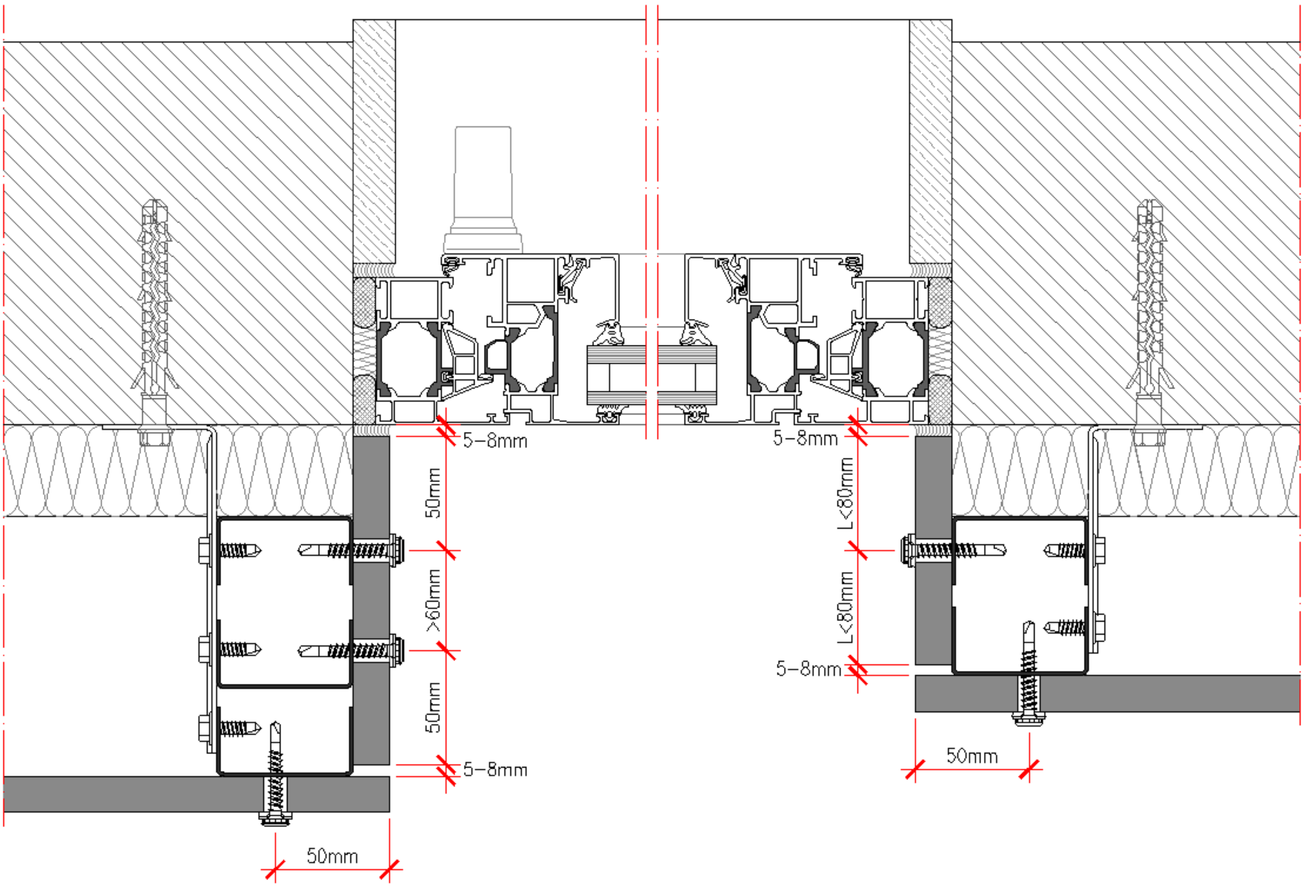


Figure 2.1.61 - Horizontal section, window opening

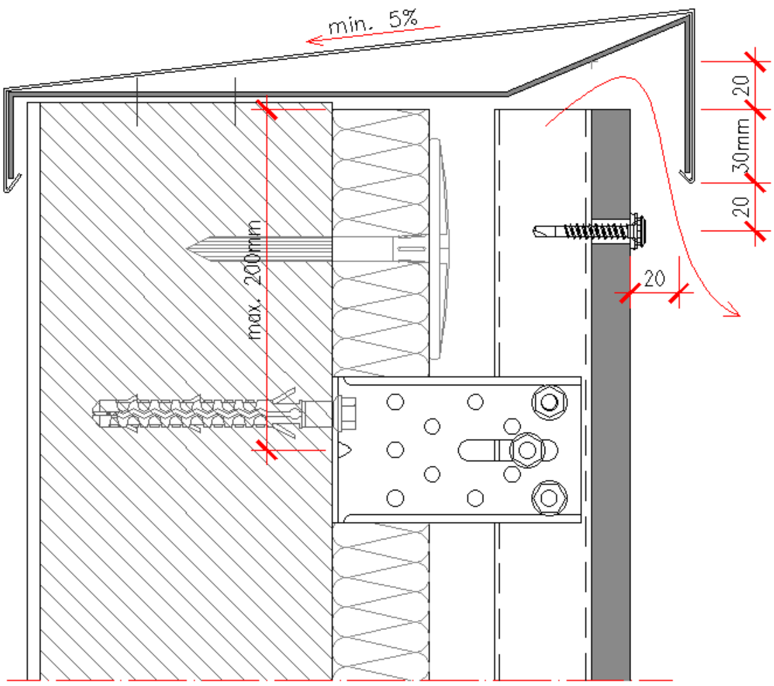


Figure 2.1.62 - Detail of the top

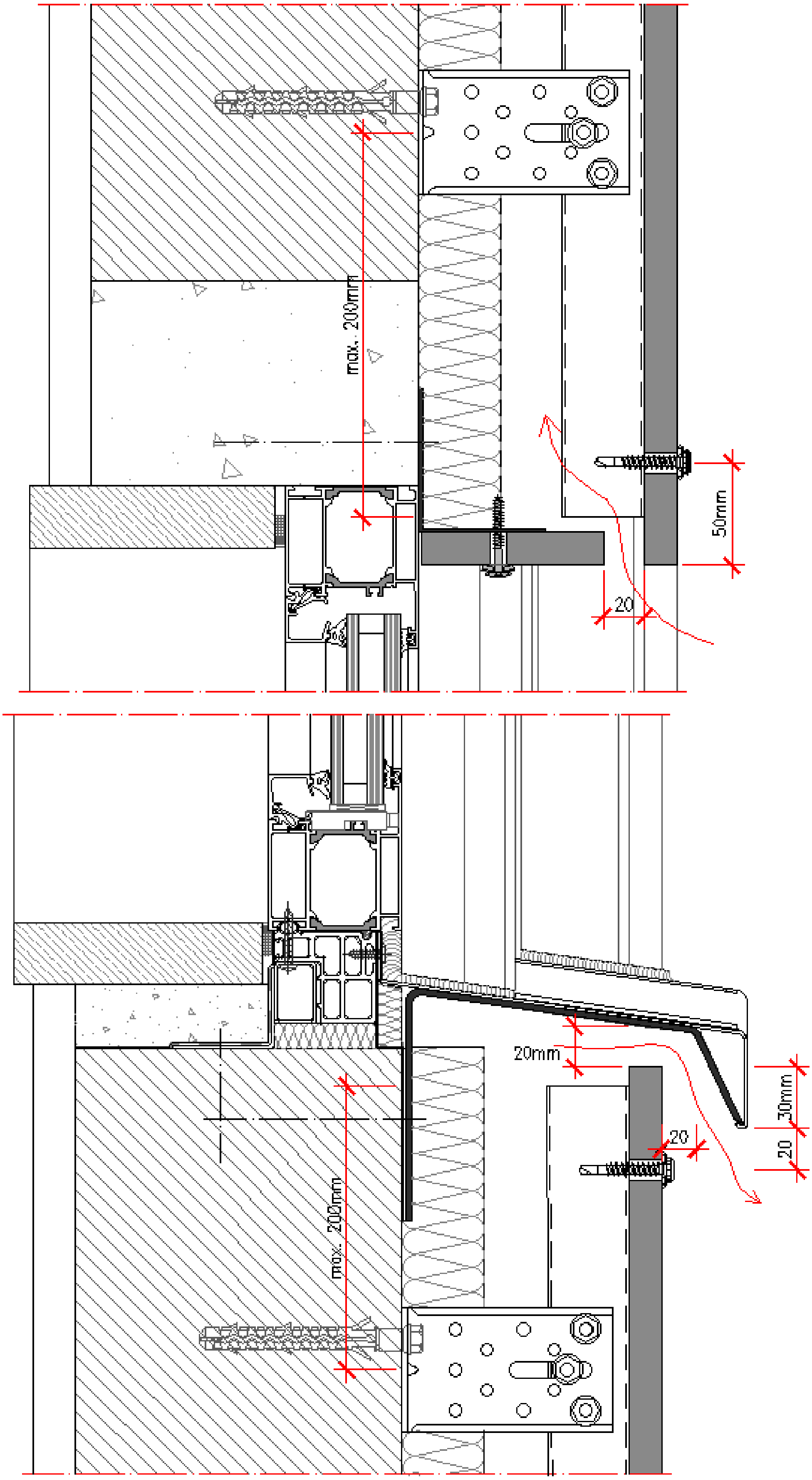


Figure 2.1.63 - Vertical section, window opening

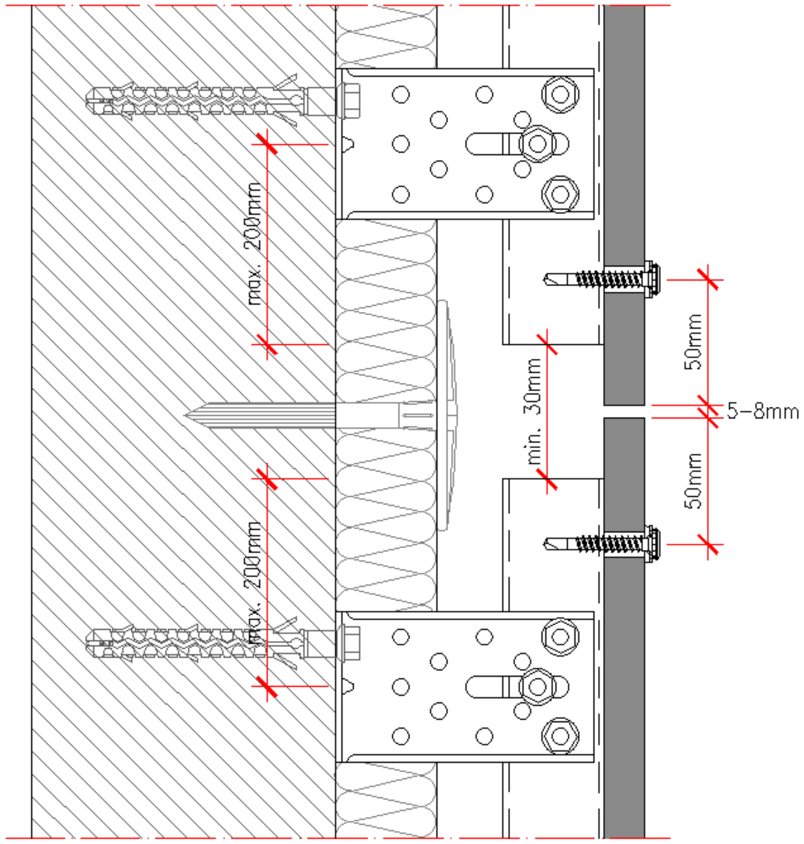


Figure 2.1.64 - Fractioning the structure: Profiles length ≤ 6 m

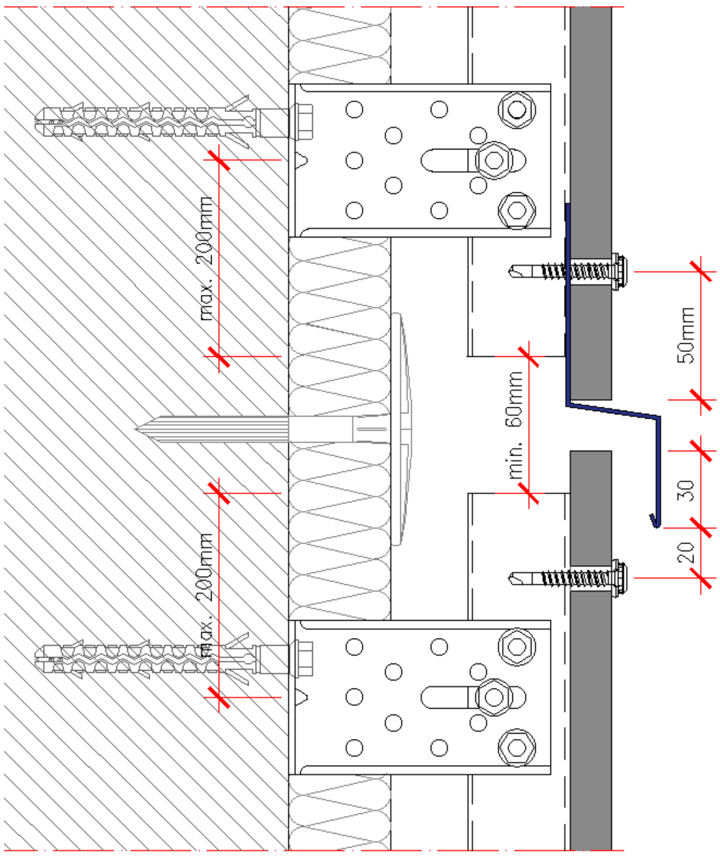
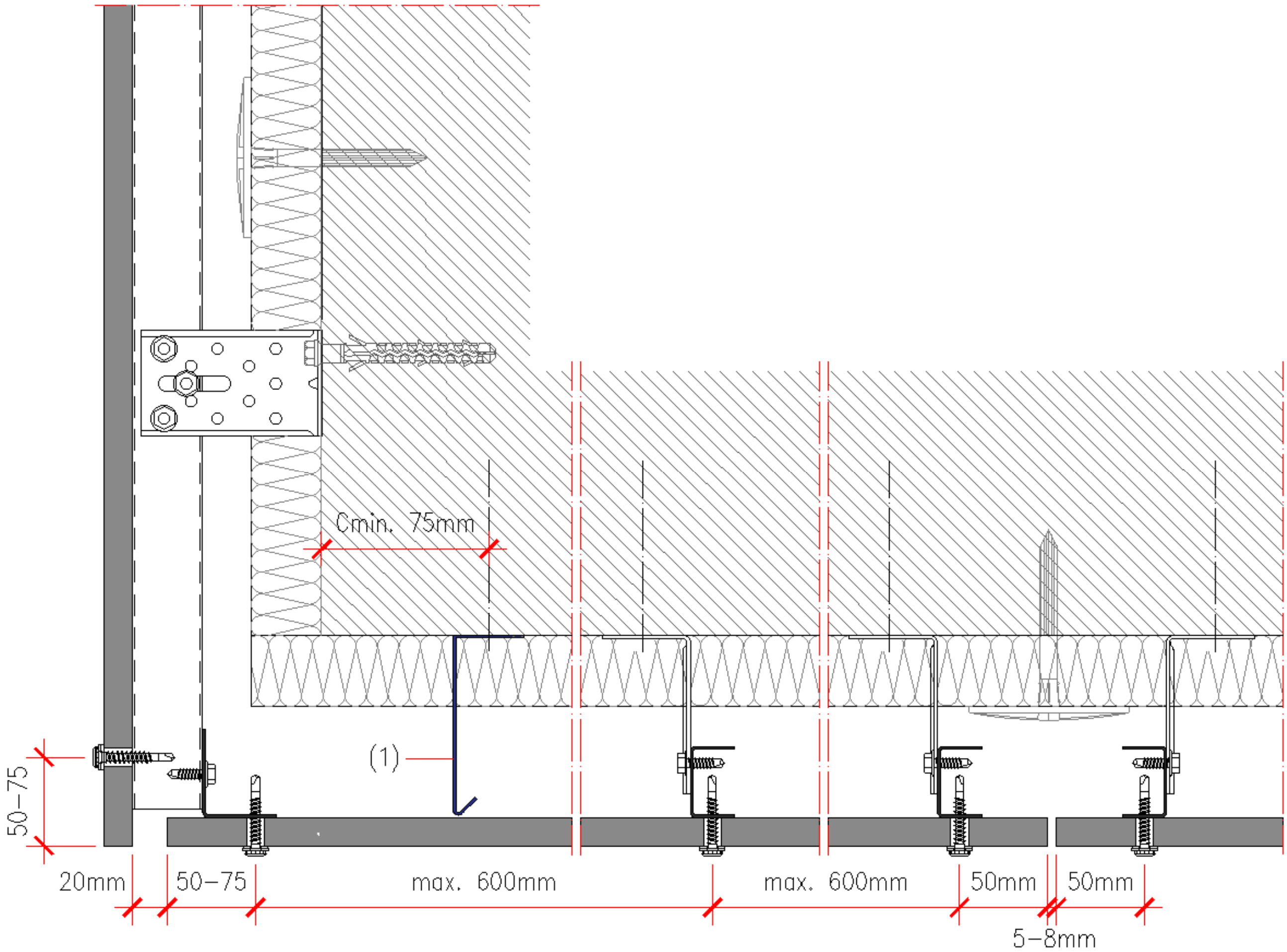


Figure 2.1.65 - Fractioning the structure: Profiles length > 6 m



(1) Compartmentalisation of the

Figure 2.1.66 - Detail of the façade - false ceiling connection

2.1.44 Details, Aluminium frame

Figures 2.1.67 to 2.1.82 show examples of various details and unique areas of the façade.

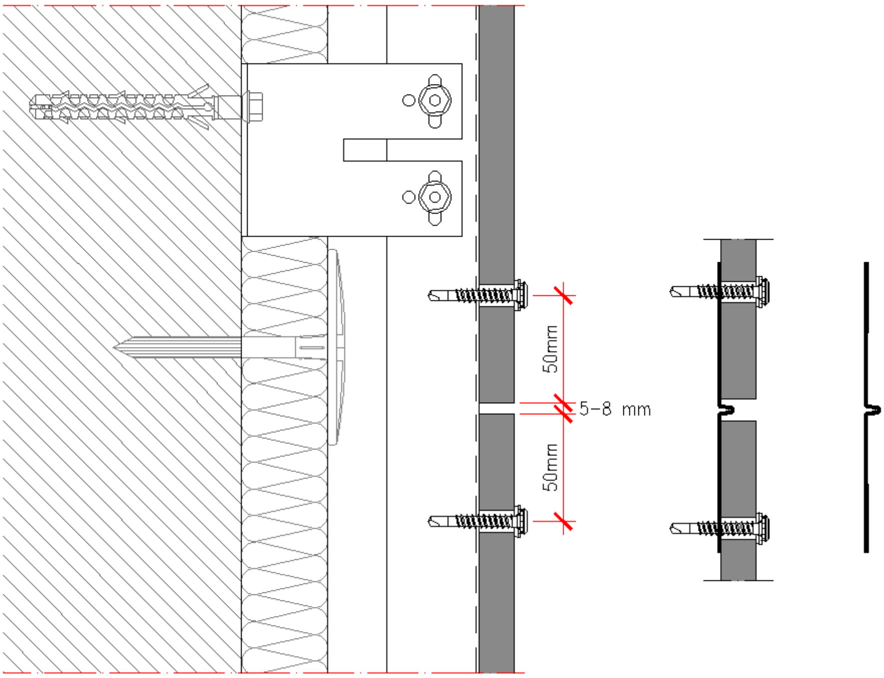


Figure 2.1.67 - Vertical section, joint between panels

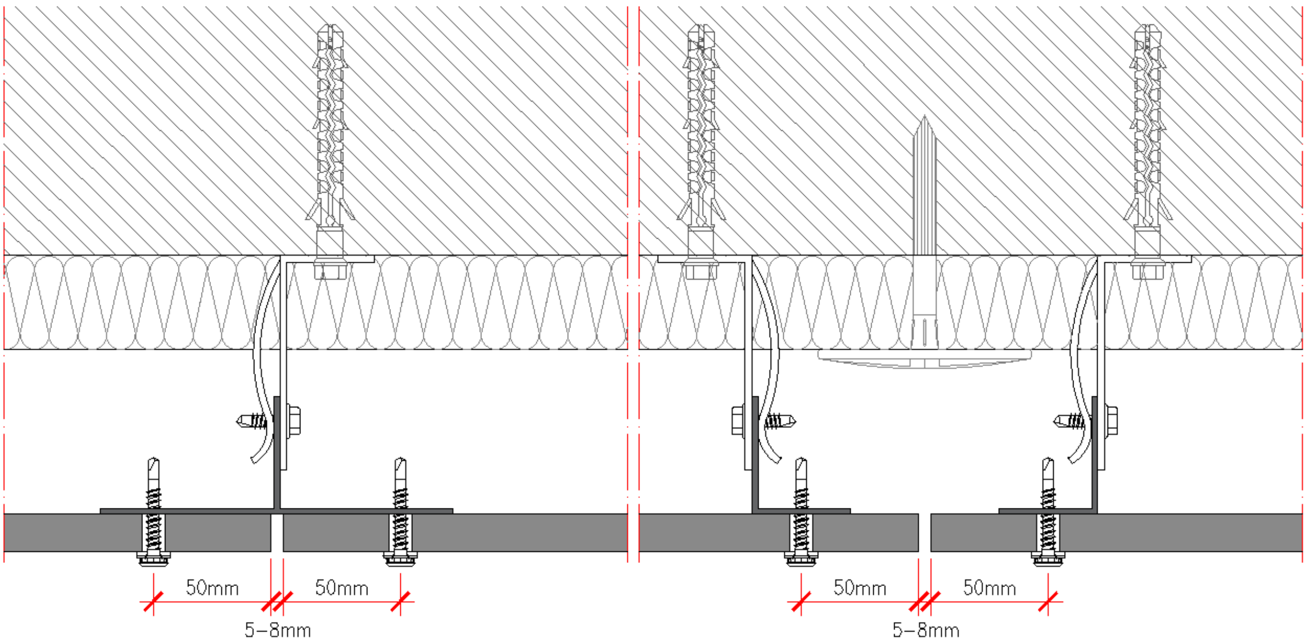


Figure 2.1.68 - Horizontal section, joint between panels

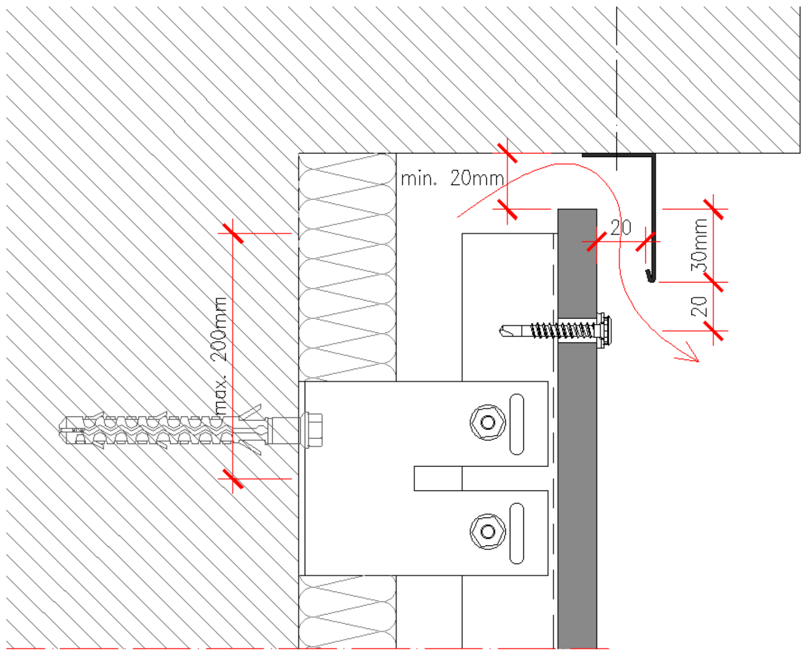


Figure 2.1.69 - Balcony finish

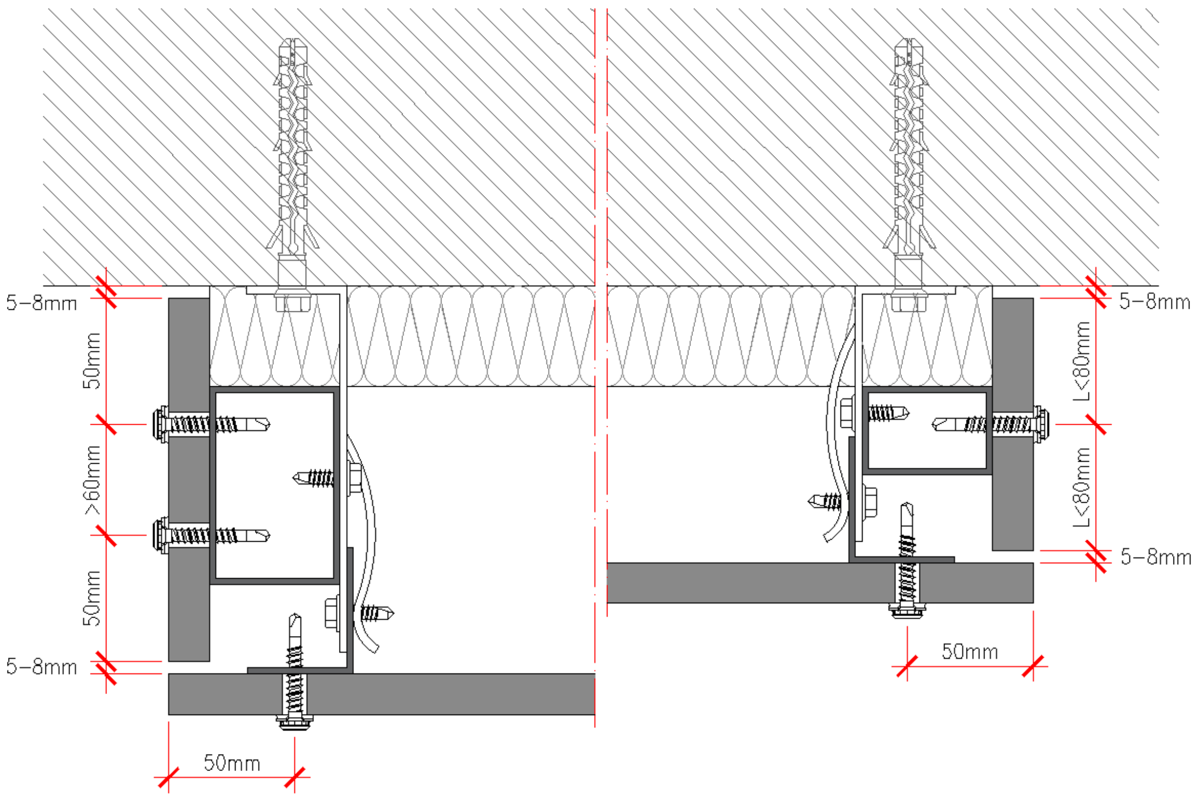


Figure 2.1.70 - Side finish

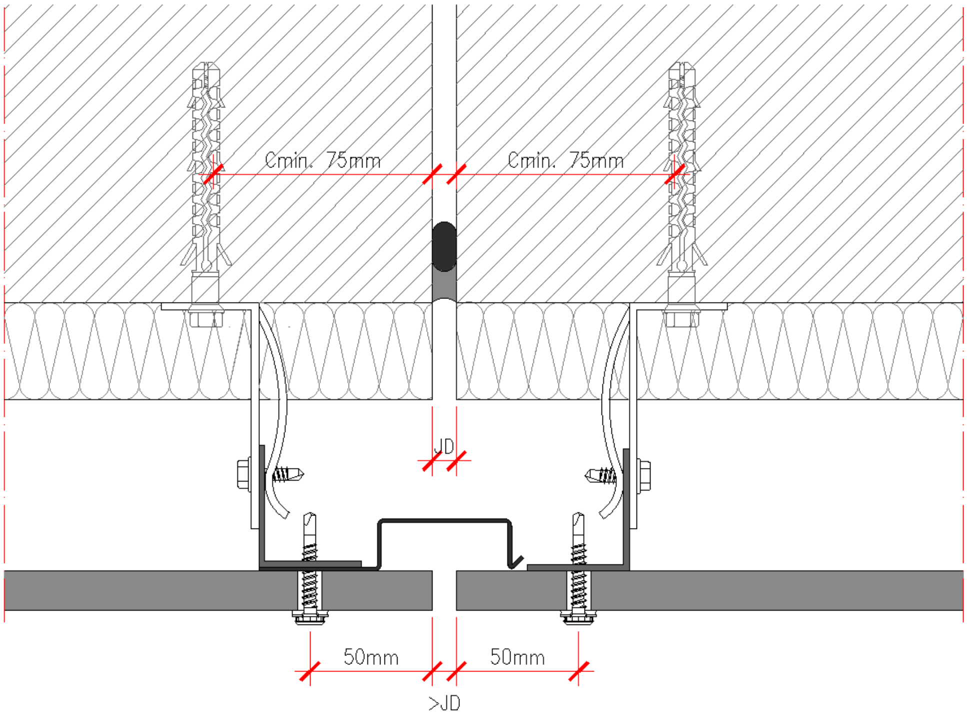


Figure 2.1.71 - Expansion joint

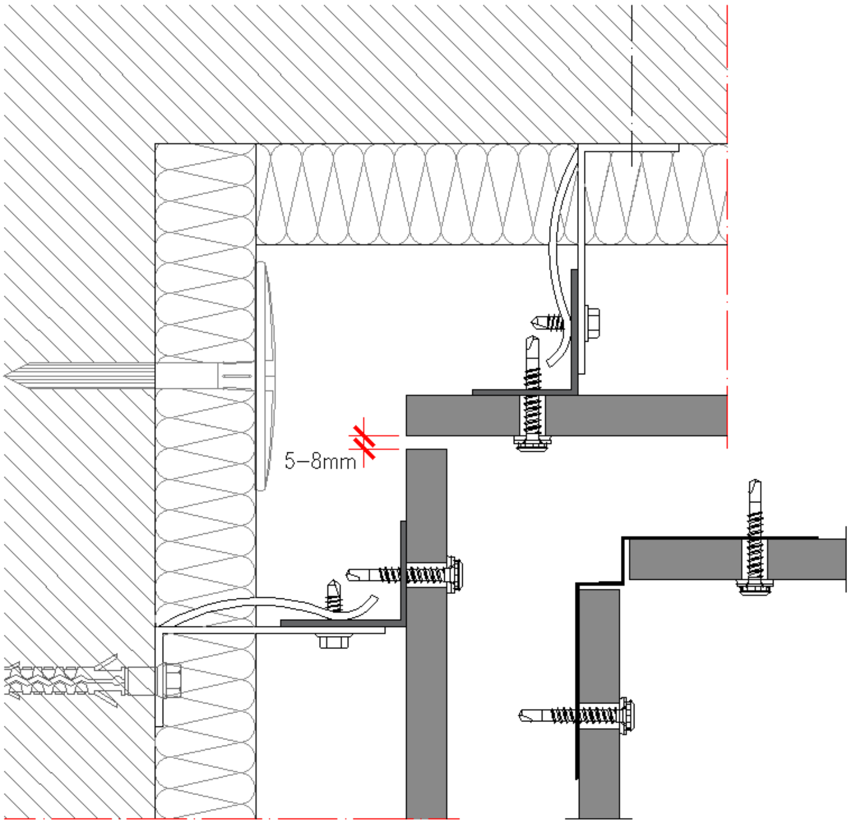
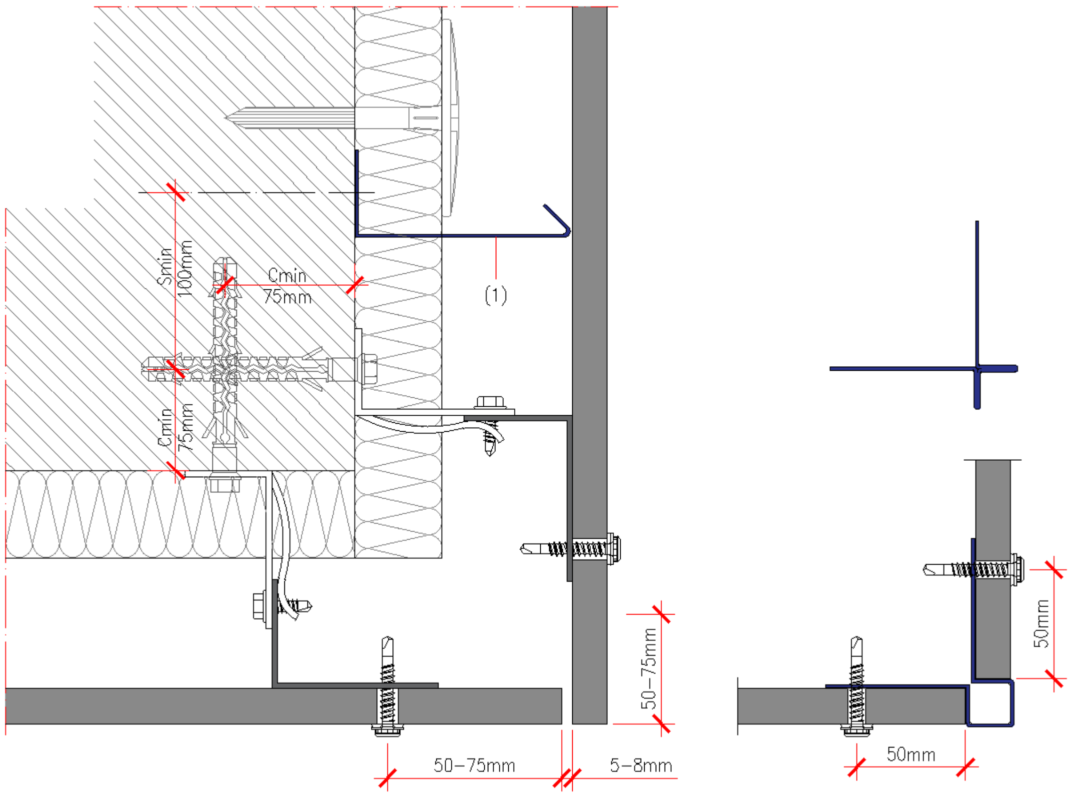
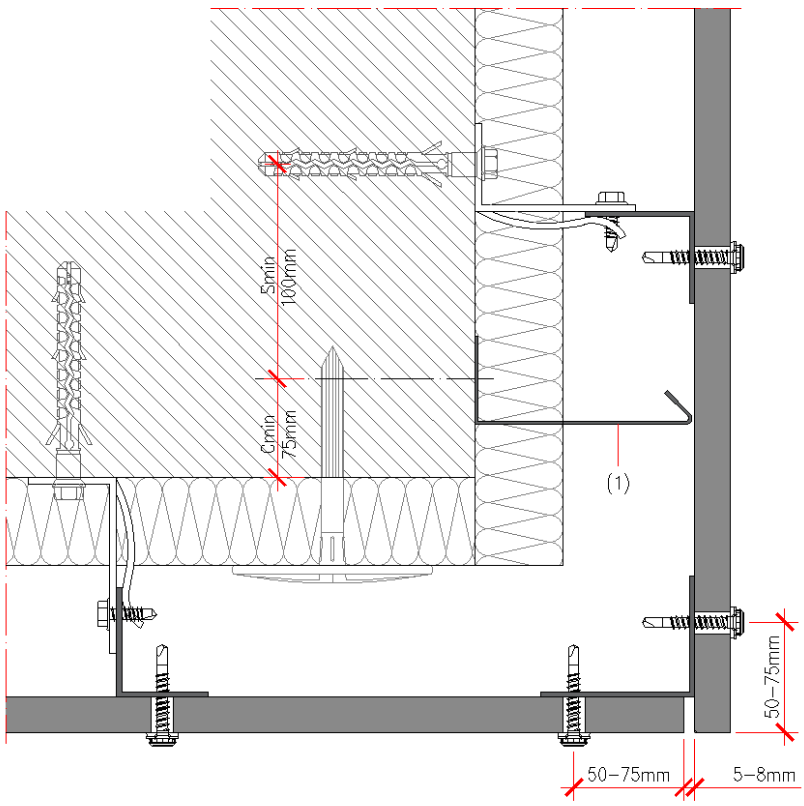


Figure 2.1.72 - Corner angle



(1) Compartmentalisation of the air foil

Figure 2.1.73 - Corner angle



(1) Compartmentalisation of the air foil

Figure 2.1.74 - Corner angle, variant

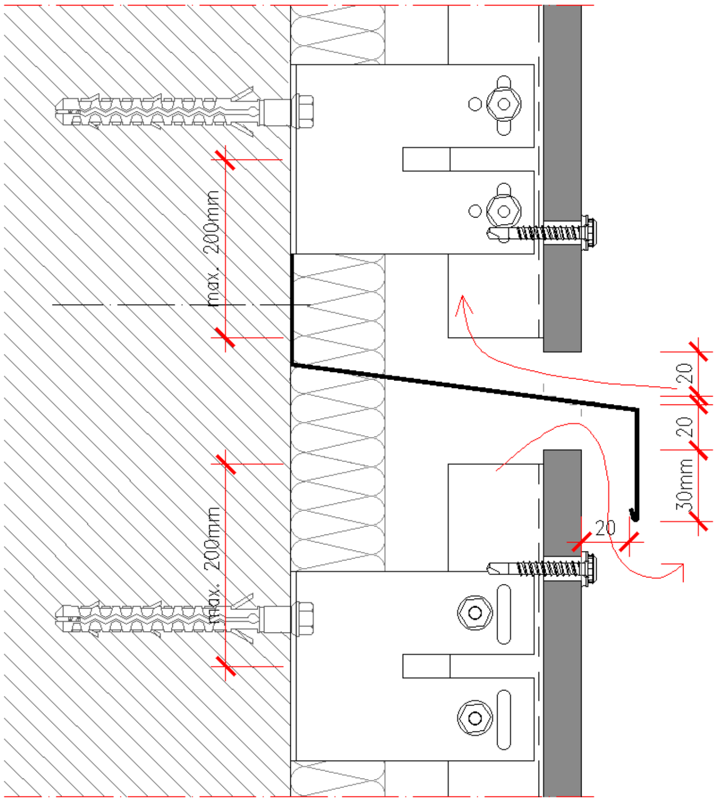


Figure 2.1.75 - Horizontal compartmentalisation of the air gap

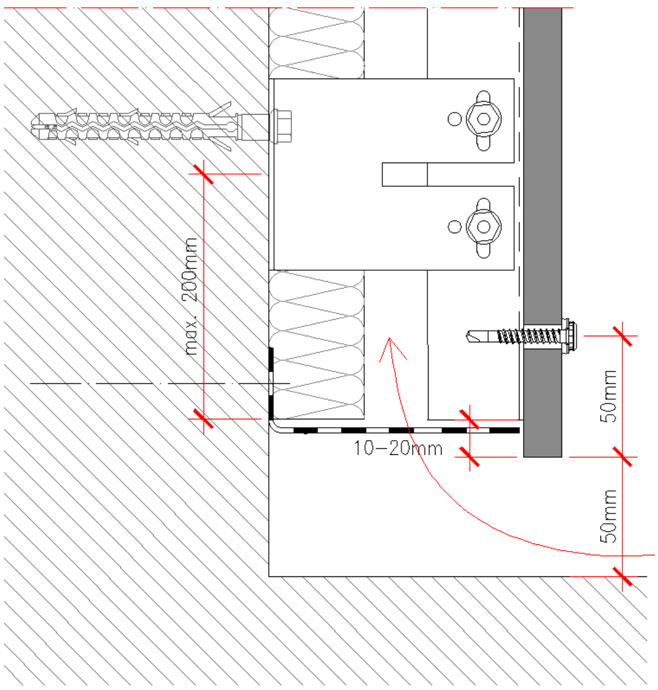


Figure 2.1.76 - Detail of the base, anti-rodent grid

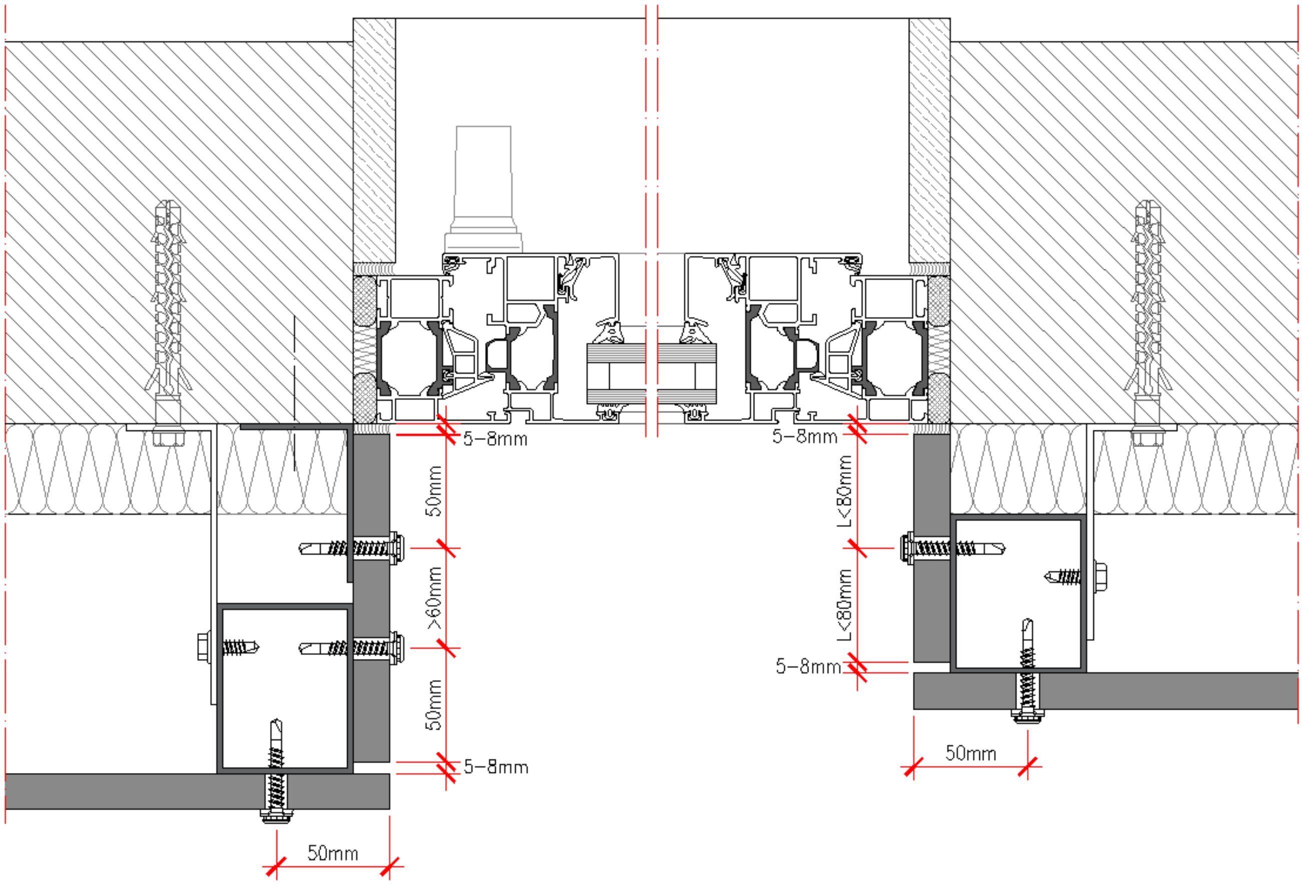


Figure 2.1.77 - Horizontal section, window opening

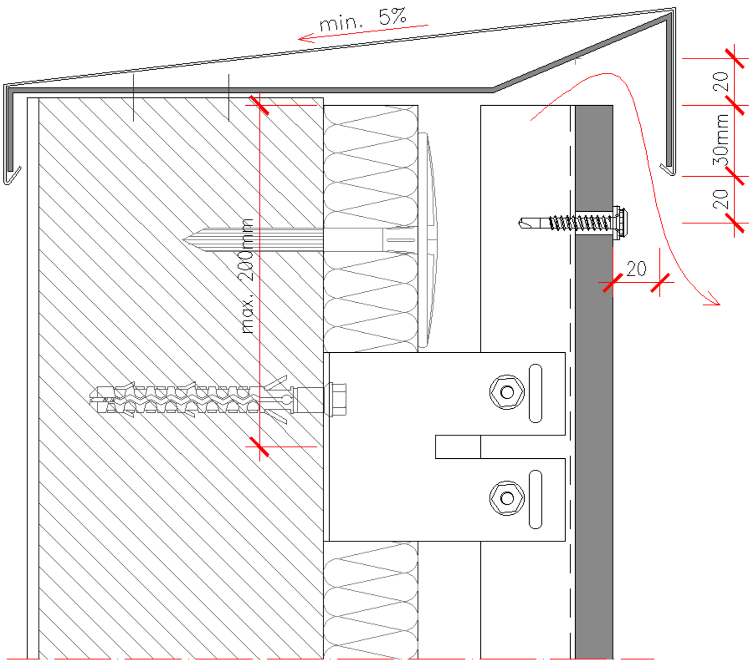


Figure 2.1.78 - Detail of the top

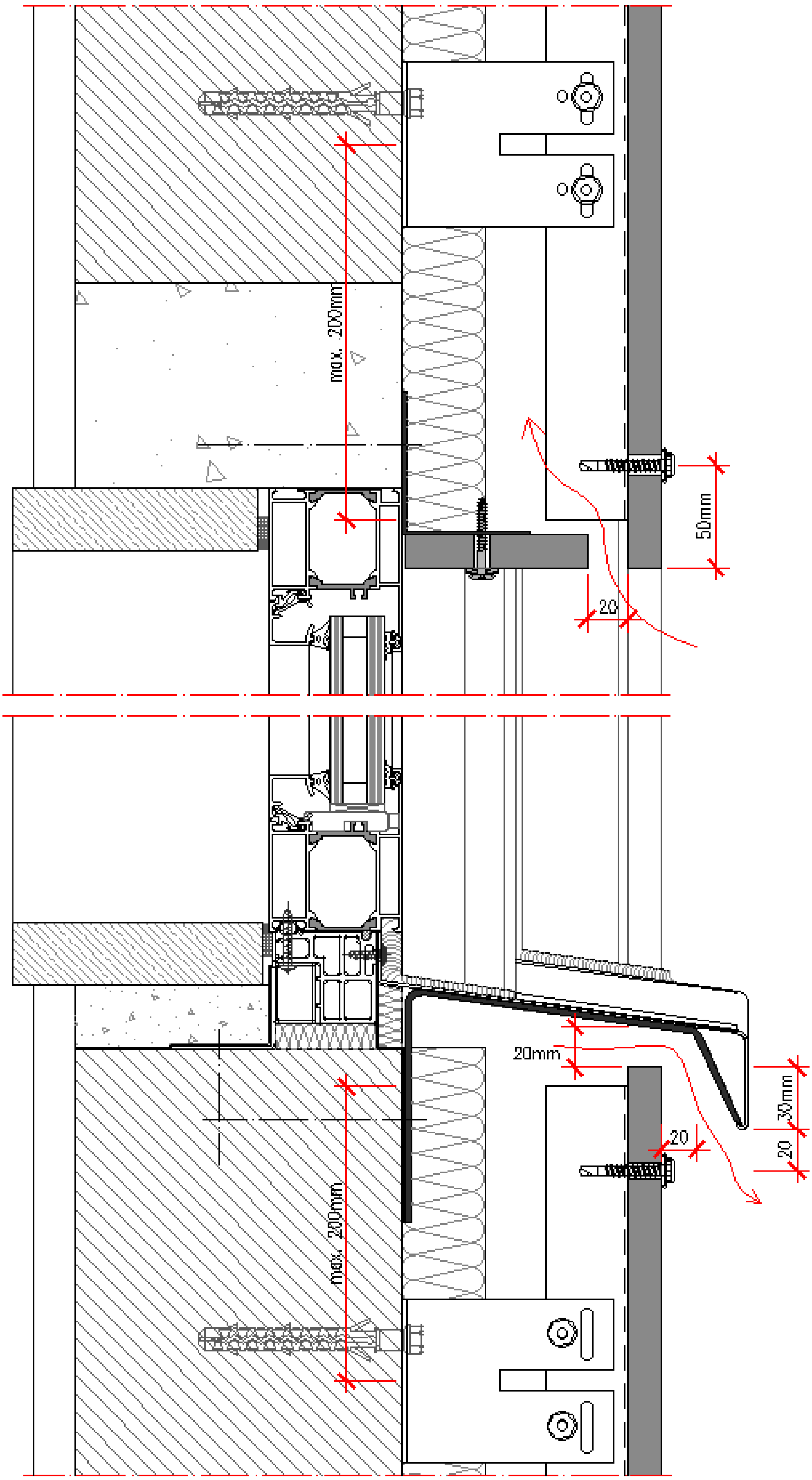


Figure 2.1.79 - Vertical section, window opening

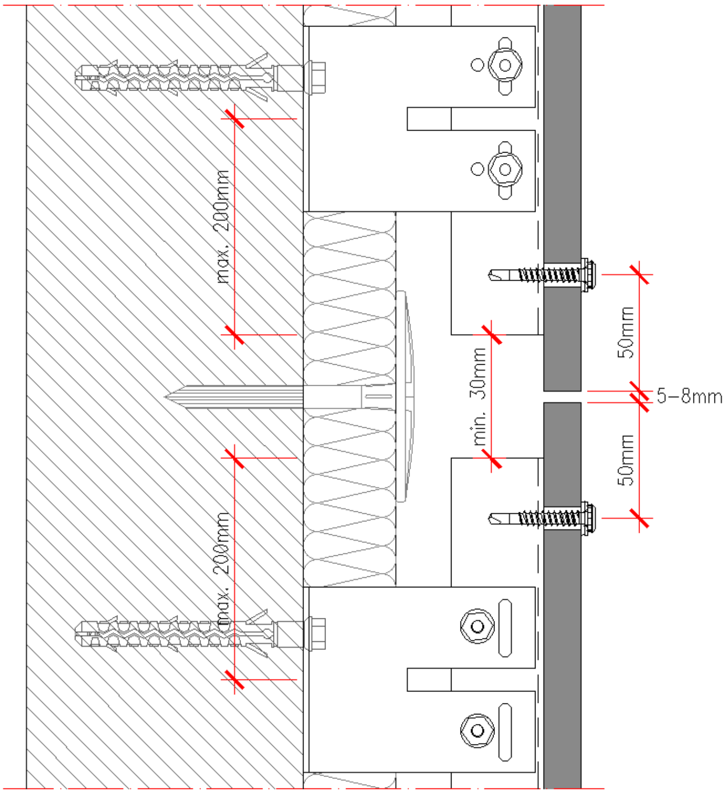


Figure 2.1.80 - Fractionation of the structure: Profiles length ≤ 6 m

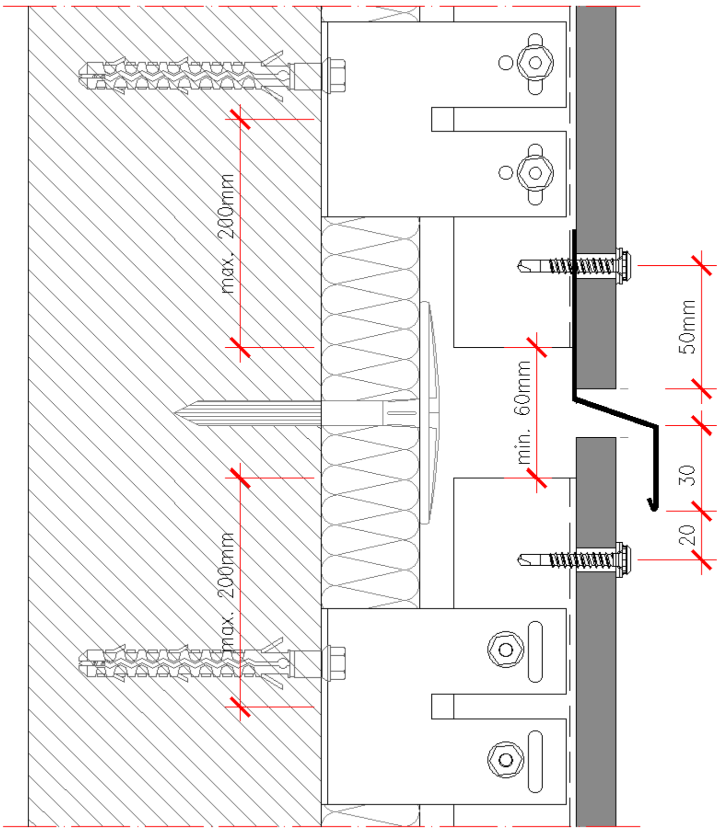


Figure 2.1.81 - Fractionation of the structure: Profiles length > 6 m

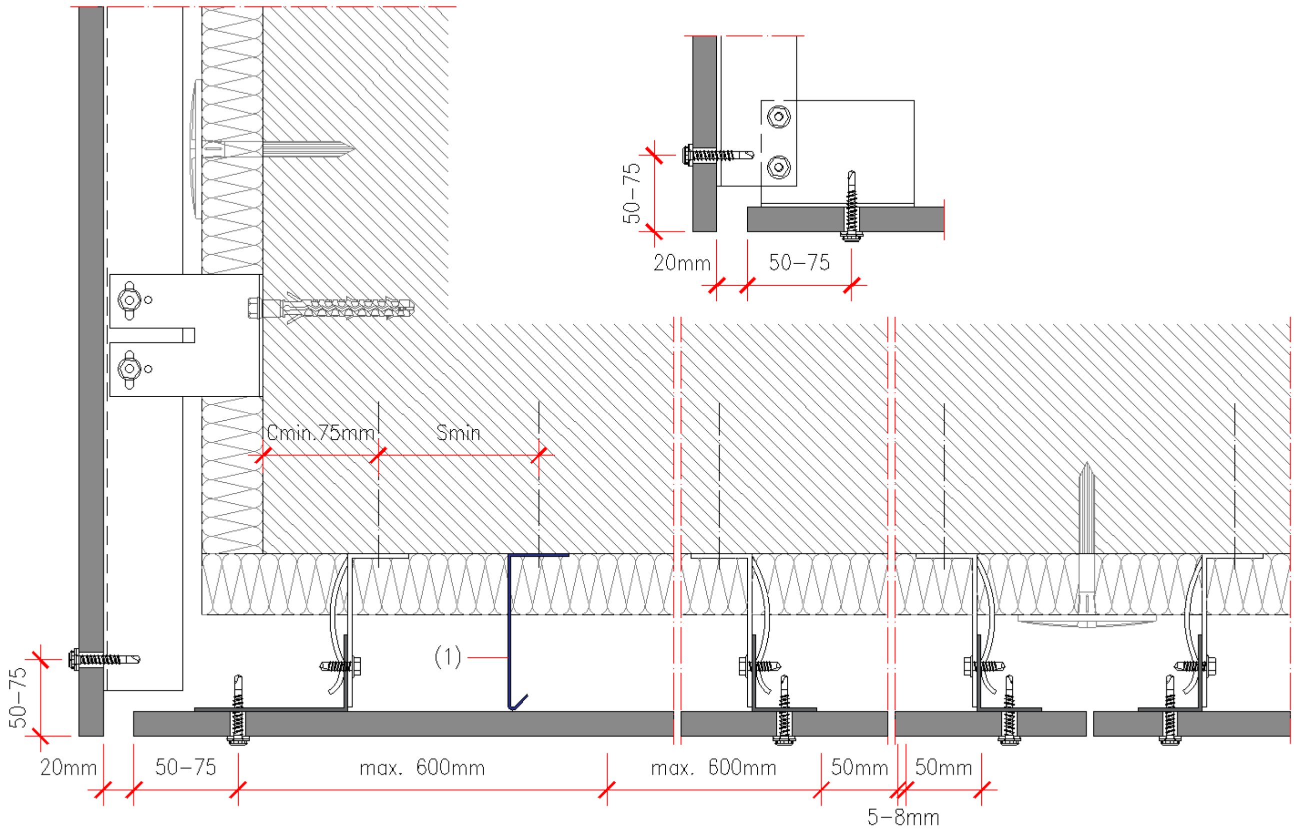


Figure 2.1.82 - Detail of the façade - false ceiling connection

WIND LOAD TABLES

Maximum pressure on 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