Cladding of ceilings on a wooden supporting structure

1 General

These application instructions are specifically intended for the fastening of EURO PANELS OVERSEAS N.V. façade panels as cladding of ceiling on a wooden supporting structure.

A number of basic principles are given that must be adhered to. For variations or additional advice one can always contact EURO PANELS OVERSEAS N.V..

2 Cladding material

The following EURO PANELS OVERSEAS N.V. products are treated in this document.

• ETER-COLOR	8 mm
• OPERAL	9 mm
• TEXTURA	8 mm
• NATURA	8 mm
• NATURA PRO	8 mm
• PICTURA	8 mm

Product data and processing information on the various panels, can be found in the product information sheets, available from EURO PANELS OVERSEAS N.V..

For façade or ceiling applications only rectified boards may be used, non-rectified boards should not be used uncut.

When sawing NATURA and NATURA PRO, the sawed edges must be impregnated with LUKO (a transparent impregnating agent) to minimize local colour differences due to moisture absorption.
In order to avoid effluorescence, NATURA has to be protected from water at the backside.

3 Area of application[1]

These instructions apply for buildings up to a certain height and subjected to a maximum actual wind load in a certain wind zone. The maximum intermediate distance of the supporting structure is determined in relation to the occurring wind load taking into account a safety factor. The table below only shows non-binding reference values for the wind loads. The exact values can be found in the standards NBN B 03-002-1; NEN 6702:2001 and NBN-EN 1991-1-4.

Location	Building height		Max. actual wind load	
		Max. center-to-center distance supporting laths	Middle area façade	Edge area façade and single span
Wind zone	m	mm	N/m²	mm
Land	0-10	400	650	1000
Land	10-20	400	800	1200
Land Coast	20-50 * 0-20	400	1000	1500

* The fixing of OPERAL to a building height higher than 20 m is not advised.

The width of the edge area amounts to at least 1 m from the corner of the building and must be further determined on the basis of prevailing national standards and conditions. If variations of the aforementioned load limits occur (e.g. due to certain location or form factors, etc.), the design must be determined by building services engineers.

4 Supporting structure

The EURO PANELS OVERSEAS N.V. panels are fixed on wooden supporting laths. The wooden supporting laths are fixed at a certain distance (depending on the required insulation thickness and air cavity) on the back construction by means of

- adjustable suspension system
- aluminium supporting structure

[1] These instructions are only valid for applications in Europe, for applications outside this territory the Technical Service Centre of EURO PANELS OVERSEAS N.V. should be consulted.

- wooden laths

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The supporting structure and the back construction must be able to resist the wind forces exerted on the building and the load of its own weight.

- maximum buckle under the influence of strain : ≤ span/300
- safety factor calculation of strength : 3

The quality of the wood must suffice with regard to that described in the prevailing standards for this area of application. The wood must also be protected against being affected by fungi, etc. in accordance with the prevailing standard.

- minimum characteristic bending strength of wood : 18 N/mm^2
- minimum average modulus of elasticity : 9000 N/mm^2

The fastening of EURO PANELS OVERSEAS N.V. facade panels must always take place with a ventilated cavity. The necessary openings are provided on the ceiling edges and in the details to allow sufficient ventilation.
Badly ventilated façade panels could result physic problems for the construction and differences in colors under influence of humidity for panels with a semi-transparent coating.

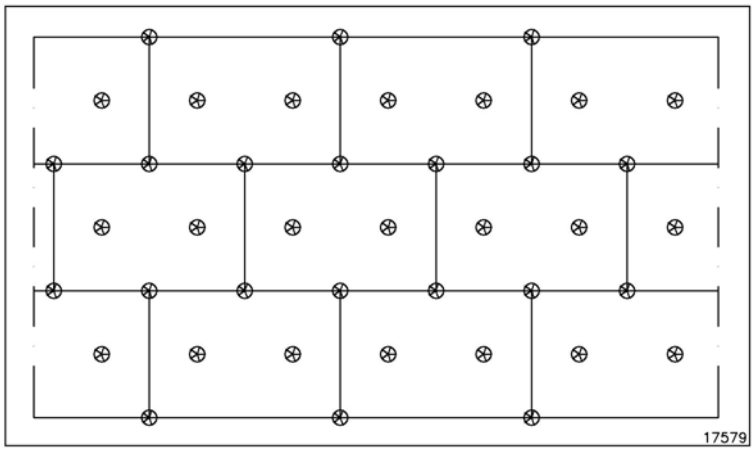
- ventilation openings above/below : ≥ 10 mm/m or 100 cm^2/m

SPECIAL POINTS OF INTEREST

- The connection of the ceiling with the façade has to be detailed in a way that rainwater or cavitywater cannot infiltrate behind the boards but is evacuated to the outside at all times.

- The construction also has to be designed in order to avoid water stagnation on the ceiling.

Mineral wool with a water-repellent black protective coating is recommended for insulation. The insulation is fixed with synthetic insulation fastenings. The insulation is fastened according to the instructions of the producer of the insulation, e.g. with five insulation fasteners per square meter.



If the wooden supporting laths are fixed with brackets, the insulation is fastened after the fitting of the brackets and before the fitting of the wooden supporting laths. A slit is cut in the insulation at the bracket.

It is preferable to isolate the bracket from the supporting wall by using a piece of hard insulation material (THERMOSTOP).

If the wooden supporting laths are fixed with wooden cross laths, the insulation is placed in between the cross laths before the fitting of the wooden supporting laths.

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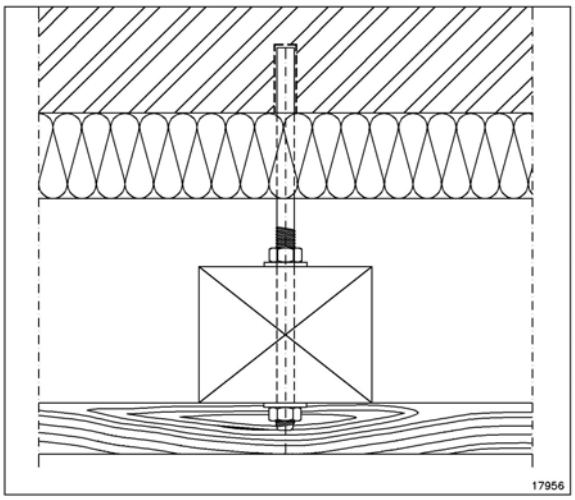
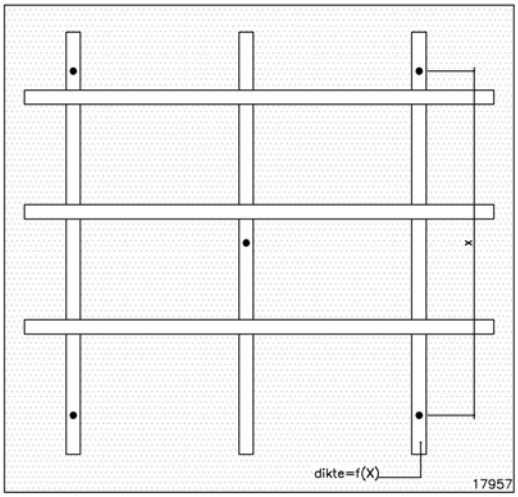
VARIANT 1: ADJUSTABLE SUSPENSION SYSTEM ON SOLID BACK CONSTRUCTION

For uneven solid back constructions or significant lowering the wooden supporting laths can be fixed to wooden cross laths which are fixed to the solid back construction with an adjustable suspension system.

In this standard the suspension system is diagrammatically represented as follows.





The adjustable suspension system must be sufficiently strong to withstand the loads occurring. The cross lath is sufficiently thick to enable the good fastening of the suspension system. The distance between the fastenings of the suspension system is determined by the load occurring (wind load, force of gravity, etc.) and the strength characteristics of the wooden cross laths.

Thickness wooden cross lath	Distance between fastening accessories
50 mm	1500 mm

The fastening of the suspension system to the solid back construction is separately determined for each project depending on the nature and the situation of the ceiling to cover. The minimum pull-out value per fastening is determined by the load (wind load, gravity, etc.) and the fixing distances.

For concrete and full brick a stainless steel screw with a hexagonal head and associated nylon plug is usually used. The screws with hexagonal head are, however, not tightened too firmly so the thread in the nylon plug is not damaged.

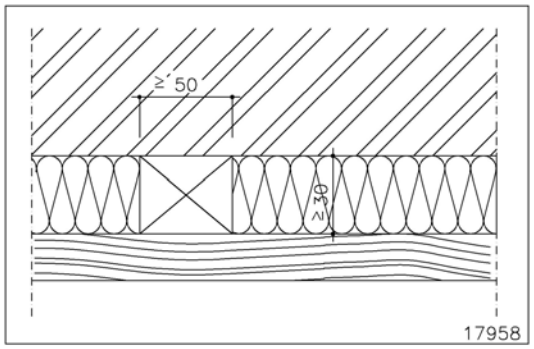
For other surfaces suitable fastening accessories must be used which can withstand the forces occurring. If necessary a pull-test must be conducted on site.

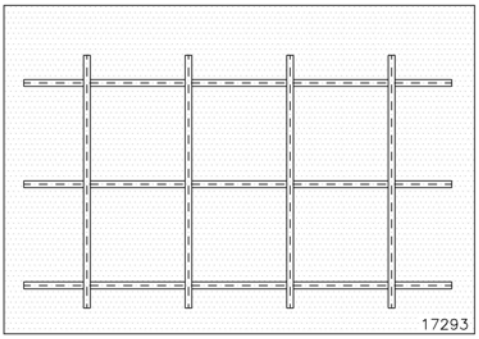
The wooden supporting laths must be sufficiently wide for the correct fitting of the fastening accessories.

Cladding of ceilings on a wooden supporting structure

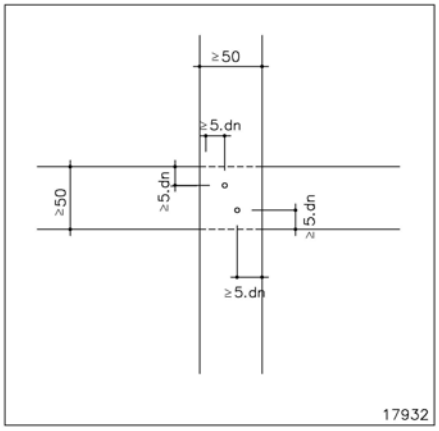
VARIANT 2: CROSS LATHS ON SOLID BACK CONSTRUCTION

For sufficiently flat solid back constructions or small lowering wooden cross laths are fixed to the back construction onto which the supporting laths are then fixed.





2 bevestigingsmiddelen



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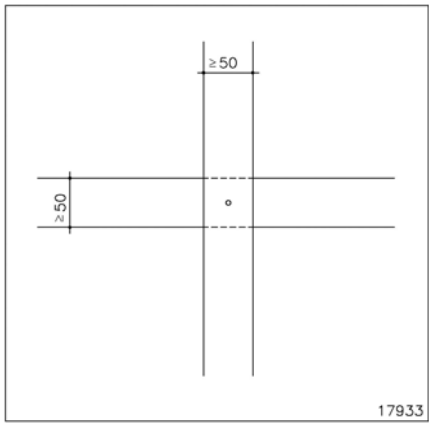

The distance between the fastenings of the suspension system is determined by the load occurring (wind load, force of gravity, etc.) and the strength characteristics of the wooden cross laths.

Thickness wooden cross lath	Distance between fastening accessories
50 mm	1500 mm

The fastening of the suspension system to the solid back construction is separately determined for each project depending on the nature and the situation of the ceiling to cover. The minimum pull-out value per fastening is determined by the load (wind load, gravity, etc.) and the fixing distances.

For concrete and full brick a stainless steel screw with a hexagonal head and associated nylon plug is usually used. The screws with hexagonal head are, however, not tightened too firmly so the thread in the nylon plug is not damaged.

For other surfaces suitable fastening accessories must be used which can withstand the forces occurring. If necessary a pull-test must be conducted on site.

The supporting laths are fixed on the cross laths with one or two fastening accessories per crossing. The number of fastening accessories needed per crossing depends on the load (wind, own weight) and the strength per fastening accessory (pull-out value, shear, etc.).

The wooden laths must be sufficiently wide, and the fastening accessories between the supporting laths and the cross laths must be fixed in such a way that the wooden laths cannot split.

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WOODEN SUPPORTING LATHS

The wooden supporting laths are planed on one side and aligned in the same plane when placing to obtain sufficient evenness. The wood must also be sufficiently stable so that alignment is retained. A small expansion joint is left between the wooden supporting laths.

- maximum unevenness : ≤ L/1000
- joint between supporting laths : ≥ 5mm

The wooden supporting laths must be sufficiently wide to enable the correct application of the fastening accessories.

At joints it is recommended to use slightly wider wooden supporting laths than the minimum width to be able to accommodate tolerances in alignment (and therefore avoid "air screws) and to prevent the splitting of wooden laths.

Fastening	glue	screws
Minimal width supporting lath without joint	≥ 40 mm	≥ 40 mm
Minimal width supporting lath with joint	≥ 100 mm	≥ 90 mm
Adviced width supporting lath with joint	100 mm	110 mm

The wooden supporting laths must be sufficiently thick to resist occurring forces and to enable the correct application of the screws.

Fixing with adjustable brackets

- Minimum thickness of supoorting laths: 50 mm
- Maximum distance between brackets in ceiling application: ≤ 400 mm

Fixing on horizontal cross laths

	Distance between horizontal cross laths	Minimum thickness of the supporting laths
Ceiling	400 mm	≥ 50 mm

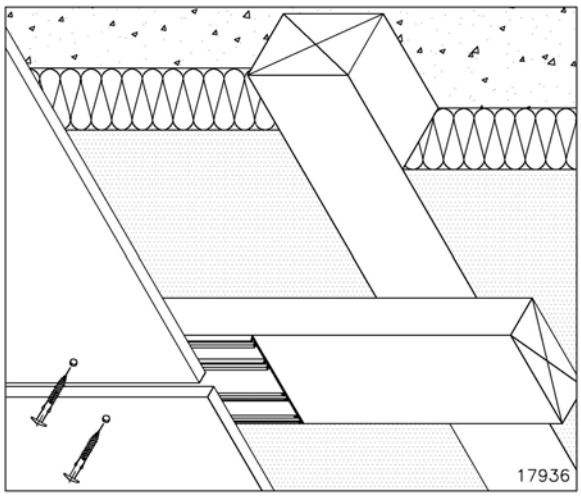
APPLICATION PROCEDURE

The following procedure can be used for the fitting of construction panels on a supporting structure by means of adjustable brackets.

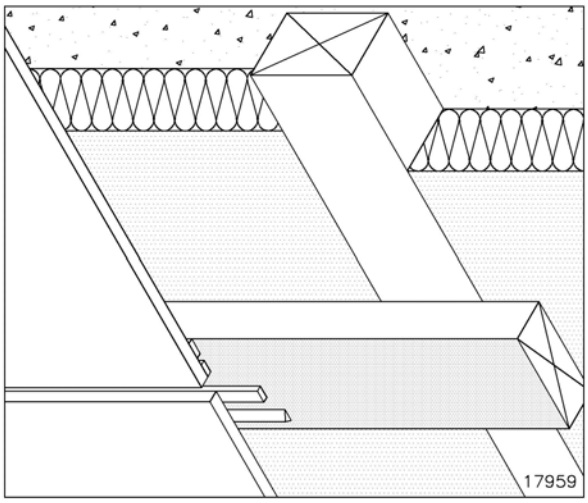
1. Check the straightness of the wooden laths
2. Use the ceiling cladding design plan to mark off the centre to centre distances between the cross laths on the ceiling
3. Fit the adjustable suspension system
4. Fit the cross laths on the adjustable suspension system
5. Align the cross laths in a section by the gradual arrangement of the suspension system (maximum unevenness is less than L/1000)
6. Fit the supporting laths on the cross laths.
7. Fit the EURO PANELS OVERSEAS N.V. construction panels. Calibrated plates can be used to assemble the panels with the correct joint width.
8. The calibrated plates have to be removed carefully, so that the sheet edges are not damaged.

5 Fixing method

Screws



Glue



5.1. Maximum distances between fastening accessories

The horizontal centre to centre distance between the supporting laths is determined by:
- the width of the panel
- the maximum distance between the fastening accessories per fixing variant in the centre area or edge area (see below)
- the distances from the edge of the screws (see below)
- the joint opening

As a general rule, the following maximum distances between the fixing accessories must be respected.

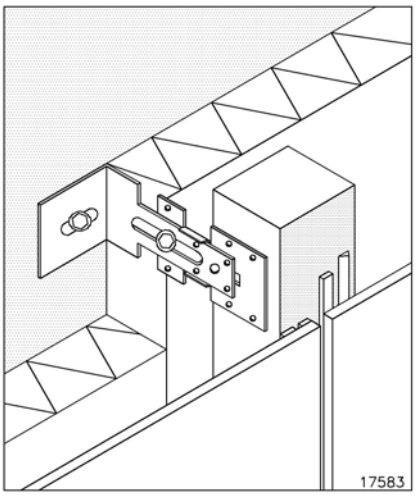
	Land 0-20 m	Land 20-50 m Coast 0-20 m
	mm	mm
Centre area	400	400
Centre area Single span	400	400

Example (fixing with screws):
width of panel = 1220 mm, maximum distance between screws = 400 mm, distance from edge screws = 25 mm, joint opening = 10 mm
→→→centre to centre distance between supporting laths = (1220+10)/3 = 410 mm
→→→ distance between the screws = (1220-2*25)/3 = 390 mm ≤ 400 mm

5.2. Invisible fixing through bonding[2]

5.2.1. Fixing method

Bonding must always take place in accordance with the conditions of the supplier of the bonding system and under his supervision and guarantee conditions. Gluing on a metal supporting structure is a more durable method than gluing on a wooden supporting structure.



Whether panels can be glued or not depends on the chosen bonding system. The following table gives an overview of the different suppliers that have bonding systems for the indicated Euro Panels Overseas N.V. façade panels.

	Textura	Natura	Eter-Color	Pictura	Natura Pro
Bostik	●	●		●	●
Innotec	●	●		●	●
Sika	●	●		●	●
Soudal		PA			
Tweha	●	●	●	●	●

PA= project advice

- Always consult the complete gluing advice of the manufacturer of the glue!
- An excellent quality of the glue can only be obtained by strictly following these instructions.
- Always work with certified products (KOMO, ATG or equivalent), tested on Euro Panels Overseas N.V. material.
- The above mentioned list is regularly subject to changes. Always consult the manufacturer of the glue to be informed on the latest updates.

Depending on the chosen bonding system it is possible that:

- The backside of the panel must be raised with sandpaper P80 on the spot of the adhesive bonding
- The supporting laths must undergo prior treatment with an adhesion primer. Hereby the supporting laths must suffice with regard to the requirements made for the application of the adhesion primer (e.g. maximal moisture level, prescribed wood preservation techniques).
- The façade panel must be cleaned and be given prior treatment with an adhesion primer.

A double-sided adhesive strip is applied as support for the façade panel during the hardening period of the glue, while also indicating the distance between the façade panel and the wooden supporting laths. The correct quantity of glue must be applied. The application of the façade panel requires the necessary precision.

Gluing always has to be done on multiple support structure, or in other words, gluing on a simple support structure is forbidden because of aesthetic reasons.

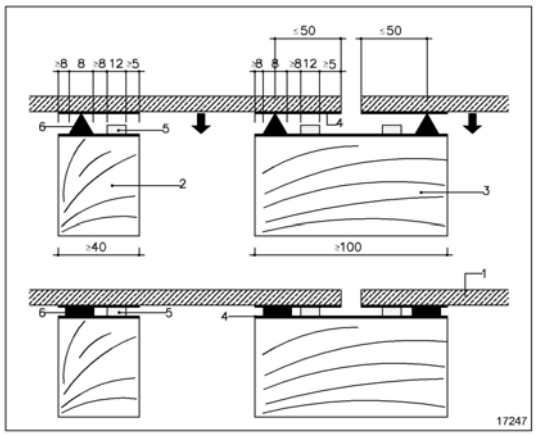
[2] The maximum height can be restricted by the conditions of the supplier of the glue or by prevailing legislation.

5.2.2. Edge distances

The following maximum edge distance must be respected.

- Maximum edge distance of the adhesive : 50 mm

The following schematic drawing illustrates the gluing procedure.



1. façade panel
2. supporting lath without joint
3. supporting lath with joint
4. adhesion primer
5. double-sided adhesive strip
6. glue

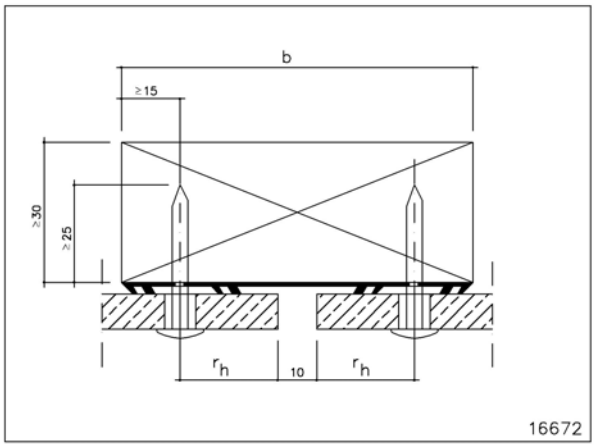
5.3. Visible fixing with button head screws

5.3.1. Fixing method

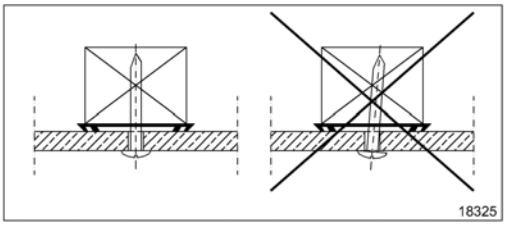
The cladding panel is fixed by means of a stainless steel (quality A2, AISI 304) button head screw with coloured T20 TORX head to the wooden supporting laths.

The screws are inserted using an electric drill with a high quality bit suitable for the type of screw head. The screws must be inserted perpendicular to the panel surface, and may not be tightened to too firmly so that the free expansion of the panel is impeded. This is achieved by limiting the moment setting of the drill.

- minimum screw depth in supporting lath : 25 mm
- minimum distance from screw edge in supporting lath : 15 mm

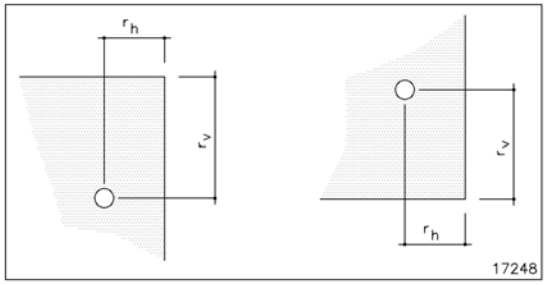


b	≥90
r_h	25



5.3.2. Edge distances

The following minimum and maximum distances from the edges must be respected. Drilling the holes can be done using a template.

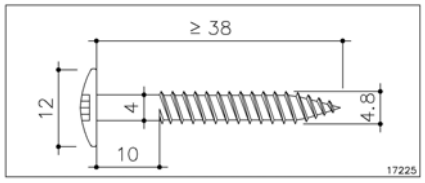


r_h	25-150
r_v	70-150

5.3.3. Types of screws

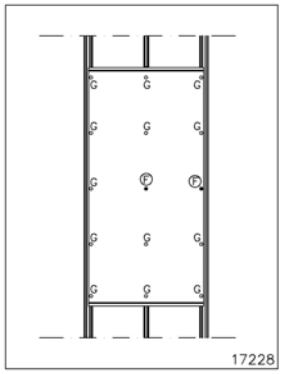
a. ETER-COLOR

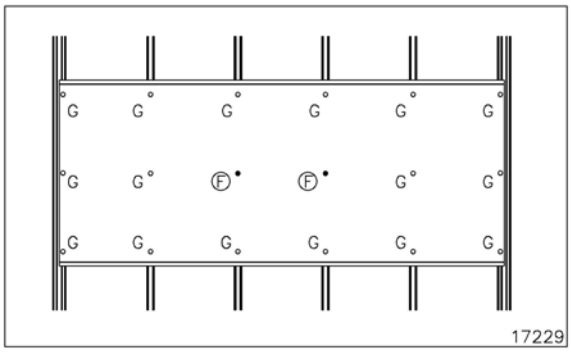
The following design of the screw must be respected.



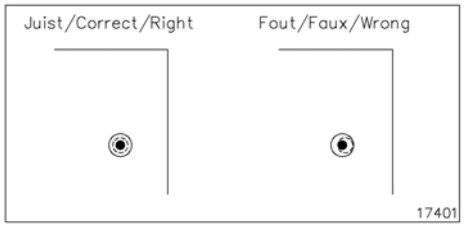
Holes for fixing points are pre-drilled in the panel. For each panel two fixed fastening points (F) located side by side are provided. All other pre-drilled holes are free fixing points to allow movements of the panel (G).

- diameter of fixed fastening point : 5 mm
- diameter of free fastening point : 8 mm



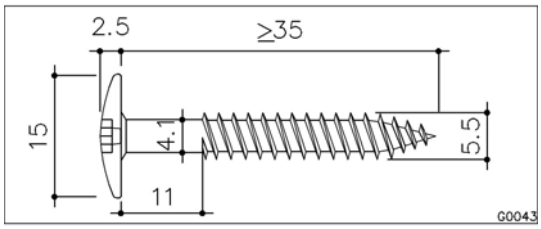


The screws must be applied in the centre of the pre-drilled holes.



b. TEXTURA, NATURA

The following fixing instructions must be respected.

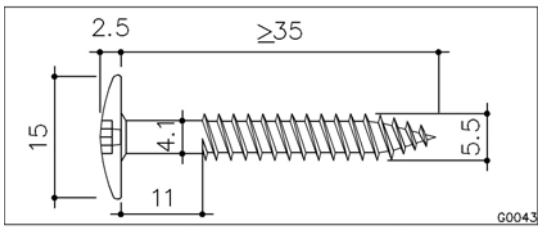


Holes for fixing points are pre-drilled in the sheet. Only pre-drilling with special fibre cement drills in hard metal.

• diameter fixing point: 6 mm

c. PICTURA, NATURA PRO

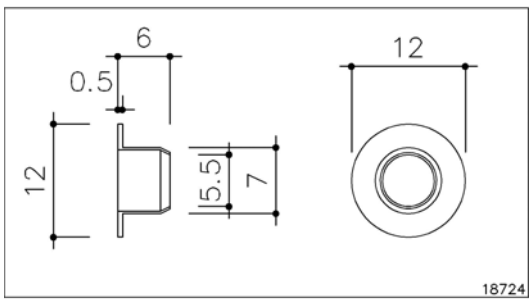
The following fixing instructions must be respected.



Holes for fixing points are pre-drilled in the sheet. Only pre-drilling with special fibre cement drills in hard metal.

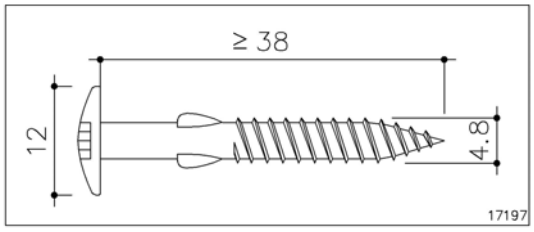
• diameter fixing point: 7 mm

A special sleeve is placed in the drill holes to protect de surface of the PICTURA and NATURA PRO panel..



d. OPERAL

The following design of the screw must be respected. The screw is provided with a very sharp point and wings on the shaft so the pre-drilling of the sheet is not needed.



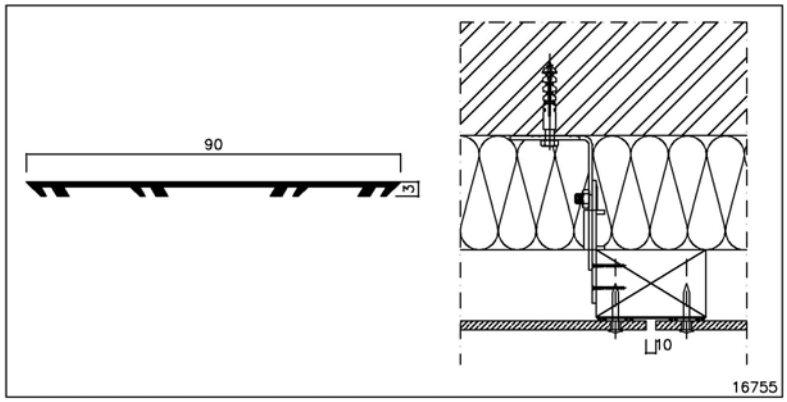
6 Joints

The panels are fixed with open joints to allow the free movement of the panel.

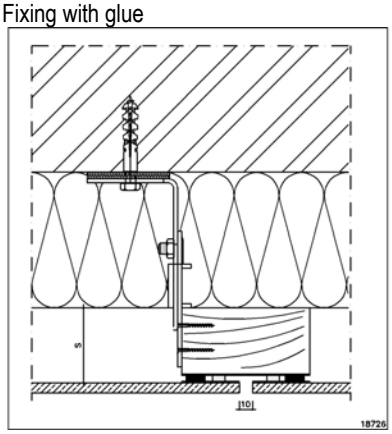
- joint width : 10 mm
- maximum thickness of underlying finishing profile : 0.8 mm

For outside ceilings, the supporting laths are covered with a UV-resistant EPDM joint profile. The joint sealing strip must always cover the wooden supporting lath over the complete width. An EPDM joint sealing strip is also applied on the centre support to obtain even spacing.

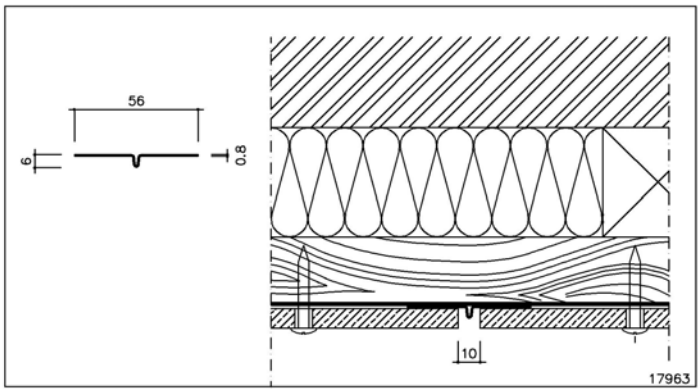
Fixing with screws



Fixing with glue



The horizontal joints can be finished with a black aluminium joint profile. This is particularly useful when the underlying insulation must be protected against the infiltration of rain. The part of the aluminium profile behind the panel may not be too thick to avoid tension. If this is the case, the wings of the profile must be wide enough for the fixing of the panel through the joint profile. The horizontal joint section is the same width as the panel so the vertical joint remains open. One can also make use of decorative horizontal joint sections. If necessary, the horizontal joints can be left open.



7 Accessories[3]

The following accessories can be obtained from EURO PANELS OVERSEAS N.V..

Horizontal joint profile	Black coated aluminium	56 x 2500 mm
Joint profile with ridges for vertical joint	EPDM	90 x 1 mm
Joint profile with ridges for intermediate support	EPDM	45 x 1 mm
Screw for Eter-Color	Coated stainless steel	4,8 x 38 K 12 mm
Screw for Operal	Coated stainless steel	4,8 x 38 K 12 mm
Screw for Textura	Coated stainless steel	5,5 x 35 K15 mm
Screw for Natura	Coated stainless steel	5,5 x 35 K15 mm
Screw for Pictura	Coated stainless steel	5,5 x 35 K15 mm
Screw for Natura Pro	Coated stainless steel	5,5 x 35 K15 mm
Sleeve for Pictura/Natura Pro	Stainless steel	Ø 7 – 12 mm

8 Other construction details

Movements in the metal sections (corner section, bottom section, etc.) must always be detached from the panels. If necessary the aluminium sections must be pre-drilled, and are fixed according to the principle of fixed and free fastening points. Joints between the metal sections must coincide with joints between the panels.

Finishing sections in metals that can leach (such as zinc, copper, lead, etc.) are advised against because of possible soiling.

HOLES IN CEILINGS:
General rule:

- Maximum 30% of the board can be perforated proportionally with a maximum dimension of the perforations of 30 mm.
- If one large perforation is required in a particular board, the maximum opening dimension is 600 x 200 mm with a minimum edge distance of 100 mm. Around the perforation additional substructure is necessary to ensure the stability of the board.
- When complete boards are to be perforated the following distances must be respected:
  - Diameter holes: 10 to 30 mm
  - Material width between the holes: 2 x diameter
  - Material width along the board edges: ≥ 120 mm

For variations or additional advice one can always contact EURO PANELS OVERSEAS N.V..

9 Information on external suppliers

The following manufacturers of glue dispose of specific gluing advices and warranty declarations.

Bostik	www.bostik.com
Innotec	www.innotec-world.com
SIKA	www.sika.com
Soudal	www.soudal.com
Tweha	www.tweha.nl

[3] Use Euro Panels Overseas N.V. accessories; not using standard Euro Panels Overseas N.V. accessories may lead to cancellation of the Euro Panels Overseas N.V. guarantee.

10 Health and safety aspects

During the mechanical machining of panels, dust can be released which can irritate the airways and eyes. Apart from this, the inhalation of fine (respirable size) quartz containing dust, particularly when in high concentrations or over prolonged periods of time can lead to lung disease and an increased risk of lung cancer. Depending on the working conditions, adequate machinery with dust extraction and/or ventilation should be foreseen. For more ample information, please check the Safety Data Sheet according to 91/155/EEC.

11 More information

Information about the various cladding panels can be found in the EURO PANELS OVERSEAS N.V. product information sheets. They can be found on the website or can be obtained on demand by phone. Information about external suppliers can also be downloaded from the website.

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