

TECHNICAL ASSESSMENT OF TRANSITION NO. ATT-21/027_V1

Valid from : " 02/01/2021 "
to : " 02/01/2026 "

on the

"COPANEL Wood and Metal Framework"

on the "Built-up cladding made of fibre-cement"

issued following the CCFAT (Commission in Charge of Issuing Technical Appraisals and Technical Application Documents) decision of 21/11/2017 as falling within the **traditional scope of** use of the product for built-up cladding applications with through-fixed panels

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Version	Date	Main changes made	Modified part
V1	10/11/2020	Creation	/

1 FOREWORD

This assessment is made because the set of reference texts or "rules of the art" required for a satisfactory deployment of the technique as a traditional technique is not available. It thus serves as a transitional assessment during this period of finalisation of the rules of the art, based on the criteria used when the traditional character of the use of the process is assessed.

The valid version of the TTA (Transitional Technical Appraisal) is the one published at <http://evaluation.cstb.fr/rechercher/>.

1.1 DESCRIPTION

The COPANEL system is a built-up cladding procedure based on fibre-cement panels fixed to a vertical framework made up of wooden rafters or metal profiles attached to the structural works by adjustable right angle brackets or fixed directly to the support.

A ventilated air gap is provided between the inner face of the panels and the outer surface of the load-bearing wall or thermal insulation, if any.

2 EVALUATION CRITERIA

This section lists the examination criteria in force at the date of issue of the ATT (art. 8 of the ATT Internal Regulations), for the use of the product in the field of application defined on the cover page.

Materials: The panels are made from Portland cement, sand and reinforced with mineralised cellulose fibres. The mass pigmentation consists of mineral pigments.

The evaluation criteria concerning the materials and the implementation of the products are defined and characterised according to the reference documents in CSTB guide n°3810 *"Evaluation guide and implementation of cladding works incorporating through-fastened fibre-cement claddings"*.

The evaluation criteria for the "COPANEL Wood and Metal Framework" process are as follows:

Evaluation criteria	Paragraphs of CSTB guide n°3810
2.1 MATERIALS AND ELEMENTS	See §3 Part 1
2.2 STABILITY AND MECHANICAL STRENGTH	See §4.1 Part 1
2.3 SAFETY IN CASE OF FIRE	See §4.2 Part 1
2.4 VENTILATION OF THE AIR GAP	See §4.3 Part 1
2.5 WATERTIGHTNESS	See §4.4 Part 1
2.6 AIRTIGHTNESS	See §4.5 Part 1
2.7 THERMAL INSULATION	See §4.6 Part 1
2.8 IMPACT RESISTANCE	See §4.7 Part 1
2.9 STABILITY IN SEISMIC ZONES	See §4.8 Part 1

3 TECHNICAL ASSESSMENT

This section verifies the achievement of the examination criteria listed in section 2 (art. 8 of the Rules and Regulations of the TTA).

3.1 ASSESSMENT OF THE EVALUATION CRITERIA

3.1.1 Materials and products

The COPANEL Wood and Metal framework panels are described in the Technical Appendix and comply with §3 PART 1 of CSTB guide n°3810.

The characteristics are described in §4.2.1 of the Technical Appendix.

3.1.2 Stability and mechanical strength

The elements described in the Technical Appendix ensure stability and mechanical resistance in accordance with §4.1 of CSTB guide n°3810.

Tables 4, 5, 6 and 7 of the Technical Appendix show the permissible normal wind depression, according to the modified NV65 Rules, of the configurations in question.

3.1.3 Safety in case of fire

The fire reaction rating and the fuel masses are described in §4.1.3 of the Technical Appendix.

3.1.4 Ventilation of the air gap

It complies with §4.3 of PART 1 of the CSTB guide n°3810.

3.1.5 Watertightness

It complies with §4.4 of PART 1 of the CSTB guide n°3810.

3.1.6 Airtightness

It complies with §4.5 of PART 1 of the CSTB guide n°3810.

3.1.7 Thermal insulation

It complies with §4.6 of PART 1 of the CSTB guide n°3810.

3.1.8 Impact resistance

The external impact performances of the COPANEL Wood and Metal Framework process, according to the P08-302 standard and the CSTB 3546-V2 and 3534 specifications, is indicated in §4.1.2 of the Technical Appendix.

3.1.9 Stability in seismic zones

The COPANEL wood and metal framework built-up cladding system can be used in seismic zones and buildings according to the table described in §4.1.2 and §4.9 and §4.10 of the Technical Appendix.

3.2 CONCLUSION

The use of the product in traditional applications is favourably received.

Façade, Covering and Roofing Division
Head of Division

Stéphane Gilliot

4 TECHNICAL APPENDIX

This section is a technical appendix intended to inform users of the product for the field of use defined on the cover page (art. 8 of the Rules and Regulations of the ATT).

4.1 DESCRIPTION

4.1.1 Identity

Commercial designation of the product : COPANEL


Holder: CONNAN


Built-up cladding system based on fibre-cement panels fixed to a vertical frame consisting of wooden rafters or steel sections attached to the structural works by adjustable right angle brackets or fixed directly to the support.

A ventilated air gap is provided between the inner face of the panels and the outer surface of the load-bearing wall or the thermal insulation, if any.

The COPANEL panels, formulated without asbestos, are manufactured by SIL Lastre SPA Italy in its Verolanueva (Brescia) factory from a homogeneous mixture of cement, sand and cellulose.

The panels are compressed before drying and then stored for 10 hours in a warm, humid place. They are then autoclaved in steam at high pressure and high temperature to achieve stability and final maturation. After this process the panels are cut and sanded. The COPANEL cladding is sanded and adjusted and given a water-repellent treatment or an anti-graffiti paint or a coloured paint at the factory.

The manufacturer taking advantage of this Technical Assessment of Transition must be able to produce a certificate  issued by the CSTB, attesting that the product complies with the characteristics described in the certification reference document after evaluation according to the control methods defined in this reference document.

Products with a valid certificate can be identified by the presence of the  logo, followed by the number identifying the factory and a number identifying the product.

4.1.2 Area of use

- Installation on flat and vertical walls, new or existing, made of masonry elements (in accordance with NF (French Law) DTU (Unified Technical Document) 20.1) or concrete (in accordance with NF DTU 23.1) located on floors and ground floors (see §4.4).
- Can also be used for the underside cladding of flat, horizontal concrete supports, new or already in service, inaccessible (more than 3m from the ground), and without a playground nearby, in accordance with the provisions described in § 4.5 of the Technical Appendix.
- Installation on a façade with a negative slope of 0 to 90° on a concrete support, in accordance with the special provisions defined in § 4.5 of the Technical Appendix;
- Exposure to wind corresponding to an admissible pressure or depression under normal wind conditions (according to the modified NV (Snow and Wind) 65 Rules) of maximum value (expressed in Pascals) given in *tables 4 to 7* at the end of the Technical Appendix;
- Possible installation on timber frame constructions (TFC) in accordance with the NF DTU 31.2 of 2019 and on a cross laminated timber (CLT) panel support wall, is limited to:
 - an open joint installation:
 - maximum height 10 m (+ gable point) in wind zones 1, 2, 3 in situation a, b, c,
 - maximum height 6 m (+ gable point) in wind zone 4 and/or in situation d,
 - In closed joint installation with specific treatment of the watertightness returns at the openings:
 - maximum height of 18m (+ gable point) in situations a, b and c,
 - maximum height 10m (+ gable point) in wind zone 4 or in situation d,

in compliance with the requirements of § 4.6 of the Technical Appendix and figures 18 to 27.

Situations a, b, c and d are defined in NF DTU 20.1 P3.

The rain barrier is cut every 6m to allow for the drainage of surface water run-off to the outside.

- The COPANEL wood and metal framework built-up cladding system can be used in seismic zones and buildings according to the table below (according to the decree of 22 October 2010 and its amendments):

Seismicity zones	Categories of importance of the buildings			
	I	II	III	IV
1	✗	✗	✗	✗
2	✗	✗	X ^①	X
3	✗	X ^②	X	X
4	✗	X ^②	X	X
✗	Installation is permitted without any special provisions depending on the accepted area of use.			
X	Authorised installation on concrete supports in flat, vertical and sloping walls and on the underside or on flat vertical TFC walls of conforming to NF DTU 31.2 of 2019 and CLT, according to the provisions described in paragraphs §4.9 and §4.10.			
①	Installation authorised without any particular provision according to the accepted field of use for schools (belonging to importance category III) fulfilling the conditions of paragraph 1.1 ¹ of the revised Paraseismic Construction Rules PS-MI 89 and 92 (NF P06-014).			
②	Installation authorised without any particular provision according to the accepted field of use for buildings of importance category II fulfilling the conditions of paragraph 1.1 ¹ of the revised Paraseismic Construction Rules PS-MI 89 and 92 (NF P06-014).			

- For structural heights ≤ 3.5 m, the installation of the COPANEL wood and metal framework built-up cladding system in seismic zones is authorised without any special provisions, regardless of the importance category of the building and the seismic zone (see ENS Guide).

4.1.3 Safety in case of fire

The checks to be carried out (in particular with regard to the "C + D" rule, (C refers to the vertical distance between the top of the opening and the bottom of the opening on the upper level of a façade. D refers to the horizontal distance between the glazing plane and the bare surface of the fire-resistant obstacle i.e a projecting element separating the walls on either side of the floor) even for buildings in service) must take into account the following characteristics:

- Fire classification: A2-s1, d0 according to the test provisions report n° RA 130154 of 12 July 2013:
- Fuel mass (MJ/m²):

Panel thickness (mm)	8	10	12
GCV (MJ/m ²)	16	20	24

(value based on GCV according to report no. RA13-0154)

The "Fire protection of concrete or masonry façades covered with external thermal insulation systems through ventilated built-up cladding" guide should be taken into account when applying paragraphs 5.2.1 and 5.4 of IT249 of 2010.

Compliance with this guide and with the fire reaction rating may lead to technical and architectural provisions, in order to comply with the fire regulations in force, which are not illustrated in the details of the Technical Appendix, in particular the overflowing flashing readings for ventilation recovery.

These provisions do not replace those referred to in this Transitional Technical Assessment for aspects not related to fire safety.

¹ Paragraph 1.1 of NF P06-014 describes its field of application

4.2 DESIGN SPECIFICATIONS

4.2.1 COPANEL Panels

Autoclaved, compressed, asbestos-free fibre-cement flat panels made from Portland cement, sand and reinforced with mineralised cellulose fibres. The mass pigmentation consists of mineral pigments.

The sanded base panel is factory-treated with water repellent (Copanel Hydro), anti-graffiti (Copanel anti-graffiti), or coloured, water repellent or anti-graffiti paint. (Copanel Colour).

The edges of panels with anti-graffiti treatment (Copanel anti-graffiti or anti-graffiti Colour range), cut on site, will be treated with Copanel, a two-component edge treatment product. The treatment of the edges will be done in one pass.

Dimensional characteristics

- The standard rectified production sizes are: 2500 x 1200mm; 3000 x 1200mm; 3050 x 1200mm; 2500 x 1220mm; 3000 x 1220mm; 3050 x 1220mm; 2500 x 1250mm; 3000 x 1250mm; 3050 x 1250mm
- Thicknesses: 8, 10, 12mm;
- Dimensional tolerances of standard manufacturing elements:
 - length: ± 2 mm,
 - width: ± 2 mm,
 - thickness: ± 0.2 mm.
- Dimensional tolerances on cut-to-size elements: ± 2.0 mm ;
- Squaring the panels: 2mm/m;
- Nominal surface weights:
 - 8mm: 14.4kg/m²,
 - 10mm: 18.0kg/m²,
 - 12mm: 21.6 kg/m².
- Colours of the standard elements: standard range of 12 colours with water-repellent treatment, 12 colours with transparent anti-graffiti paint, surface coloured paints according to RAL or NCS colour chart.

These colours are monitored by the CSTB on the basis of the internal production control system.

Other factory-validated colours and aspects may be proposed as part of the expansion of the current range on the basis of internal manufacturing monitoring and external monitoring by the CSTB.


Physical and mechanical properties

Bulk density:

The bulk density, defined in paragraph 5.4.2 of NF EN (European) rule 12467, has a nominal value of 1.60 g/cm³ (± 0.05 g/cm³).

Mechanical characteristics:

COPANEL panels meet the requirements of class 5 (category A) as defined in paragraph 5.4.4 of EN rule 12467.

The bending strength according to NF EN rule 12467 is certified  ≥ 24 MPa, class 5.

Water absorption for panels

- Water repellents (Copanel Hydro range): $9 \pm 3\%$;
- UV anti-graffiti (Copanel Antigrffiti range): $4 \pm 2\%$;
- Coloured paint (Copanel Color range): $3 \pm 2\%$.

Dimensional variation:

It complies with the specifications set out in paragraph 5.4.3 of NF EN rule 12467: maximum value 0.16%.

Waterproofing:

It complies with the specifications set out in paragraph 5.4.5 of NF EN rule 12467.

Hot water:

COPANEL panels comply with the specifications set out in paragraph 5.5.4 of NF EN rule 12467.

Immersion drying:

COPANEL panels comply with the specifications set out in paragraph 5.5.5 of NF EN rule 12467.

Freeze-thaw:

COPANEL panels comply with the specifications set out in paragraph 5.5.2 of NF EN rule 12467.

Heat-rain:

COPANEL panels comply with the specifications set out in paragraph 5.5.3 of NF EN rule 12467.

4.2.2 Fastenings

Wood screws

Screws in austenitic stainless steel, minimum class A2 with underhead washers, with lacquered head in accordance with the COPANEL colour scheme, with a domed cylindrical head of a diameter of 12mm, with minimum dimensions Ø 4,8 x 38mm for 8mm thick panels and Ø 4,8 x 60mm for 10 and 12mm thick panels in normal installation, with a characteristic_{CPK} value of at least 1460 N when removed from a wooden support at a depth of 26mm (e.g. ETANCO TORX PANEL screw 12mm Ø 4.8 x 38 or 60mm).

Rivets

N.E.-CEL aluminium rivet - stainless steel mandrel, minimum class A2, extra wide flange, with lacquered head in accordance with the COPANEL colour scheme, stainless steel expansion rod, dimensions Ø 4,8 X 16mm with diameter head 16mm, clamping capacity 10 to 12mm, for the fastening of cladding panels (The minimum characteristic pull-out _{PK} value according to NF rule P30-310 is at least equal to 1460 N (Example of rivets: code 276 963 from Etanco).

4.2.3 Frameworks

4.2.3.1 Timber frameworks

The components of the framework comply with the requirements of the *Cahier du CSTB* (CSTB Specifications) 3316-V2.

For installation with a right angle bracket

Rafter with a minimum thickness of 50mm, minimum visible width of 90mm at vertical joints between panels and 50mm at intermediate supports.

For installation directly on the support

Vertically fixed battens with a minimum thickness of 30mm and a minimum visible width of 90mm at the vertical joints between panels and 50mm at intermediate supports. The centre-to-centre distance of the fixings must not exceed 1m.

Plywood wedges certified NF exterior CTB-X with a maximum thickness of 10mm (with a drill diameter, in the wedge axis, equal to the diameter of the fastening + 5mm) will be fixed on the fastening dowel between the framework and the support.

4.2.3.2 Metal framework

The framework must comply with the provisions of the "General conditions for the design and implementation of metal framework and thermal insulation of built-up cladding systems covered by a Technical Notice" (*Cahier du CSTB* 3194-V2) and must be considered in a direct external atmosphere.

Steel framework (see fig. 30)

The steel framework of flanged design consists of:

- Hot-dip galvanised steel sections Z 275 minimum, thickness 15/10thmm, sections in:
 - Omega profile for panel connection 87 x 30mm, weight 1.66kg/m,
 - Intermediate C profile 30 x 30mm, weight 1.00kg/m,
 - L profile for building edge 40 x 40mm, weight 0.91kg/m.

Aluminium framework (see fig. 31)

The freely expandable aluminium framework consists of vertical T or L profiles and fastening right angle brackets. The profiles shall comply with the following rules: NF A 50-411 and NF A 50-710.

- Width of the L profiles: 42mm (building edge and intermediate profile);
- Width of the T profiles: 110mm minimum front view (intermediate profile and at panel junctions).

Example of an aluminium framework system: FACALU from Etanco or equivalent.

The minimum thickness of the aluminium sections is set at 2mm for rivet installation.

Other aluminium frameworks complying with the requirements of *Cahier du CSTB 3194-V2* can be used, while respecting the space widths of the panels (see fig. 3).

Fastening right angle **brackets** (see fig. 4)

Adjustable right angle brackets in stamped S220 GD steel, hot-dip galvanised to at least Z275 according to NF EN 10326, type 100 or 150 depending on the thickness of the insulation with slider. The flange to be attached to the supporting structure has an oval hole.

4.2.4 Insulation

Insulation, ACERMI (Association for the Certification of Insulating Materials) certified, conforming to the requirements of *Cahier du CSTB 3316-V2* or *Cahier du CSTB 3194-V2*.

4.3 IMPLEMENTATION SPECIFICATIONS

4.3.1 Installation of thermal insulation and framework

4.3.1.1 Thermal insulation

The insulation shall be installed in accordance with the requirements of the documents:

- For installation on wood frameworks: "General rules for the design and implementation of wood framework and thermal insulation of built-up claddings covered by a Technical Notice" (*Cahier du CSTB 3316-V2*);
- For installation on metal framework: "General rules for the design and installation of metal frameworks and thermal insulation of built-up claddings covered by a Technical Notice" (*Cahier du CSTB (CSTB Specifications) 3194-V2*).

4.3.1.2 Timber framework

The installation of the wood frame shall comply with the requirements of the "General rules for the design and installation of wood frameworks and thermal insulation of built-up claddings covered by a Technical Notice" document in the *Cahier du CSTB 3316-V2*, reinforced by those below:

- The coplanarity of the studs shall be checked between adjacent studs with a maximum permissible gap of 2mm;
- Wooden rafters with a mechanical resistance corresponding at least to class C18 according to NF EN 338, with natural or conferred durability of use class 2 with protection band or 3b according to FD P 20-651;
- At the time of installation, the wooden rafters and battens should have a maximum target moisture content of 18%, with a maximum gap of 4% between two elements. The moisture content of the elements must be determined according to the method described in NF EN 13183-2 (with a pin-type moisture meter);
- The permissible resistance of the bracket to the vertical loads to be taken into account must be that corresponding to a deformation under a load equal to 3mm;
- The maximum centre-to-centre distance of the frameworks shall be 600mm (645mm on TFC & CLT).

4.3.1.3 Metal framework

The framework shall be of freely expandable design, in accordance with the requirements of *Cahiers du CSTB 3194-V2*, reinforced by the following requirement:

- The coplanarity of the studs must be checked between adjacent studs with a maximum permissible gap of 2mm;
- The permissible resistance of the bracket to the vertical loads to be taken into account must be that corresponding to a deformation under load equal to 3mm;
- The maximum centre-to-centre gaps between the frameworks shall be 600mm.

Mark the axes on the façade and mark the location of the fastening dowels.

The right angle brackets shall be chosen according to the thickness of the insulation used.

In the case of a freely expandable framework design, two types of function right angle brackets will be used, the point right angle brackets:

- Fixed;
- Sliding.

The vertical sections are fixed to the right angle brackets with self-drilling screws or rivets in accordance with the principles of the chosen complete installation system.

The framework must be subject, for each site, a calculation note drawn up by the installation company assisted, if necessary, by the proprietor, CONNAN.

4.3.1.4 Direct installation on the support

The rafters are fixed vertically to the support. The centre-to-centre distance between the rafters must not exceed 600mm.

The wooden rafters are fixed directly to the support and must be made coplanar with an acceptable gap of 2mm between adjacent rafters by using additional wedges of 100 x 100mm dimensions made of NF Extérieur CTB-X certified plywood with a maximum thickness of 10mm threaded onto the dowel and placed between the rafter and support.

4.3.2 Implementation

4.3.2.1 General installation principles

The installation of COPANEL panels on wood and metal frameworks requires a preliminary layout to limit losses, define the panel formats and determine the fastening conditions. There is no particular method of installation.

COPANEL panels can be installed horizontally or vertically.

CONNAN can supply panels cut in the factory to the dimensions defined by the layout. The panel cutting adjustments and drilling with a suitable tool are carried out on site.

The installation of the COPANEL system includes the following operations:

- Tracing and marking;
- Installation of the framework;
- Installation of insulation;
- Fixing the panels to the framework;
- Treatment of singular points.

4.3.2.2 Fitting on a timber framework

The rafters are fixed with 3 wood screws of minimum 4 x 40 mm dimensions, 2 of which are arranged diagonally.

The COPANEL panels are fixed with stainless steel screws Ø 4.8 x 38mm with a 12mm wide head (see § 4.2.2) on a framework made of wooden rafters with a maximum centre-to-centre distance of 600mm.

COPANEL panels are pre-drilled on site. The drilling diameter of the COPANEL panels is 8mm, except at one point, called the fixed point, where it is only 5mm. This point, located in the central area of the panel, ensures a good positioning of the panel and a distribution of the dimensional variations.

The distances of the fastenings at the vertical edges of the panel are at a minimum of 30mm and a maximum of 50mm, a minimum of 70mm and a maximum of 100mm at the horizontal edges of the panel (see figure 2).

4.3.2.3 Installation on metal framework

COPANEL panels are fixed to metal or aluminium frameworks by riveting.

COPANEL panels are pre-drilled on site. The drilling diameter of the COPANEL panels is 8mm, except at one point, called the fixed point, where it is only 5mm. This point, located in the central area of the panel, ensures a good positioning of the panel and a distribution of the dimensional variations.

The distances of the fastenings at the vertical edges of the panel are at a minimum of 30mm and a maximum of 50mm, a minimum of 70mm and a maximum of 100mm at the horizontal edges of the panel (see figure 2).

4.3.2.4 Fastening

Screws

Tightening of the sliding points must be limited to allow free expansion of the COPANEL panels at these points.

To do this, screwing tools with tightening torques and depth stops shall be used to control the tightening of the fastening screws (disconnection of the screw-panel contacts). In addition, care should be taken to ensure that the screws are positioned correctly in the centre of the pre-drilled holes.

The COPANEL panels are fixed with screws from the fixed point, drilled at Ø 5mm, to the peripheral sliding points, drilled at Ø 8mm.

Rivet

Tightening of the sliding points must be limited to allow free expansion of the COPANEL panels at these points.

To do this, use a riveting attachment, which is a mechanical installation accessory designed for fastening façade panels to ensure the necessary allowance for the expansion of the materials (example of a riveting attachment: special tip for façade panels from Etanco).

On steel framework: The centring drill will be used to drill the COPANEL panel in Ø 8mm for the sliding points and in Ø 5mm for the fixed point.

On aluminium framework: The centring drill will be used to drill the COPANEL panel in Ø 8mm for the sliding points and in Ø 5mm for the fixed point.

The COPANEL panels are riveted from the fixed point to the peripheral sliding points.

4.3.2.5 Treatment of joints

Horizontal and vertical joints are normally provided with a maximum width of 6 to 8 mm. They can be left open or sealed with PVC or aluminium profiles that are fitted or clamped behind the bottom panel. In the case of widths greater than 8mm, the horizontal joints must be sealed with a profile of suitable dimensions, while limiting the opening of the joints to a maximum of 8mm.

4.3.2.6 Ventilation of the air gap

The forward positioning of the vertical profiles must provide, in addition to the thickness reserved for the insulation, an air gap with a thickness of at least 20mm, this thickness being counted from the external bare surface of the insulation to the external bare surface of the vertical framework plane.

Independently of the communication with the exterior at the joints between plates or intermediate flashings, the ventilation of the air gap is ensured by openings at the feet and top of the structure provided for this purpose and with a sufficient cross-sectional area in accordance with the *Cahier du CSTB 3194-V2*.

4.3.2.7 Single points

Figures 8 to 57 are a catalogue of examples of how to deal with single points.

4.4 AREAS EXPOSED TO IMPACT RISKS

According to *Cahiers du CSTB 3546-V2* and *3534*, the Copanel Wood and Metal Framework impact risk processes correspond to exposure class Q4 in easily replaceable walls.

4.5 INSTALLATION IN WALLS INCLINED FROM 15° TO 90° AND CLADDING OF THE UNDERSIDE (SEE FIG. 51)

The right angle brackets should be doubled and placed face to face to avoid asymmetry.

The centre-to-centre distance between the frameworks shall be limited to a maximum of 400mm.

Spans between panel fastenings are limited to 400mm in both directions.

The distance of the fastenings to the edges of the panels is 70mm.

The installation is done without insulation.

The joint between the panels is 8mm.

The low pressure wind resistance shall be recalculated from tables 4 and 6 taking into account the dead weight of the COPANEL panels.

Figures 51 and 52 are examples of the installation of underface cladding.

4.6 INSTALLATION ON TIMBER FRAMEWORK CONSTRUCTION (TFC) AND CROSS LAMINATED TIMBER (CLT)

4.6.1 General principles of implementation

The supporting wall complies with the NF DTU 31.2 standard of 2019 (TFC) or is covered by a Technical Opinion of the Specialised Group n°3 (CLT).

The fixing of the cladding is in accordance with § 4.3.2.2 of the Technical Appendix.

The COPANEL panels are fixed to an added on framework made up of battens with a maximum distance between centres of 645mm located at the level of the TFC studs, in order to leave an air gap of at least 20mm between the wall and the external cladding.

The panels are supported on battens with a visible width of 90mm at the edge and 45mm at the running part.

The framework is split at each floor.

The bridging of joints between successive studs by COPANEL panels is excluded.

A rain barrier in accordance with NF DTU 31.2 shall be placed on the outside of the TFC wall, under the vertical battens.

In situations a, b and c, the bracing panels of the TFC can be positioned on the inside or outside of the wall.

In situation d, the bracing panels of the TFC must be positioned on the outside of the wall.

The rain barrier is cut every 6m to allow for the drainage of surface water run-off to the outside.

Under no circumstances should the rain screen be placed against the COPANEL panel (minimum air gap of 20mm).

4.6.2 Special provisions

Special implementation provisions to be made in the following cases (see table 8):

- From 10 to 18m high (+ gable point) in situations a, b and c;
- From 6 to 10m high (+ gable point) in situation d,

are:

- joints closed with metal "support" or shaped sections as shown in figure 5,
- implementation of preformed metal wing flashings extended beyond the vertical plane of the cladding, implementation of preformed metal lintel profiles extended 40mm beyond the reveals,
- implementation of pre-formed metal sections on the reveals.

Figures 20 to 27 show the principles for the treatment of openings according to the type of installation of the joinery (inside tunnel or outside tunnel).

4.6.3 Design of a CLT wall

Depending on the position of the insulation, inside or outside, the elements making up the complete wall and their order of installation are given below:

4.6.3.1 Internal thermal insulation

- Plaster panel insulation lining according to NF DTU 25.41;
- Technical void;
- Vapour barrier with $S_d \geq 90\text{m}$ (unless otherwise specified in the Technical Opinion of the CLT process, issued by GS3);
- Interior insulation;
- CLT wall;
- Rain barrier;
- Framework fixed to the CLT wall (without right angle bracket) according to §4.6.1 or §4.6.2;
- Ventilated airflow to the outside;
- Cladding.

4.6.3.2 External thermal insulation

- CLT wall;
- Temporary protection of the CLT wall prior to the installation of the insulation, as defined in the Technical Opinion of GS3;
- External insulation (WS and semi-rigid mineral wool) supported in accordance with §11.3.5-a) of NF DTU 31.2 of 2019 for built-up cladding systems with a ventilated air gap;
- Framing fixed to the CLT wall (without right angle bracket) according to §4.6.1 or §4.6.2;
- Ventilated airflow to the outside;
- Cladding.

Concerning interim protection:

- Either it is removed before the external thermal insulation is installed;
- Or it is conserved, in which case:
 - Either it is a rain barrier with an $S_d \leq 0.18\text{m}$;
 - Or it is unknown, then the thermal resistance of the CLT (see Technical Opinion of Specialised Group 3) must be less than or equal to one third of the overall thermal resistance of the complete wall.

4.7 SUPPLY - TECHNICAL ASSISTANCE

CONNAN does not carry out the installation works itself; it distributes and delivers the COPANEL elements of the wood and metal/aluminium system to installation companies.

All other elements are supplied directly by the installer, in accordance with the recommendations of this Technical Appendix. Copanel, a two-component edge treatment product, is offered by CONNAN for on-site anti-graffiti treatments.

CONNAN can provide technical assistance at the request of the installer.

4.8 MAINTENANCE AND REPAIR

The appearance of the COPANEL panels is preserved over time without any maintenance other than periodic washing with clear water, or in case of heavy soiling, additional washing with a detergent wetting agent followed by a rinse with clear water.

4.9 INSTALLATION OF COPANEL BUILT-UP CLADDING ON WOOD FRAMEWORKS IN SEISMIC ZONES AREA OF USE

4.9.1 Area of use

The COPANEL process for thicknesses of 8, 10 and 12mm, can be used on vertical flat walls, in areas and buildings according to the *table* below (according to the decrees of 22 October 2010 and their amendments):

Seismicity zones	Categories of importance of the buildings			
	I	II	III	IV
1	X	X	X	X
2	X	X	X ^①	X
3	X	X ^②	X	X
4	X	X ^②	X	X
X	Authorised installation on concrete supports in flat and vertical and sloping walls and in the underside or on flat vertical TFC walls in accordance with NF DTU 31.2 of 2019 and CLT, according to the provisions described in this paragraph,			
X	Installation is permitted without any special provisions depending on the accepted area of use,			
①	Installation authorised without any particular provision according to the accepted area of use for schools (belonging to importance category III) fulfilling the conditions of paragraph 1.1 ² of the revised Parasismic Construction Rules PS-MI 89 revised 92 (NF P06-014),			
②	Installation authorised without any particular provision according to the accepted area of use for buildings of importance category II fulfilling the conditions of paragraph 1.1 ² of the revised Parasismic Construction Rules PS-MI 89 and 92 (NF P06-014).			

For structural heights $\leq 3.5\text{m}$, the installation of the COPANEL built-up cladding system in seismic zones is authorised without any special provisions, regardless of the importance category of the building and the seismic zone (see ENS Guide).

4.9.2 Technical Assistance

CONNAN does not carry out the installation works itself.

The installation is carried out by a company specialised in external insulation to which CONNAN provides technical assistance on request.

4.9.3 Requirements

4.9.3.1 **Support**

The support for the built-up cladding system is made of shuttered concrete in accordance with DTU 23.1 or TFC walls in accordance with NF DTU 31.2 of 2019 and Eurocode 8-P1 or on a CLT panel support wall.

4.9.3.2 **Dowels for fastening to the support**

Fastening to the concrete structural works is carried out with CE marked metal dowels based on an ETA or ETE according to ETAG 001 - Parts 2 to 5 (accepted as EAD) with performance category C1 assessed according to its Appendix E for all seismic zones and all categories of importance of buildings requiring a particular justification.

Galvanised steel dowels can be used in protected, rural, unpolluted, urban, industrial, normal or severe outdoor environments when protected by insulation.

For other environments, A4 stainless steel dowels must be used.

These metal dowels must withstand the stresses given in *table 1* when the rafters are installed with right angle brackets and in *table 2* when they are against the support

Example of dowels meeting the stresses of *Table 1*: FM753 CRACK Ø 10 from Friuldsider.

² Paragraph 1.1 of NF P06-014 describes its field of application

Example of a screw bolt meeting the stresses of Table 2: TH 13/SH Ø 7 mm screw bolt from Etanco.

4.9.3.3 Direct installation of the rafters to the concrete support

The wooden rafters are fixed directly to the support and must be made coplanar with an acceptable gap of 2mm between adjacent rafters by using additional wedges of 100 x 100mm dimensions made of NF Extérieur CTB-X certified plywood with a maximum thickness of 10mm threaded onto the dowel and placed between the rafter and support.

4.9.3.4 Fastening of the rafters to the concrete support by means of right angle brackets

- ETANCO's ISOLCO 80 to 240mm right angle brackets are installed in a staggered pattern with a maximum spacing of 1m;
- The right angle brackets are fixed to the support with an FM 753 CRACK Ø 10 dowel from Friulsider under ETA 09/0056.

4.9.3.5 Rafter fastenings on COB and TFC

On walls complying with DTU 31.2, the rafters are fastened with coachbolts.

These coach bolts must withstand the stresses given in *table 2*.

Example of a coach bolt: TH 13/SH Ø 7mm screw bolt from Etanco.

4.9.3.6 Wooden framework

The wood framework complies with the requirements of *CSTB 3316-V2*, reinforced by the requirements below:

- At the time of installation, the wooden rafters and battens should have a maximum target moisture content of 18%, with a maximum gap of 4% between two elements. The moisture content of the elements must be determined according to the method described in NF EN 13183-2 (with a pin-type moisture meter);
- The rafters are split at each floor of the structure;
- The maximum centre-to-centre gap of the rafters is 600mm;
- Their cross-section area is at least 90mm for the junctions between panels and 50mm for the intermediate ones;;
- On TFC and CLT, the rafters have a minimum thickness of 50mm and a maximum spacing of 645mm.

4.9.3.7 Cladding elements

The fastening of the cladding elements is in accordance with the Technical Appendix.

4.9.3.8 Singular points

Figures 53 to 54 are examples of solutions.

Tables of seismic stresses


Table 1 - Tensile and shear stresses applied to a dowel for a flanged timber framework installation with 3m high studs spaced 600mm apart and fixed with 240mm long staggered right angle brackets spaced 1m apart


Timber framework	Seismicity zones	Plan perpendicular to the façade			Plan parallel to the façade		
		Categories of importance of the buildings			Categories of importance of the buildings		
		II	III	IV	II	III	IV
Tensile stresses (N)	2		5134	5211		5852	6048
	3	5278	5399	5520	6217	6526	6835
	4	5553	5729	5905	6919	7368	7818
Shear stresses (V)	2		187	187		203	209
	3	187	187	187	214	225	237
	4	187	187	187	241	261	283

 Areas without parasismic requirements

Table 2 - Tensile and shear stresses applied to a dowel for direct installation, with 3m high studs spaced 600mm apart (645mm on TFC and CLT)

Direct fastening	Seismicity zones	Plan perpendicular to the façade			Plan parallel to the façade		
		Categories of importance of the buildings			Categories of importance of the buildings		
		II	III	IV	II	III	IV
Traction stresses (N)	2		94	109		-	-
	3	123	147	172	-	-	-
	4	178	214	249	-	-	-
Shear stresses (V)	2		221	221		240	246
	3	221	221	221	252	265	279
	4	221	221	221	284	307	333

 Areas without parasismic requirements

 - Non-determining values for fastenings

4.10 INSTALLATION OF COPANEL BUILT-UP CLADDING ON ALUMINIUM FRAMEWORKS IN SEISMIC ZONES

4.10.1 Area of use

The Copanel Wood and Metal Framework process for thicknesses of 8,10 and 12mm can be used on vertical flat walls, in areas and buildings according to the *table* below (according to the decrees of 22 October 2010 and its amendments):

Seismicity zones	Categories of importance of the buildings			
	I	II	III	IV
1	X	X	X	X
2	X	X	X ^①	X
3	X	X ^②	X	X
4	X	X ^②	X	X
X	Authorised installation on concrete support on flat, vertical or sloping walls and on the underside of the wall, in accordance with the provisions described in this paragraph,			
X	Installation is permitted without any special provisions depending on the accepted area of use,			
①	Installation authorised without any particular provision according to the area of use accepted for schools (belonging to importance category III) fulfilling the conditions of paragraph 1.1 ⁽³⁾ of the revised Parasismic Construction Rules PS-MI 89 92 (NF P06-014),			
②	Installation authorised without any particular provision according to the accepted area of use for buildings of importance category II fulfilling the conditions of paragraph 1.1 ⁽³⁾ of the revised Parasismic Construction Rules PS-MI 89 92 (NF P06-014).			

For structural heights ≤ 3.5 m, the installation of the COPANEL wood and metal framework built-up cladding system in seismic zones is authorised without any special provisions, regardless of the importance category of the building and the seismic zone (see ENS Guide).

4.10.2 Technical Assistance

CONNAN does not carry out the installation works itself.

The installation is carried out by a company specialised in external insulation to which CONNAN provides technical assistance on request.

4.10.3 Requirements

4.10.3.1 Support

The support for the built-up cladding system is made of shuttered concrete in accordance with NF DTU 23.1 and Eurocode 8.

4.10.3.2 Fastenings

Fastening to the concrete structural works is carried out with CE marked metal dowels based on an ETA or ETE according to ETAG 001 - Parts 2 to 5 (accepted as EAD) with performance category C1 assessed according to its Appendix E for all seismic zones and all categories of importance of buildings requiring a particular justification.

Galvanised steel dowels can be used in protected, rural, unpolluted, urban, industrial, normal or severe outdoor environments when protected by insulation.

For other environments, A4 stainless steel dowels must be used.

These metal dowels must withstand the stresses given in *table 3*.

Example of dowels meeting the stresses of *Table 3*: BARACO FM 753 CRACK Ø 10 from FRIULSIDER.

4.10.3.3 Fastening of the studs to the concrete support with right angle brackets

- Etanco's ISOLALU LR 80 to 240mm right angle brackets are installed in a staggered pattern with a maximum spacing of 1m;

⁽³⁾ Paragraph 1.1 of NF P06-014 describes its field of application

- The studs are connected to the right angle brackets with an FM 753 CRACK Ø 10 dowel from Friulsider under ATE 09/0056.

4.10.3.4 Metal framework

The freely expandable aluminium framework complies with the requirements of *Cahier du CSTB 3194-V2* and paragraph 4.2.3 of the Technical Appendix.

- Vertical aluminium sections FACALU 50/42, thickness 2.5mm from Etanco;
- The maximum centre-to-centre gap of the sections is 600mm;
- The studs are split at each floor.

4.10.3.5 Cladding elements

The fastening of the cladding elements is in accordance with § 4.2.2 of the Technical Appendix.

4.10.3.6 Singular points

Figures 56 and 57 are examples of solutions.

Table of seismic stresses

Table 3 - Tensile and shear stresses applied to a dowel for installation on a freely expandable aluminium framework, with 3m high dowels spaced 600mm apart and fixed with 150mm high fastening brackets for the fixed point and 80mm high for the sliding points and 240mm long dowels staggered and spaced 1m apart.

		Fixed point					
		Plan perpendicular to the façade			Plan parallel to the façade		
		Classes of importance of the buildings			Classes of importance of the buildings		
Seismicity zones		II	III	IV	II	III	IV
Tensile stress (N)	2		3797	3833		4834	5043
	3	3864	3921	3977	5222	5551	5879
	4	3993	4075	4157	5968	6446	6923
Shear stress (V)	2		412	412		418	420
	3	412	412	412	422	427	432
	4	412	412	412	434	443	454

		Sliding point					
		Plan perpendicular to the façade			Plan parallel to the façade		
		Classes of importance of the buildings			Classes of importance of the buildings		
Seismicity zones		II	III	IV	II	III	IV
Tensile stress (N)	2		216	252		1253	1462
	3	283	340	396	1641	1970	2298
	4	412	494	576	2388	2865	3343
Shear stress (V)	2		-	-		72	84
	3	-	-	-	94	113	132
	4	-	-	-	137	165	192

	Areas without parasismic requirements
—	Non-determining values for fastenings

Technical Appendix Tables

Table 4 - Permissible wind loads with 8 and 10mm thick panels and centre-to-centre gap between 400mm studs

Arrangement of fastenings	Centre-to-centre gaps (mm) of the fastenings along the studs (V)								
	200	250	300	350	400	450	500	550	600 (645mm on TFC & CLT)
V x H	Permissible values in pascals (Pa)								
2 x 2	3211	2799	2481	2228	2022	1850	1706	1582	1475
3 x 2	5318	4636	4109	3690	3348	3064	2825	2367	1823
2 x 3	7694	6155	5129	4396	3847	3419	3077	2798	2565
3 x 3	4281	3425	2854	2446	2141	1903	1712	1557	1427

Table 5 - Permissible wind loads with 8 and 10mm thick panels and centre-to-centre gap between 600mm studs

Arrangement of fastenings	Centre-to-centre gaps (mm) of the fastenings along the studs (V)								
	200	250	300	350	400	450	500	550	600 (645mm on TFC & CLT)
V x H	Permissible values in pascals (Pa)								
2 x 2	1676	1461	1295	1163	1055	966	890	826	770
3 x 2	1557	1358	1203	1081	981	897	827	767	716
2 x 3	2371	1897	1581	1355	1186	1054	948	862	790
3 x 3	2079	1663	1386	1188	1039	924	832	756	693

Table 6 - Permissible wind loads with 12mm thick plates and centre-to-centre gap between 400mm studs

Arrangement of fastenings	Centre-to-centre gaps (mm) of the fastenings along the studs (V)								
	200	250	300	350	400	450	500	550	600 (645mm on TFC & CLT)
V x H	Permissible values in pascals (Pa)								
2 x 2	9376	8174	7245	6506	5903	5403	4981	4620	4308
3 x 2	8168	7121	6312	5668	5143	4707	4339	4025	3753
2 x 3	11818	9454	7878	6753	5909	5252	4727	4297	3939
3 x 3	5563	4451	3709	3179	2782	2473	2225	2023	1854

Table 7 - Permissible wind loads with 12mm thick plates and centre-to-centre gap between 600mm studs

Arrangement of fastenings	Centre-to-centre gaps (mm) of the fastenings along the studs (V)								
	200	250	300	350	400	450	500	550	600 (645mm on TFC & CLT)
V x H	Permissible values in pascals (Pa)								
2 x 2	2508	2187	1938	1741	1579	1446	1333	1236	1153
3 x 2	2877	2508	2223	1997	1812	1658	1529	1418	1322
2 x 3	4380	3504	2920	2503	2190	1947	1752	1593	1460
3 x 3	3709	2967	2473	2119	1854	1648	1484	1349	1236

Table 8 - Installation on TFC and CLT - Provisions to be made for the treatment of joints between panels and at openings, depending on the cases

Installation height	Location/wind area	Treatment of joints between panels	Treatment at the opening level
≤ 6m (+ gable point)	Situation d or zone 4	Open or closed joints	Wooden joinery in accordance with NF DTU 36.5. Aluminium or PVC joinery with a Technical Opinion or DTA for installation on TFC and CLT. Cladding of the opening with a return of the cladding in the panelboard.
≤ 10m (+ gable point)	Situations a,b,c, or zones 1,2 or 3		
≤ 10m (+ gable point)	Situation d	Closed joints	Wooden joinery in accordance with NF DTU 36.5. Aluminium or PVC joinery under Technical Notice or DTA for installation on TFC and CLT. Joints closed with metal "support" or shaped sections. Implementation of preformed metal wing flashings extended beyond the vertical plane of the cladding. extended beyond the vertical plane of the cladding. Implementation of preformed metal lintel sections extended 40mm beyond the reveals Installation of pre-formed metal sections on the reveals.
>10 to ≤ 18m (+ gable point)	Situations a,b and c; zones 1 to 3		

Summary of figures

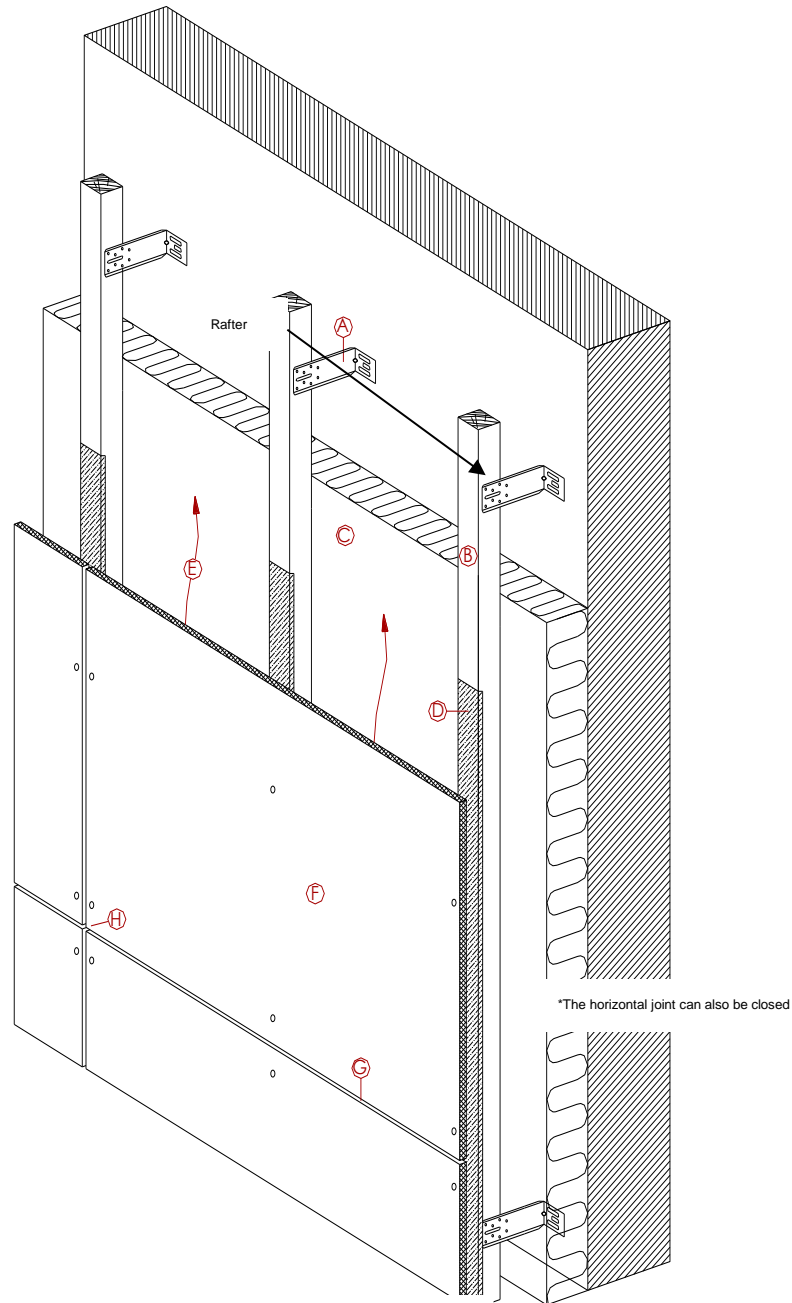
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Timber framework



- A- Battens
- B- Rafter
- C- Insulation
- D- Protection band
- E- Ventilation
- F- COPANEL cladding
- G- Open horizontal joint (can also be closed)
- H- Fastening

Figure 1 - Principle of COPANEL cladding on timber framework

(the panels can be fitted horizontally)

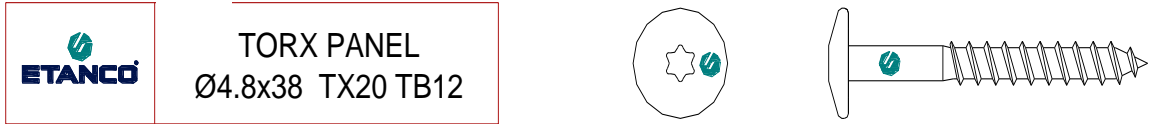


Figure 3 - ETANCO TORX PANEL screw, minimum class A2 4.8 x 38mm (Screw for fastening panels to rafters)

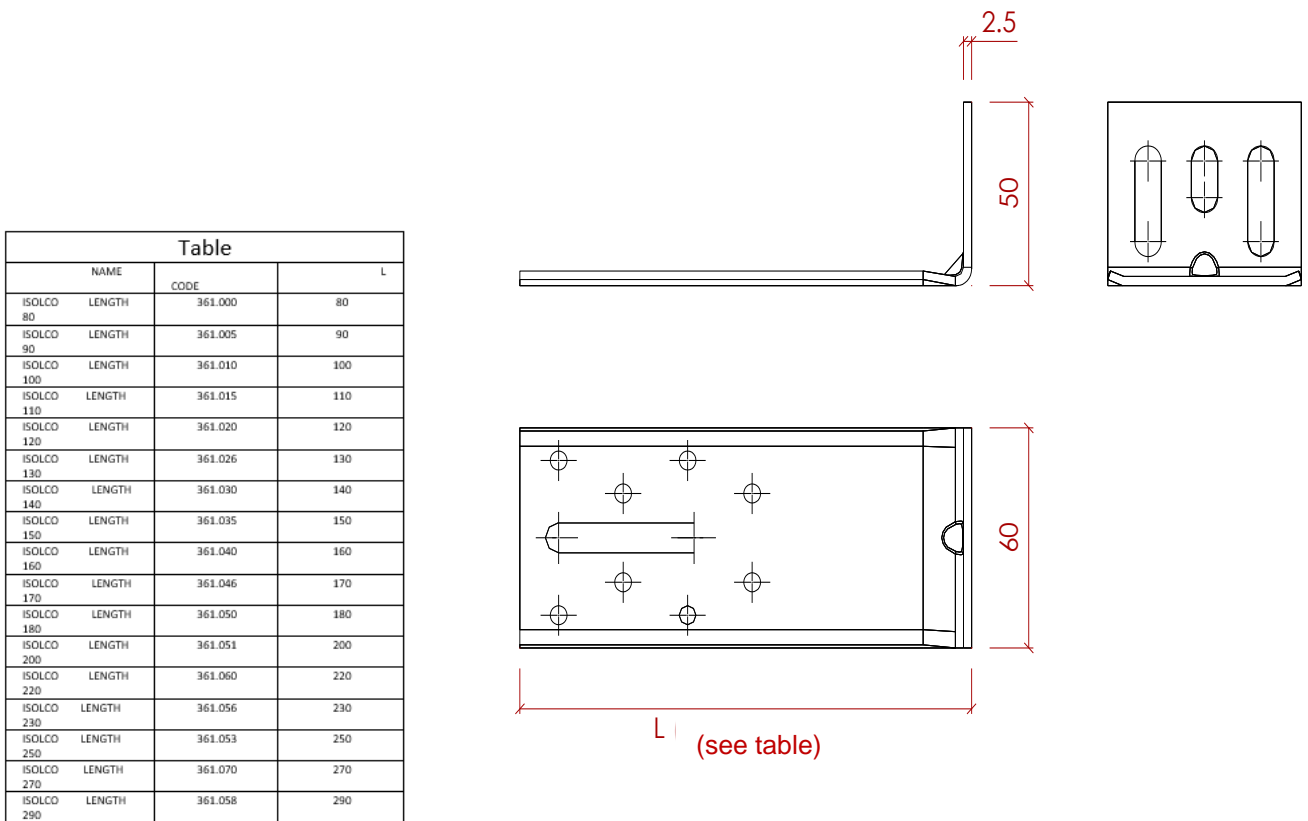
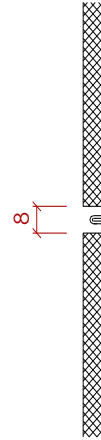
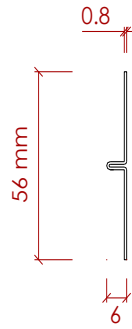
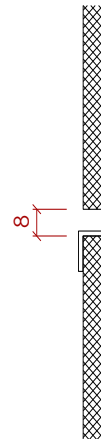
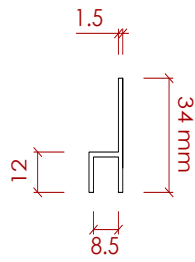


Figure 4 - Fastening bracket (ETANCO ISOLCO 3000P example)

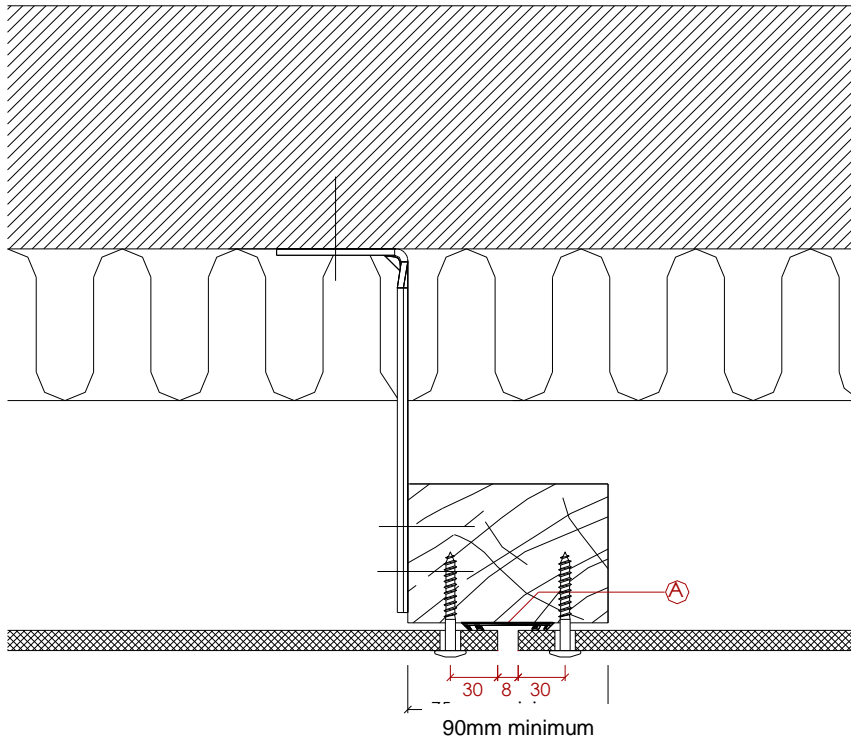
Aluminium Joint
Joint aluminium



Rigid PVC joint
Joint PVC rigide

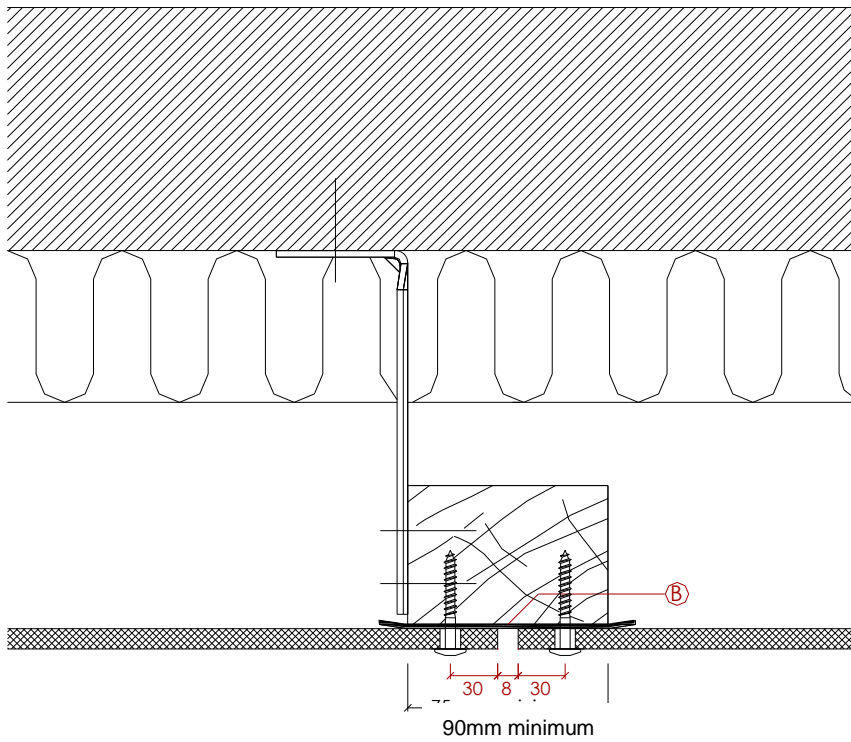


**Figure 5 -
Type of
horizontal
joint
sections**



A- Flexible lip seal

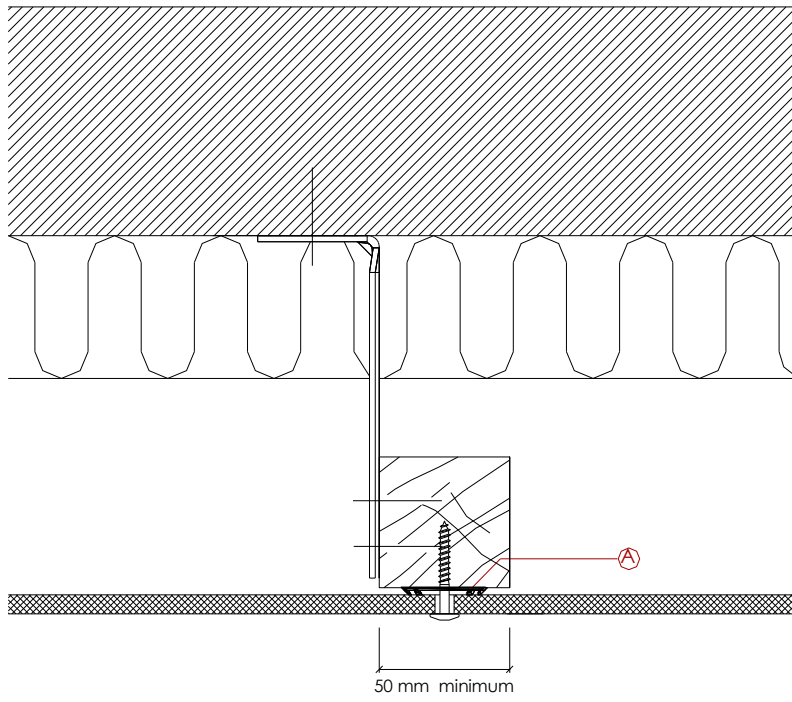
Fitting of closed horizontal joints



B- Protection band

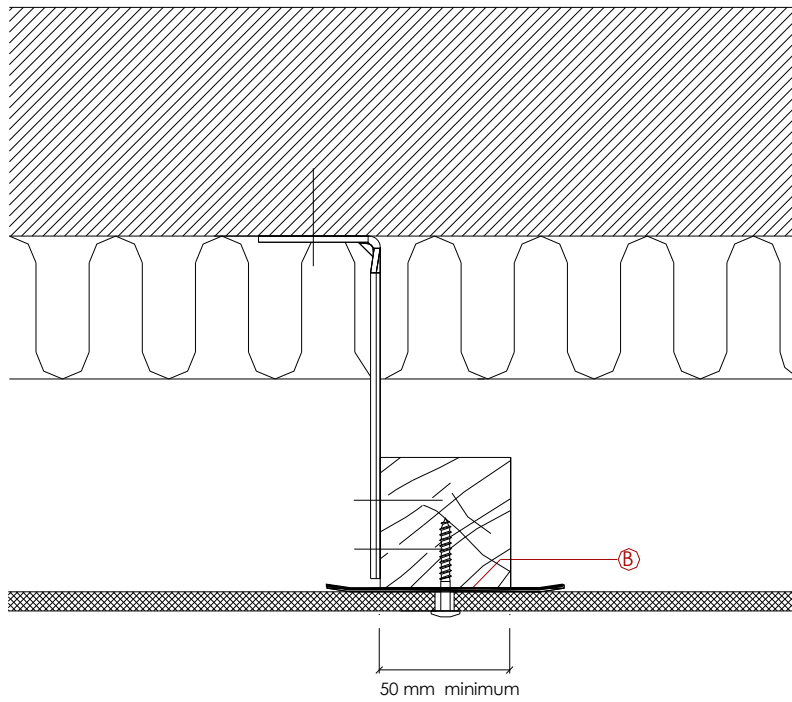
Fitting of open or closed horizontal joints

Figure 6 - Main rafter fastening



A- Flexible lip seal

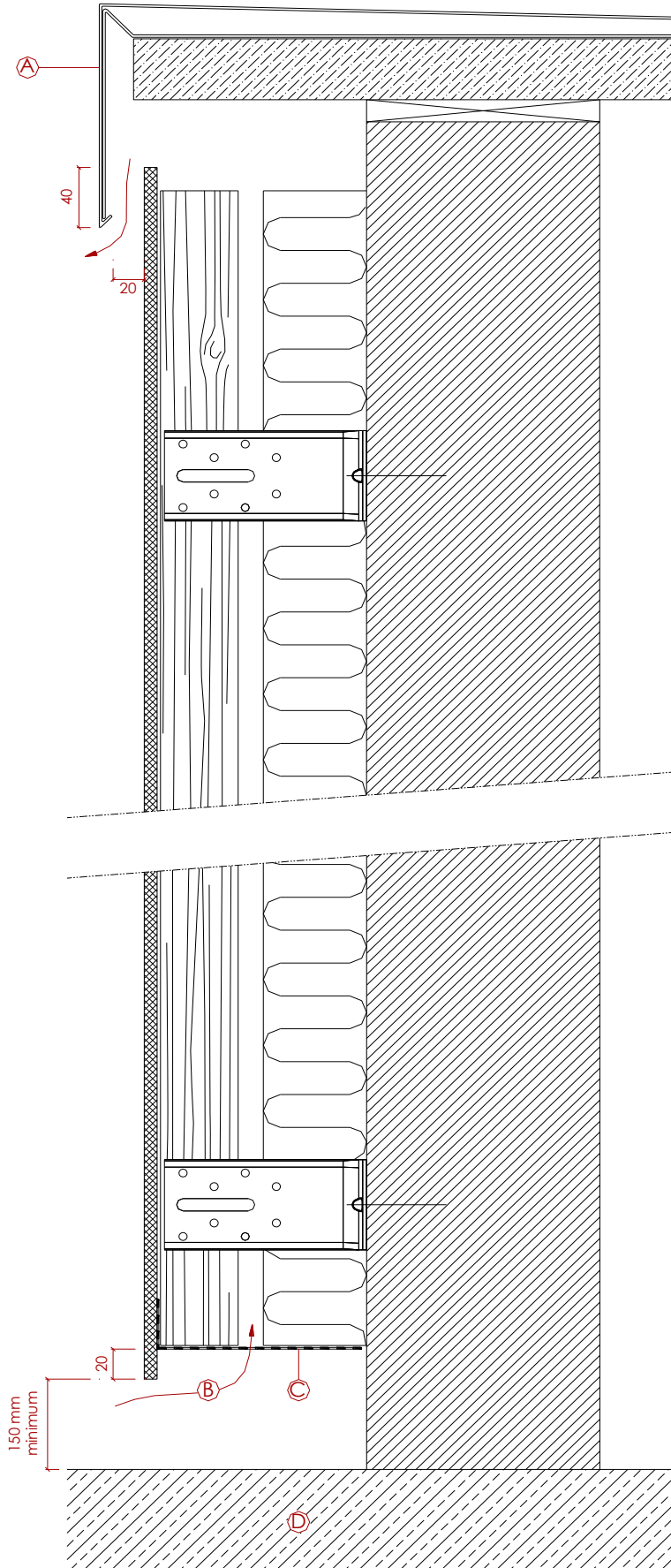
Fitting of closed horizontal joints



B- Protection band

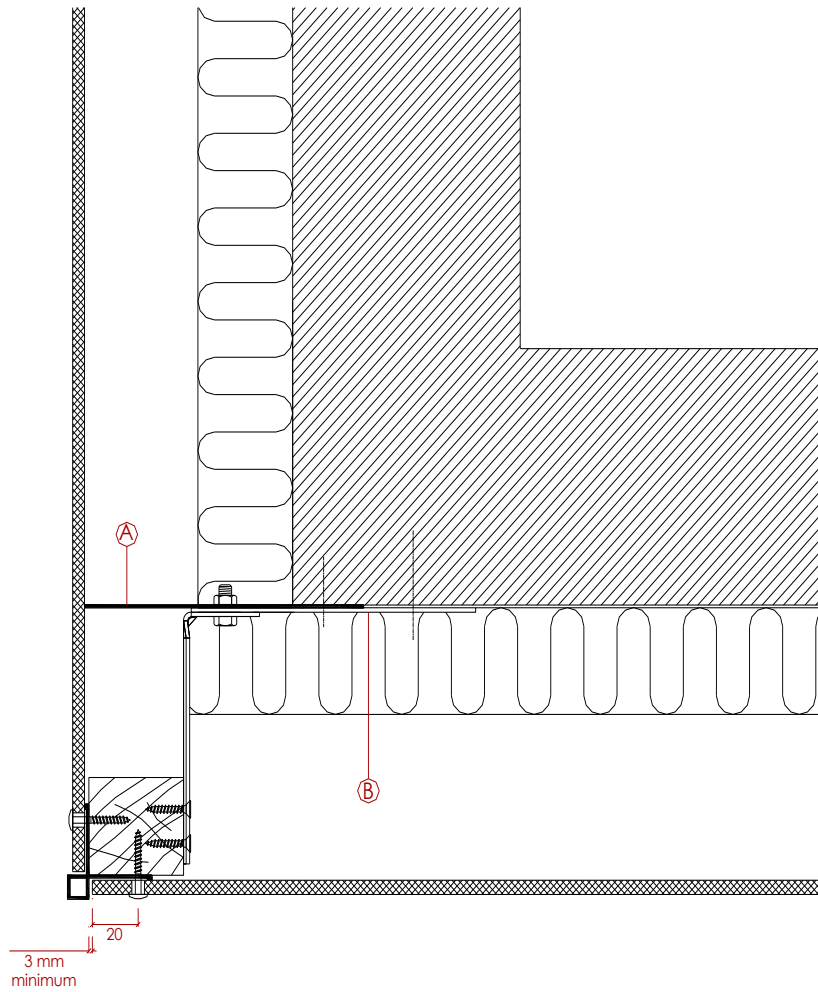
Fitting of open or closed horizontal joints

Figure 7 - Intermediate rafter fastening



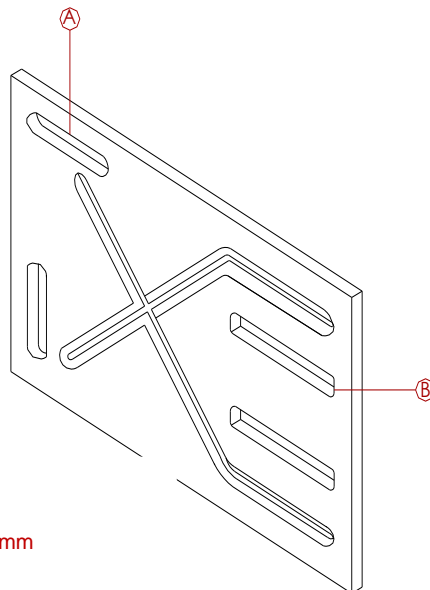
- A- Acroterion coping
- B- Ventilation
- C- Anti-rodent grid
- D- Slab

Figure 8 - High and low edges



A- Compartmentation metal plate
B- ETANCO angle plate

Figure 9 - Outgoing angle - Case of closed horizontal joints



ETANCO angle plate
Galvanised steel Z350
Dimensions: 120 x 180mm
Thickness: 25/10th

A- Light 8 x 60mm
B- Light 10 x 65mm

Figure 10 - ETANCO angle plate

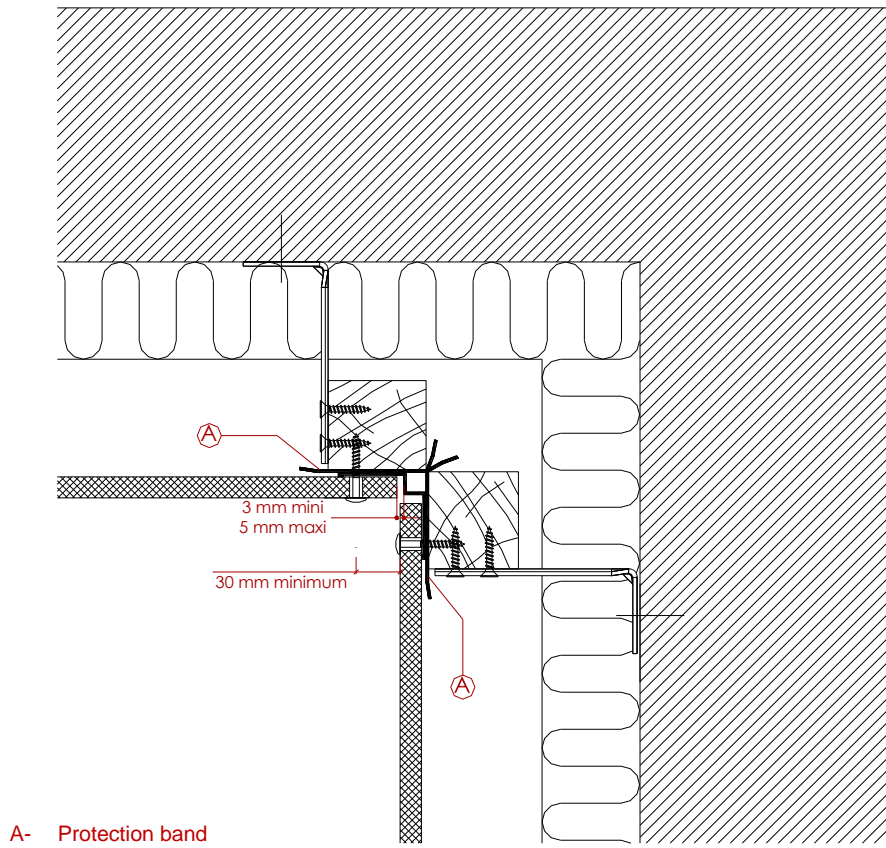


Figure 11 - Re-entrant angle (case with open horizontal joints)

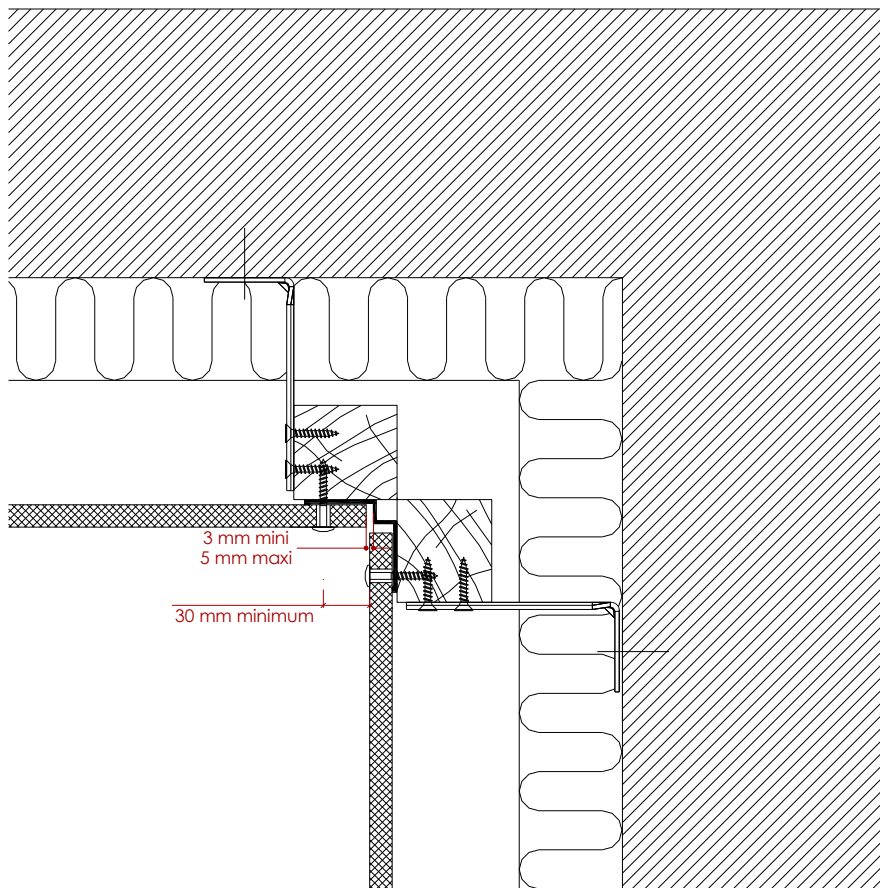


Figure 11bis - Re-entrant angle (case with closed horizontal joints)

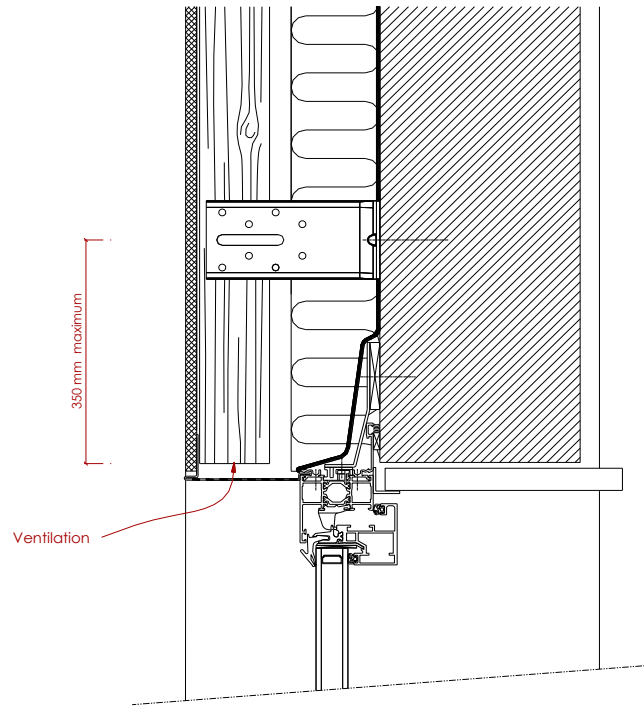


Figure 12 - Lintel

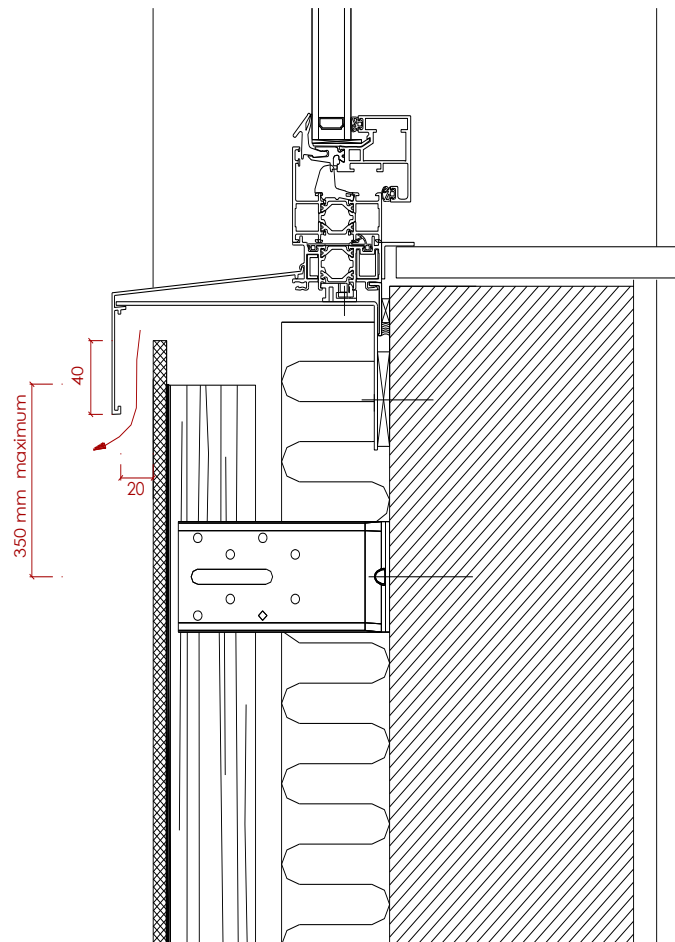


Figure 13 - Support

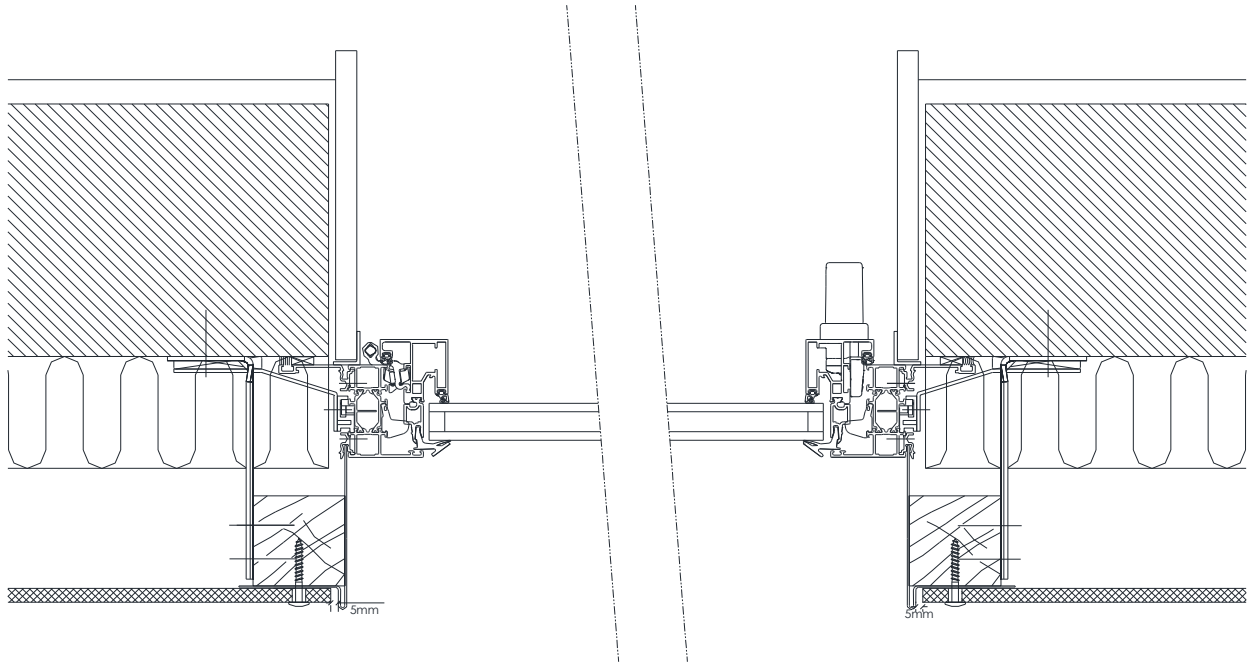


Figure 14 - Window framing (panelboard section)

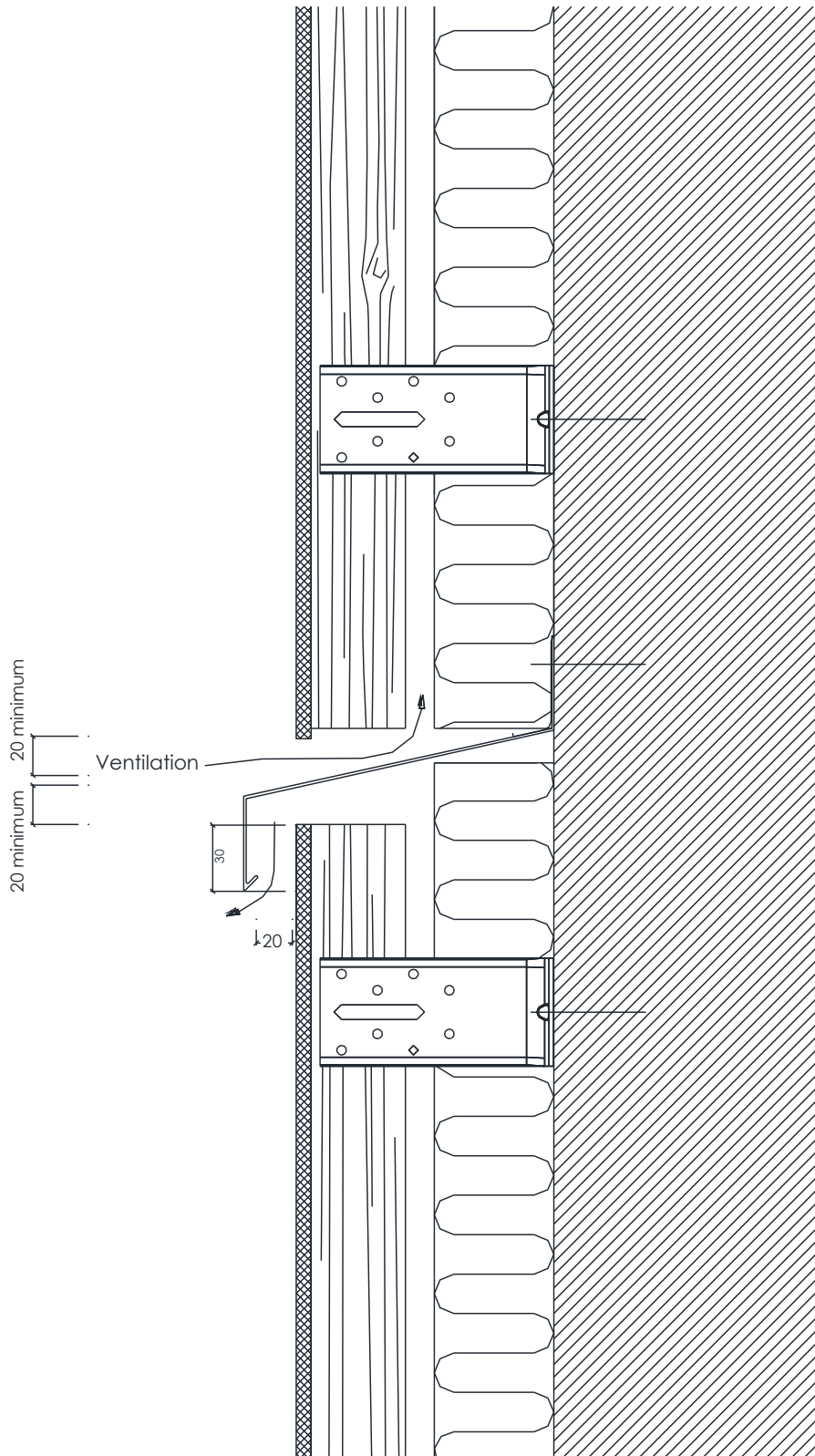


Figure 15 - Air gap splitting

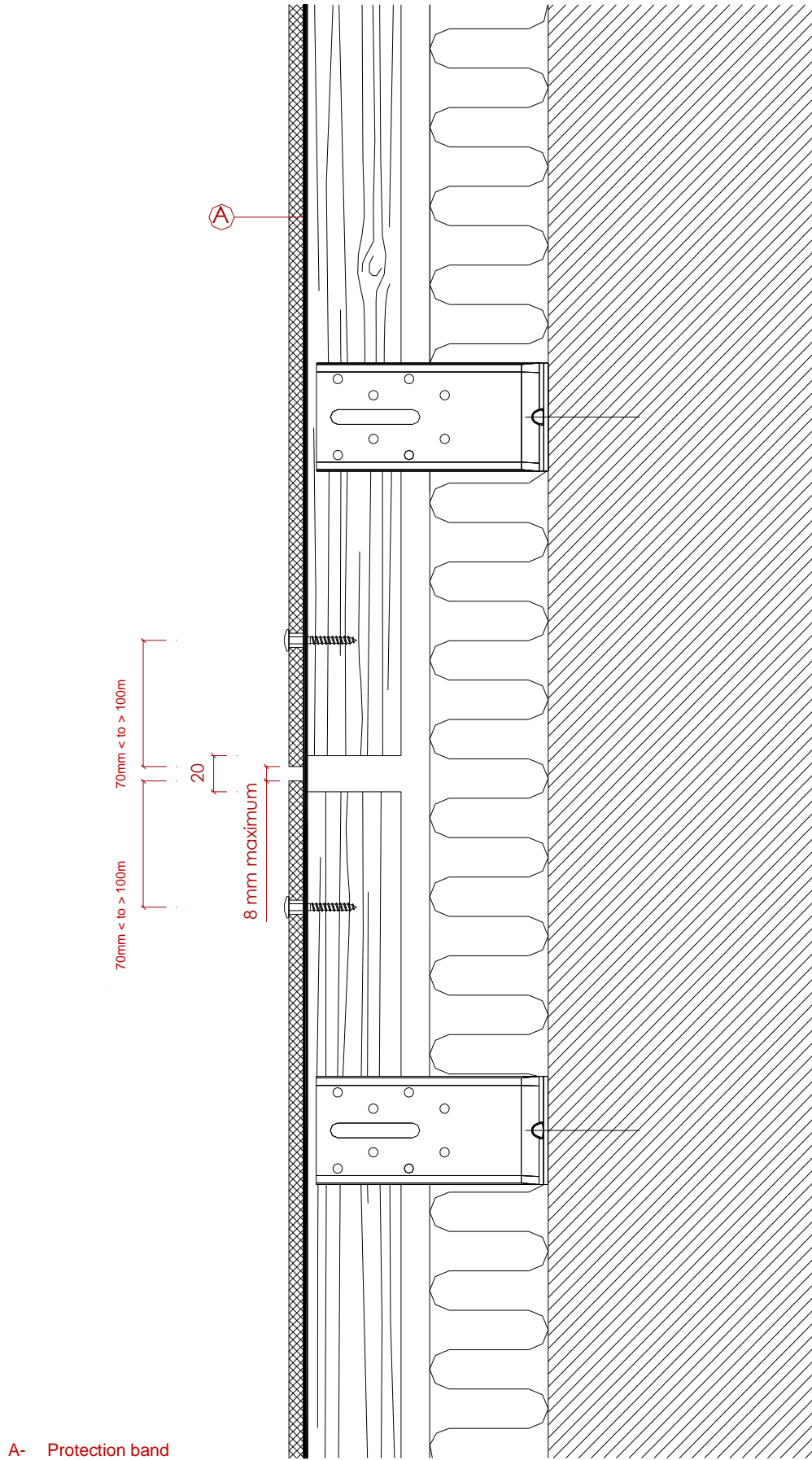


Figure 16 - Framing splitting for studs with lengths of $\leq 5.4m$

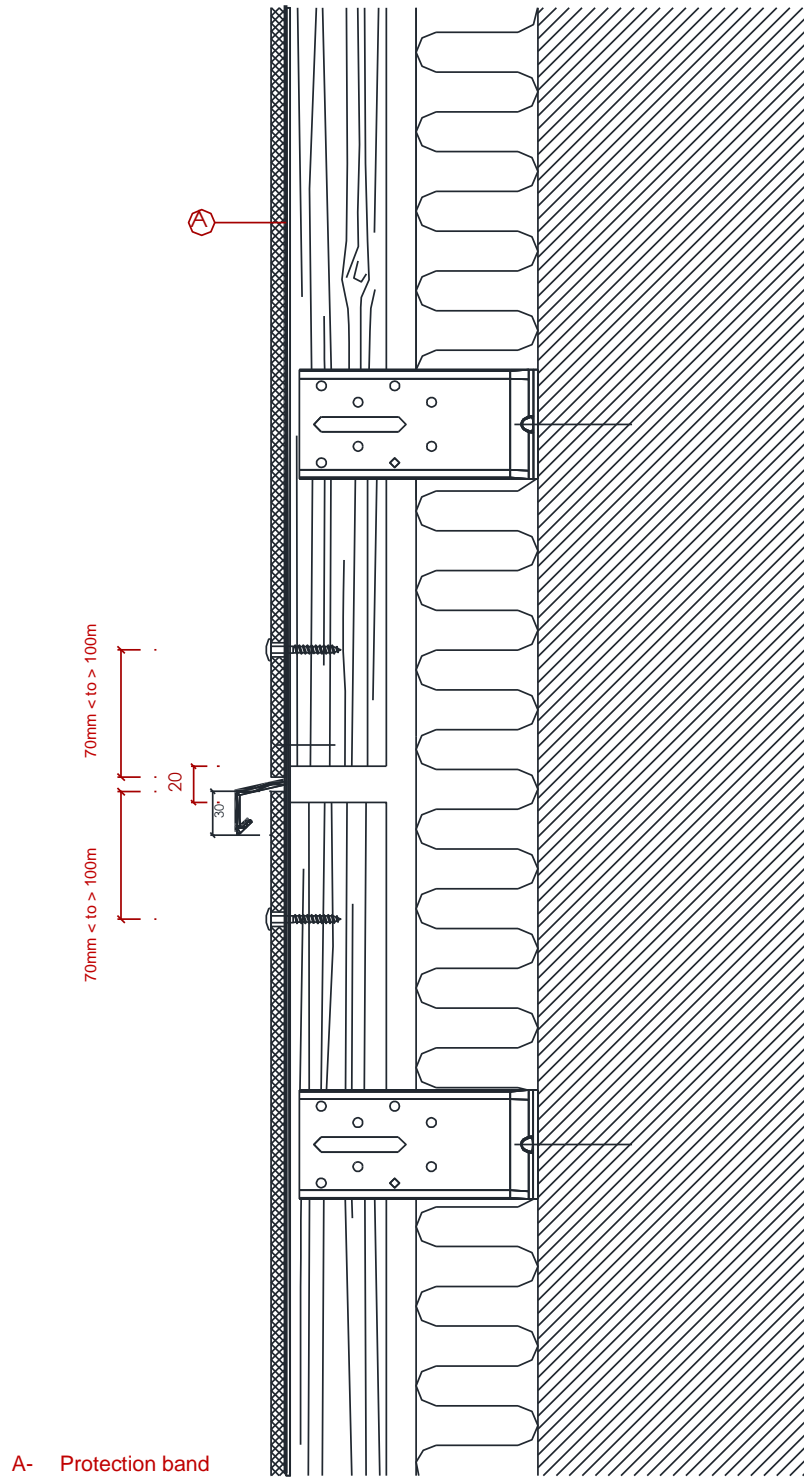


Figure 16bis - Framework splitting for stud lengths $\geq 5.4m$

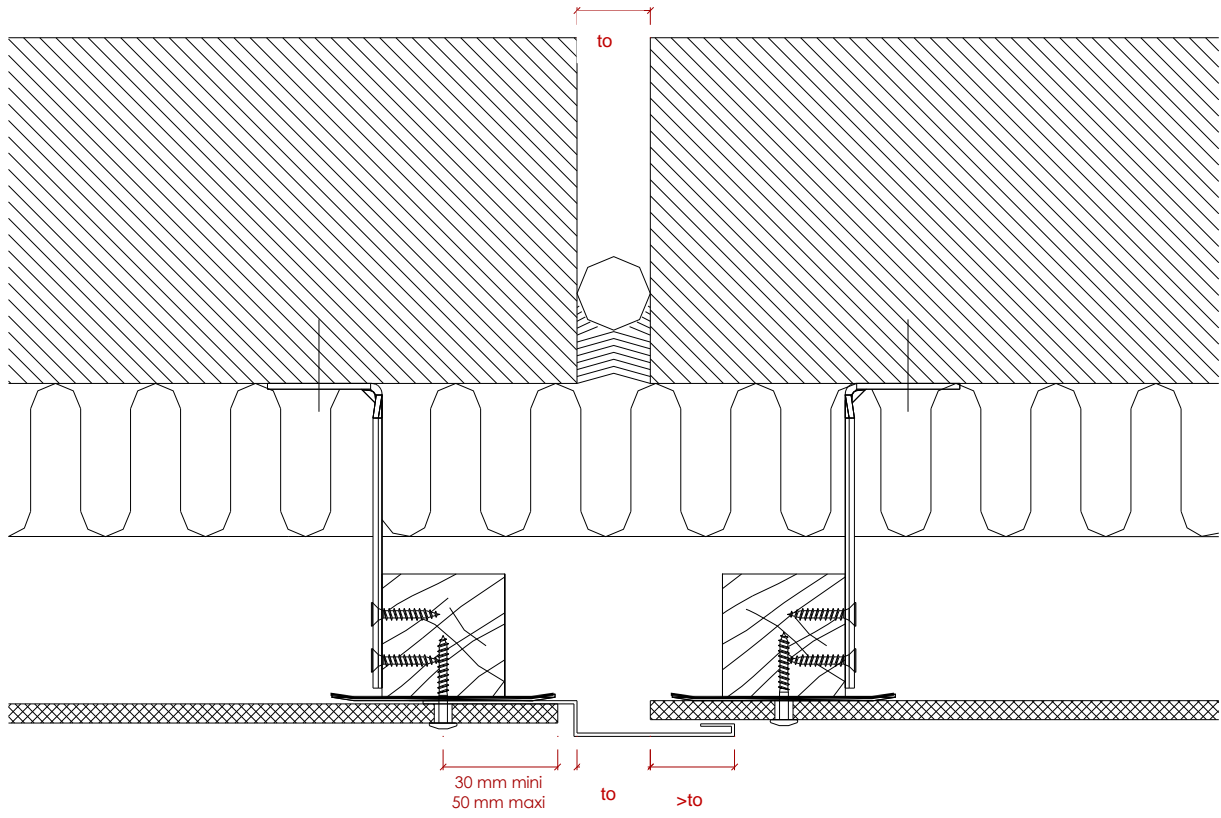
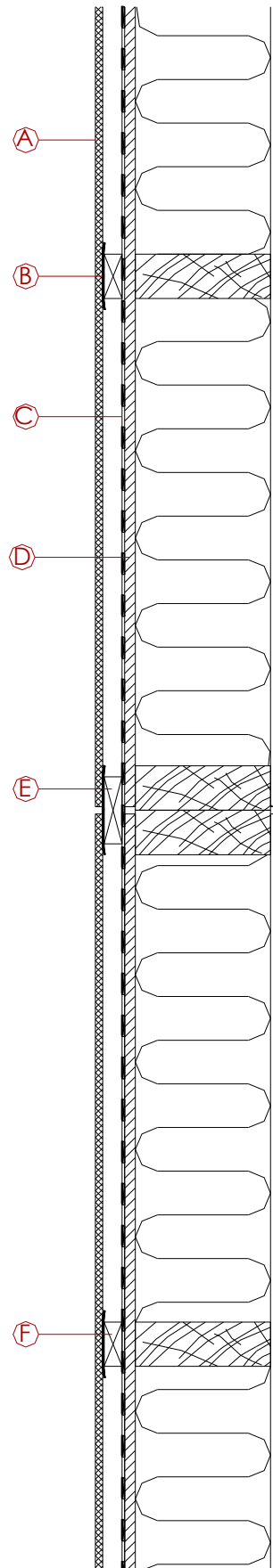


Figure 17 - Expansion joint

Installation on TFC



- A- COPANEL cladding
- B- Protection band
- C- Rain barrier in accordance with paragraph 11
- D- Bracing panel
- E- Batten (75mm long minimum)
- F- Batten (50mm long minimum)

Figure 18 - Installation on TFC (horizontal section)

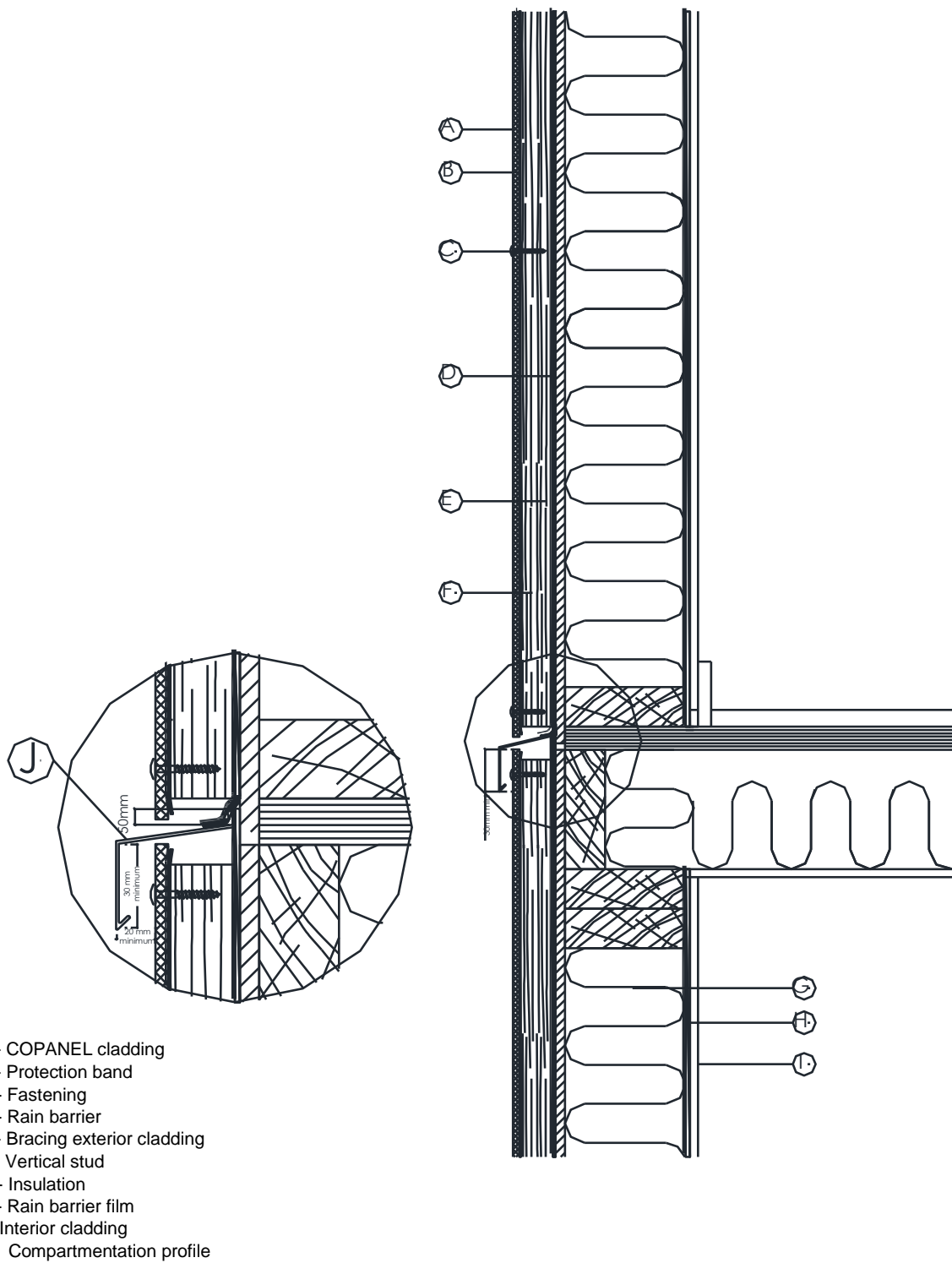
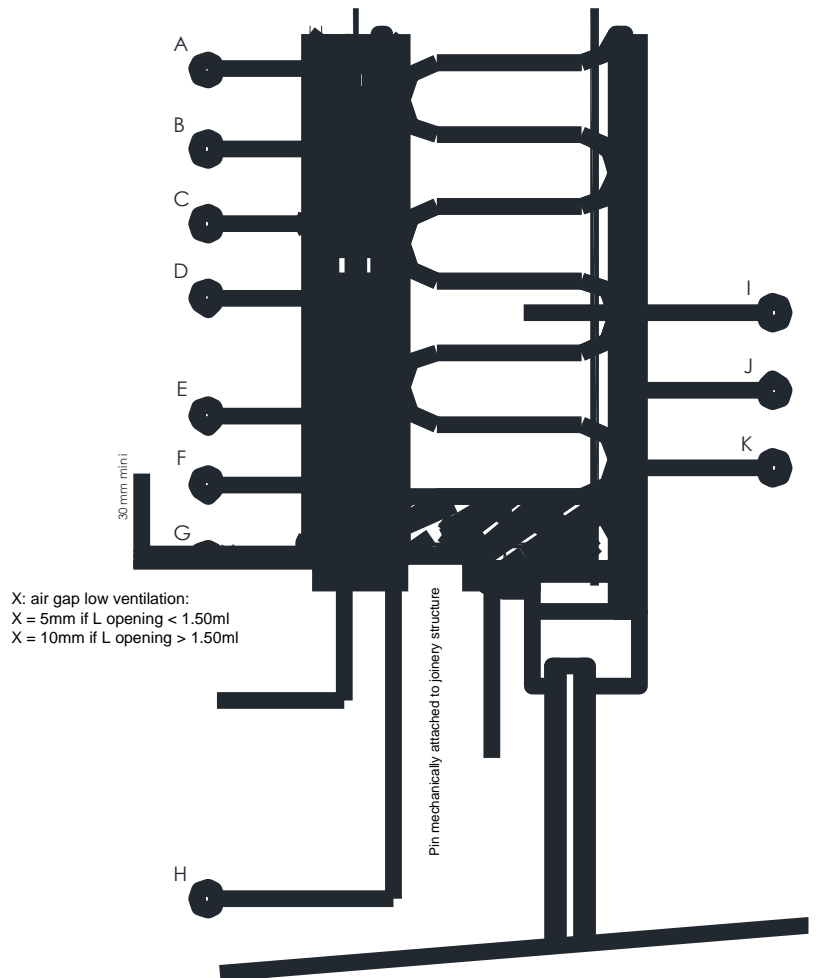


Figure 19 - Splitting at the TFC floors

- A- COPANEL cladding
- B- Protection band
- C- Fastening
- D- Rain barrier (continuity of watertightness between the joinery and rain barrier)
- E- Bracing exterior cladding
- F- Vertical stud
- G- Soaked foam gasket
- H- Metal cladding and flashing
- I- Insulation
- J- Rain barrier film
- K- Interior cladding

Wall complies with NF DTU 31.2
 Joinery complies with NF DTU 36.5
 or Aluminium under DTA with TFC concerned
 or PVC under DTA with TFC concerned



**Figure 20 - Installation on TFC - Section on the lintel of the opening
 Special arrangement for the treatment of openings - Interior tunnel joinery**

- A- COPANEL cladding
- B- Protection band
- C- Fastening
- D- Rain barrier (continuity of watertightness between the joinery and rain barrier)
- E- Bracing exterior cladding
- F- Vertical stud
- G- Supporting metal plate
- H- Insulation
- I- Rain barrier film
- J- Interior cladding
- K- Joinery draining

Wall complies with NF DTU 31.2
Joinery complies with NF DTU 36.5
or Aluminium under DTA with TFC concerned
or PVC under DTA with TFC concerned

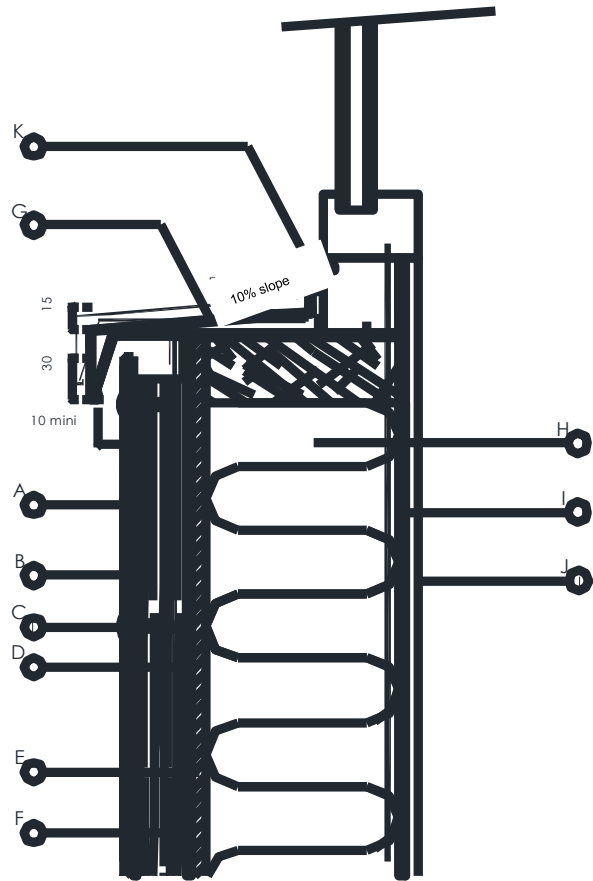


Figure 21 - Fitting on TFC - Section on opening support Special arrangement for the treatment of openings - Interior tunnel joinery

- A- COPANEL cladding
- B- Protection band
- C- Rain barrier (continuity of watertightness between the joinery and rain barrier)
- D- Bracing exterior cladding
- E- Insulation
- F- Rain barrier film
- G- Interior cladding
- H- Rise in supporting metal plate
- I- Metal plate panelboard
- J- Lintel drip edge

Wall complies with NF DTU 31.2
Joinery complies with NF DTU 36.5
or Aluminium under DTA with TFC concerned
or PVC under DTA with TFC concerned

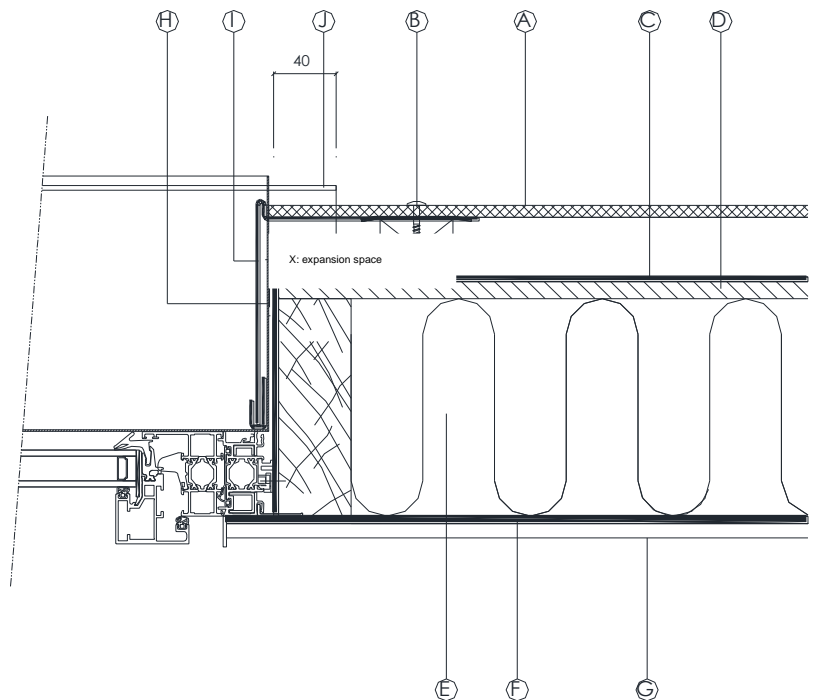
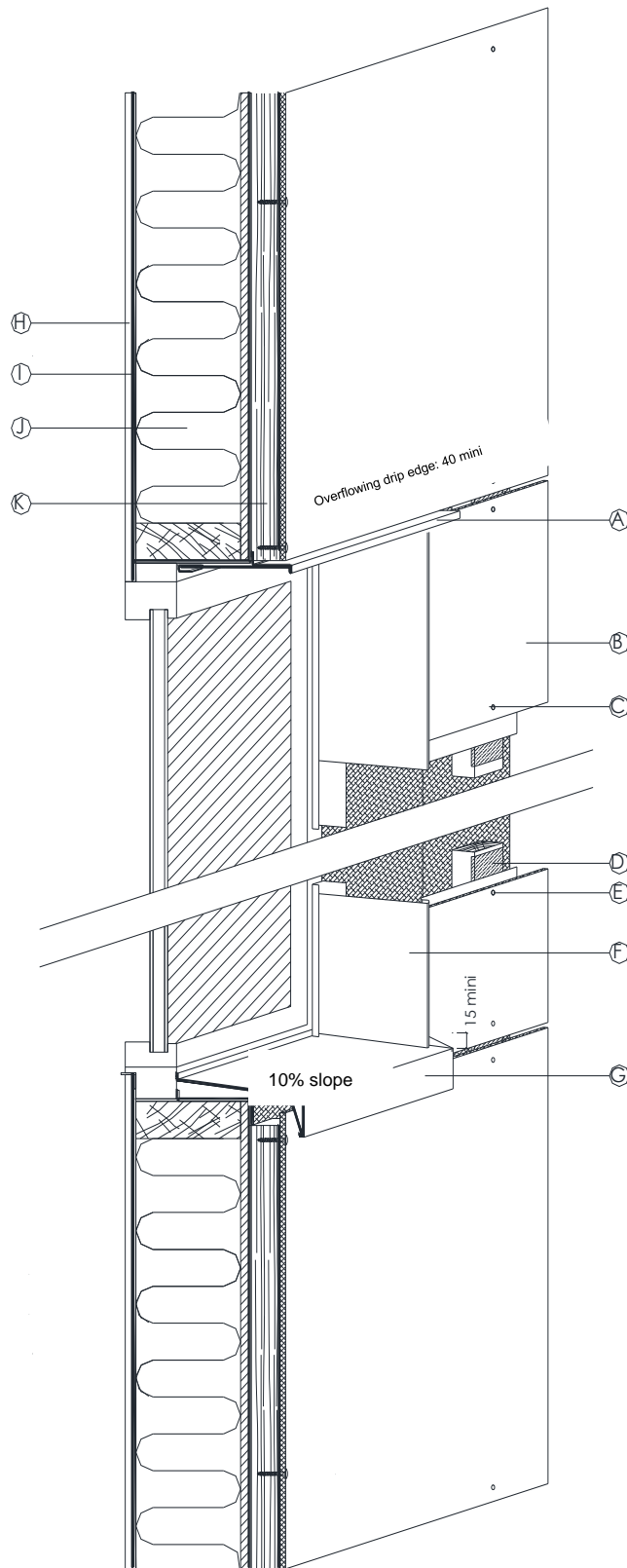


Figure 22 - Installation on TFC - Section on the opening panel Special arrangement for the treatment of openings - Interior tunnel joinery



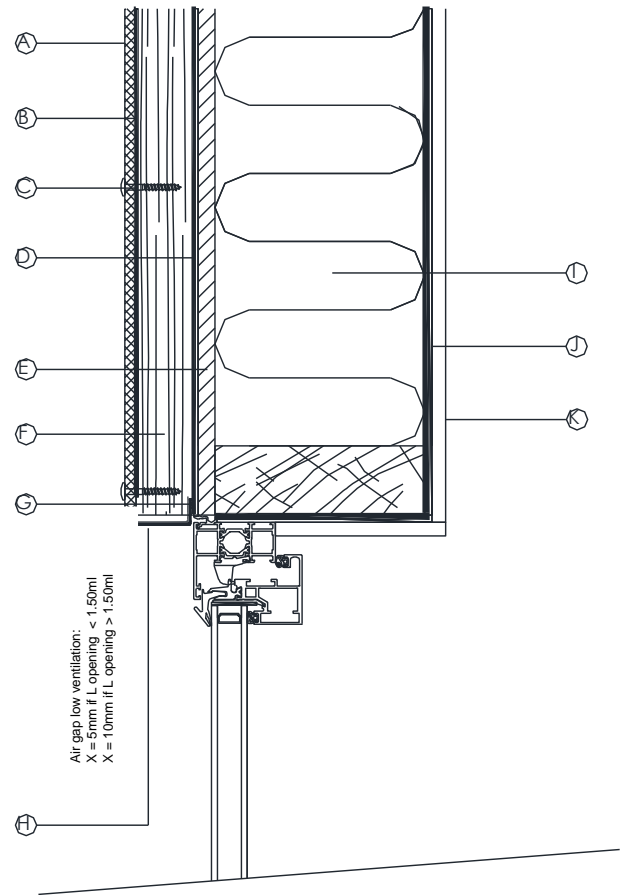
- A- Lintel drip edge
- B- COPANEL cladding
- C- Rain barrier (continuity of watertightness between joinery and rain barrier)
- D- Protection band
- E- Fastening
- F- Metal plate panelboard
- G- Supporting metal plate
- H- Interior cladding
- I- Rain barrier film
- J- Insulation
- K- Vertical stud

Wall complies with NF DTU 31.2
 Joinery complies with NF DTU 36.5
 or Aluminium under DTA with TFC concerned
 or PVC under DTA with TFC concerned

**Figure 23 - Installation on TFC - Perspective
 Special treatment of openings - Interior tunnel joinery**

- A- COPANEL cladding
- B- Protection band
- C- Fastening
- D- Rain barrier (continuity of watertightness between the joinery and rain barrier
- E- Bracing exterior cladding
- F- Vertical stud
- G- Compressed soaked foam joint
- H- Metal cladding and flashing
- I- Insulation
- J- Rain barrier film
- K – Interior cladding

Wall complies with NF DTU 31.2
 Joinery complies with NF DTU 36.5
 or Aluminium under DTA with TFC concerned
 or PVC under DTA with TFC concerned



**Figure 24 - Installation on TFC - Section on the lintel of the opening
 Special treatment of openings - Tunnel joinery on the outside**

- A- COPANEL cladding
 - B- Protection band
 - C- Fastening
 - D- Rain barrier (continuity of watertightness between joinery and rain barrier)
 - E- Bracing exterior cladding
 - F- Vertical stud
 - G- Supporting metal plate
 - H- Insulation
 - I- Rain barrier film
 - J- Interior cladding
 - K- Joinery draining
- Wall complies with NF DTU 31.2
Joinery complies with NF DTU 36.5
or Aluminium under DTA with TFC concerned
or PVC under DTA with TFC concerned

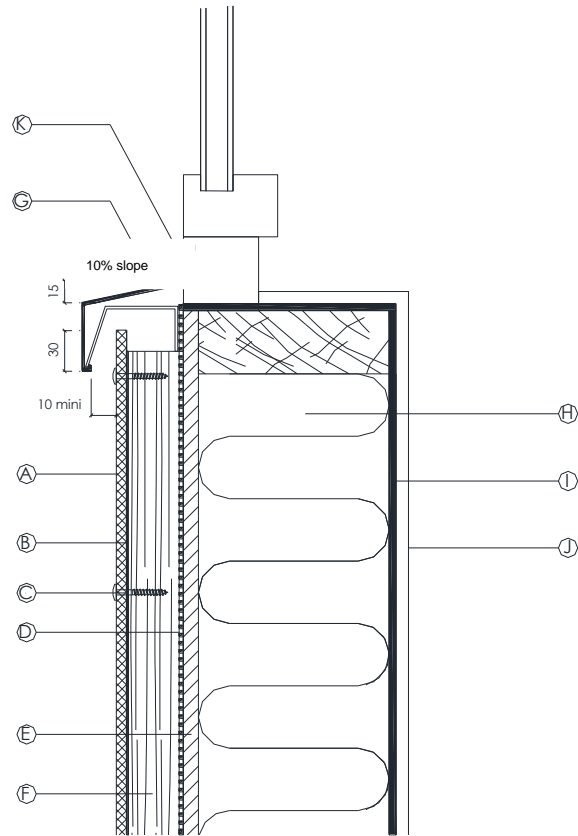


Figure 25 - Installation on TFC - Section on opening
Special treatment of openings - Tunnel joinery on the external surface

- A- COPANEL cladding
- B- Protection band
- C- Rain barrier (continuity of watertightness between joinery and rain barrier)
- D- Bracing exterior cladding
- E- Insulation
- F- Rain barrier film
- G- Interior cladding
- H- Raising of supporting metal plate
- I- Metal plate section
- J- Lintel drip edge

Wall complies with NF DTU 31.2
Joinery complies with NF DTU 36.5
or Aluminium under DTA with TFC concerned
or PVC under DTA with TFC concerned

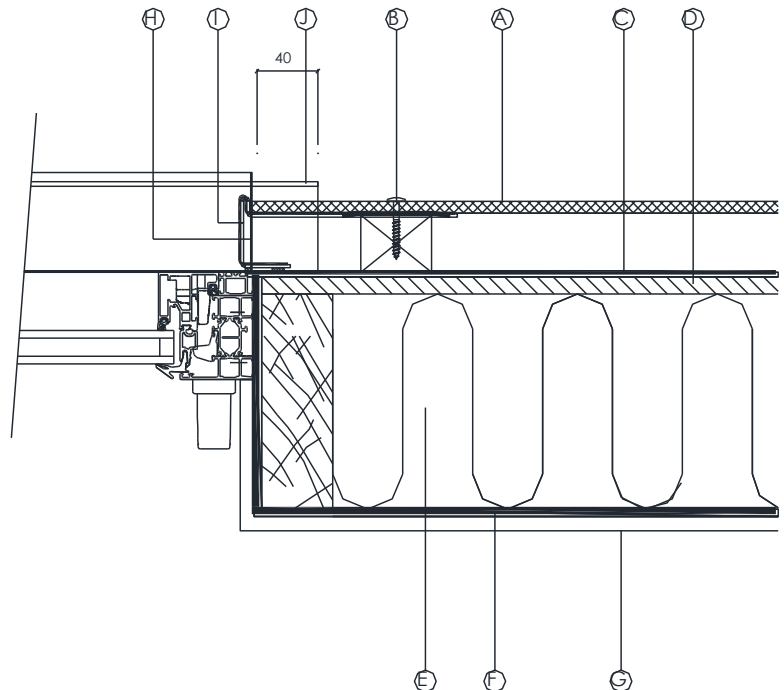
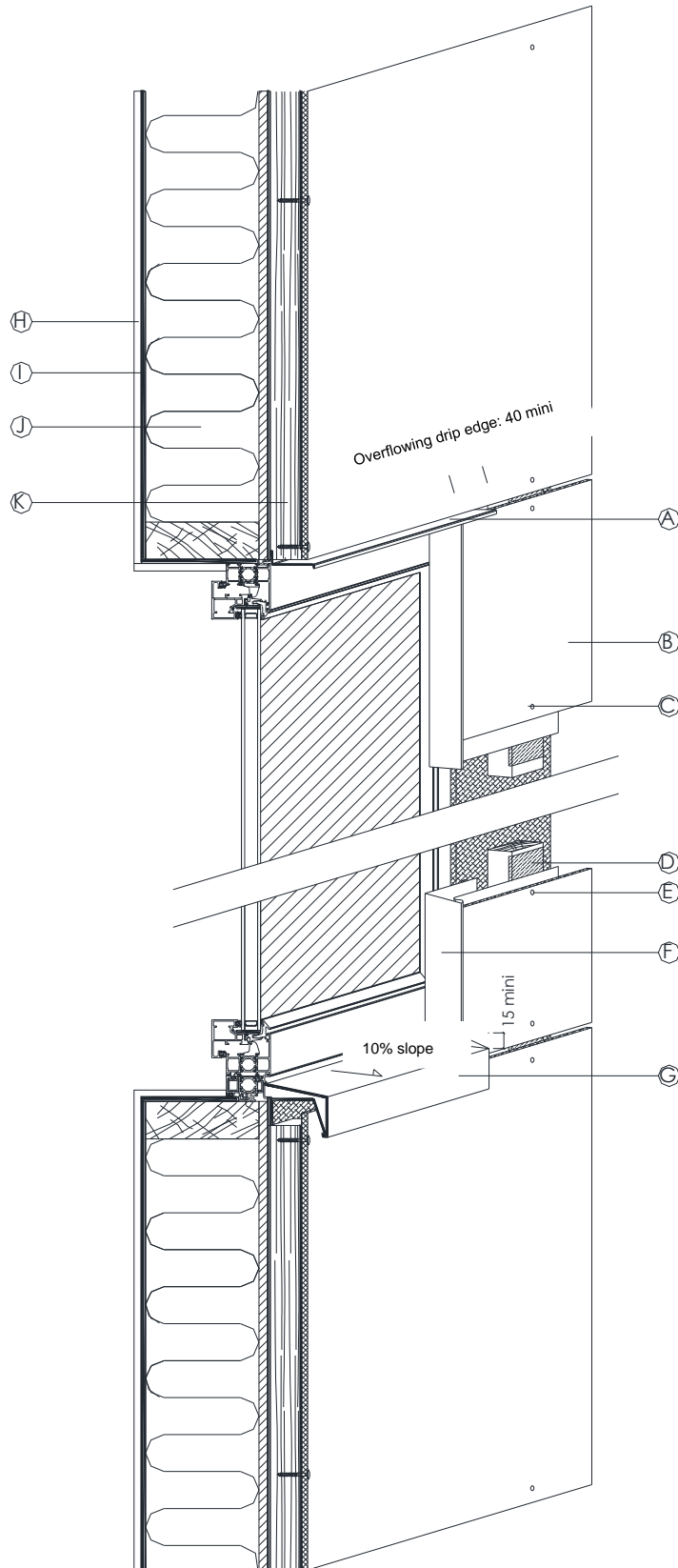


Figure 26 - Installation on TFC - Section on the opening panel
Special treatment of openings - Tunnel joinery on the outside

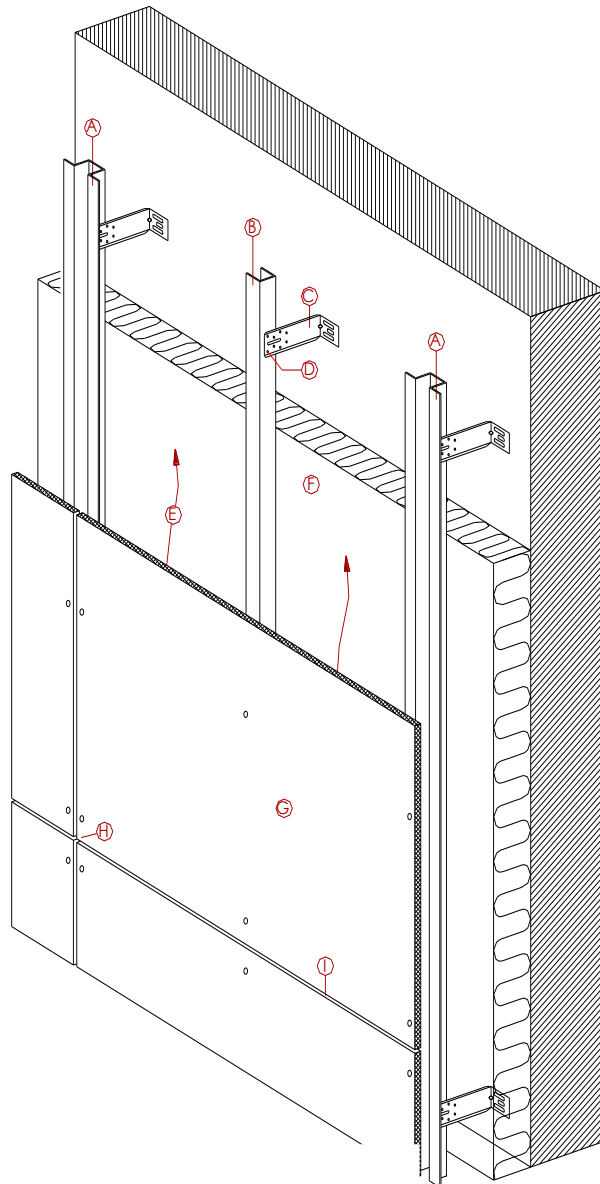


- A- Lintel drip edge
- B- COPANEL cladding
- C- Rain barrier (continuity of watertightness between the joinery and the rain barrier)
- D- Protection band
- E- Fastening
- F- Metal plate section
- G- Supporting metal plate
- H- Interior cladding
- I- Rain barrier film
- J- Insulation
- K- Vertical stud

Wall complies with NF DTU 31.2
 Joinery complies with NF DTU 36.5
 or Aluminium under DTA with TFC concerned
 or PVC under DTA with TFC concerned

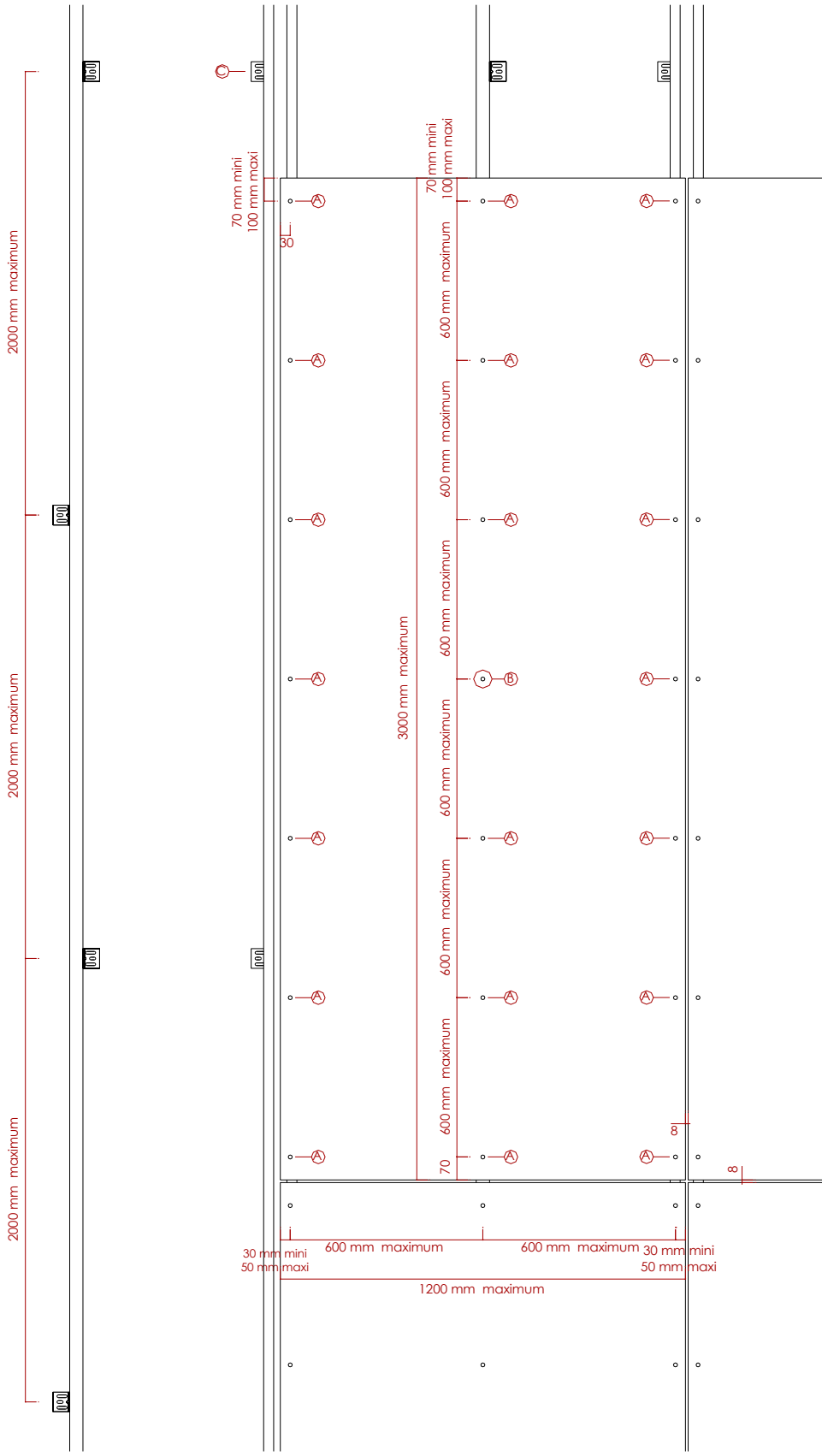
Figure 27 - Installation on TFC - Perspective
Special treatment of openings - Tunnel joinery on the outside

Metal framework



- A- T profile
- B- U profile
- C- ETANCO right angle brackets
- D- Rivets
- E- Ventilation
- F- Insulation
- G- COPANEL cladding
- H- Fastening
- I- Open horizontal joint (can also be closed)

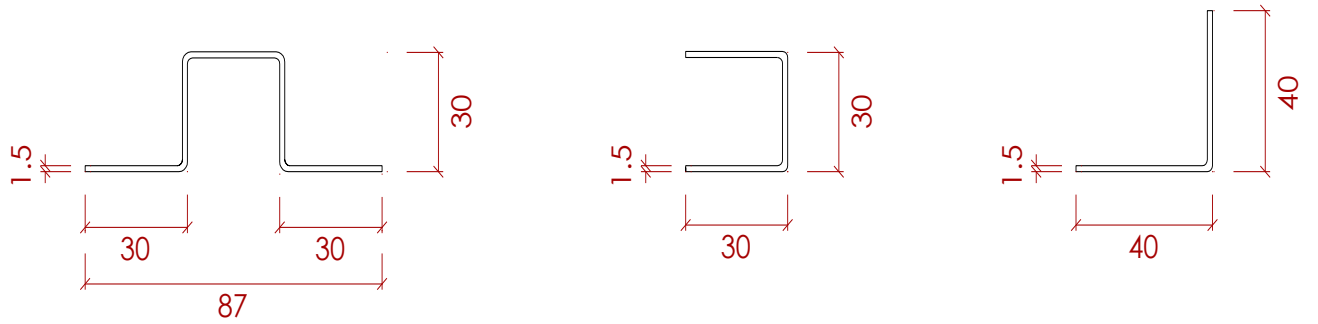
Figure 28 - Principle of COPANEL cladding on metal framework



- A- Sliding point
- B- Fixed point
- C- Right angle bracket

Figure 29 - Principle of vertical installation on a metal framework

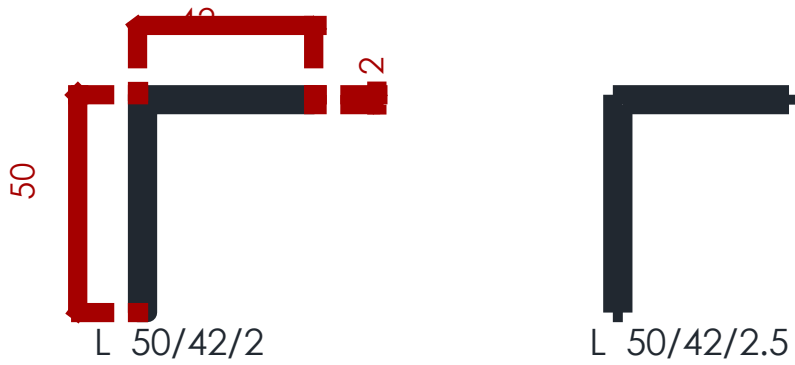
(the panels can also be laid horizontally)



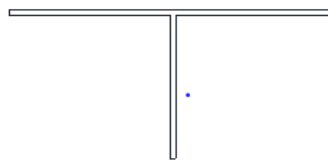
Omega = Joining profile C = Intermediate profile

L = profile for building edge

Figure 30 - Steel profiles



L profiles for building edge and intermediate profile



T 110/52/2



Standard length : 6ml and 3ml
Custom length on request

Intermediate profiles and joining T profile

Figure 31 - Examples of aluminium profiles

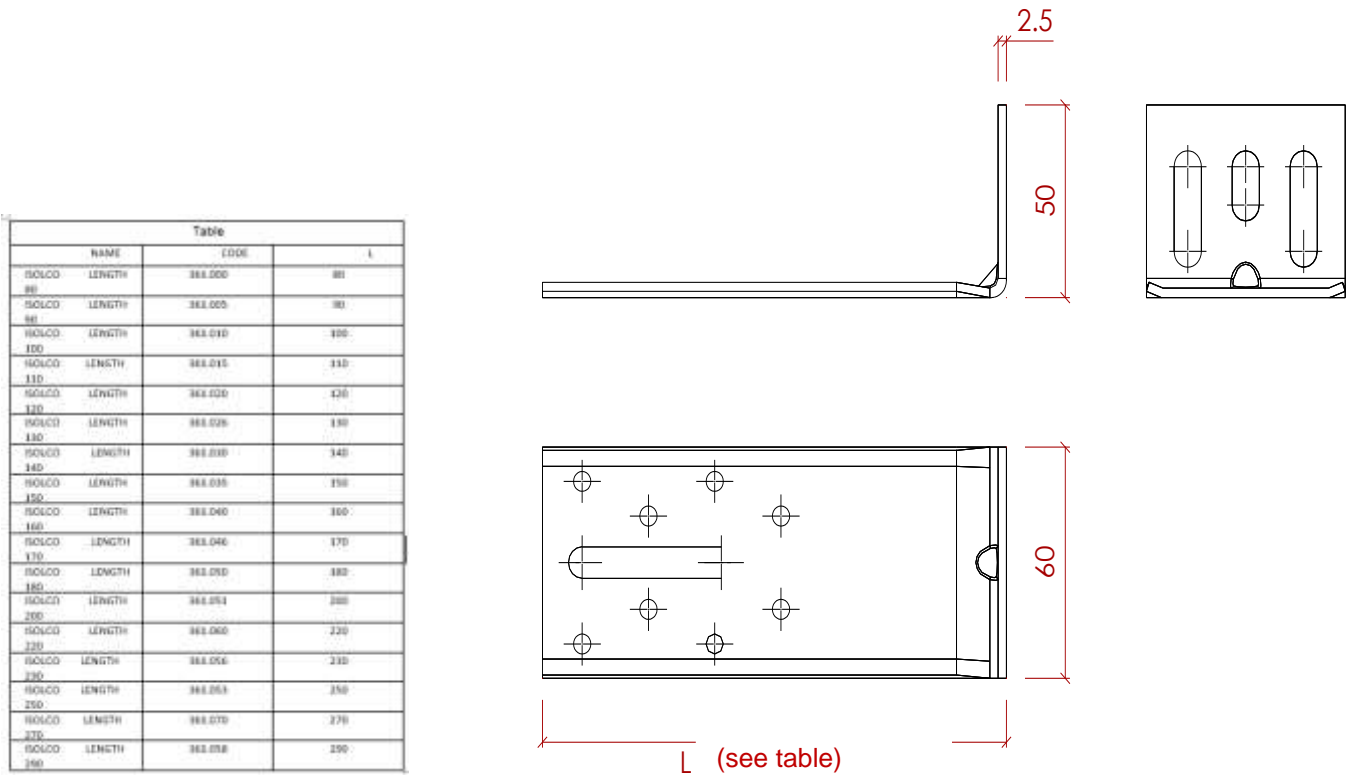


Figure 32 - Right angle bracket for flanged framework (ETANCO ISOLCO 3000P example)

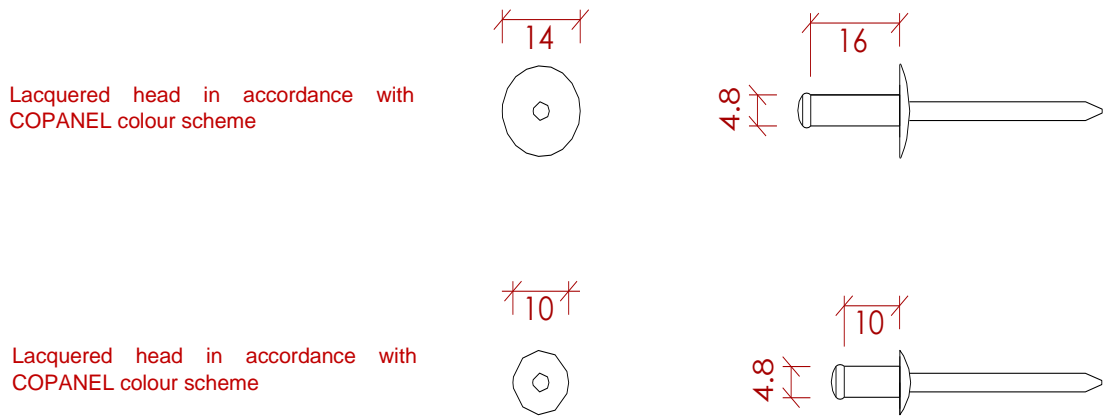


Figure 33 - Steel framework fastening rivets

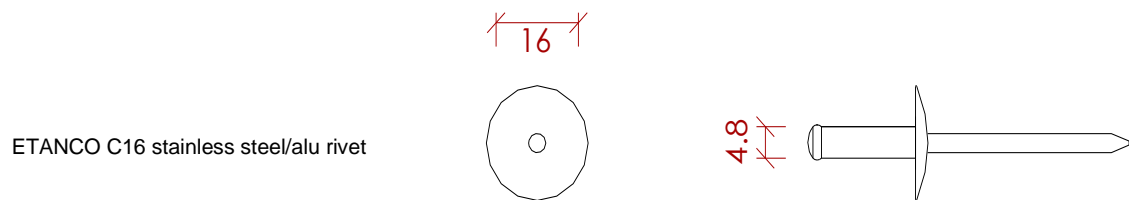
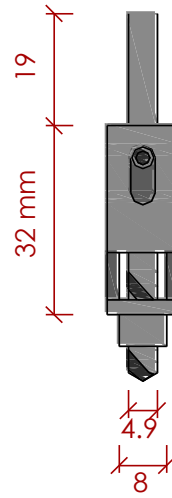
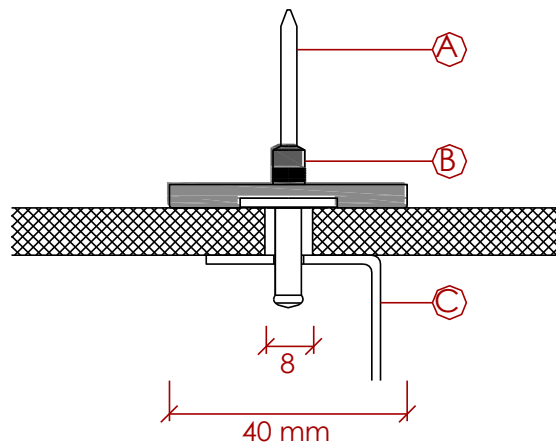


Figure 34 - Rivet for fastening COPANEL panels to aluminium framework

Centering Drill



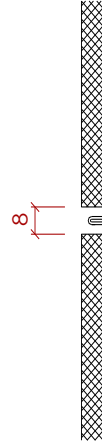
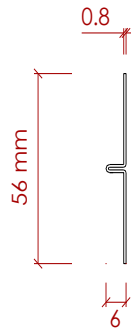
Riveting Attachment



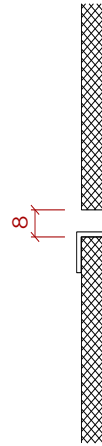
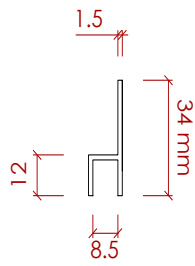
- A- Rivet
- B- Attachment
- C- Profile

Figure 35 - Centring drill and clamping wedge for fastening the sliding points

Aluminium Joint
Joint aluminium



Rigid PVC Joint
Joint PVC rigide



**Figure 36 -
Example of a
horizontal joint**

Installation on metal framework

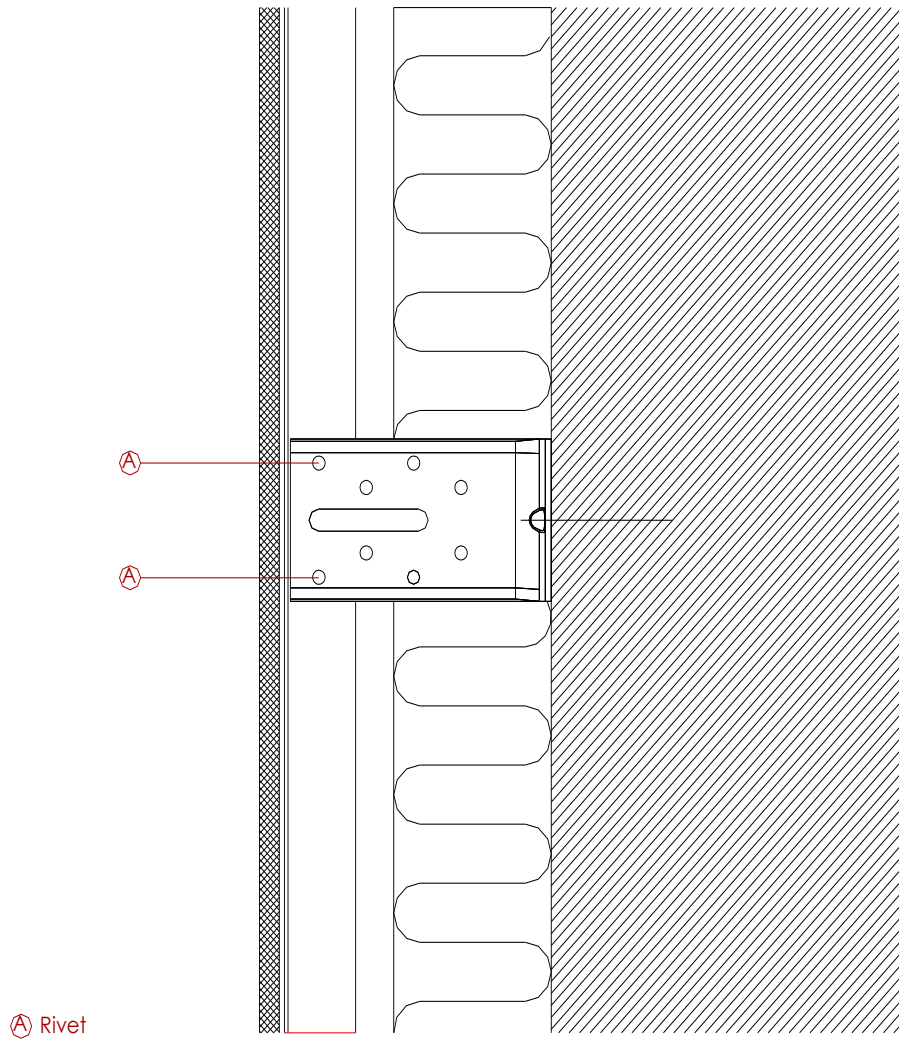


Figure 37 - Installation of the metal framework

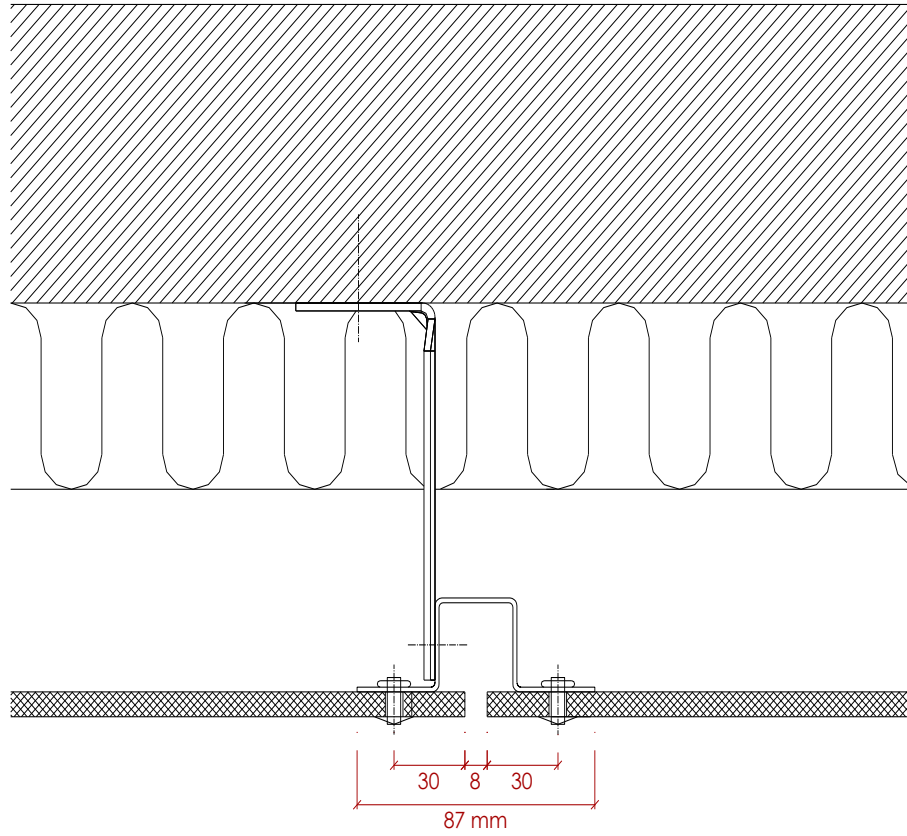


Figure 38 - Riveting on metal framework

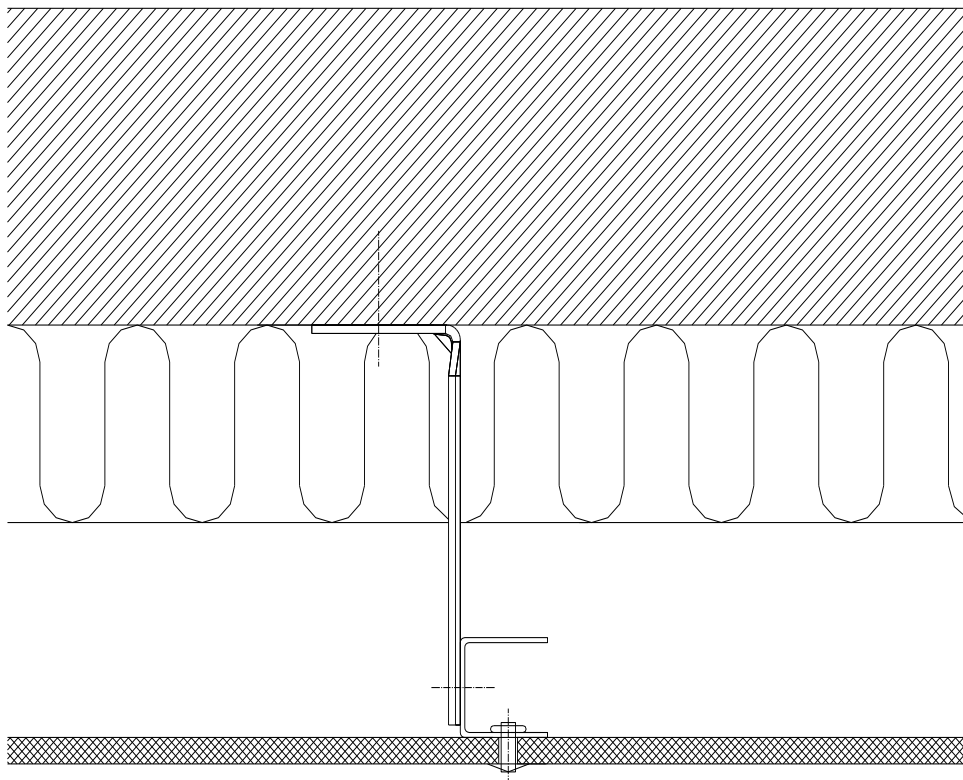
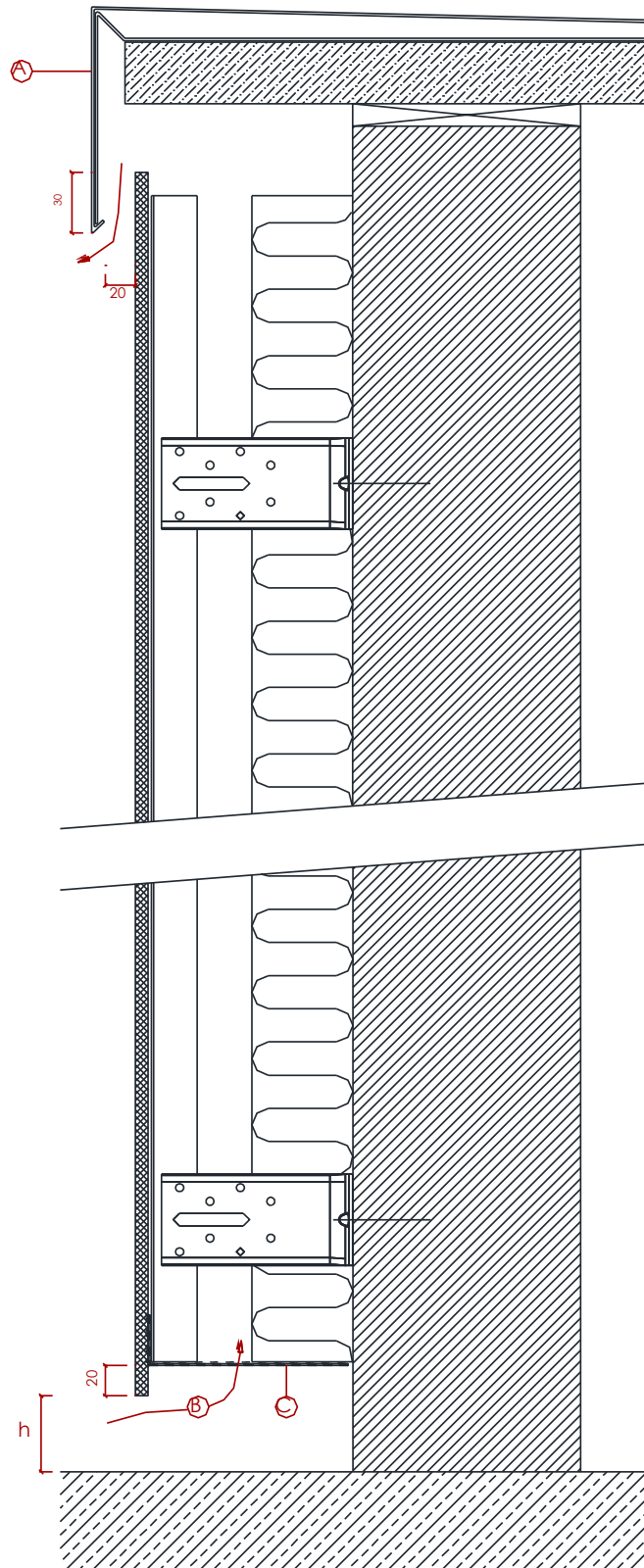


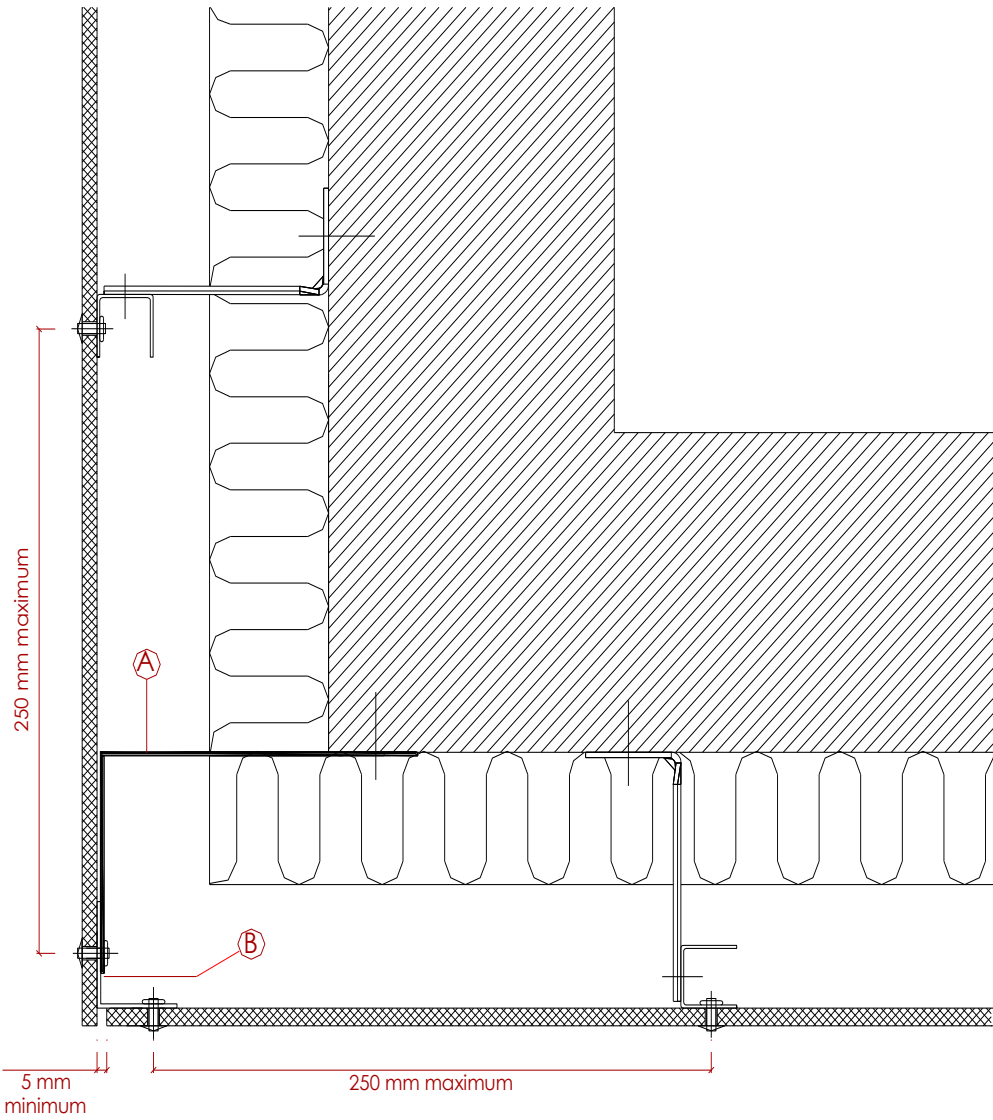
Figure 39 - Riveting on metal framework



- A- Acroterion coping
- B- Ventilation
- C- Anti-rodent grid

Hard soil: h = 50mm
Other soil: h = 150mm

Figure 40 - High and low edge



A- Compartmentation metal plate
B- ETANCO right angle bracket

- Ⓐ Tôle de compartimentage
- Ⓑ Equerre d'angle ETANCO

Figure 41 - Outgoing angle

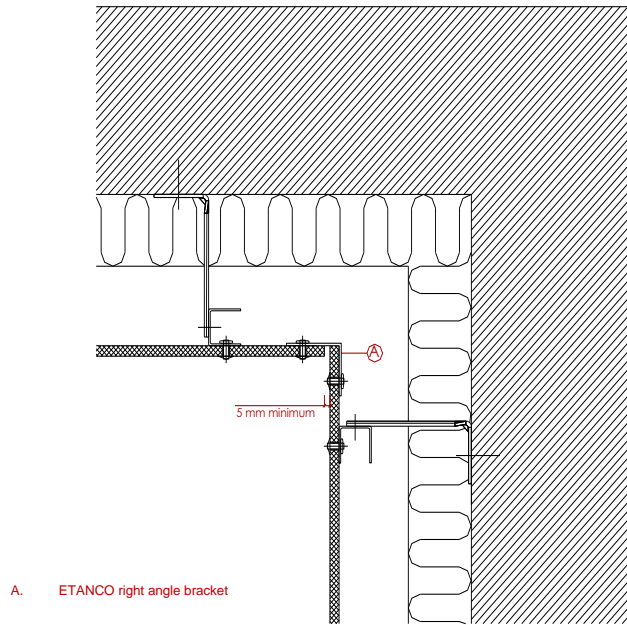


Figure 42 - Re-entrant angle

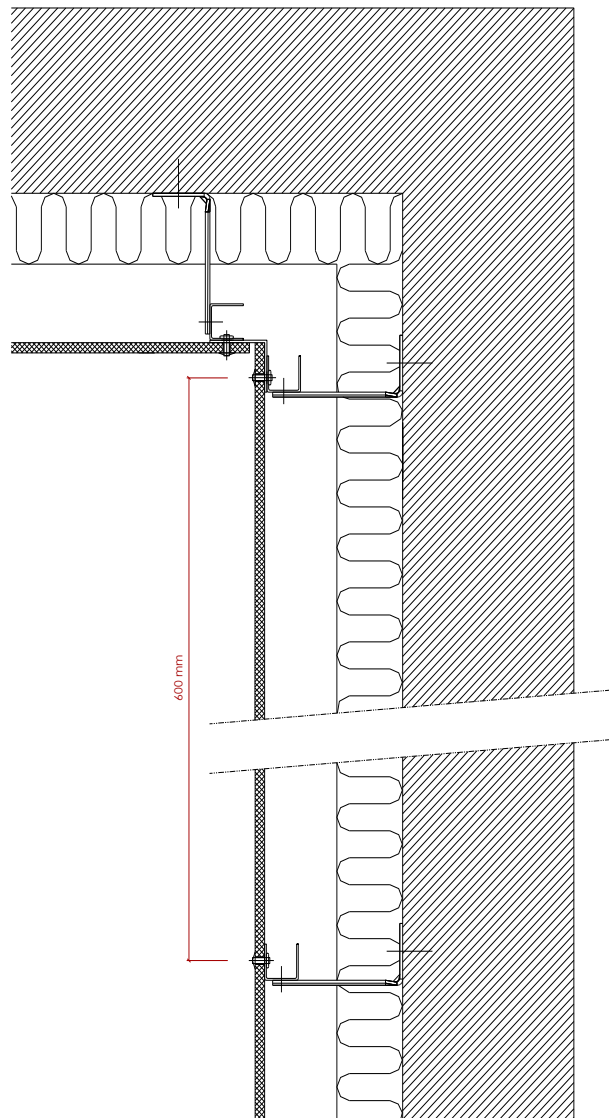


Figure 43 - Re-entrant angle

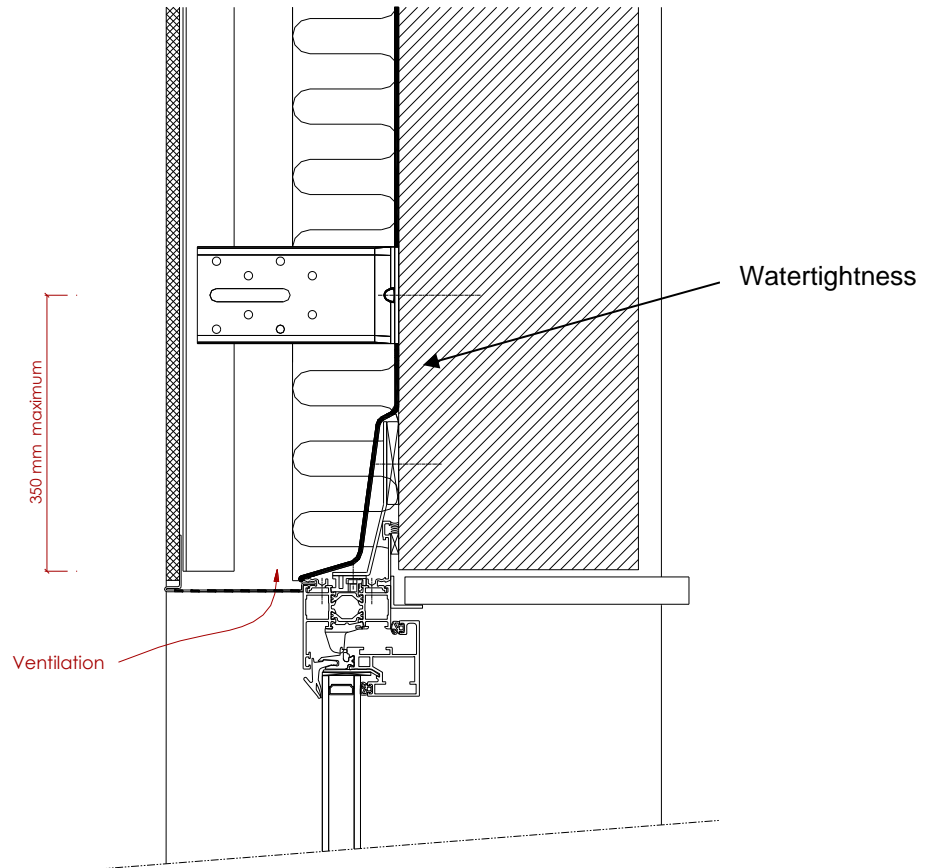


Figure 44 - Lintel

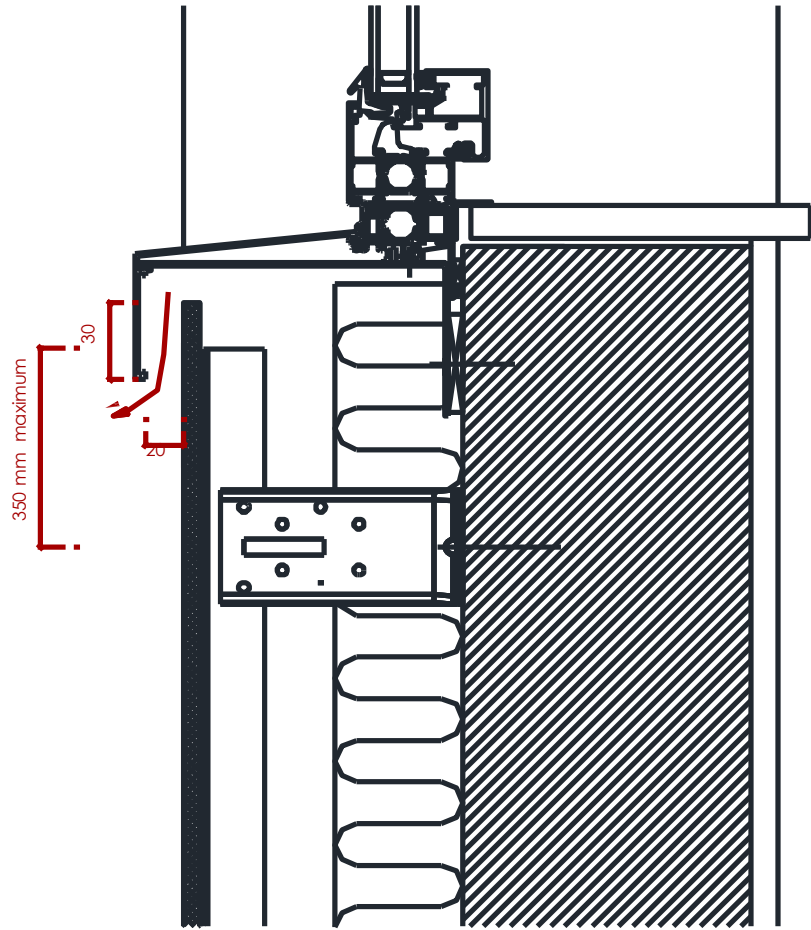


Figure 45 - Support

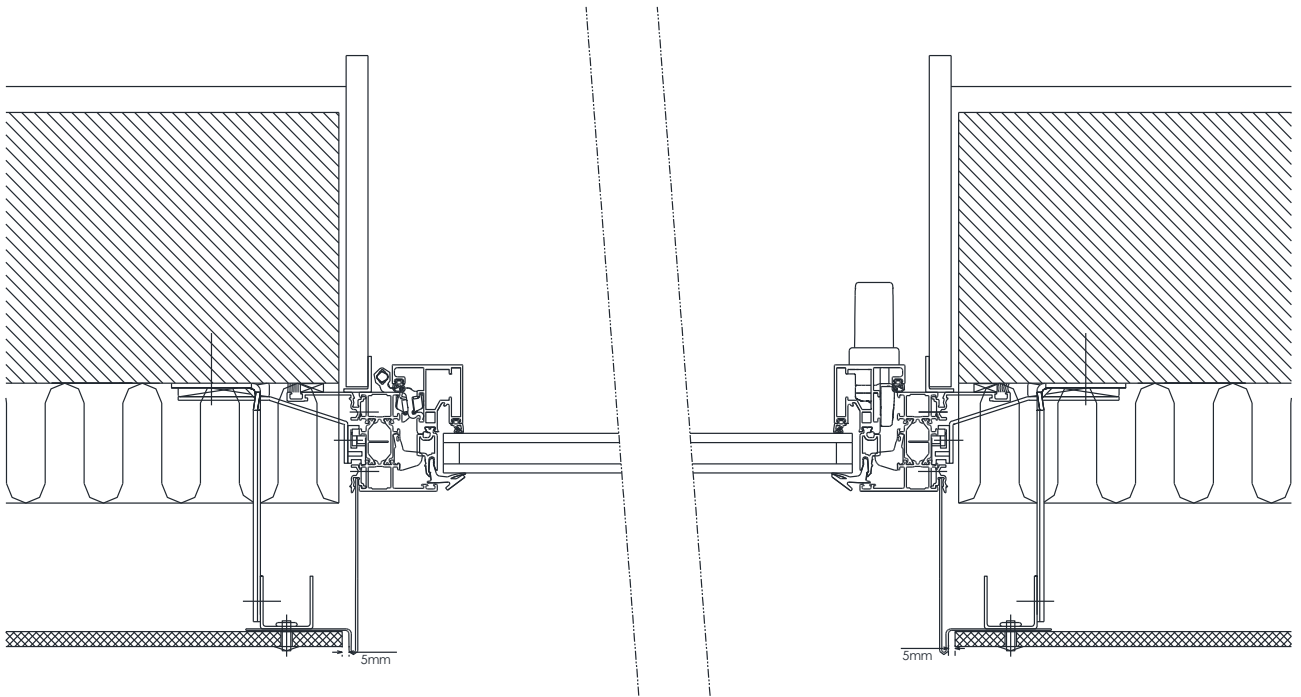


Figure 46 - Panelboard

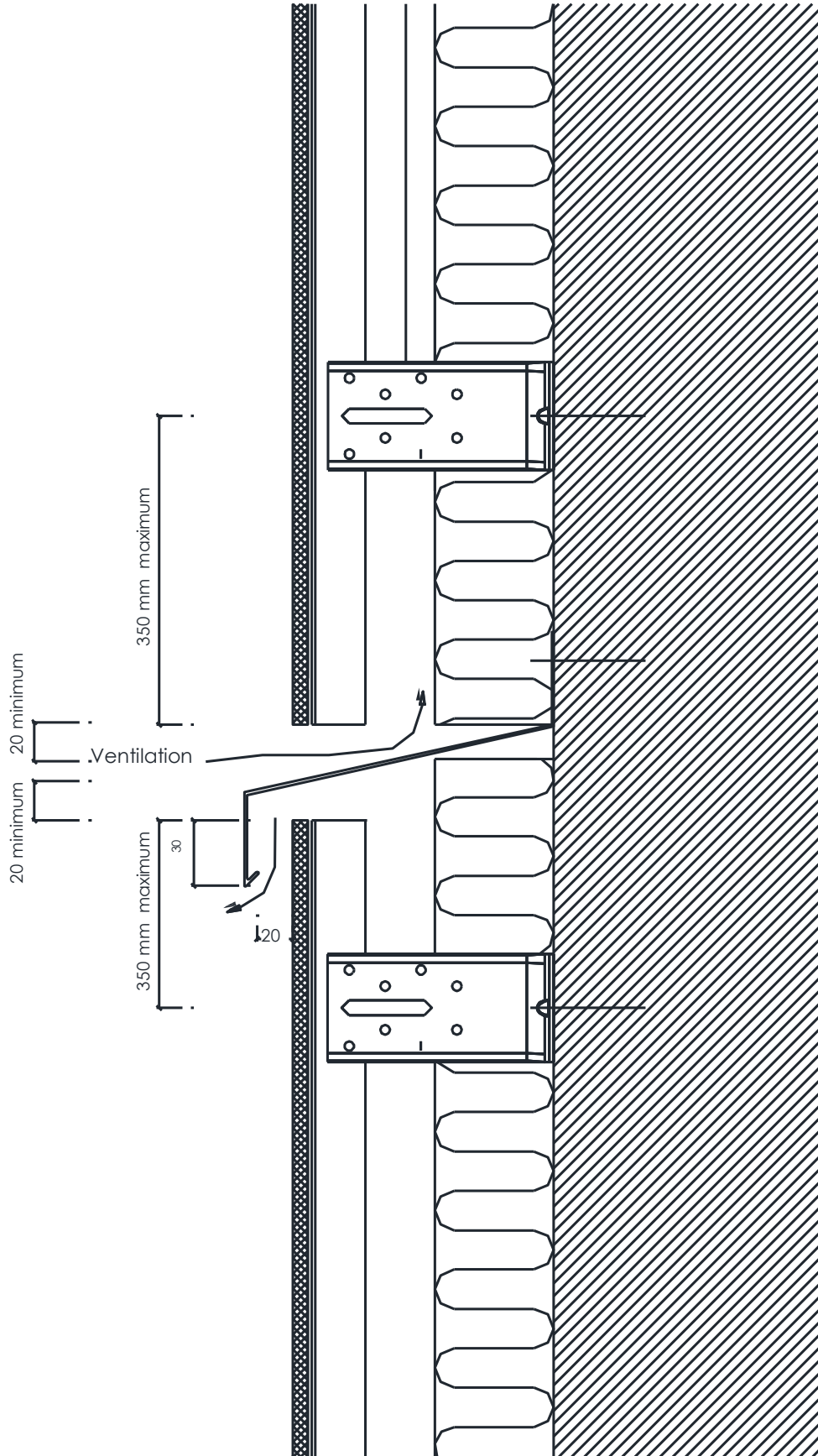


Figure 47 - Air gap splitting

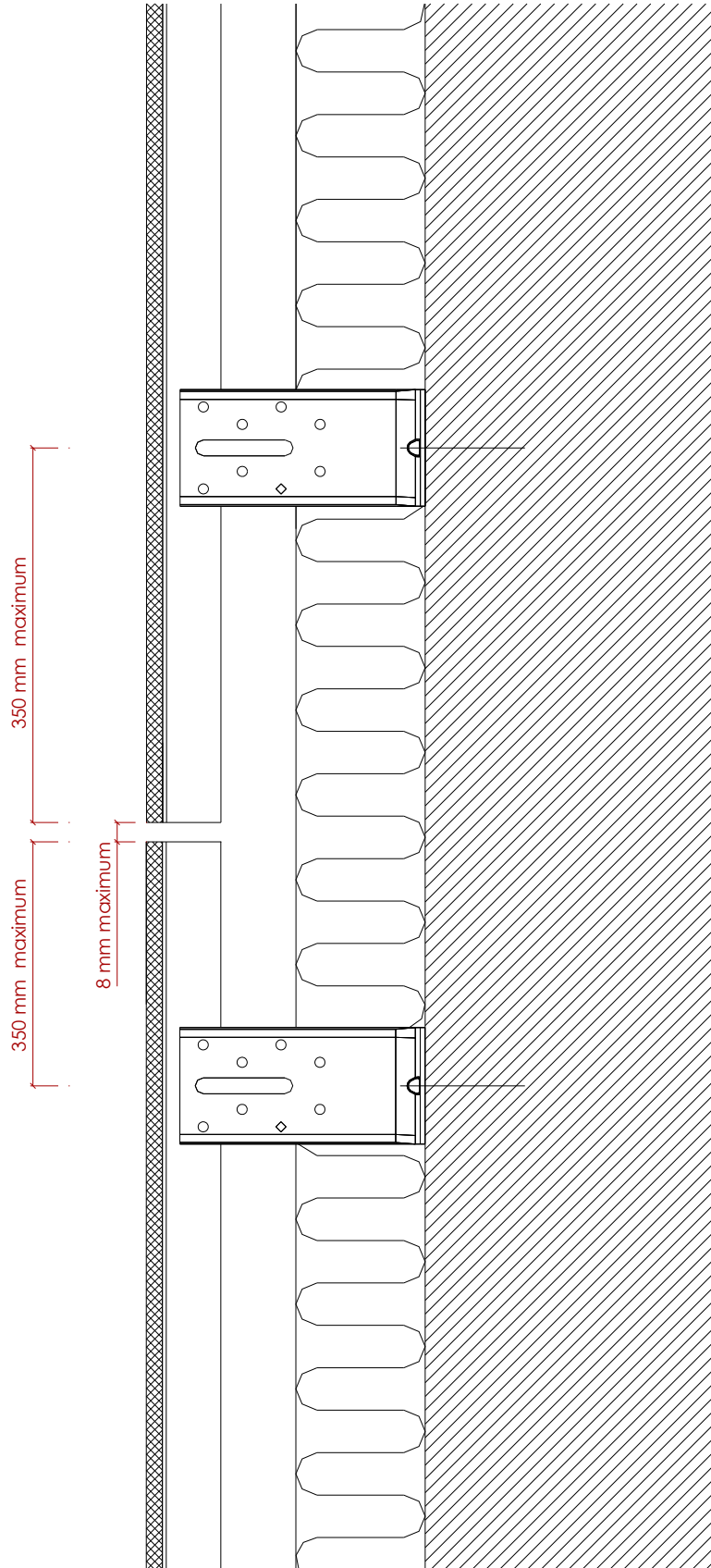


Figure 48 - Framework splitting for steel studs $\leq 6m$ in length

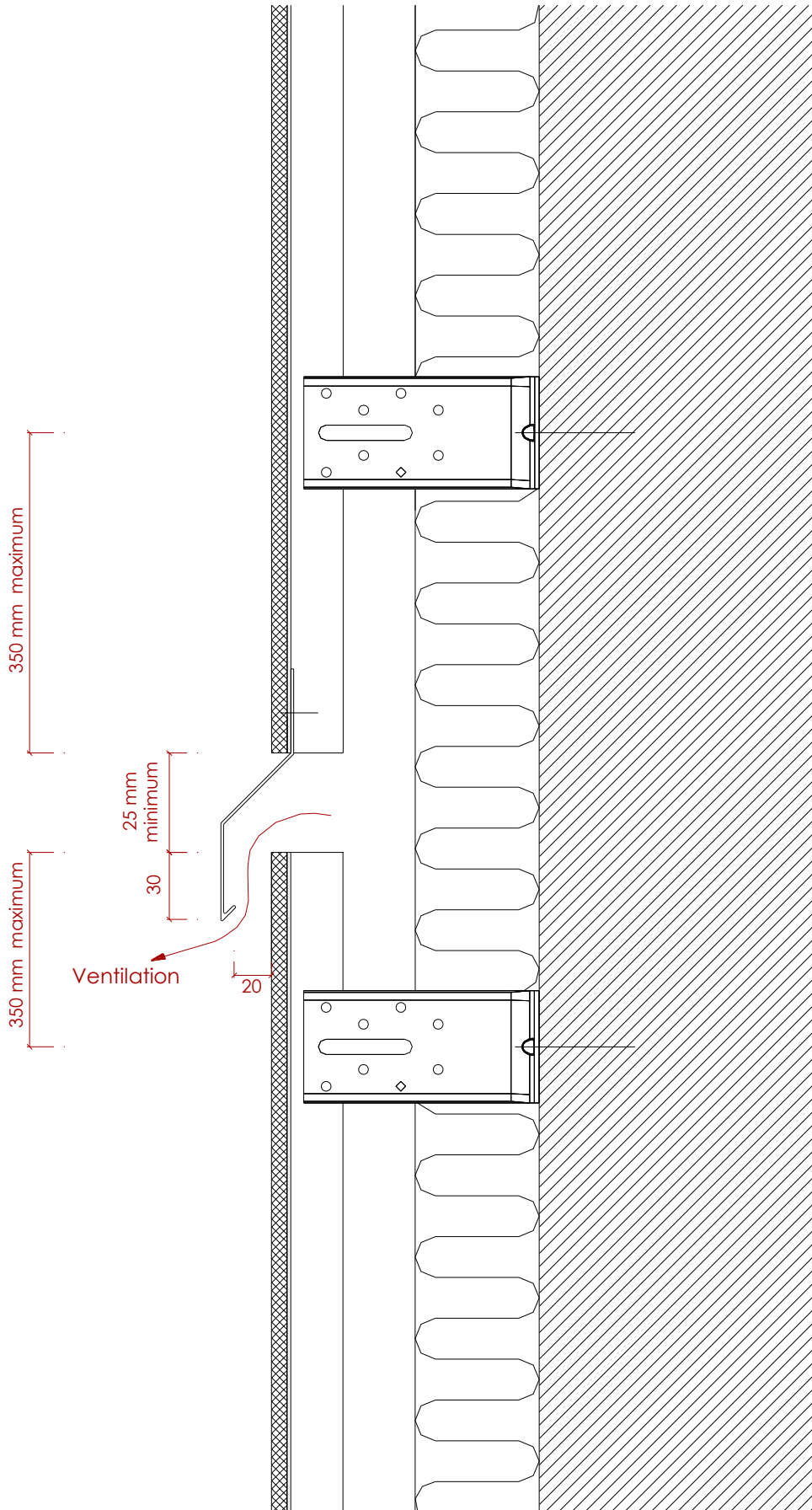


Figure 48bis - Framework splitting for steel studs $\geq 6m$ in length

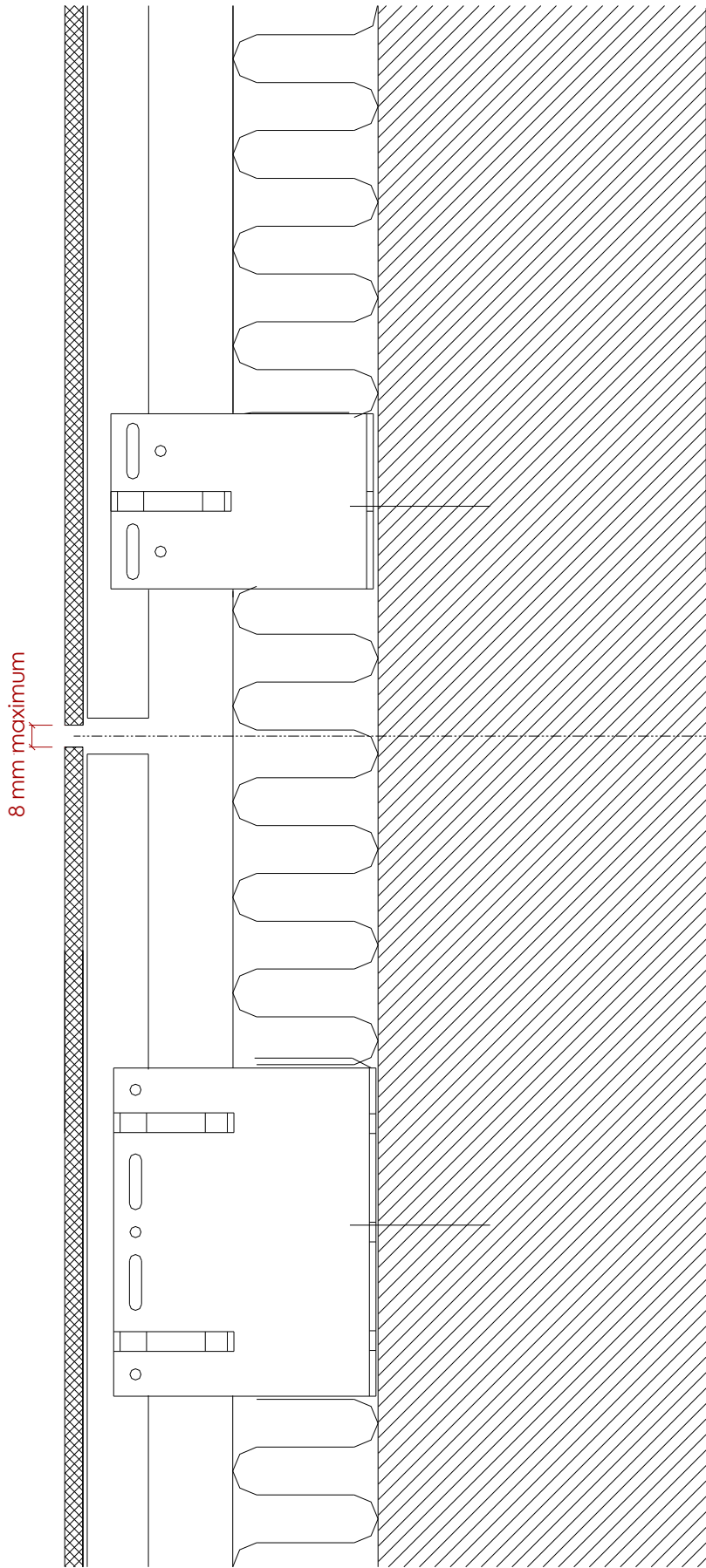


Figure 49 - Framework splitting for aluminium studs $\leq 3m$ in length

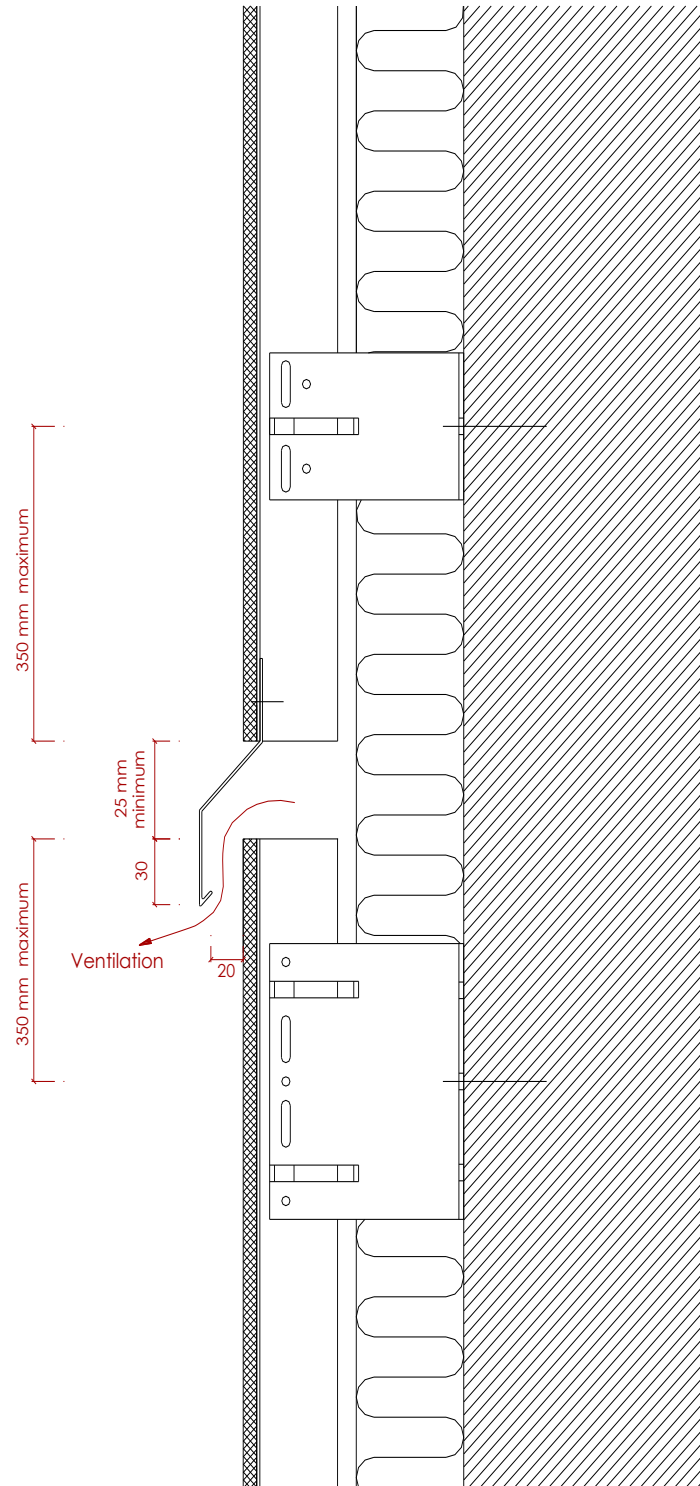


Figure 49bis - Framework splitting for aluminium studs $\geq 3m$ in length

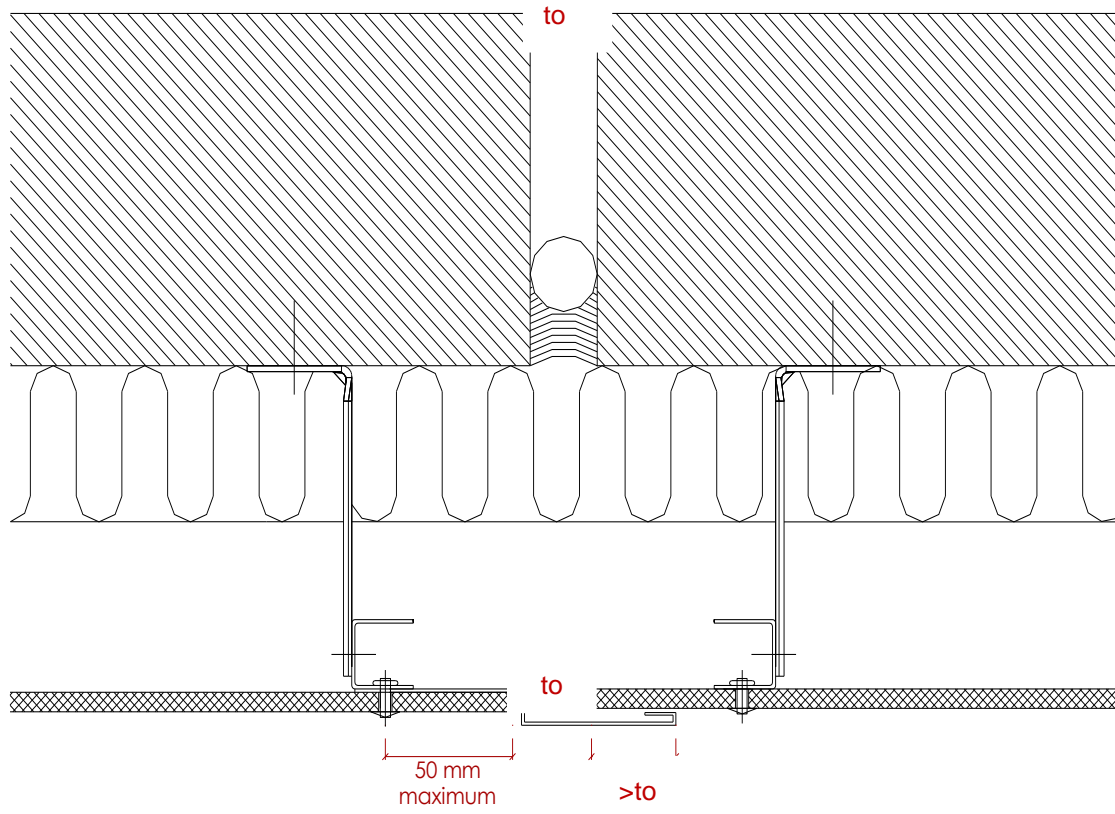
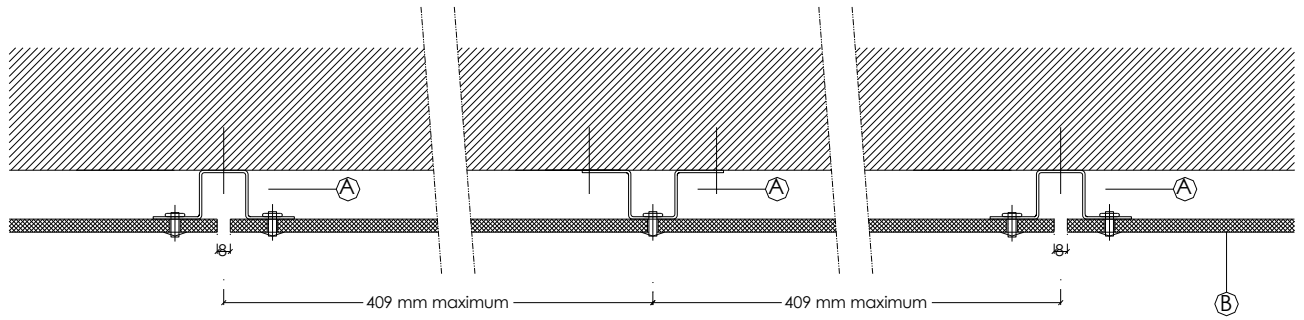
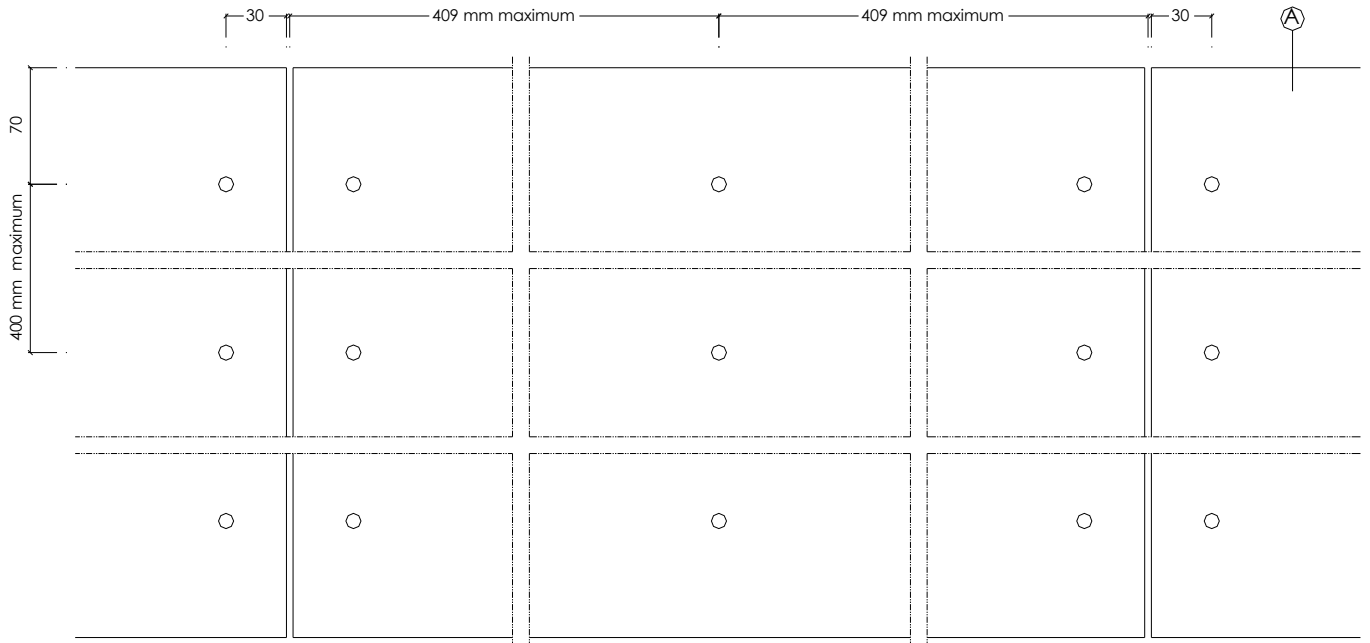


Figure 50 - Expansion joint

Cladding without insulation

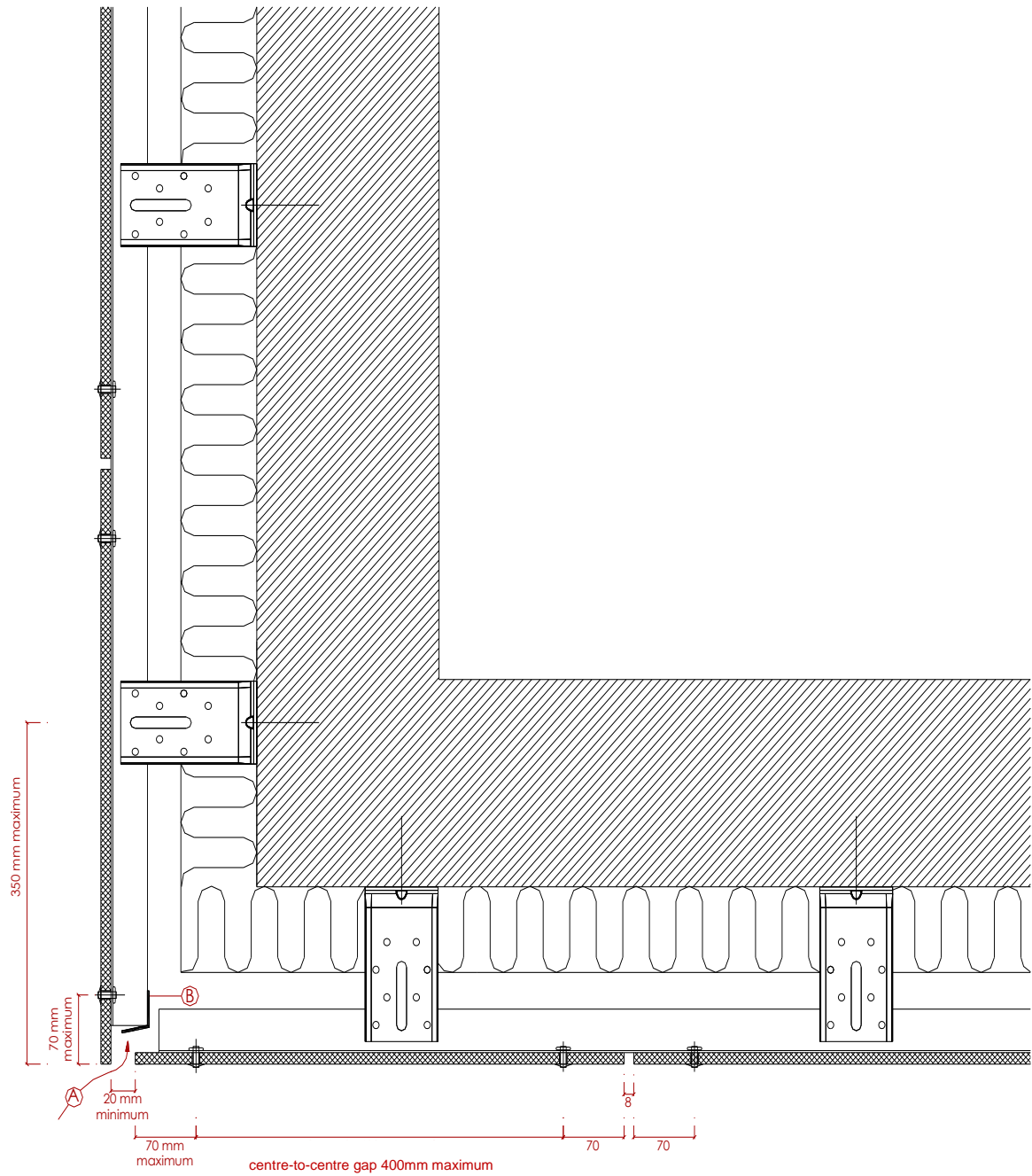


- A- Omega profile
- B- COPANEL cladding



- A- COPANEL cladding

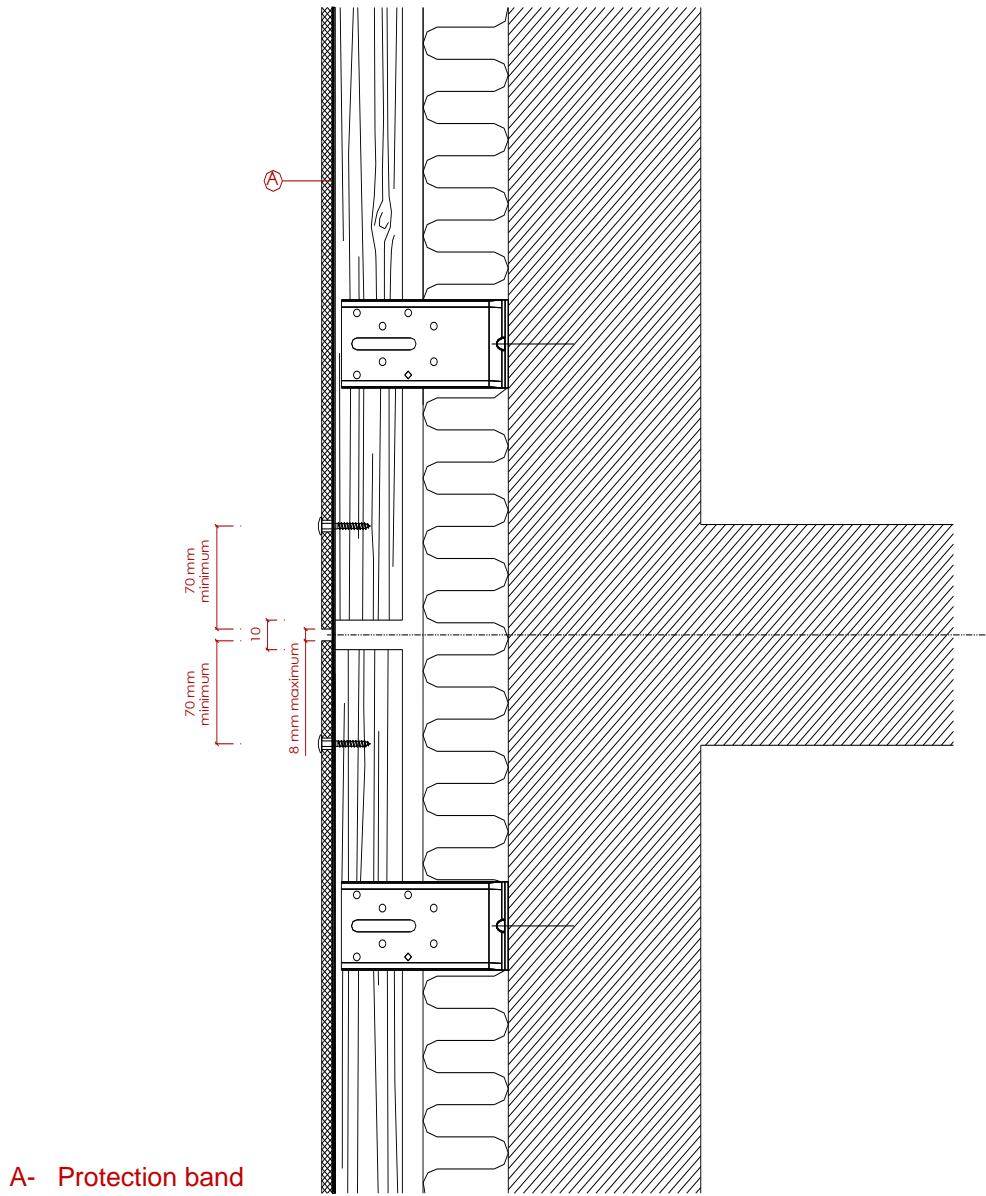
Figure 51 - Installation on the underside of the slab



- A- Ventilation
- B- Water discharge corner
(hot dip galvanised steel Z 275 minimum
mechanically fixed every 600mm)

Figure 52 - Junction between cladding and underside

Installation in seismic zones



A- Protection band

Figure 53 - Framework splitting at each floor on concrete (timber framework)

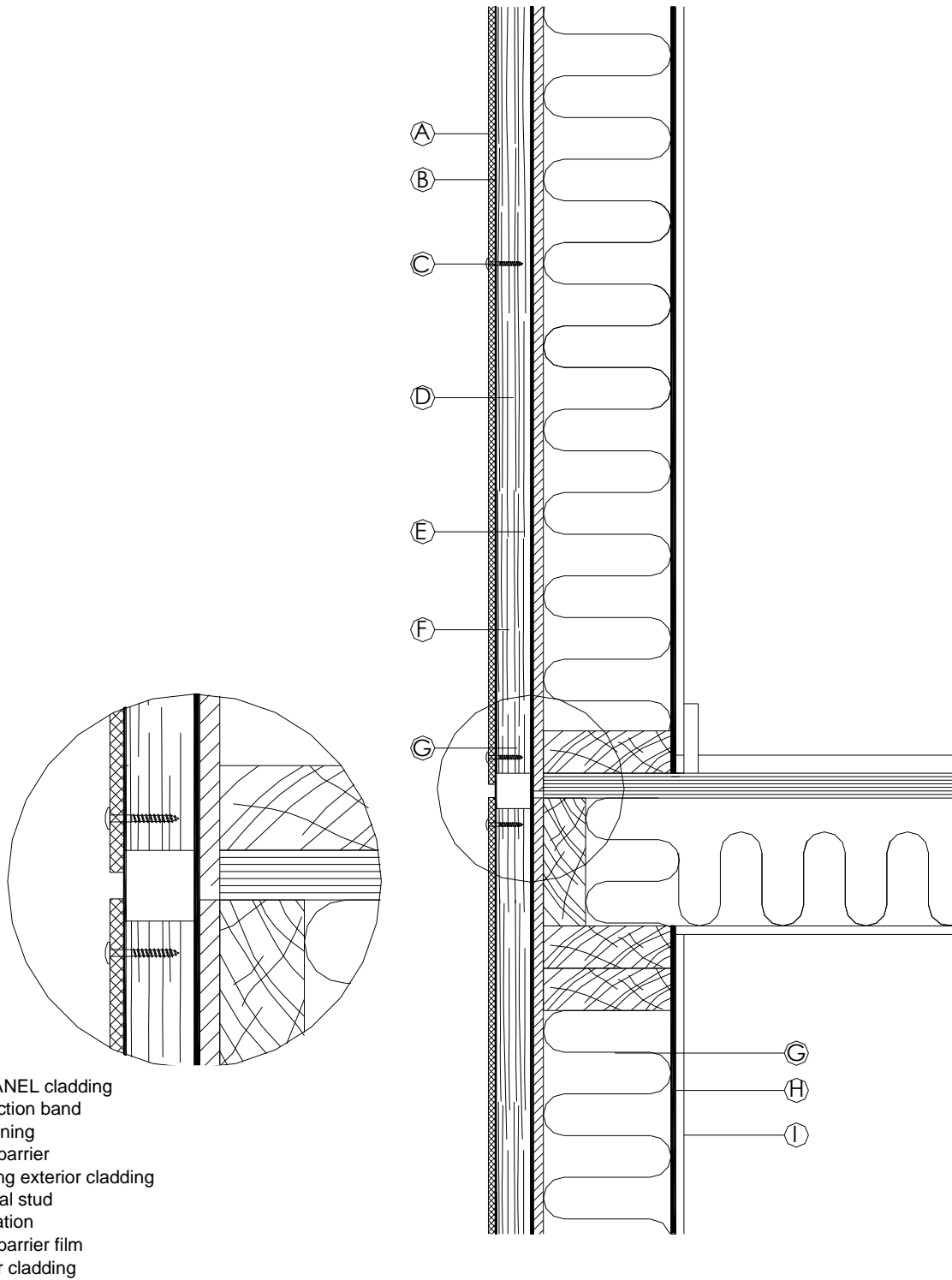


Figure 54 - Framework splitting at each floor on TFC

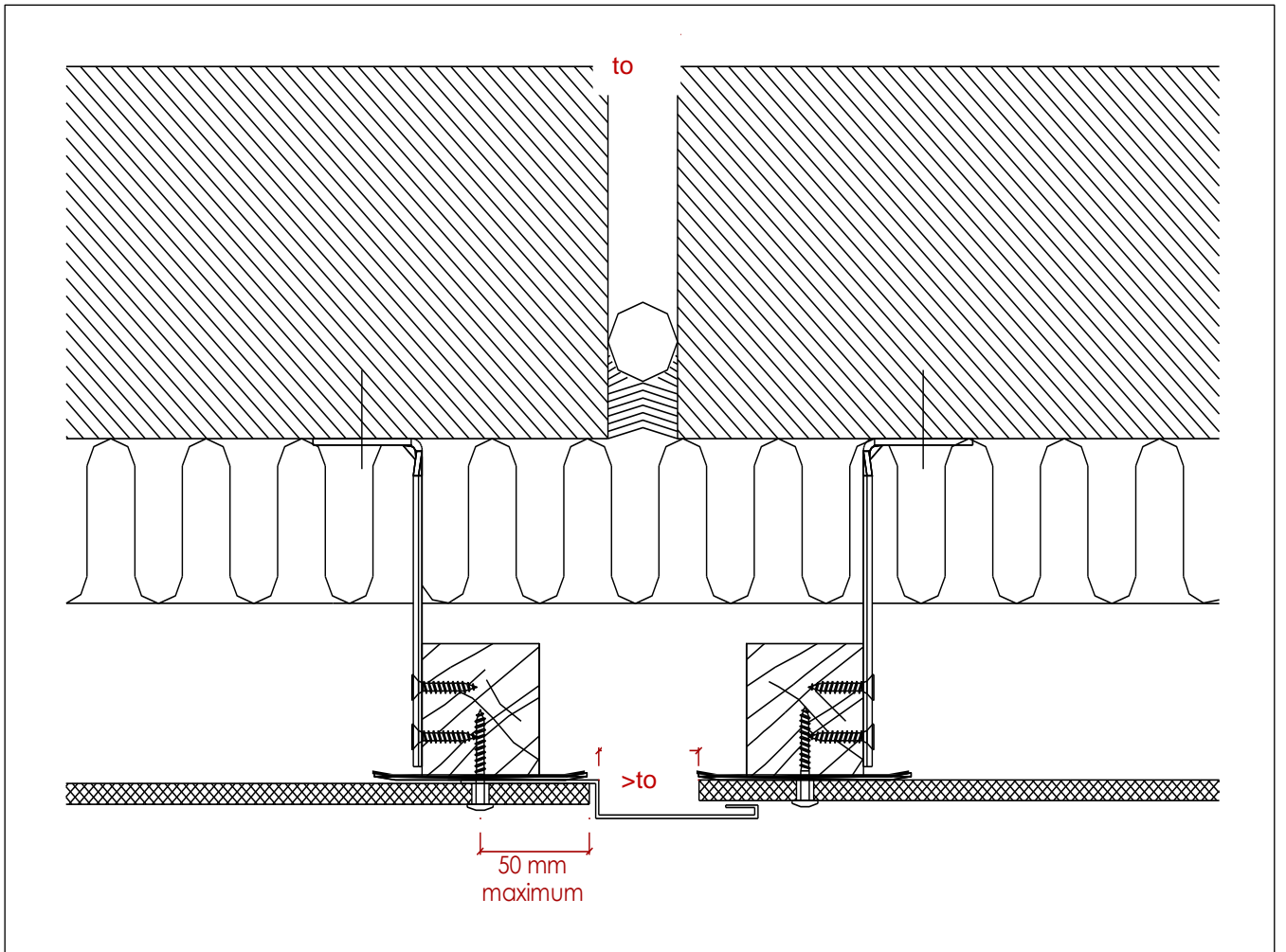


Figure 55 - Expansion joint between 12 and 15cm (timber framework)

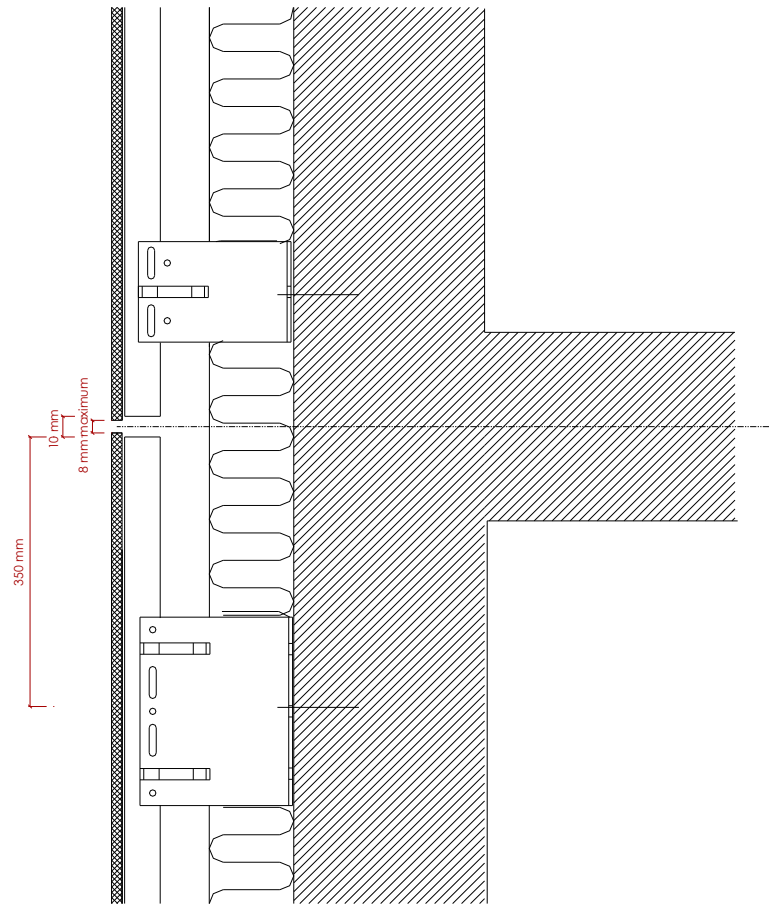


Figure 56 - Framework split at each floor(metal framework)

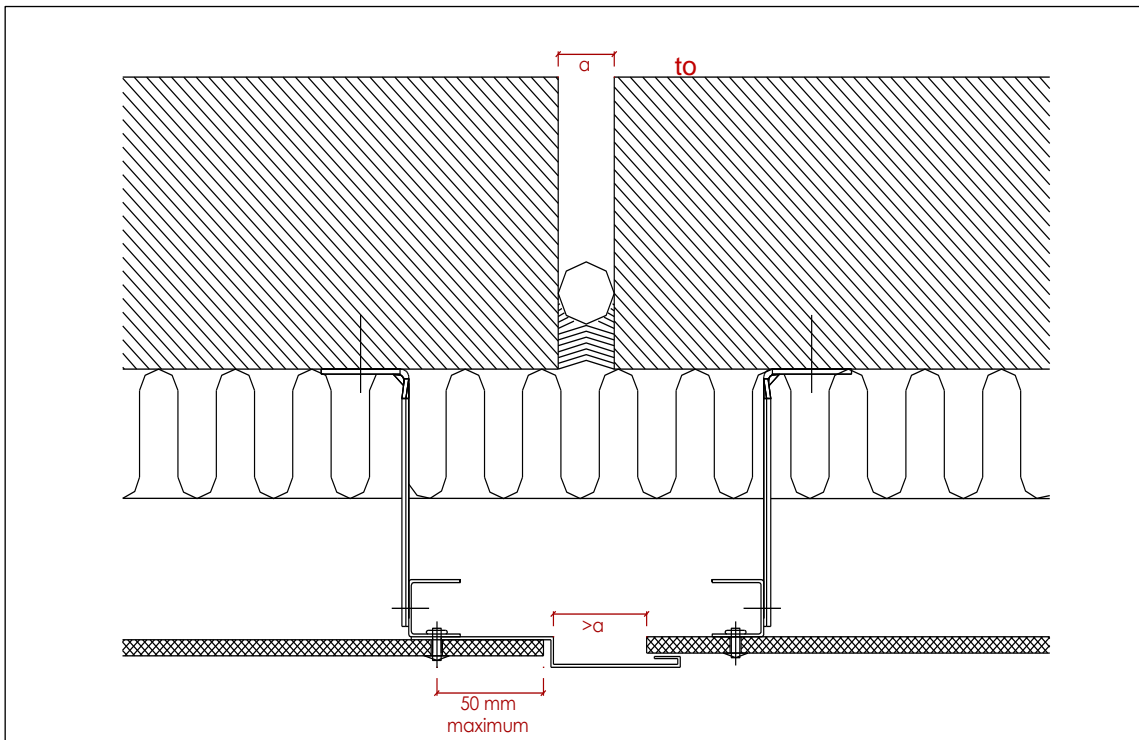


Figure 57 - Expansion joint between 12 and 15cm (metal framework)