

Avis Technique 2/12-1514

Clay Tiles – ArGeLite Built up cladding

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Commission to formulate Technical Opinions
(Order of 21 March 2012)

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Specialised Group No. 2



Constructions, facades and light partitions

The Specialized Group n ° 2 "Constructions, facades and light partitions" of the commission in charge of formulating the Technical Opinions examined on September 18, 2012, the method of cladding reported ArGeLite presented by the company WIENERBERGER. He formulated the following Opinion on this process. This Notice applies only to the manufacture of ArGeLite shingles with a CERTIFICSTB CERTIFIED certificate attached to the Notice issued by CSTB. This Notice has been formulated for use in France.

1. Brief description of the system

1.1 Summary description

Cladding method based on single-skinned clay elements arranged horizontally and maintained by horizontal rails fixed on a metal frame or wood joined to the shell.

General Characteristics

- Dimensions of tiles (see Table 1)
 - Height: 200, 250, 300mm
 - Length: 400 to 800mm
 - Thickness: 24mm

Weight of the tiles: 31.8 kg/m²

Suggested shades include: Beige Apricot, Salmon Red/Pastel, Tuscan Red, Natural Red, Red Brown, Ice Blue, Light Gray, Platinum Gray, Mineral Gray, Volcanic Gray, Pearl White, Sand, Sahara Yellow.

1.2 Identification of tiles

ArGeLite shingles CTBC certified and are identifiable by a marking in accordance with §6.3 of Chapter 1 of the special requirements of the certification CERTIFICSTB CERTIFIED (EP11) of cladding, vetures and cladding, and under-roof cladding ». The marking is in accordance with § 6 of the Technical File.

2. AVIS

2.1 Field of use accepted

- Installation on vertical supports in masonry or in concrete, new or in service, blind or pierced with bays, located on floors and protected ground floor of exposure class Q1 to Q3 in accordance with P 08-302 (see Table 1 at the end of the file).
- Installation on timber framed houses (MOB) in accordance with DTU 31.2, is limited to:
 - R + 2 (height 9 m maximum) in situation a, b, c,
 - R + 1 (height 6 m maximum) in situation d, respecting the prescriptions of § 11 of the Technical File.
- The rain screen is cut every 6 m for the drainage of runoff to the outside.
- Wind exposure corresponding to admissible pressures and depressions under normal maximum wind speed according to Table 2 at the end of the file.

2.2 Assessment on the system

2.2.1 Satisfaction with applicable laws and regulations and other qualities of terms of use

Stability

Reported cladding does not participate in the functions of load transmission, bracing, resistance to impact safety. They are the responsibility of the structure that supports it.

The stability of the cladding reported on this structure is adequately ensured in the proposed field of use:

Safety in case of fire

The system does not preclude compliance with regulatory requirements. The verifications to be carried out (about the so-called "C + D" rule, including for buildings already in service) must consider the following characteristics:

- The fire reaction rating for tiles alone is M0.
- The combustible mass of mineral wool is negligible with respect to the levels of requirement

Security in seismic zones

Timber frame

The ArGeLite timber-cladding system can be used on concrete walls or MOB in accordance with DTU 31.2, vertical planes, in zones and buildings according to the table below (according to the decrees of October 22, 2010 and July 19, 2011):

Seismic Zone	Classes of importance categories of buildings			
	I	II	III	IV
1	X	X	X	X
2	X	X	X	X
3	X	X	X	X
4	X	X	X	X
X	Allowed installation			

The provisions to be respected in the seismic zone 2 for buildings of categories III and IV and in seismic zones 3 and 4 for buildings of all categories of importance are given in Annex A at the end of the Dossier.

Metal frame

The ArGeLite steel-cladded siding system can be used on concrete walls, vertical planes, limited to areas and buildings according to the table below (according to the orders of 22 October 2010 and 19 July 2011):

Seismic Zone	Classes of importance categories of buildings			
	I	II	III	IV
1	X	X	X	X
2	X	X	X	X
3	X	X	X	X
4	X	X	X	
X	Allowed installation			
	Not Allowed installation			

The provisions to be respected in the seismicity zone 2 for the buildings of categories of importance III and IV and in zone of seismicity 3 for the buildings of categories of importance II, III

and IV and in zone of seismicity 4 for the buildings of categories II and III are given in Annex B at the end of the Dossier

Prevention of accidents during implementation

It can normally be assured.

Thermal insulation

The satisfaction of the minimum requirements of the current Thermal Regulation, applicable to new constructions, must be verified on a case by case basis.

Elements of thermal calculation

The surface thermal transmittance coefficient U_p of a wall incorporating an external insulation system based on ventilated cladding is calculated according to the following formula:

$$U_p = U_c + \sum_i \frac{\psi_i}{E_i} + n \cdot \chi_j$$

With:

- U_c - is the surface heat transfer coefficient in the current part, in $W/(m^2.K)$.
- ψ_i - is the linear thermal transmission coefficient of the integrated thermal bridge i , in $W/(m.K)$.
- E_i - is the distance between the linear thermal bridge i , in m.
- n - is the number of point thermal bridges per m^2 of wall
- χ_j - is the point thermal transmittance of the integrated thermal bridge j , in W/K .

The coefficients ψ and χ must be determined by numerical simulation according to the method given in the Th-Bât rules, issue 5. In the absence of numerically calculated values, the default values given in § III.9.2-2 of Fascicle 4/5 Th-U Rules can be used.

In the case of singular points, account should also be taken of loss through the trim profiles.

Sealing/tightness

Air tightness: it is the responsibility of the support wall,

Water tightness: it is satisfactorily ensured by the joints covering the facings between them and by the profiles of dressing of the singular points.

- On concrete or masonry substrates: In the sense of the document "General Conditions of Use for External Thermal Insulation Systems Subject to a Technical Opinion" (CSTB Paper 1833 of March 1983), the system allows to make walls of type XIII
- The support walls must meet the requirements of Chapters 2 and 4 of this document and be airtight.
- On MOB substrates: The tightness is satisfactorily ensured within the accepted field of use.

Environmental and health data

There are no FDES for this process. It is recalled that FDES do not fall within the scope of the process suitability test.

Additional useful information

The external shock performance of the ArGelite process corresponds, according to the P 08 302 standard, to the easily replaceable wall class Q1, with the spacing of the uprights 900 mm maximum. In the reinforced configuration (horizontal rail positioned at mid-height of ArGelite tiles and a primary frame amount every 40cm), the external shock performance of the ArGelite process corresponds, according to the P 08 302 standard, to the exposure class Q3 in wall easily replaceable. Replaceability considered easy, however, requires replacement elements to be supplied at the site.

In application of the attribution rules defined in the document "ReVETIR classification of thermal insulation systems of facades from the outside", the system is classified:

$r_2 \ e_4 \ V^*_{384} \ E_3 \ T_{1+} \ I_4 \ R_4$

*V According to Table 2 at the end of the file.

2.22 Sustainability - Maintenance

The inherent durability of the components of the system and their compatibility make it possible to estimate that the reported cladding will have satisfactory durability equivalent to that of traditional cladding. The durability of the structural work is improved by the implementation of this cladding reported, especially in case of associated thermal insulation.

2.23 Manufacturing and control

The manufacture of ArGelite elements is the subject of a systematic self-control regularly monitored by CSTB, to ensure a consistent consistency of quality.

The manufacturer availing himself of this Technical Notice must be able to produce a certificate issued by CSTB, attesting to the regularity and the satisfactory result of this self-check supplemented by the verification tests carried out by CSTB on products taken during the inspection visits. Products with a valid certificate are identifiable by the presence on the elements of the CSTB logo, followed by the marking number.

2.24 Supply

Elements supplied by WIENERBERGER include ArGelite tiles, horizontal rails, EPDM shims, EPDM shims, splints and corner trim profiles.

All other elements are directly supplied by the laying company in accordance with the description given in the Technical File.

2.25 Installation

This reported cladding arises without difficulty, by means of prior recognition of the support, a layout of the tiles and

complementary profiles, and compliance with the conditions of installation. The company WIENERBERGER provides, at the request of the installation company, technical assistance.

2.3 Technical Specifications

2.31 Design Conditions

Fixings

The fastenings to the load-bearing structure must be chosen considering the conditions of exposure to the wind and their value of design resistance to tearing in the considered support.

In the case of concrete supports filled with common aggregates or masonry, the resistance to the ultimate limit state of the anchors will be calculated according to the ETA (or possibly according to the Technical Notice in the case of certain chemical seals on masonry).

In the case of substrates with unknown characteristics, the ultimate limit state resistance of the anchors shall be verified by prior recognition, in accordance with the document "On-Site Determination of Ultimate Limit Resistance of a Mechanical Attachment". cladding reported "(Cahier du CSTB 1661 V2).

Timber frame

The design and implementation of the timber frame will comply with the requirements of the document "General rules for the design and implementation of wood framing and thermal insulation of cladding reported subject to a Notice Technical "(Cahier du CSTB 3316-V2), reinforced by the following ones:

- The coplanarity of the rafters shall be verified between adjacent chevrons with a maximum permissible gap of 2mm.
- Wooden rafters having a mechanical strength corresponding to at least class C18 according to standard NF EN 338, of natural durability or conferred by use class 3b according to FD P 20-651.
- At the time of their installation, rafters and wooden battens shall have a maximum target moisture content of 18%, with a difference of not more than two elements of 4%. The moisture content of the elements must be determined according to the method described by standard NF EN 13183-2 (with a peak moisture meter).
- Fixing brackets shall have been tested considering deformation under vertical load of not more than 1mm.
- The centre distance of the rafters must be 600 mm maximum

Metal frame

The frame will be a steel flanged design and freely expandable aluminium, complying with the requirements of the document "General rules for the design and implementation

of metal framing and thermal insulation of cladding reported the subject of a Technical Opinion "(Cahier du CSTB 3194 and its modification 3586-V2), reinforced by the following ones:

- The uprights must be checked between adjacent amounts with a maximum permissible deviation of 2mm.
- The permissible resistance of the brackets to the vertical loads to be considered must be that corresponding to a deformation under load equal to 1mm.
- The spacing of the uprights is at most 900 mm.

The frame must be subject, for each worksite, to a calculation note drawn up by the laying company assisted, if necessary, by the holder of the Wienerberger Company.

2.32 Conditions of installation

Layout plan

Bridging of junctions by tiles, between bearing profiles is excluded.

Laying on MOB

MOB installation according to DTU 31.2 is limited to:

- R + 2 (maximum height 9 m) in situation a, b, c,
- R + 1 (height 6 m maximum) in the d situation, respecting the prescriptions of § 11 of the Technical File.

The rain screen will be cut every 6m for the drainage of the runoff water to the outside.

The frame will be intersected at all levels.

The rafters will be placed to the right of the frame studs of the timber framed house.

Seismic zones

Laying in seismic zones is described in Appendices A and B at the end of the file. Framing is split at the right of each floor

3. Additional comments from the Specialized Group

About the wind resistance, the admissible values under normal wind announced vis-à-vis the effects of depression account for a factor of safety taken equal to 3.5 on the value of ruin, which resulted in test by tearing off 2 screws fixing the rails of the central upright causing the fall of the elements.

The Specialist Group Rapporteur No. 16

Conclusions

Global appreciation

The use of the process in the proposed field of use is favourably appreciated

Validity

Until September 30, 2015

Technical file prepared by the applicant

A. Description

1. Principal

ArGeLite is a cladding system based on single-skinned clay elements arranged horizontally and maintained by horizontal rails fixed on a metal frame or timber frame. Additional insulation is usually arranged between the roughing and the cladding reported. The air gap between the cladding and the insulation is ventilated.

2. Material

2.1 Used for Manufacture

The tiles are clay

2.2 Implementation

- Primary structure:
- Timber: Usual components of the cladding reported on timber frame conforming to the Cahier du CSTB 3316 V2;
- Metallic: Metal frame components in galvanized steel or aluminium alloy conforming to CSTB 3194 and are modifying 3586-V2.
- Horizontal rails are made from extruded aluminium with EN AW 6063 T6 grade.
- Stabilization/safety shims: EPDM (Ethylene Propylene Diene Monomer) with a hardness of 60 ± 5 Shore A (according to DIN 53505).
- Protective tape in accordance with CSTB Handbook 3316-V2.
- EN AW-6063 T66 aluminium corner trim profiles distributed by Wienerberger.
- ACERMI certified insulation, in accordance with Cahiers du CSTB 3316-V2 and 3586-V2.

3. Elements

3.1 Argelite clay tile

ArGeLite elements are 24 mm thick clay tiles with a length of 400mm to 800mm and a height of 200mm, 250mm or 300mm.

Corner tiles (right and left) are made by sawing at 45° in the direction of the height.

The surface of ArGeLite tiles is smooth.

Dimensional characteristics

- Height: ± 2mm
- Length: ± 1mm
- Thickness: ± 1mm
- Flatness and straightness: in accordance with standard NF EN 1304

Other features

- No persistent efflorescence.
- Water absorption according to DIN 52251 (boiling water): maximum 12%.

- Resistance to freezing according to standard NF EN 539-2-Method C.
- Nominal surface weights: Approximately 31 kg/m², valid for all heights proposed.

Colour of standard shingles

Standard shades include: Beige Apricot, Salmon Red/Pastel, Tuscan Red, Natural Red, Red Brown, Ice Blue, Light Gray, Platinum Gray, Mineral Gray, Volcanic Gray, Pearl White, Sand, Sahara Yellow.

Other colours and aspects may be proposed as part of the expansion of the range based on internal manufacturing monitoring and external monitoring of CSTB (mechanical characteristics). The other characteristics of the elements are given in Table 1 at the end of the Technical File.

3.2 Fixings

On metal frame

The fixing of the horizontal rail on the metal frame is carried out:

- with a stainless steel self-tapping A2 screw with a minimum diameter of 5.5mm and a length of 25mm (5.5 x 25) with a minimum pull-out resistance of PK: 190 daN, according to NF P30 310,
- with aluminum - stainless rivets with a diameter of 5 mm and a length of 12mm. The diameter of the head being 14mm minimum.

Other fixations of the same nature and of equal or superior characteristics may be used

On Timber frame

The fixing of the horizontal rail to the wood frame is carried out with a stainless-steel screw with flat underside of minimum diameter 6mm and length 38mm (6.0x38) of minimum tear resistance PK = 190 daN according to the standard NF P 30-310.

3.3 Framing

3.31 Timber frame

The timber frame must comply with the requirements of Cahier du CSTB 3316-V2 "General rules for the design and implementation of timber framing and thermal insulation of cladding reported subject to a Technical Notice".

The minimum view width is 40mm for wood rafters.

3.32 Metal Frame

The metal frame must comply with the requirements of CSTB Specification 3194 & its modification 3586-V2 "General conditions for the design and implementation of the metal framework & the thermal insulation of the cladding reported subject to a technical advice".

The metal frame can be galvanized steel at least Z 275 or aluminium alloy.

The amounts can consist of Omega, T, Z or L profiles.

The width is 40mm minimum for metal studs.

The steel frame is considered in a protected & ventilated outside atmosphere. The aluminium frame is of freely expandable design.

The profiles have a maximum length of 6 m.

3.4 Associated accessories

- Complementary trim profiles
Corner trim profiles are available in natural aluminium, anodised or lacquered.
The lacquered corner trim profiles are available in the following three shades: copper brown (RAL 8004), light ivory (RAL 1015) or gray (RAL 7005).
Other RAL colors can be offered on request.
Corner trim profiles are marketed by Wienerberger.
- Horizontal rails and splint (see Fig. 4 and 4bis)
The horizontal rails & splints are made of EN AW 6063 T6 aluminium alloy and are marketed by Wienerberger.
The horizontal rails are used in length of up to 3.6 m.
The fishplates have a length of 20cm.
- Stabilization wedges in EPDM (see Fig. 5)
The EPDM shims are positioned between two shingles at the vertical joints on each rail and provide the triple function:
 - Avoid lateral shifting of ArGeLite tiles
 - To guarantee a vertical joint of width 4mm between the tiles.
 - To ensure a damping effect allowing a clutch without tightening of the tiles, while preventing the beating due to the wind.

There are two types of stabilization wedges:

- an EPDM stabilization wedge for use in the main part
- an EPDM stabilization wedge for shore use.

EPDM stabilizers are available in black & sold by Wienerberger.

- EPDM safety wedge (see Fig. 4.4)
The shims help to prevent the disassembly of shingles not covered by a tile in accessible places (ex: window sills on the ground floor), and to avoid the lifting of the tiles at the head of the wall (eg acroterium).
They are marketed by Wienerberger.

4. Fabrication

ArGeLite tiles are manufactured by the Wienerberger factory in Görlitz, Germany. The raw materials come from Stephan Schmidt Kamenz and Wienerberger GmbH Ebersbach and Rudakmühle. The manufacturing process is as follows:

- Grinding and rolling,
- Addition of barium carbonate,
- Wetting the mixture,
- Casting and extrusion of tiles by spinning (control of spinning pressure and moisture),
- Drying,

- Cooking in a roller oven,
- Permanent cut

5. Manufacturing controls

On raw materials

Every week:

- Humidity,
- Granulometry,
- Loss of fire,
- Visual inspection of the colour.

During manufacture

- Storage of the clay for four weeks before putting into production.
- Manufacturing parameters: empty, aspect, plasticity, dimensions (at the beginning of each post and every hour).
- Duration & drying temperature, residual humidity, appearance (once a day and by dryer).
- Duration & cooking temperature, appearance, removal after cooking (twice per station).

On finished products

- Dimensional control on 3 samples (once per station).
- Squareness control, straightness, flatness on 3 samples (once per station).
- Sound control (on each tile).
- Frost resistance test according to EN 539-2 method C followed by flexural strength according to NF EN 538 (once a quarter): no alteration.
- Control of water absorption with boiling water according to DIN 52251 (once a week).
- Control of flexural strength according to standard NF EN 538 (once a week): Certified CSTB value: 10 MPa.
- Water absorption and porosity control according to NF EN ISO 10543-3 (once a year).

6. Identification

ArGeLite elements benefiting from a CSTB certificate are identifiable by a marking in accordance with § 6.3 of Chapter 1 of the "Particular requirements of the CSTB Certification of cladding, and under-roofing" and including:

On the product

- The CSTB logo,
- The certificate number,
- The identification mark of the batch of manufacture

On pallets

- The CSTB logo,
- The certificate number,
- The name of the manufacturer, an identification of the production plant,
- The trade name of the system and the trade name of the product,
- The number of the Technical Notice for which the certified product is appropriate.

7. Supply - Technical Assistance

Wienerberger does not pose itself; it provides ArGeLite tiles, horizontal rails, EPDM shims, EPDM shims, splints and corner trim profiles.

All other elements are directly supplied by the installer, in accordance with the recommendations of this Technical File. Wienerberger has a technical service that can provide, at the request of the installer, technical assistance both in the study of a project and at the stage of its execution.

8. Working Area

- Implementation on flat and vertical walls, new or existing masonry elements or concrete located on floor and ground floor.
- Possible installation on houses and buildings with timber frame in accordance with DTU 31.2, in compliance with the requirements of paragraph 11 of the Technical File.
- Wind exposure corresponding to a pressure or a vacuum permissible under normal wind of maximum value (expressed in Pascals) given in Table 2 at the end of the file.

9. Implementation of thermal insulation & vertical framing

9.1 Thermal insulation

Insulation is implemented according to the requirements of the documents:

- For timber-frame installation: "General rules for the design and implementation of wood framing and thermal insulation of reported cladding subject to a Technical Notice" (CSTB Paper 3316-V2) .
- For installation on metal substructure: "General rules for the design and implementation of the metal framework and the thermal insulation of the cladding reported subject to a Technical Notice" (CSTB Handbook 3194 and its amendment 3586-V2).

9.2 Timber frame

The implementation of the timber frame must comply with the requirements of Cahier du CSTB 3316-V2, reinforced by the following ones:

- The coplanarity of the amounts must be between adjacent amounts with a maximum permissible difference of 2mm.
- At the time of installation, wooden rafters and battens shall have a maximum target moisture content of 18%, with a difference of no more than two elements of 4%. The moisture content of the elements must be determined according to the method described by standard NF EN 13183-2 (with a peak moisture meter).
- The permissible resistance of the bracket to the vertical loads to be considered must be that corresponding to a deformation under load equal to 1mm.

- Wooden rafters having a mechanical strength of at least class C18 according to standard NF EN 338, of natural durability or conferred with class of use 3b according to FD P 20-651.
- In the case of a direct laying of the rafters on the support, it is advisable to check the defects of flatness of the latter (bumps, irregularities various) which must not be superior to 5mm under the ruler of 20cm, and 10mm under the rule of 2m.
- The maximum distance between the studs is 600mm in the common part (or 645mm on MOB).

9.3 Metal frame

The implementation must comply with the requirements of CSTB Cahier 3194 and its modification 3586-V2, reinforced by the following:

- The coplanarity of the amounts should be checked to 2mm between adjacent amounts,
- Fixing brackets shall have been tested, considering deformation under vertical load of 1mm,
- The maximum distance between the posts is 900mm.

10. Installation

10.1 General principles of laying

The preliminary establishment of a layout is recommended to locate the singular points and to identify the zones of cuts. To establish the grid pattern, it should be noted that the value of the vertical joint between tiles is 41mm. The value of the horizontal joint between ArGeLite tiles is 10mm.

Example of a grid pattern:

- Tile 290/596 mm weft 300/600
- Tile 240/696 mm weft 250/700
- Tile 190/796 mm weft 200/800

Cutting ArGeLite tiles

The company should be equipped with a water table saw and equipped with a saw blade for ceramic material.

Fastening to the supporting structure

It is imperative that the installation company foresees the method of fixing the brackets according to the type of wall (hollow, solid, new, old) to determine with the chosen fasteners manufacturer:

- The type of fastening adapted, benefiting from a European Technical Approval or a Technical Notice.
- The vertical profile fixing distance, considering the weight of the ArGeLite system, the impact class and the wind effects of the site.

Laying the horizontal framework

The horizontal rail, ArGeLite tile support is attached to the vertical supporting frame. In the case of an assembly with an external insulation, the legs ensure a good circulation of the air space and allow adjustment of the verticality of the vertical frame.

Horizontal aluminium rails are attached to the vertical load-bearing framework. The installation height depends on the height of the tiles. Following the layout, the laying company will proceed to a vertical line on the support wall. The company will respect in common part:

- 300mm spacing between the horizontal rails for tiles 300mm high,
- 250mm spacing between horizontal rails for tiles 250mm high,
- 200mm spacing between horizontal rails for 200mm high tiles.

The company will be able to develop a laying template and use a level, to facilitate assembly and ensure the horizontality of the ArGeLite tile support rails.

The maximum overhang of ArGeLite horizontal rails at an angle or in a table is 300mm.

The junction of 2 horizontal rails is done:

- screwed onto a vertical support profile with a minimum width of 60mm. A space of 10mm will be left between the 2 rails,
- using the ArGeLite splint. The rails are slid in the splice on a length of 9.5cm on both sides, a space of 10mm is left between the 2 rails. The splint is screwed onto one of the rails at about 5cm from its end.

Installation of ArGeLite Tiles

(see Figs 10 and 11)

The assembly of the tiles consists firstly of embedding the upper part of the tile in the upper horizontal rail, then of resting the lower tongue of the tile in the lower rail. An EPDM stabilization wedge will be slid into the rail at the back of the ArGeLite tiles at the vertical joints.

This wedge avoids the lateral displacement of the ArGeLite tiles and allows to ensure a damping effect and a tight fitting of the tiles, while preventing the beating due to the wind.

The vertical joint between ArGeLite tiles is 4mm and the horizontal joint between ArGeLite tiles is 10mm. Laying with vertical cross joints is possible.

This system allows the installation of ArGeLite tiles in the upward direction of the facade and in the downward direction of the facade.

10.2 Singular points

Figures 12 to 28bis are a catalogue of examples of treatment of singular points. The treatment of singular points is detailed in the figures.

10.21 Outbound angles (see fig.21 and 27)

Outbound angles are processed using the following parts:

- ArGeLite of right or left angle or ArGeLite used in current part
- Vertical profiles, horizontal rails and, if necessary, corner trim profiles and shim stabilizers.

The left and right corner shingles are hung in the horizontal support rail, the maximum cantilever being 300mm. A clearance of 5mm must be respected at the angle between the two corner tiles. Corner tiles can be trimmed at the factory. The treatment of outward angles can also be achieved by using a complementary trim profile (see Fig. 27a and 27Ter).

10.22 Incoming angles (see Fig. 14)

Incoming angles are treated using the following parts:

- ArGeLite used in common part,
- Vertical profiles, horizontal rails and, if necessary, corner trim profiles and stabilizing wedges.

The realization of the re-entrant angles is made as part of the current, the ArGeLite tile abutting recovery. A 4mm gap will be created between the ArGeLite elements in the re-entrant angle.

10.23 Detail at the bottom (see Fig. 17 and 23)

In the lower part, it is necessary to protect the insulation and close the air gap by a perforated sheet. The sheet is fixed to the support on one side and held by one bracket on the uprights of the other. The ArGeLite tile will be hooked to the lower horizontal rail using the second reinforcement bar on the back of the tile. A start with a tile is possible.

10.24 Detail at the top (see Fig. 12)

At the top, the ArGeLite tile must be protected by a waterproof flap. This tile can be whole or cut according to the layout.

A safety wedge is placed at the bottom of the last tile. This shim is inserted between the first tile bar and the top of the horizontal rail before the shim.

10.25 Treatment of bays (see Fig. 18 to 20 and 24 to 26Quater)

Generally, the junctions between ArGeLite tiles and joinery are treated by metal frames fixed on the vertical profiles that overlap or outcrop the naked tiles.

- In the table, the returns are processed using metal profiles (see Fig. 19, 19bis, 25 and 25bis).
- In lintel, ArGeLite tiles start in the same way as in the lower part. Ventilation of the air space is ensured by a 10mm high entrance over the entire width of the lighter (see Fig. 20 and 26 to 26). As in the lower part, a perforated sheet attached to the shell protects the insulation and the air gap.
- In support, the treatment is performed using metal flaps implemented in accordance with DTU 37.1 and the ArGeLite tiles installation principle at the top (see figures 18 and 24).

It is also possible to dress the lintels and tables with ArGeLite tiles (see Figs 25bis and 26bis). The lintel tiles are held by an

EPDM blocking wedge that prevents slippage of the clay element.

- External blinds (see Fig. 26quater)

For openings equipped with external blinds (BSO: sunshade directional) it is possible to realize a safe between the structural work and the ArGeLite cladding. Beforehand, it must be ensured that the necessary space is sufficient. A chest is made of sheet metal folded and fixed directly to the shell. If necessary, the core of the framing profile can be swept over half of its thickness without being less than 25mm and a maximum height of 200mm. A perforated sheet is riveted to the trunk to protect the insulation and the air gap. A vertical spacing of 10 mm is provided between the sheet and the tile.

10.26 Treatment of expansion joints

The horizontal rails must not overlap the expansion joint of the shell, which imposes a vertical framework on either side of the joint at a maximum distance of 300mm. A space of 10mm minimum is provided between the horizontal rails on both sides of the expansion joint, similarly for tile. A trim sheet can be attached to the back of the horizontal rails on one side of the expansion joint. The sheet is left free on the opposite side (see Fig. 13).

10.27 Other singular points

- Frame splitter (see Fig. 22 and 28a) At the junction between 2 sections a space of at least 10mm should be provided. The upper ArGeLite tile is hooked to the lower horizontal rail using the second reinforcement bar on the back of the tile.
- Splitting the air gap (see Fig. 15) If splitting the air gap is necessary, attach a 15/10 steel sheet metal formed directly to the shell. The upper ArGeLite tile is hooked to the lower horizontal rail using the second reinforcement bar on the back of the tile.

10.3 Special case of zero vertical joints

It is possible to use the clay tiles with zero vertical joints. The tiles are implemented edge to edge. Beforehand, have a stabilizing wedge at the back of the tiles to cut the lug. For the layout it should be considered that the effective tile length is 4mm less than the nominal length. A splitting joint of 8mm is made every 6m maximum.

10.4 Laying in areas exposed to shocks (Q3)

In the case of using ArGeLite in areas where Q3 impact resistance is required, a reinforced mounting must be performed. This installation consists in positioning a horizontal rail at the half height of the ArGeLite tiles and a primary frame stud every 400mm (see Fig. 16).

11. Installation on MOB (see Fig. 29 to 34)

The outer wall will consist of panels in accordance with DTU 31.2. The centre distance of the timber frame is 645mm maximum.

A rain screen according to DTU 31.2 will be used on the bracing panels of the MOB. It will be held by vertical wooden battens, fixed on the vertical uprights of the MOB. The rain screen will be cut every 6m for the drainage of runoff water to the outside.

Wood battens with a minimum dimension of 20 x 40mm are attached to the frame members through the wood panel. An air gap of a minimum thickness of 20mm is thus formed between the wall panel and the back of the aluminium rails. The rails are screwed to the frame through the battens and the wood panel by stainless steel screws according to the specifications of § 3.2 and minimum dimension $\varnothing 6 \times 60$ mm. The fixing of the cleat in the amounts of the MOB must be checked (considering the distances between them, own weight). The fastening of the cladding is in accordance with § 10 of the Technical File.

12. Maintenance and repair

12.1 Cleaning

No treatment, preventive or curative is to be applied on ArGeLite tiles without the agreement of the manufacturer.

12.2 Replacement of a tile

In case of accidental breakage of a product, the ArGeLite tile can be easily replaced. The replacement (actions identical to the initial pose) is done according to the following steps:

- Remove the broken ArGeLite tile, clean the rail of any clay debris.
- Install the replacement ArGeLite tile by first embedding the top of the tile in the top horizontal rail and then resting the bottom tab of the tile in the lower rail.
- The replacement tile will be stabilized using the stabilizing shims and the horizontal support rail.

B. Experimental Results

- CSTB Report No. CLC 11 26033252 on external performance conservation shocks on ArGeLite elements
- CSTB Report No. CLC 11 26033253 concerning resistance to wind load of ArGeLite elements
- CSTB report no. EEM 11 26033905 A and B concerning behavioural tests regarding seismic actions
- CSTB Study Report No. DER / CLC-12-0058 concerning the calculation of seismic stresses in the anchors to the support of the ArGeLite cladding system.

C. References

C1. Environmental and Sanitary Data1

The ArGeLite process is not the subject of an Environmental and Sanitary Declaration Form (FDES). The FDES data are intended to be used to calculate the environmental impacts of structures in which the products (or processes) targeted are likely to be integrated.

C2. Other references

To date, several thousand square meters have been completed in Europe and in the rest of the world.

Since 2010 more than 5000m² have been installed in France.

Tables and figures of the Technical File

Table 1 - Exposure class of ArGeLite elements according to P 08-302

Design	Height	Length	Frame spacing	Intermediate reinforcement	Class
ArGeLite	200	400 – 800	900*	No	Q1
	250	400 – 800	900*	No	Q1
	300	400 – 800	900*	No	Q1
	200	400 – 800	400	Yes	Q3
	250	400 – 800	400	Yes	Q3
	300	400 - 800	400	Yes	Q3

* 600 mm maximum in the case of a wood frame (or 645 mm on MOB)

Table 2 - Exposure class of ArGeLite elements in normal wind according to the modified NV 65 Rules

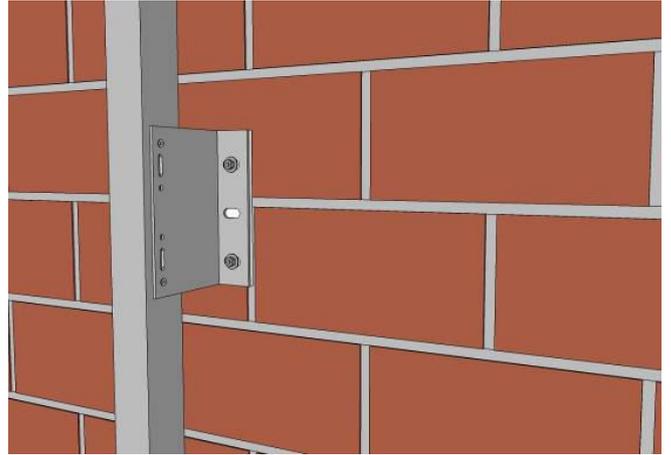
Design	Height	Length	Frame spacing (mm)	Rail overhang max (mm)	Intermediate reinforcement	Class	Admissible value
ArGeLite	200	300 – 800	900	300	No	V4	2257
	250	300 – 800	900	300	No	V4	2257
	300	300 - 800	900	300	No	V4	2257

Principle figures

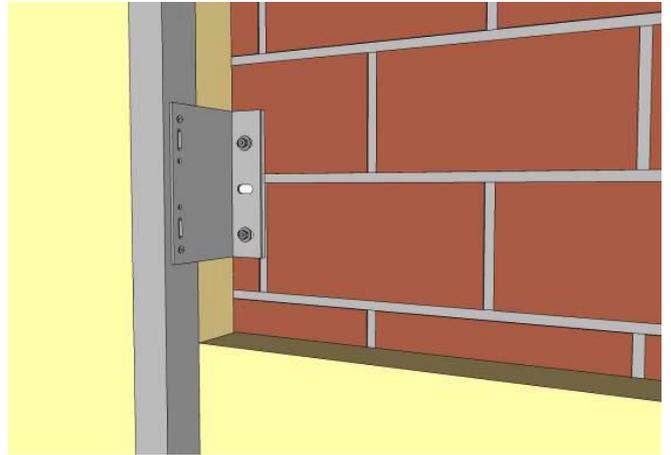
Timber rail



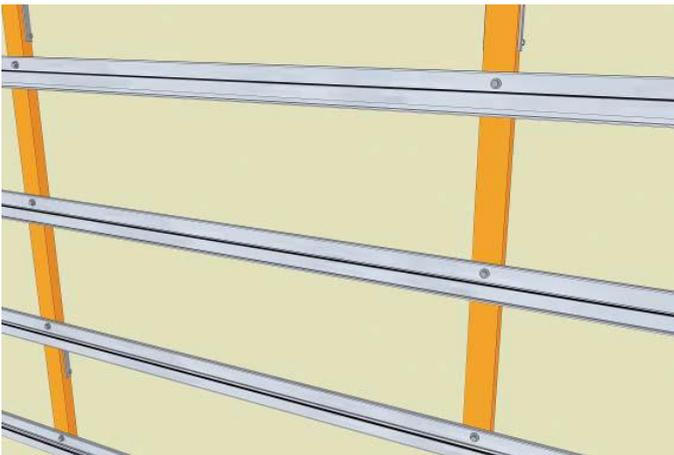
Metal Rail



Assembly of the primary framework

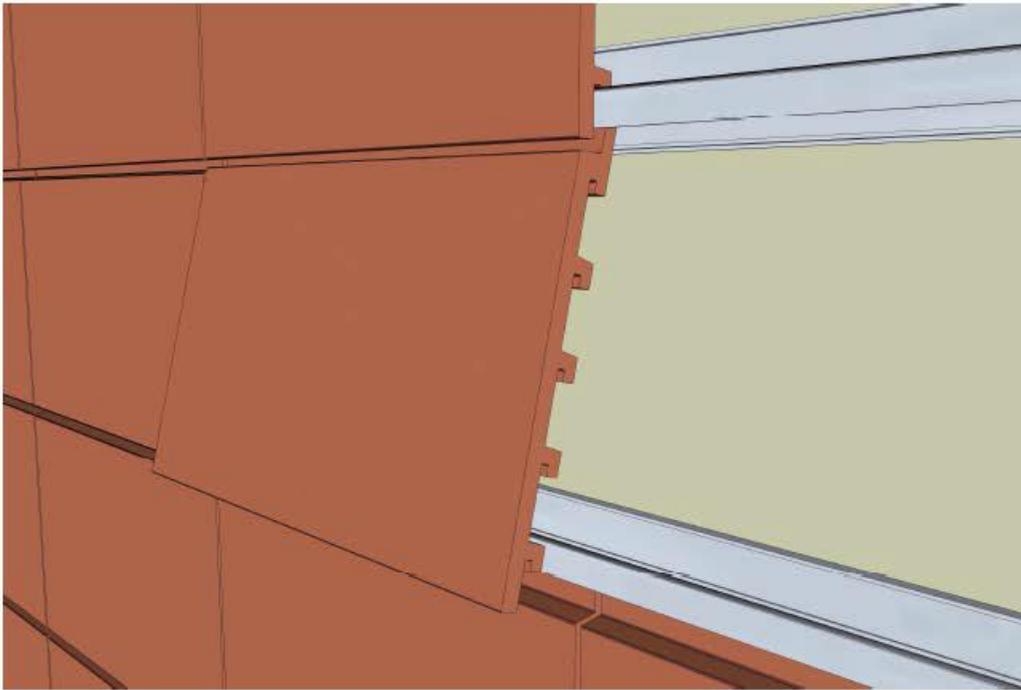


Installation of thermal insulation

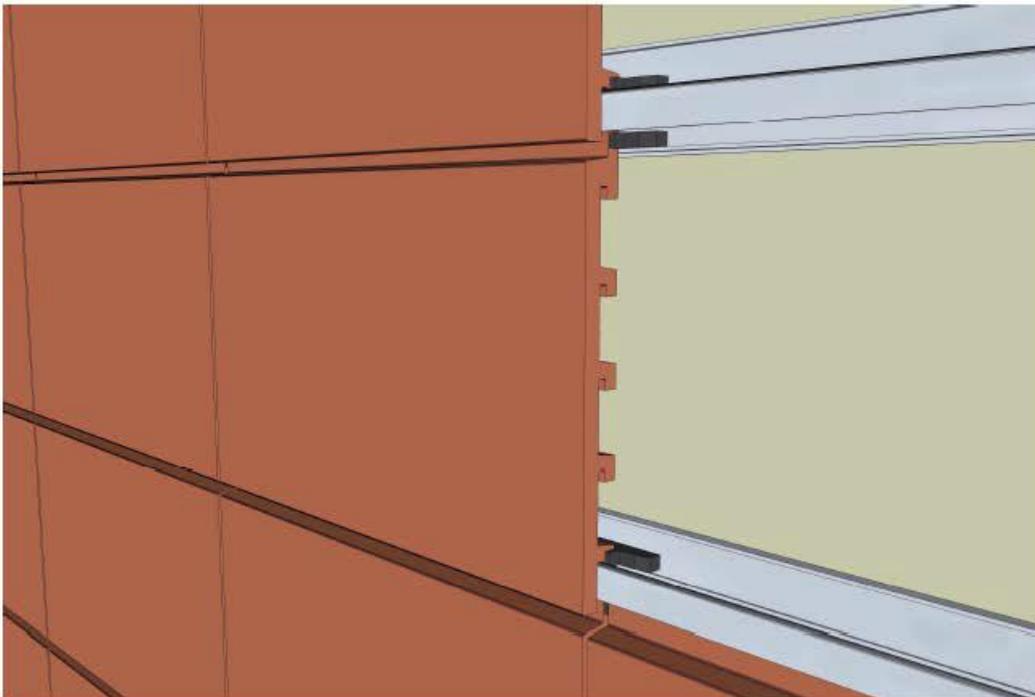


Fixing horizontal aluminium rails

Figure 1 - Principle pose frame



Setting up of the ArGeLite tiles



insertion of stabilizing wedges in EPDM

Figure 2 - ArGeLite pose principle

Figure 3.1
Bardeau ArGeLite de hauteur 200mm

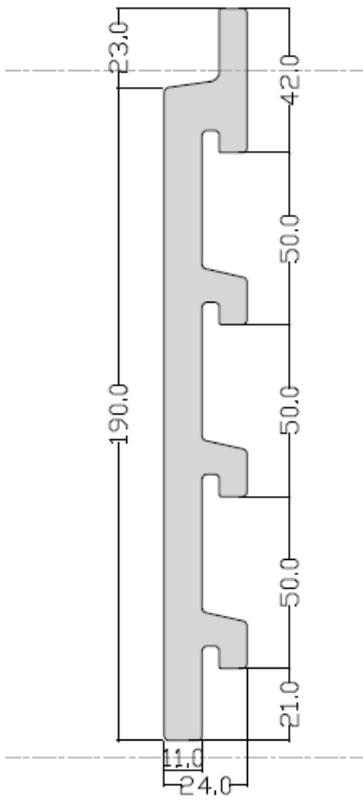


Figure 3.2
Bardeau ArGeLite de hauteur 250mm

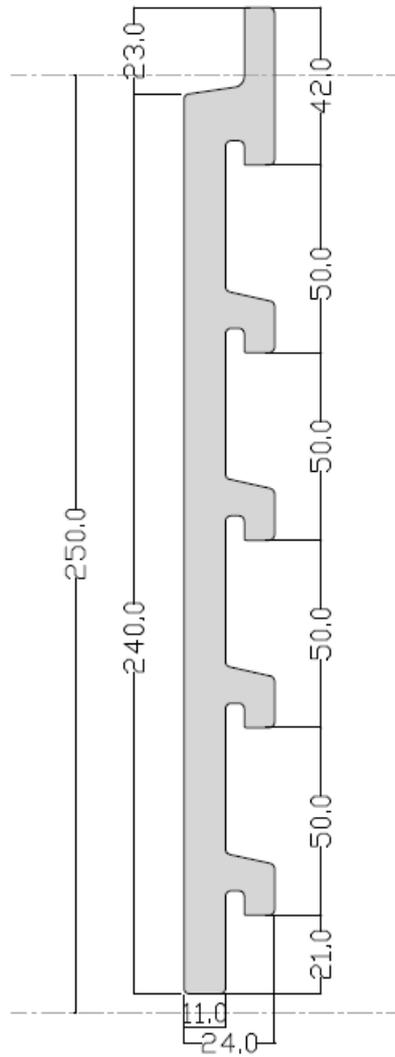


Figure 3.3
Bardeau ArGeLite de hauteur 300mm

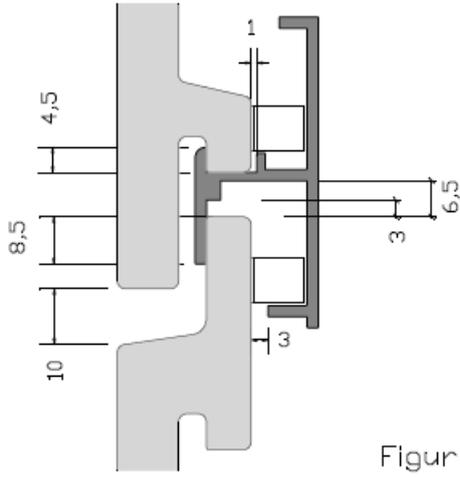
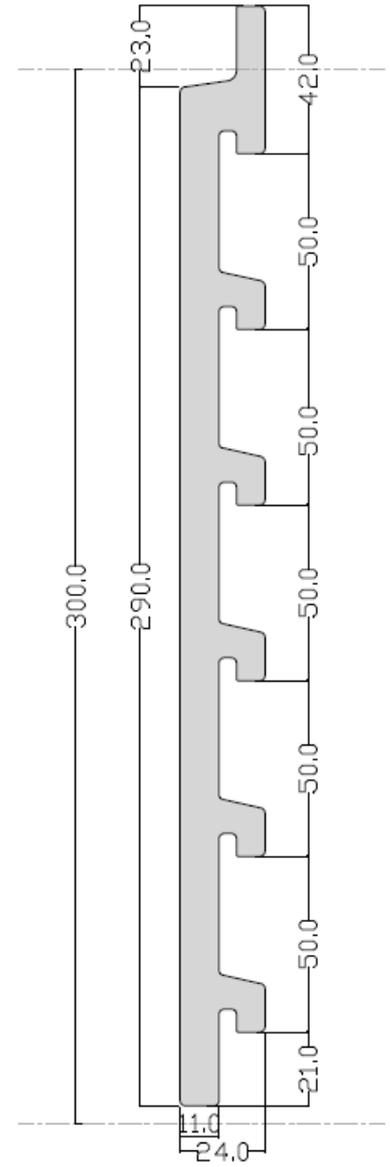


Figure 3.4
Zoom sur un emboitement du Bardeau ArGeLite

Figures 3 - ArGeLite Tiles