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European Technical Assessment

ETA 16/0351 of 29/11/2016

English translation prepared by IETcc. Original version in Spanish language

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) Nº305/2011:

Instituto de Ciencias de la Construcción
Eduardo Torroja (IETcc)

Trade name of the construction product

CUPACLAD® 201 VANGUARD

Product family to which the construction product belongs

Kits for external wall claddings

Manufacturer

CUPA PIZARRAS, S.A.
La Medua, S/N.
32330 SOBRADELO DE VALDEORRAS
(Ourense) España
website: www.cupapizarras.com

Manufacturing plant(s)

CUPA PIZARRAS, S.A.
La Medua, S/N.
32330 SOBRADELO DE VALDEORRAS
(Ourense) España

This European Technical Assessment contains

16 pages including 4 Annexes which form an integral part of this assessment. Annex D contains confidential information and is not included in the ETA when is publicly available

This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of

Guideline for European Technical Approval (ETAG) nº 034 ed. April 2012, part 1 and 2 used as European Assessment Document (EAD)

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SPECIFIC PART

1. Technical description of the product

The assessed kits for ventilated external wall claddings “CUPACLAD® 201 VANGUARD” consist of an external cladding, mechanically fastened to a framework, which is fixed to the external wall of new or existing buildings (retrofit). An insulation layer is usually fixed on the external wall.

This kit for vertical exterior wall claddings are classified as family H, according to the ETA Guidance n° 034: *Kits for external wall claddings. Part 1: Ventilated cladding kits comprising cladding components and associated fixings and Part 2: Cladding kits comprising cladding components, associated fixings, subframe and possible insulation layer*, edition April 2012 (hereinafter ETAG 034), used as European Assessment Document (EAD), and comprises the components specified in table 1, which are factory produced by the ETA holder or a supplier.

| TABLE 1 – DEFINITION OF THE KIT COMPONENTS | | | |
|--|--|--|---|
| Components | | Material | Sizes [mm] |
| Cladding element | Tile of natural slate produced by CUPA PIZARRAS, S.A. CE marking ⁽¹⁾ according to Annex ZA of the EN 12326-1:2014 ⁽²⁾ | Natural slate | 600 x 300 x 7,5 |
| Cladding fixings | Elements used to secure the cladding tiles to the subframe ⁽³⁾ | Stainless steel AISI 316 L | 15 x 62 x 1,5 |
| Subframe ⁽⁴⁾ | Horizontal profiles | Horizontal guide rails to hung the tiles by the mean of clips (cladding fixings) ⁽⁵⁾ | Extruded aluminium 51,5 x 30,2 x 2-1 |
| | Vertical profiles | Vertical elements ⁽⁶⁾ used to fix the horizontal guide rails | Extruded aluminium 50 x 60 x 2 |
| | Brackets | Metalic elements ⁽⁷⁾ used as load transmission between the subframe and the substrate wall. | Bending aluminium ⁽⁸⁾ 120 x 40 x 75-150-250 60 x 40 x 75-150-250 |
| Ancillary material | Top profiles | Extruded aluminium | 63 x 27 x 2-1,5 |
| | Self-drilling screws between - Brackets and vertical profiles - vertical profiles-horizontal profiles ⁽⁹⁾ | Stainless steel A2 or A4 | Ø 5,5 L≥19 |
| | Self-drilling screws between - top profile and cladding elements ⁽¹⁰⁾ | Stainless steel A2 | Ø 5,5 L≥25 |
| Auxiliary components | Anchorage to substrate ⁽¹¹⁾ | - | - |

2. Specification of the intended use in accordance with the applicable EAD

2.1 Intended use

“CUPACLAD® 201 VANGUARD” is intended to be used for ventilated external wall claddings which can be fixed to the external wall of new or existing buildings.

The substrate walls are made of masonry (bricks or blocks), concrete (cast on site or as prefabricated panels), timber or metal frame. Insulation material is defined in accordance with an EN standard or an ETA and is not manufactured by CUPA PIZARRAS, S.A.

Kit for ventilated external wall claddings is non-load-bearing construction system. It does not contribute to the stability of the wall on which is installed, neither to ensure the air tightness of the building structure but it can contribute to durability of the works by providing enhanced protection from the effect of weathering.

2.2 Relevant general conditions for the use of the kit

The provisions made in this European Technical Assessment, according to the ETAG 034 used as EAD, are based on an assumed working life of 25 years as minimum, provided that the conditions lay

(1) Declaration of performance n° 0098

(2) EN 12326-1:2014 “Slate and stone products for discontinuous roofing and cladding. Product specification”

(3) See Annex 2 and figure 4

(4) Not manufactured by CUPA PIZARRAS, S.A.

(5) Geometric and mechanical features of horizontal profile in Annex 2 and figure 4

(6) Geometric and mechanical features of vertical profile in Annex 2 and figure 4

(7) Geometric and mechanical features of brackets in Annex 2 and figure 5

(8) Physical and mechanical properties of aluminum in Annex 2

(9) Geometric and mechanical features of the hex head screw in Annex 2

(10) Geometric and mechanical features of the flat head screw in Annex 2 and figure 3

(11) See Annex 3

down in sections 4.2, 5.1 and 5.2 for the installation, packaging, transport and storage as well as appropriate use, maintenance and repair are met.

The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

2.3 Design of the kits

The design of the external wall cladding system for ventilated façade using “CUPACLAD® 201 VANGUARD” kit should take into account:

- The mechanical characteristic values of the kit components (e.g. plates, cladding fixings and subframe) in order to resist the actions applying on the specific work. National safety factor must be used.
- The substrate material to define the suitable anchorages.
- The possible movements of the substrate and the position of the building expansion joints.
- The dilation of the kit components and of the plates.
- The category of corrosivity of the atmosphere of the works ⁽¹²⁾.
- Because joints are not watertight, the first layer behind ventilated air space must be composed by materials with low water absorption.
- The construction of façade specific parts (e.g. base, top, corners, windows etc.)
- If the entire building must comply with the specific building regulations, particularly concerning fire and wind-load resistances of the Member State where the work is to be built.

2.4 Installation of the kits in works

Installation should be carried out according to the ETA holder’s specifications and using the specific kit components, manufactured by the ETA holder or by suppliers recognized by the ETA holder.

Installation should be carried out by appropriately qualified staff and under the supervision of the technical responsible of the site.

2.5 Use, maintenance and repair of the works

Maintenance of the assembled systems or kit components includes inspections on site, taking into account the following aspects:

- Regarding the plates: appearance of any damage such as cracking or detachment due to permanent and irreversible deformation.
- Regarding metallic components: presence of corrosion or water accumulation.

Necessary repairs should be done rapidly, using the same kit components and following the repair instructions given by ETA holder.

3. Performance of the product and references to the methods used for its assessment.

The identification tests and the assessment for the intended use of these kits for ventilated external wall claddings according to the Basic Work Requirements (BWR) were carried out in compliance with the ETAG 034 used as an EAD. The characteristics of the components shall correspond to the respective values laid down in the technical documentation of this ETA, checked by IETcc.

3.1 Mechanical resistance and stability (BWR1)

Requirements with respect to the mechanical resistance and stability of non-load bearing parts of the works are not included in this Basic Requirement but are treated under the Basic Requirement Safety in use (See section 3.4)

⁽¹²⁾ (E.g. See table 1 of Standard EN ISO 12944-2: 1998. Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Part 2: Classification of environments.

3.2 Safety in case of fire (BWR2)

3.2.1 Reaction to fire

The reaction to fire of the whole kit according to standard EN 13501-1: 2007 + A1:2010⁽¹³⁾, is Class A1 without need of testing in agreement with Decision 96/603/EEC as amended.

This classification is valid if the insulation layer placed in the ventilated air space is made of a non-combustible material (mineral wool) or if the layer behind the cladding elements is a mineral substrate like masonry or concrete (A1 or A2-s1, d0).

In other cases the class of reaction to fire has not been assessed.

A European reference fire scenario has not been laid down for facades. In some Member States, the classification of external wall cladding kits according to Standard EN 13501-1 might not be sufficient for the use in facades. An additional assessment of the system according to the national provision (e.g. on the basis of a large scale test) might be necessary to comply with Member State Regulations, until the existing European classification system has been completed.

3.2.2 Fire resistance

The fire resistance requirement is applicable to the wall itself (made of masonry, concrete, timber or metal frame) and not on the cladding kits. The cladding kit alone does not meet any fire resistance requirements. The evaluation of "fire propagation to upper levels" is not part of the European classification and thus, cannot be evaluated, i.e. to be omitted.

3.3 Hygiene, health and the environment (BWR3)

3.3.1 Watertightness of joints

Joints in "CUPACLAD[®] 201 VANGUARD" kits are open, therefore they are not watertight.

3.3.2 Water permeability and Water vapour permeability

These performances are not relevant for external wall cladding kits with ventilated air space.

3.3.3 Drainability

On the basis of the standard construction details (see figures 6, 7 and 8) and the installation criteria of these kits and the technical knowledge and experience, it may be said the water which penetrates into the air space or the condensation water can be drained out from the cladding without accumulation or moisture damage into the substrate.

3.3.4 Release of dangerous substances

The natural slate tiles complies with the Annex ZA of the EN 12326-1: 2014. A declaration of conformity in this respect was made by the manufacturer.

According to this declaration **CUPA PIZARRAS natural slate** do not contain/nor release dangerous substances according to the European and national regulations, when and where in the Member States of destination.

Also regarding the subframe a declaration of conformity in this respect was made by the manufacturer.

According to this declaration the aluminium alloys used for the subframe contain:

- hexavalent Cr, Hg, Pb which amount is always less than 0.1%;
- Cd which amount is always less than 0.1%.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the kits falling within its scope (e.g. transposed European

⁽¹³⁾ EN 13501-1:2007 + A1:2010 Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Regulations, these requirements need also to be complied with, when and where apply.

3.4 Safety in use (BWR4)

3.4.1 Wind load resistance

3.4.1.1 Wind suction resistance

Wind suction resistance has been determined by test carried out according to ETAG 034 part 1, § 5.4.1.1.

The weakest design mechanically has been tested.

| | |
|--------------------|--|
| Cladding elements | CUPA PIZARRAS natural slate 600mm x 300mm x 7.5 mm |
| Fixings | Distance between cladding fixings in horizontal direction H=300mm Distance between cladding fixings in vertical direction V=260mm |
| Horizontal profile | Distance 260mm |
| Vertical profile | Maximum distance 800mm |
| Brackets | Maximum distance 1000mm |

The test results and calculated values for the tested specimen are indicated in table 2

| TEST SPECIMEN | MAXIMUM LOAD Q (Pa) | TYPE OF FAILURE | DISPLACEMENT UNDER MAXIMUM LOAD (mm) |
|------------------------|----------------------|-----------------|--------------------------------------|
| CUPACLAD® 201 VANGUARD | 3200 ⁽¹⁴⁾ | - | 19,07 |

3.4.1.2 Wind pressure resistance

The kit behaviour exposed to wind pressure is most favourable than when exposed to wind suction. Therefore, according to paragraph § 5.4.1.2 of ETAG 034, wind pressure test has been avoided and wind pressure resistance of kit can be considered as equal to wind suction resistance.

3.4.2 Mechanical test

3.4.2.1 Mechanical test (Family H)

3.4.2.1.1 Resistance of metal clip

Resistance of metal clip has been tested according to ETAG 034 part 1 section 5.4.2.9.1.

Test results are indicated in table 3.

| CLADDING FIXING (mm) | FAILURE LOAD (N) | | FAILURE MODE |
|---------------------------------------|------------------|------------------|------------------|
| | F _m | F _{u,5} | |
| Stainless steel clip 15 x 62 x 1,5 | 207.4 | 179 | Clip deformation |

3.4.2.1.2 Resistance of vertical load

Resistance to vertical load has been tested according to ETAG 034 part 1 § 5.4.2.3.3 using:

| | |
|----------|---|
| Subframe | Vertical distance between brackets: 1000mm Maximum distance between vertical profiles: 800mm Distance between horizontal profiles: 260mm Cladding elements are fixed on four points by clips |
|----------|---|

⁽¹⁴⁾ The test had to be stopped at 3400Pa because the equipment did not achieve stabilization. No failure occurs.

Cladding elements – CUPA PIZARRAS natural slate 600mm x 300mm x 7.5mm

After 1h the deflection measured on the clips at the bottom was less than 0,1mm.

3.4.2.1.3 Pull-through resistance of cladding element

Pull-through resistance of cladding element has been tested according to ETAG 034 part 1 section 5.4.2.1.1, using screws ⁽¹⁵⁾ as cladding fixings.

Test results are indicated in table 4.

| TABLE 4 - PULL-THROUGH RESISTANCE OF CLADDING ELEMENT | | | | | |
|---|----------------|-------------------------------------|------------------|------------------|------------------|
| PANEL THICKNESS (mm) | SUPPORT Ø (mm) | FIXING POSITION (Aluminum rivet) | FAILURE LOAD (N) | | FAILURE MODE |
| | | | F _m | F _{u,5} | |
| 7.5 | 180 | Border | 1863.70 | 1435.90 | Cladding element |
| | 270 | Border | 1045.55 | 785.97 | Cladding element |

3.4.2.3 Mechanical test (Subframe)

3.4.2.3.1 Load bearing capacity of the brackets

The resistance of the brackets and their fixings under tension and shear loads was determined by calculation using the specifications defined in the annex E of ETAG 034 part 2.

The calculation results are indicated in table 5 and 6.

| TABLE 5: RESISTANCE TO VERTICAL LOAD OF BRACKETS – CALCULATION RESULT | | | | |
|---|--------------------------------------|---------------------------------|---------------------------------|---------------------------------|
| BRACKETS DIMENSIONS | F _r (daN) ΔL=0.2% de L | F _{1d} (daN) ΔL=1mm | F _{3d} (daN) ΔL=3mm | F _s (daN) failure |
| 60 x 40 x 75 x 3 | 400 | 630 | 720 | Purposeless |
| 60 x 40 x 150 x 3 | 180 | 240 | 300 | Purposeless |
| 60 x 40 x 250 x 3 | 110 | 130 | 155 | Purposeless |
| 120 x 40 x 75 x 3 | 1400 | 2200 | 2500 | Purposeless |
| 120 x 40 x 150 x 3 | 620 | 890 | 1080 | Purposeless |
| 120 x 40 x 250 x 3 | 360 | 450 | 590 | Purposeless |

| TABLE 6: RESISTANCE TO HORIZONTAL LOAD OF BRACKETS – CALCULATION RESULT | | |
|---|--------------------------------|---------------------------------|
| BRACKETS DIMENSIONS | F _c (daN) ΔL=1mm | F _s (daN) failure |
| 60 x 40 x 75 x 3 | 1950 | Purposeless |
| 60 x 40 x 150 x 3 | 1850 | Purposeless |
| 60 x 40 x 250 x 3 | 1800 | Purposeless |
| 120 x 40 x 75 x 3 | 3600 | Purposeless |
| 120 x 40 x 150 x 3 | 3400 | Purposeless |
| 120 x 40 x 250 x 3 | 3200 | Purposeless |

3.4.3 Resistance to horizontal point loads

Resistance to horizontal point loads has been tested according to the method indicated in section 5.4.3 of ETAG 034 part 1. After test the kit have acceptable resistance to horizontal point loads as no permanent deformation on any component was visually appreciated.

3.4.4 Impact resistance

Impact resistance has been tested and classified according to the method indicated in section 5.4.4 of ETAG 034 part 1.

(15) Physical and mechanical properties in Annex 2. Just in the crown the top fixings of the cladding elements are screws.

According with the test results the use category of CUPACLAD® 201 VANGUARD kit for vertical exterior wall claddings is the Category III, that means this kit can be used in zones not likely to be damage by normal impacts caused by people or by thrown or kicked object.

3.4.5 Resistance to seismic actions

This performance has not been assessed.

3.4.6 Hygrothermal behaviour

This performance has not been assessed.

3.5 Protection against noise (BWR5)

This requirement is not relevant for cladding kits designed with ventilated air space.

3.6 Energy economy and heat retention (BWR6)

This requirement is not relevant for cladding kits designed with ventilated air space.

3.7 Sustainable use of natural resources (BWR7)

This performance has not been assessed.

3.8 Aspects of durability and serviceability

3.8.1 Pulsating load

This performance has not been assessed.

3.8.2 Dimensional stability

The tabulated values of subframe are included in Annex B following the standards:

- for aluminium EN 1999-1
- for stainless steel EN 10088-1: 2015

3.8.3 Immersion in water

The CUPA PIZARRAS natural slate tiles have water absorption 0.32%.

According to EN 12326-1: 2014 (see Annex A) CUPA PIZARRAS natural slate tiles are classified W1 (≤ 0.6).

3.8.4 Freeze / thaw behaviour

According to EN 12326-1: 2014, natural slate tiles with a water absorption $\leq 0.6\%$ do not need be tested.

3.8.5 Chemical and biological attack

This performance has not been assessed.

3.8.6 Corrosion

The material and corrosion protection of the kit components are defined in the relevant table of Annex 2.

3.8.7 UV radiation

This performance has not been assessed.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

4.1 System of assessment and verification of constancy of performances

According to the decision 2003/640/EC of the European Commission ⁽¹⁶⁾ the system of assessment and verification of constancy of performances (see Annex V to Regulation (EU) N° 305/2011) given in the following table applies:

| Product(s) | Intended use(s) | Level(s) or class(es) | System(s) |
|--|------------------------------------|-----------------------|-----------|
| Claddings kit based on natural slate tiles fastened to the subframe by visible fixings | kit for external finishes of walls | - | 2+ |

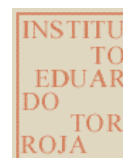
5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the quality plan deposited at the Instituto de Ciencias de la Construcción Eduardo Torroja.



Instituto de Ciencias de la Construcción Eduardo Torroja
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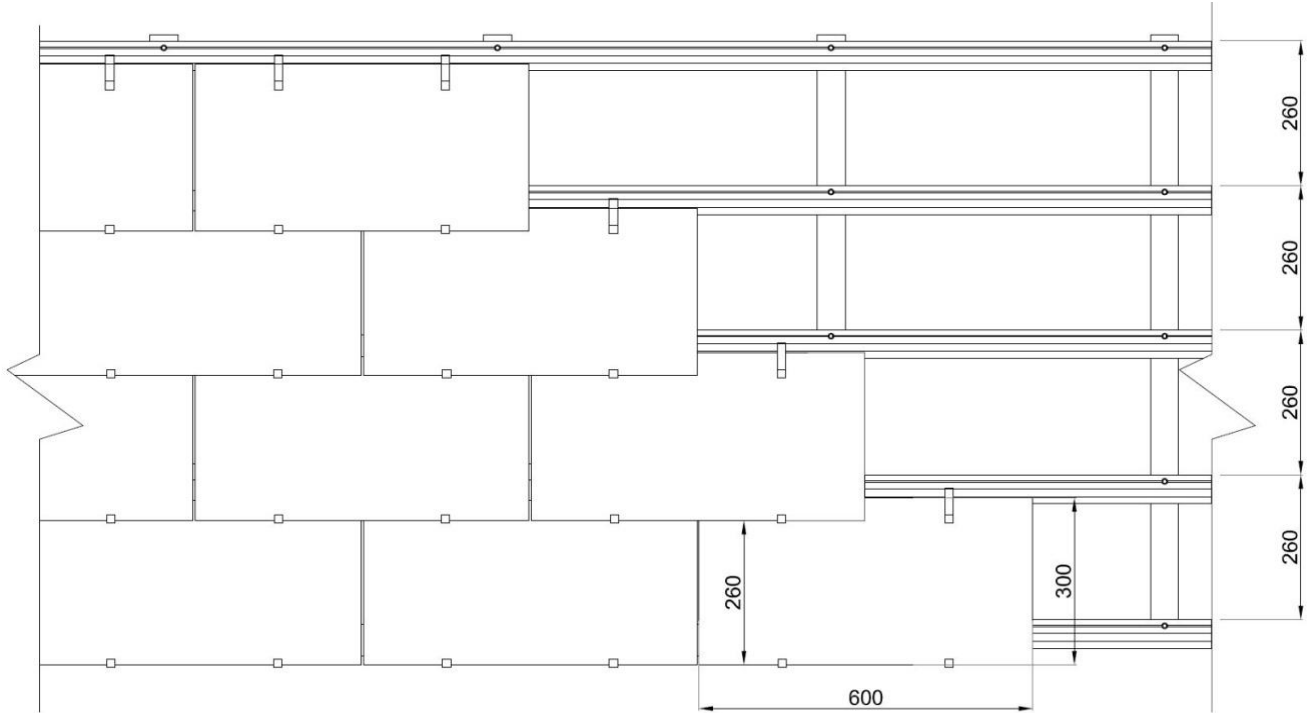


On behalf of the Instituto de Ciencias de la Construcción Eduardo Torroja
Madrid, 29th of November 2016

Marta Castellote Armero
Director

⁽¹⁶⁾ Published in the Official Journal of the European Communities L226/21 of 10.09.2003. See www.new.eur-lex.europa.eu/oj/direct-access.html

FIGURE 1: CUPACLAD® 201 VANGUARD KIT- GENERAL CONFIGURATION



SYSTEM COMPONENTES

FIGURE 2: CLADDING ELEMENT – NATURAL SLATE TILE

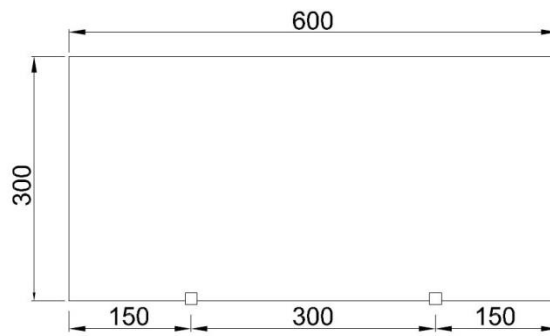
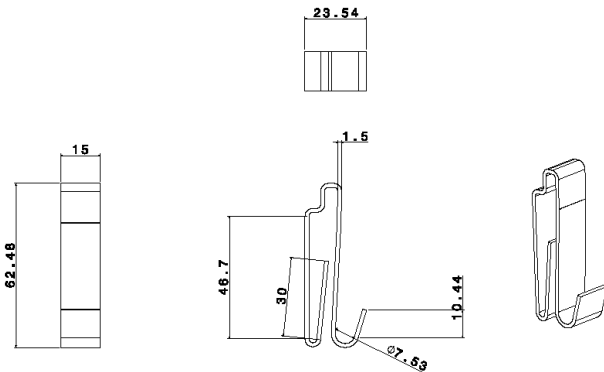


FIGURE 3: CLADDING FIXINGS

STAINLESS STEEL CLIP



STAINLESS STEEL SCREW
(only in the top of the crown tile)

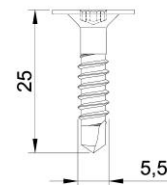


FIGURE 4: SUBFRAME – ALUMINIUM PROFILES

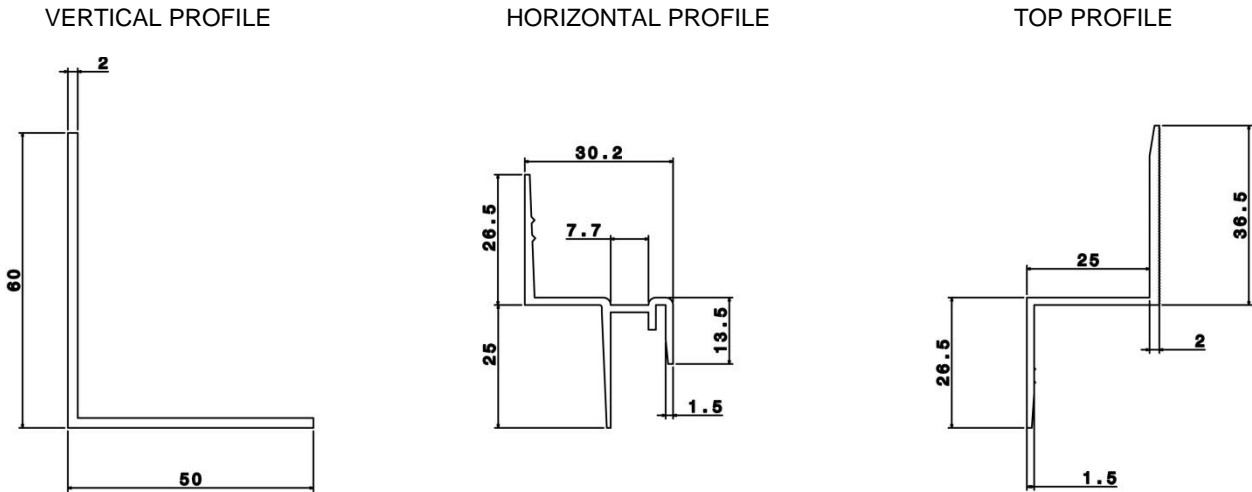


FIGURE 5: SUBFRAME – ALUMINIUM BRACKETS

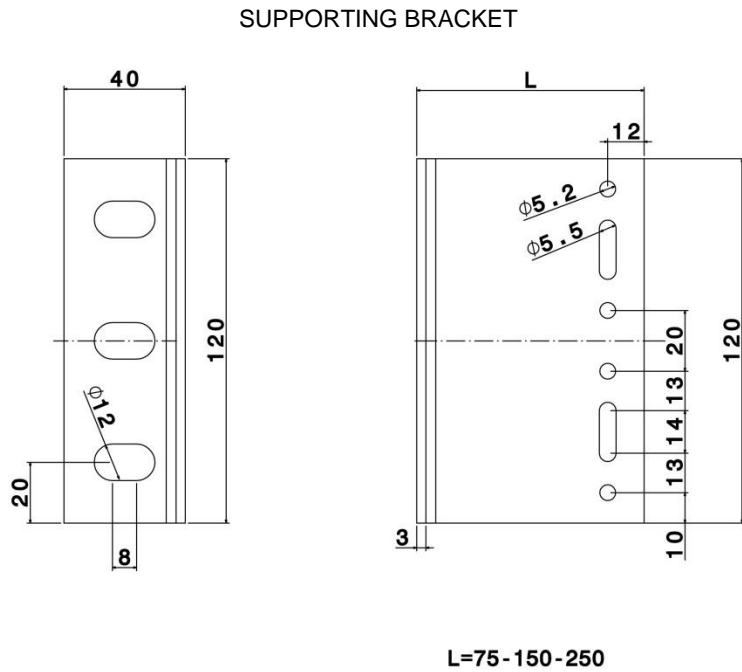
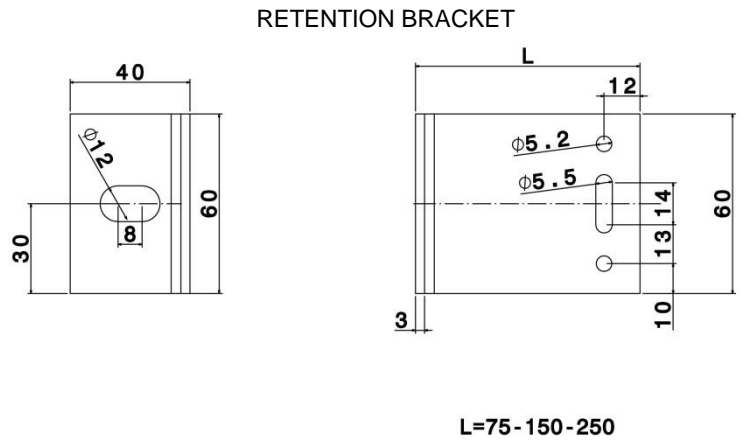
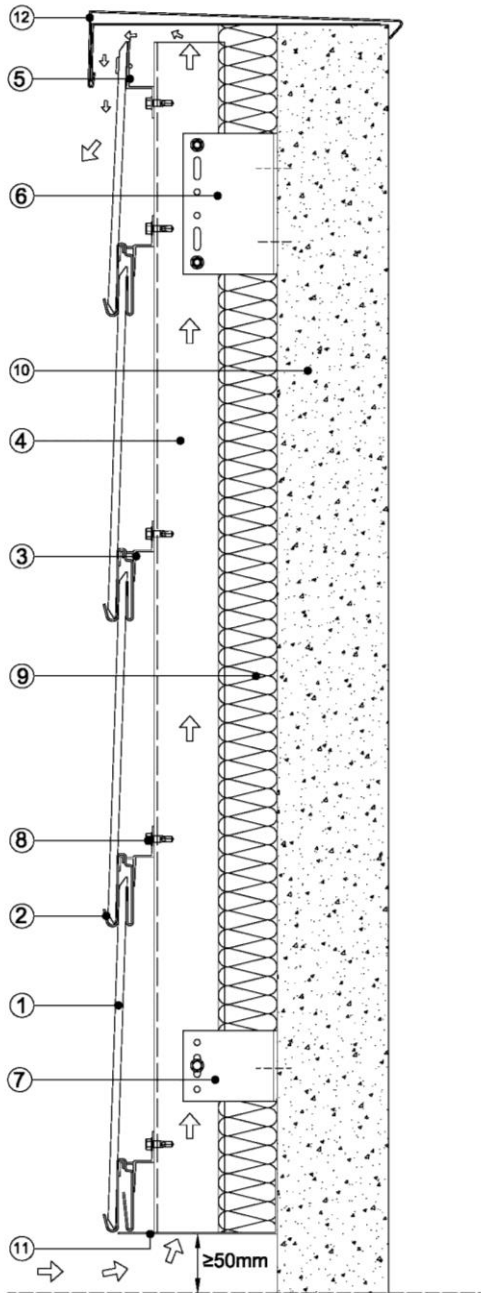


FIGURE 6. DETAIL OF CROWN AND BASE



1. CUPA PIZARRAS Natural slate
2. Clip CUPACLAD® 201
3. Horizontal rail CUPACLAD® 201
4. Vertical "L" rail 50x60
5. Top horizontal rail
6. Retention bracket "fixed point"
7. Supporting bracket "floating point"
8. Self-drilling Inox screw
9. Insulation layer
10. Load-bearing wall
11. Ventilation grid
12. Coping flashing

Note: The details shown in figures above are approximate and must be defined for each project. These details concern the kit for ventilated external wall claddings and may not be used as justification for compliance with the CTE basic requirements.

FIGURE 7. EXTERNAL CORNER

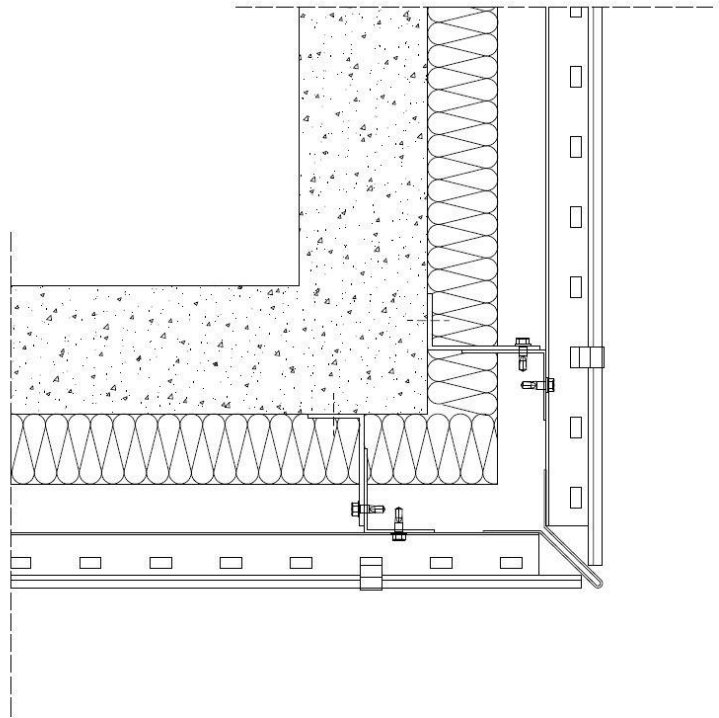
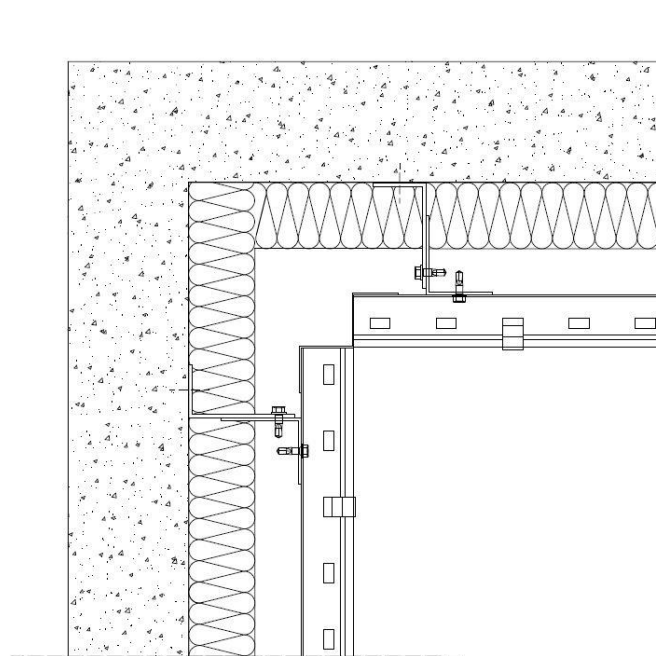


FIGURE 8. INTERNAL CORNER



Annex A: Cladding element specifications

| STANDARD DIMENSIONS ⁽¹⁷⁾ AND GEOMETRY ⁽¹⁸⁾ | | |
|--|---------------|-----------|
| Características | Nominal value | Tolerance |
| Length | 600 | < ±5 mm |
| Width | 300 | < ±5 mm |
| Thickness | 7,5 | ±25% |
| Squareness | | < ±1% |
| Straightness | | < ±1% |
| Flatness | | < 0,9 % |
| Nominal weight (Kg/m ²) | | 21 |

| PHYSICAL AND MECHANICAL PROPERTIES | | |
|--|--------------|-------------------------|
| Apparent density | | ≈ 2,8 g/cm ³ |
| Characteristic MoR | Trasversal | 38 MPa |
| | Longitudinal | 50 MPa |
| Water absorption | | W1(<0.6%) |
| Frost resistance | | Pass <0.6% |
| Thermal cycle | | T1 |
| Carbonate content | | <20% |
| SO ₂ exposure | | S1 |
| Content of non-carbonate carbon | | <2% |
| External fire performance and reaction | | A1 |
| According to EN 12326-1 | | |

⁽¹⁷⁾ Available smaller dimensions with the same thickness

⁽¹⁸⁾ Properties according to EN 12326-1:2004

Annex B: Subframe specifications

Aluminium Physical and mechanical properties

| | | |
|--|--|--------------------------------|
| Symbolic designation | EN AW-Al MgSi | |
| Numeric designation | AW 6060 ⁽¹⁹⁾ | |
| Treatment | T5/T6 | |
| Corrosion protection | Anodic oxidation | Class 15 or 20 ⁽²⁰⁾ |
| | Lacquered (thickness 0.1 mm and 0.15 mm) | Class SEASIDE ⁽²¹⁾ |
| PHYSICAL PROPERTIES | | |
| Specific weight | 2.70 g/cm ³ | |
| Coefficient of linear thermal expansion | 23.4 · 10 ⁻⁶ K ⁻¹ (20/100 °C) | |
| Elastic modulus | 69500 MPa | |
| Poisson coefficient | 0.33 | |
| MECHANICAL PROPERTIES | | |
| Tensile strength (R_m) | ≥ 160 N/mm ² (T5) ≥ 190 N/mm ² (T6) | |
| Elastic limit (R_{p0,2}) | ≥ 120 N/mm ² (T5) ≥ 150 N/mm ² (T6) | |
| Elongation (A_{50mm}) | ≥ 6 % | |
| Brinell hardness | 60 HB (T5) 70 HB(T6) | |
| According to EN 755-2 ⁽²²⁾ and EN 12020-1 ⁽²³⁾ | | |

Brackets Geometrical and mechanical features

| Reference | 120x40x75x3 | 120x40x150x3 | 120x40x250x3 | 60x40x75x3 | 60x40x150x3 | 60x40x250x3 |
|---------------------------------------|-------------|--------------|--------------|------------|-------------|-------------|
| Section (mm²) | 330 | 555 | 855 | 330 | 555 | 855 |
| x_c (mm) | 31,75 | 34,48 | 35,89 | 31,75 | 34,48 | 35,89 |
| I_x (cm⁴) | 19,7 | 130 | 531 | 19,7 | 130 | 531 |
| y_c (mm) | 26,07 | 61,12 | 110 | 26,1 | 61,12 | 110 |
| I_y (cm⁴) | 4,22 | 4,85 | 5,18 | 4,22 | 4,85 | 5,18 |

Vertical profiles Geometrical and mechanical features

| Reference | VERTICAL PROFILE | |
|---------------------------------------|------------------|--|
| | L 50x60 | |
| Thickness (mm) | 2 | |
| Section (mm²) | 216 | |
| Perimeter (mm) | 0,22 | |
| Weight (kg/m) | 0,584 | |
| x_c (mm) | 12,11 | |
| I_x (cm⁴) | 8,08 | |
| y_c (mm) | 42,88 | |
| I_y (cm⁴) | 5,18 | |

Horizontal profiles Geometrical and mechanical features

| Reference | HORIZONTAL PROFILE | | TOP PROFILE | |
|---------------------------------------|--------------------|--|-------------|--|
| | 51.5 x 30.2 | | 63 x 27 | |
| Thickness (mm) | 1.5 | | 1.5 | |
| Section (mm²) | 145 | | 143 | |
| Perimeter (mm) | 0.191 | | 0.182 | |
| Weight (kg/m) | 0.392 | | 0.386 | |
| x_c (mm) | 14.67 | | 14.658 | |
| I_x (cm⁴) | 1.54 | | 1.783 | |
| y_c (mm) | 0.29 | | 5.754 | |
| I_y (cm⁴) | 1.515 | | 3.096 | |

⁽¹⁹⁾ Aluminium alloy 6060 T5 is classified as class B according to (Eurocode 9): EN 1999-1-1:2007+A1:2009 Design of aluminium structures. General structural rules. Table 3.1 and Table C.1 in Annex C.

⁽²⁰⁾ Mean thickness 15μ or 20μ according to the quality mark QUALANOD

⁽²¹⁾ According to the quality mark QUALICOAT

⁽²²⁾ EN 755-2 Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 2: Mechanical properties.

⁽²³⁾ EN 12020-1 Aluminium and aluminium alloys. Extruded precision profiles in alloys en aw-6060 and en aw-6063. Part 1: technical conditions for inspection and delivery.

Stainless Steel Physical and mechanical properties

| | |
|---|---------------------|
| Symbolic designation | X2CrNiMo17-12-2 |
| Numeric designation | 14.404 |
| ASTM | 316-L |
| PHYSICAL PROPERTIES | |
| Specific weight | 8 g/cm ³ |
| Coefficient of linear thermal expansion | 16 (20/100 °C) |
| Elastic modulus | 200 GPa |
| Poisson coefficient | 0.3 |
| MECHANICAL PROPERTIES | |
| Tensile strength (R _m) | 540-620 MPa |
| Elastic limit (R _{p0,2}) | >240 MPa |
| Elongation (A _{50mm}) | >45 % |
| Brinell hardness | <200 |
| According to EN 10088-2: 2008 ⁽²⁴⁾ | |

Stainless steel screw between brackets, vertical profiles and horizontal profiles

| | |
|------------------------------------|---|
| Description | Hex head self-drilling screw |
| Standard | DIN 7504K EN ISO 15480: 2000 ⁽²⁵⁾ |
| Diameter | 5.5 mm |
| Length | ≥19 mm |
| Material | Austenitic stainless steel A2 (AISI 304) or A4 (AISI 316) |
| Standard | EN ISO 3506-4:2010 ⁽²⁶⁾ |
| Resistance class | ≥70 |
| Tensile strength (R _m) | ≥700 MPa |
| Elastic limit (R _{p0,2}) | ≥450 MPa |

Stainless steel screw between cladding elements and top profile

| | |
|------------------------------------|---|
| Description | Flat head self-drilling screw |
| Standard | EN ISO 1478 ⁽²⁷⁾ EN ISO 4759- 1-A ⁽²⁸⁾ |
| Diameter | 5.5 mm |
| Length | ≥25 mm |
| Material | Austenitic stainless steel A2 (AISI 304) |
| Standard | EN ISO 3506-1:2010 ⁽²⁹⁾ |
| Resistance class | ≥50 |
| Tensile strength (R _m) | ≥500 MPa |
| Elastic limit (R _{p0,2}) | ≥210 MPa |

⁽²⁴⁾ EN 10088-2:2008 Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes

⁽²⁵⁾ EN ISO 15480: 2000 HEXAGON WASHER HEAD DRILLING SCREWS WITH TAPPING SCREW THREAD (ISO 15480:1999)

⁽²⁶⁾ EN ISO 3506-4: 2010 Mechanical properties of corrosion-resistant stainless steel fasteners - Part 4: Tapping screws (ISO 3506-4:2009)

⁽²⁷⁾ EN ISO 1478: 2000 TAPPING SCREWS THREAD (ISO 1478:1999)

⁽²⁸⁾ EN ISO 4759-1: 2001 Tolerances for fasteners. Part 1: Bolts, screws, studs and nuts. Product grades A, B and C. (ISO 4759-1:2000).

⁽²⁹⁾ EN ISO 3506-1: 2010 Mechanical properties of corrosion-resistant stainless steel fasteners - Part 1: Bolts, screws and studs (ISO 3506-1:2009)

Annex C: Anchorage to substrate

The fixings between the subframe and the substrate are not part of the kit, therefore have not been assessed, even so it is important define type, position and number of the anchorage according to the substrate material and the resistance required due to the envisaged actions and when possible, CE marking according to the ETA via ETAG 001, ETAG 020 or ETAG 029 is recommended.