EUROPEAN ASSESSMENT DOCUMENT

EAD 040914-00-0404

November 2018

VETURE KITS -

PREFABRICATED UNITS FOR EXTERNAL WALL INSULATION AND THEIR FIXING DEVICES

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

This EAD covers the assessment of VETURE kits[1] for the thermal insulation of external walls.

This EAD is applicable to the VETURE kits belonging to the families given in table 1.1.1. They consist of the following components:

1. VETURE unit. Prefabricated component to be delivered on site as a factory made unit composed of:
   - Factory made thermal insulation products made of materials given in table 1.1.2,

     Thermal insulation product may or not present superficial treatments.

     Thermal insulation products type of material, dimensions, density or weight per square meter and water absorption are known and can be duly specified.
   - Skin. Factory applied coverings such as claddings (sheets, tiles, boards, panels, brick slips, shingles) or renders (reinforced or not) made of the materials given in table 1.1.2.

     Skins type of material (in the case of natural stone also name and petrographic description), dimensions (when relevant also grooves and dowel holes dimensions) and density or weight per square meter are known and can be duly specified.
   - Skin-attachment. Factory applied mode to attach the skin to the thermal insulation product. Two types of attachments may be considered:
     - Adhesively attached: with adhesive (specific adhesive or organic/inorganic mortar) or without adhesive (skin attached: during the forming process of insulation).

       Adhesives type of material, range of thickness application, water quantity ratio (if relevant), coverage and density are known and can be duly specified.
     - Mechanically attached by means of mechanical fixings as indicated in table 1.1.1

       Mechanical fixings geometric and physical parameters (such as form and dimensions, weight, cross clause, distance between fixings) and material parameters (such as type of material, specific gravity, material mechanical properties) are known and can be duly specified.

     A combination between both attachment modes (adhesively and mechanically attached) is also possible.

     Exceptionally, for VETURE kits family C and family D (see table 1.1.1) there may not be any skin-attachment as such but directly the VETURE fixing device.
2. VETURE fixing devices such as rails, profiles or punctual fixings as indicated in table 1.1.1

   Optional retaining devices may also be considered (mainly for VETURE kits family A or family B).

   Fixing or retaining devices geometric and physical parameters (such as form and dimensions, weight, cross clause, distance between fixings) and material parameters (such as type of material, specific gravity, material mechanical properties) are known and can be duly specified.
3. Anchors between the VETURE fixing device and the substrate (optional).

   Anchors geometric parameters (such as form and dimensions) and material parameters (such as type of material, mechanical properties) are known and can be duly specified.
4. Other ancillary components (optional):
   - Grout or sealant material for the joints between the VETURE units (e.g. for tiles according to EN 13888[2]).

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1 Definition of “Kit” according to Art. 2 nº 2 of CPR. The components are assembled on site, and thus, become an “assembled kit” when installed in the construction works.

2 All undated references to standards or to EAD’s in this document are to be understood as references to the dated versions listed in clause 4.

Grout or sealant the type of material, range of thickness application, water quantity ratio (if relevant), coverage and density are known and can be duly specified.

- Supplementary thermal insulation products. Factory made thermal insulation products usually made of the same material than the considered in the VETURE unit.

  Thermal insulation products type of material, dimensions, density or weight per square meter and water absorption are known and can be duly specified.

- Any other supplementary component used in the kit (e.g. to form joints such as sealant, corner strips, etc.; or to achieve continuity such as mastic, joint-covers, gaskets, trims, etc.; or to keep the position of the VETURE unit such as springs, groove protectors, etc.).

  Ancillary components geometric parameters (such as form and dimensions) and material parameters (such as type of material, mechanical properties) are known and can be duly specified.

Table 1.1.2 indicates the materials related to these components and the possible associated component harmonized technical specifications.

The VETURE kits covered by this EAD always include the VETURE unit (skin and thermal insulation product).

There may be a non-ventilated air space between the VETURE unit and the substrate.

Two categories of VETURE kits, classified according to the degree of protection against driving rain are considered:

- Type I: a VETURE kit which significantly limits the amount of water that can reach the substrate and also includes arrangements for collecting and expelling infiltrating water (for instance, VETURE kits with open joints with a pressure equilibrium space and drainage arrangements).
- Type II: a VETURE kit in which the outer skin avoids the penetration of water, and therefore protects the inner part of the VETURE kit and the joints between the VETURE units from water penetration.

The product is not covered by EAD 040083-00-0404 (ETAG 004 conversion) or EAD 040287-00-0404 because it is composed of a prefabricated unit (whereas the ETICS components are installed in-situ) and it is fixed to the substrate by purely mechanically fixings.

The VETURE kits are non-load bearing construction elements. They do not contribute to the stability of the wall on which they are installed. The VETURE kits can contribute to durability of the works by providing enhanced protection from the effect of weathering. They are not intended to ensure airtightness of the building.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise its clients on the transport, storage, maintenance, replacement and repair of the product as it considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

Table 1.1.1: Description of the VETURE kit families.

VETURE kit	Description of the VETURE kit	Type of VETURE fixing device
Family A (see figure 1.1a)	Kits in which the VETURE unit is fixed through the insulation layer by means of the grooves available on it.	Rail profiles, small rails, clips, clamps pins or other similar punctual or linear fixings.
Family B (see figure 1.1b)	Kits in which the VETURE unit is fixed through the insulation layer by means of punctual fixings.	Nails, screws, anchors or other similar punctual fixings.
Family C (see figure 1.1c)	Kits in which the VETURE unit is fixed through the skin layer by means of the grooves available on it.	Rail profiles, small rails, clips, clamps pins or other similar punctual or linear fixings.
Family D (see figure 1.1d)	Kits in which the VETURE unit is fixed through the skin layer by means of punctual fixings.	Nails, screws, anchors or other similar punctual fixings.

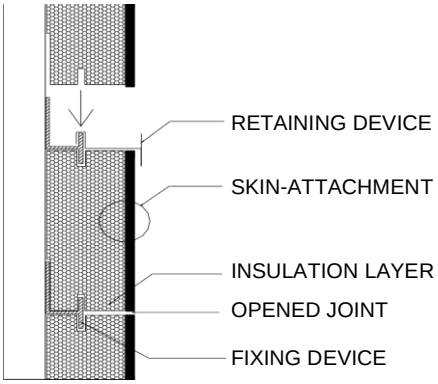

Figure 1.1a: VETURE kit family A.

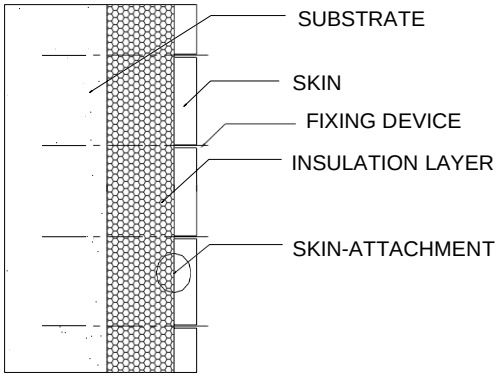

Figure 1.1b: VETURE kit family B.

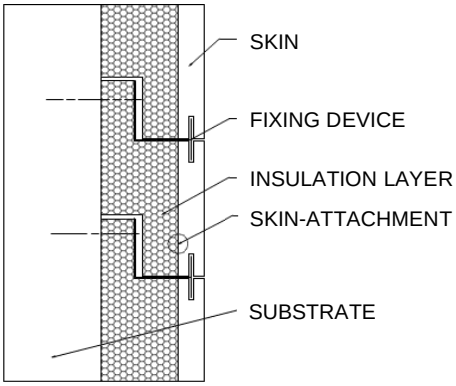

Figure 1.1c: VETURE kit family C.

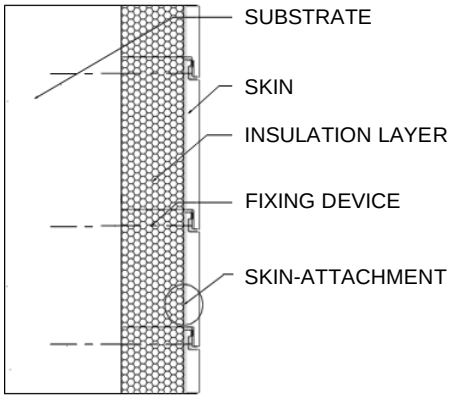

Figure 1.1d: VETURE kit family D.

Table 1.1.2: Components' materials and associated technical specifications.

Generic component	Component material	Possible associated component technical specifications (*)	
		Harmonized (hEN or EAD)	Other references
VETURE kit component			
Skin-cladding	Wood based	EN 13986; EN 14915	---
	Fibre-cement Fibre reinforced cement	EN 12467; EN 492; EN 494; EN 14992	EN 15191
	Concrete	EN 490; EN 14992	---
	Natural stone	EN 1469; EN 12057 EN 12326-1	---
	Terra cotta or ceramic	EN 1304; EN 14411	---
	Metal	EN 14782; EN 14783	---
	HPL Laminates	EN 438-7	---
	Plastic	EN 16153; EN 1013; EN 13245-2	---
	Bituminous shingles or brick slips	EN 13956; EN 13967; EN 13970; EN 13984; EN 14909; EN 14967	---
	Agglomerated stone	EN 15286	---
	Wood-polymer composite (WPC) and natural fibre composite (NFC)	---	EN 15534-5
Skin-render	Mineral mortar	EN 998-1	---
	Organic mortar	EN 15824	---
	Reinforcement mesh (optional)	EAD 040016-00-0404	EN 13496
Adhesive skin-attachment	Mineral mortar	EN 998-1	---
	Organic mortar	EN 15824	---
	Specific adhesive (e.g. resin, polymer, hybrid polymer, polyurethane based, etc.)	---	EN 923
Mechanical fixing skin-attachment	Metal (steel or aluminum)	---	---
	Plastic	---	---
Thermal insulation product	Mineral wool (MW)	EN 13162	---
	Cellular plastic (EPS; XPS or PU; PF, PIR)	EN 13163; EN 13164; EN 13165; EN 13166	---
VETURE fixing device			
Punctual, linear fixings or retaining devices	Metal (steel or aluminum)	---	EN 1993 EN 1999
	Plastic	EAD 330196-01-0604	---
Anchor to substrate (optional)			
For use in concrete	Metal	EAD 330747-00-0601 EAD 330232-00-0601	---
	Bonded	EAD 330499-01-0601	---
	Plastic	EAD 330284-00-0604	---
For use in masonry			
	Metal injection	EAD 330076-00-0604	---
(*) Other technical specifications applicable to these components' materials may be considered.			

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

VETURE kits are intended to be mechanically fixed on external vertical walls made of masonry (clay, concrete or stone), concrete (cast on site or as prefabricated panels) in new or existing buildings (retrofit).

VETURE kits are not itended to be used:

- in contact with the ground;
- under the effects of seismic actions.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the VETURE kit for the intended use of 25 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[3].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or its representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD (if necessary in addition to the definitions in CPR, Art 2)

1.3.1 Substrate

The term "substrate" refers to the vertical wall, which in itself already meets the necessary airtightness and mechanical strength requirements (resistance to static and dynamic loads).

It may be faced with mineral or organic renders or paints.

The substrate walls can be made of masonry (clay, any kind of concrete or stone) or concrete (cast on site or as prefabricated panels).

1.3.2 VETURE kit

A VETURE kit is a specific kit[1] composed of at least a VETURE unit (see 1.3.3) and the fixing device to attach it on the substrate wall.

The components are assembled on site, and thus, become an "assembled kit" when installed in the construction works.

[3] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

1.3.3 VETURE unit

Prefabricated (factory made) unit composed of a thermal insulation product (see 1.3.3.1) and a skin (see 1.3.3.2).

1.3.3.1 Thermal insulation product

Factory made product, made of the materials given in table 1.1.2, for which the main function is to give thermal insulation properties to the VETURE kit.

1.3.3.2 Skin

External factory applied covering made of the materials given in table 1.1.2,

There are two types of skins:

- Skin-cladding: The skin is made of one or more discontinuous pieces such as sheets, tiles, boards, panels, brick slips or shingles. Optionally a grout may be applicated in the joints between the pieces in one VETURE unit;
- Skin-render: The skin is made of one or multilayer renderings, reinforced or not.

1.3.3.3 Skin-attachment

Factory applied mode to fix the skin to the thermal insulation product.

Skin attachment mode may be:

- Adhesively attached:
  - with adhesive (specific adhesive or organic/inorganic mortar) or;
  - without adhesive (skin attached during the forming process of insulation).
- Mechanically attached by means of mechanical fixings as indicated in table 1.1.1.

1.3.4 Fixing device

Profiles/rails, brackets, screws/anchors or any special fixing device (see table 1.1.1) used to secure the VETURE unit to the substrate.

1.3.4.1 Retaining device

A permanent mechanical means of retaining the skin to reduce risks in the event of a failure between the insulation layer and the skin.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1 shows how the performance of VETURE kit is assessed in relation to the essential characteristics.

Table 2.1: Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics.

No	Essential characteristic		Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire				
1	Reaction to fire		2.2.1	Class
2	Façade fire performance		2.2.2	Description or Level
3	Propensity to undergo continuous smouldering		2.2.3	Description
Basic Works Requirement 3: Hygiene, health and the environment				
4	Watertightness (resistance to driving rain)		2.2.4	Description or Level
5	Water absorption by capillarity		2.2.5	Level
6	Water vapour permeability		2.2.6	Level
7	Accelerated ageing behaviour (Moisture behaviour)		2.2.7	Level
8	Content, emission and/or release of dangerous substances		2.2.8	Description
Basic Works Requirement 4: Safety and accessibility in use				
9	Wind load resistance		2.2.9	Level
10	Bond strength (only for skin adhesively attached)		2.2.10	Level
11	Tensile strength (*)		2.2.11	Level
12	Pull-through resistance	Through the insulation product (only for family B)	2.2.12	Level
		Through the skin (only for family D)		
		Through the fixing device (only for family A & C)		
13	Resistance of the grooves	Grooved insulation product (only for family A)	2.2.13	Level
		Grooved skin (only for family C)		
14	Dead load resistance		2.2.14	Level
15	Displacement behaviour		2.2.15	Level
16	Resistance to horizontal point loads		2.2.16	Description
17	Impact resistance		2.2.17	Level
Basic Works Requirement 5: Protection against noise				
18	Airborne sound insulation		2.2.18	Level
Basic Works Requirement 6: Energy economy and heat retention				
19	Thermal resistance		2.2.19	Level
Durability (**)				
20	Dimensional stability (*):by humidity		2.2.20.1	Level
21	Dimensional stability (*):by temperature		2.2.20.2	
22	Thermal shock (*)		2.2.20.3	Level or description
23	Chemicals and biological resistance (*)		2.2.20.4	Level

Table 2.1: Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics.

No	Essential characteristic	Assessment method	Type of expression of product performance
24	Corrosion	2.2.20.5	Description
25	UV radiation resistance (*)	2.2.20.6	Level
(*) When available, performance included in the DoP for the CE marking as individual component should be used as far as possible to avoid retesting or reassessment.			
(**) Durability of the kit is assessed by means of relevant component durability, when relevant. See clause 2.2.20.			

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

Testing will be limited only to the essential characteristics which the manufacturer of the VETURE kit intends to declare. If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant essential characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

2.2.1 Reaction to fire

The whole VETURE kit shall be tested, using the test method(s) according to EN 13501-1 relevant for the corresponding reaction to fire class, in order to be classified according to the Commission Delegated Regulation (EU) 2016/364.

Criteria and associated mounting and fixing rules for the SBI test shall be in accordance with Annex A.

Otherwise, reaction to fire of the VETURE kit may be assessed by considering the reaction to fire of the components (skin, thermal insulation product, skin-attachment, fixing devices, etc.), in order to be classified according to Commission Delegated Regulation (EU) 2016/364.

The kit may be classified based on the worst class of any component obtained according to a CWFT Decisions or according to the relevant tests method(s) according to EN 13501-1.

2.2.2 Façade fire performance

If the manufacturer intends to declare the façade fire performance of the product, in absence of a European assessment approach, the ETA shall be issued taking into account the situation in Member States where the manufacturer intends his product to be made available on the market.

Information on such situation is included in Annex O.

The assessment method(s) used shall be indicated in the ETA.

2.2.3 Propensity to undergo continuous smouldering

This characteristic is only applicable for VETURE kits in which the thermal insulation product (see table 1.1.2) is made of mineral wool (MW).

The assessment of the kit propensity to undergo continuous smouldering is carried out by means of the assessment of the propensity to undergo continuous smouldering of the thermal insulation product. It is considered representative of this essential characteristic for VETURE kits.

Propensity to undergo continuous smouldering of thermal insulation product shall be assessed according to EN 16733.

Note: When available, performance included in the DoP regarding the thermal insulation component should be used as far as possible to avoid retesting or reassessment.

Description of propensity to undergo continuous smouldering shall be given in the ETA according to clause 11 of EN 16733.

2.2.4 Watertightness (resistance to driving rain)

In the case of Type I VETURE kit (see clause 1.1) the watertightness of the VETURE kit shall be tested according to EN 12865 Procedure A on one specimen.

At least the worst case (e.g. maximum number of joints, maximum water absorption, minimum thickness, etc.) or the most representative case of the VETURE kit shall be tested.

The limit level of pressure (e.g. just before water penetration) shall be given.

In the case of Type II VETURE kit (see clause 1.1), the watertigthness shall be carried out by description considering the kit water absorption (see clause 2.2.5) and the relevant design details provided by the manufacturer, regarding the geometry of VETURE unit and joints and the connections of the VETURE kit with the base edge, openings (windows or doors), etc.. These design details should be included in the ETA.

Otherwise, when no information on kit water absorption, when no relevant design details is available, or when the manufacturer specifically requires it, the watertightness of the Type II VETURE kit may be tested as indicated for Type I VETURE kit.

2.2.5 Water absorption by capillarity

Water absorption by capillarity of the VETURE kit shall be tested according to Annex B.

At least the worst case (e.g. maximum number of joints, maximum water absorption, minimum thickness, etc.) or the more representative case of the VETURE kit shall be tested.

VETURE kit with each different type of thermal insulation material shall be tested.

When essential characteristic for “Water absorption by capillarity” will be assessed, the mean [4] values of water absorption (in kg/m^2) after 3 minutes, 1 hour and 24 hours of the VETURE kit shall be given.

Mean value of the water absorption after 1 hour shall be less than 1 kg/m^2.

2.2.6 Water vapour permeability

The equivalent water vapour diffusion resistance of the VETURE unit shall be tested according to EN ISO 12572.

Additionally, the equivalent water vapour diffusion resistance of the VETURE kit shall be assessed by calculation according to the method indicated in Annex C (using the water vapour permeability of each VETURE kit component).

When essential characteristic for “Water vapour permeability” will be assessed, the maximum equivalent water vapour diffusion resistance factor, μ, and/or maximum equivalent water vapour diffusion air layer thickness, S_d (in metres) shall be given.

Note 1 :The resistance to water vapour diffusion of the equivalent air thickness of the skin (S_d in m = δ_a x Z skin where δ_a is the air water vapour permeability in kg/(m.s.Pa)) should normally not exceed:

- 3,0 metres if the combination involves a cellular plastic insulation product.

4 The mean value is the arithmetic average value.

- 1,0 metre if the combination involves a mineral wool insulation product.

Note 2 :for materials which would be higher than this indicative values, it is possible to adapt the size of the VETURE in order to increase the ratio of opened join and so increase also the air permeability:

2.2.7 Accelerated ageing behaviour

This characteristic is only relevant for VETURE kits in which the skin is adhesively attached and when skin material is known to be or suspected of being sensitive to hygrothermal variation such as skins made from factory applied render, plastics or bituminous brick slips and thin layers of the other materials.

Accelerated ageing behaviour of the VETURE kit shall be assessed by means of bond strength test (see clause 2.2.10) of specimens taken from the assembled kit submitted to:

- The hygrothermal cycles given in clause D.1 of Annex D.
- The freeze-thaw cycles given in clause D.2 of Annex D. The freeze-thaw resistance test shall only be carried out when the water absorption by capillarity (see clause 2.2.5) is greater than or equal to 0,5 kg/m² after 24 hours.

If for some specific intended uses the manufacturer wishes to declare performance of the product under severe conditions then the combined test with hygrothermal and freeze-thaw cycles given in clause D.3 of Annex D may be carried out.

At least the worst case (e.g. minimum bond strength, maximum water absorption by capillarity, minimum thickness of kit components, etc.) or the most representative case of the kit shall be tested.

If any of the following defects occur during or at the end of the accelerated ageing cycles programme, it shall be recorded.

- deterioration such as cracking or delamination of the skin that allows water penetration to the insulation;
- deterioration or cracking of seals between VETURE units;
- detachment of the skin or the VETURE unit;
- irreversible deformation.

The following values shall be given:

- Minimum and mean[4] value of bond strength tests (see clause 2.2.10) after ageing cycles (in MPa).
- Ratio (in %) between the bond strength mean value after ageing cycles test and the mean value in the bond strength tests without ageing cycles.

The bond strength mean value of the VETURE unit after hygrothermal or freeze-thaw cycles should be greater or equal than 75% of the mean value in the initial bond strength test (see clause 2.2.10) and the ruptures shall be at least 90% cohesive.

2.2.8 Content, emission and/or release of dangerous substances

The performance of the kit related to the emission and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer[5] after identifying the release scenarios taking into account the intended use of the product and the Member States where the manufacturer intends his product to be made available on the market.

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5 The manufacturer may be asked to provide to the TAB the REACH related information which he must accompany the DoP with (cf. Article 6(5) of Regulation (EU) No 305/2011).
The manufacturer is **not** obliged:
- to provide the chemical constitution and composition of the product (or of constituents of the product) to the TAB, or
- to provide a written declaration to the TAB stating whether the product (or constituents of the product) contain(s) substances which are classified as dangerous according to Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the SGDS.

Any information provided by the manufacturer regarding the chemical composition of the products may not be distributed to EOTA or to TABs.

The identified intended release scenario for this product and intended use with respect to dangerous substances is:

S/W2: Product with indirect contact to soil, ground- and surface water.

2.2.8.1 Leachable substances

For the intended use covered by the release scenario S/W2, the performance of the kit concerning leachable substances has to be assessed.

The dangerous substances assessment of the kit is carried out by means of the assessment of the most relevant kit components materials, which are: the skin materials.

The leachable substances assessment of the kit components materials shall be assessed according to the relevant hEN (see table 1.1.2) or EAD.

Note: When available, performance included in the DoP regarding the relevant kit components shall be used as far as possible to avoid retesting or reassessment.

When the hEN or EAD does not give an assessment method or when there is no relevant hEN or EAD, leachable substances assessment of the kit components materials shall be assessed according to the following methods:

For skin made of cement-based materials:

A leaching test with subsequent eluate analysis must take place, each in duplicate. Leaching tests of the skin conducted according to CEN/TS 16637-2:2014, but considering the steps below indicated for the leachant renewal. The leachant shall be pH-neutral demineralised water and the ratio of liquid volume to surface area must be (80 ± 10) l/m².

Samples shall be prepared according to clause 8.2 of CEN/TS 16637-2:2014.

The eluate is produced by a tank test according to CEN/TS 16637-2. The eluates taken after 6 hours, 1 day, 2 days and/or 6 hours, 4 days, 9 days, 16 days, 36 days and 64 days shall be analysed for the following environmentally relevant parameters:

- aluminium, antimony, arsenic, barium, lead, cadmium, chromium (total), chromate (Cr VI), cyanide (total), cobalt, copper, molybdenum, nickel, mercury, thallium, vanadium, zinc,
- chloride (Cl^-), sulphate (SO_4^{2-}), fluoride (F^-),
- TOC,
- pH-value, electrical conductivity, odour, colour, turbidity, and tendency to produce foam

The parameters shall be analysed using an appropriate equipment with a measurement range allowing the measurement of the substance concentration.

Measured concentration of the leaching test according to CEN/TS 16637-2 of these skins must be expressed per step for each parameter in µg/l and mg/m^2. Additionally, the cumulatively released quantities must be expressed for each parameter in mg/m^2.

The used test methods for the analysis of the parameters shall be documented, including the equipment and its measurement range.

For skin materials other than cement-based covered by CEN/TS 16637-2:

A leaching test with subsequent eluate analysis must take place, each in duplicate. Leaching tests of the skins conducted according to CEN/TS 16637-2:2014. The leachant shall be pH-neutral demineralised water and the ratio of liquid volume to surface area must be (80 ± 10) l/m².

Samples shall be prepared according to clause 8.2 of CEN/TS 16637-2:2014.

In eluates of "6 hours" and/or "64 days", the following biological tests shall be conducted:

- Acute toxicity test with Daphnia magna Straus according to EN ISO 6341
- Toxicity test with algae according to ISO 15799
- Luminescent bacteria test according to EN ISO 11348-1, EN ISO 11348-2 or EN ISO 11348-3.

For each biological test, EC20-values shall be determined for dilution ratios 1:2, 1:4, 1:6, 1:8 and 1:16.

If the parameter TOC is higher than 10 mg/l, the following biological tests shall be conducted with the eluates of "6 hours" and/or "64 days" eluates:

- Biological degradation according to OECD Test Guideline 301 part A, B or E.

Determined toxicity in biological tests must be expressed as EC20-values for each dilution ratio. Maximum determined biological degradability must be expressed as "…% within …hours/days". The respective test methods for analysis must be specified.

2.2.9 Wind load resistance

The wind suction load resistance of the kit shall be tested according to the methods given in Annex E.

Depending on the thermal insulation product material used in the VETURE unit, the wind suction test is either a static test or a fatigue test as follows:

- Mineral wool or cellular plastic (see table 1.1.2): static test according to clause E.1 of Annex E.
- Other thermal insulation product materials (see table 1.1.2): fatigue test according to clause E.2 of Annex E.

In addition, VETURE kits where the skin is attached to the thermal insulation product by means of mechanical fixings (not adhesively attached) shall also be tested according to fatigue test given in clause E.2 of Annex E.

At least the worst case (the mechanically weakest case) or the most representative case of the assembled kit shall be considered.

In the case of VETURE kit include retaining devices (see clause 1.3.4.1), the VETURE kit may be tested with or without the retaining devices.

In cases where wind pressure may be relevant (e.g. for some kits with air gap between the skin and the insulation product), a supplementary test with a wind pressure load shall be performed. The same test methods (static test or fatigue test) given in Annex E shall be carried, only the wind action is inverse.

One test specimen for each chosen geometry shall be assessed. If the test result does not confirm the results obtained by mechanical tests in accordance with sections 2.2.16, at least two other test specimens have to be tested.

When essential characteristic for “Wind load resistance” will be assessed, the maximum wind load resistance “Q” or “Q1” (accordingly with the test method applied) for assembled VETURE kit shall be given.

2.2.10 Bond strength

This characteristic is only applicable to VETURE kits in which the VETURE unit is formed of a skin adhesively attached to the thermal insulation product.

Bond strength or adhesion between the skin and the thermal insulation product of a VETURE unit shall be tested according to the method given in Annex F.

Bond strength test shall be carried out in normal conditioning (without ageing) and also, when relevant, after ageing cycles tests given in clause 2.2.7.

The following bond strength values shall be given:

- The mean[4] value and the rate (in %) of rupture types (cohesive rupture and/or adhesive rupture).
- The characteristic value according to Annex N.
- Ratio (in %) between the bond strength mean value after ageing cycles test and the bond strength mean value without ageing cycles.

The characteristic value of the VETURE unit should be greater or equal than 0,08 MPa and the ruptures shall be at least 90% cohesive.

2.2.11 Tensile strength

The assessment of the kit tensile strength is carried out by means of the assessment of the tensile strength of the thermal insulation product which is representative of this essential characteristic for VETURE kits.

The tensile strength perpendicular to faces of the thermal insulation products shall be given according to the relevant harmonized standard (see table 1.1.2, tested according to EN 1607). At least the worst case shall be tested (e.g. minimum density, maximum thickness, etc).

The test shall be carried out:

- on dry conditions (without any supplementary conditioning);
- after exposed to heat-moisture actions at (70 ± 2) ºC and (95 ± 5) % RH in a climatic chamber for 7 days and followed by a drying period at (23 ± 2) ºC and (50 ± 5) % RH until constant mass is achieved.
- after exposed to heat-moisture actions at (70 ± 2) ºC and (95 ± 5) % RH in a climatic chamber for at least 28 days and followed by a drying period at (23 ± 2) ºC and (50 ± 5) % RH until constant mass is achieved.

At least 5 specimens shall be tested.

When essential characteristic for “Tensile strength” will be assessed, values shall be given according to the relevant hEN.

Note: When available, performances included in the DoP regarding the thermal insulation component should be used as far as possible to avoid retesting or reassessment.

2.2.12 Pull-through resistance

The assessment of the kit pull-through resistance is carried out by means of:

- The assessment of the pull-through of fixings through the thermal insulation product. Test according to the method indicated in clause G.1 of Annex G. Only relevant for VETURE kits family B.
- The assessment of the pull-through of fixings through the skin. Test according to the method indicated in clause G.2 of Annex G. Only relevant for VETURE kits family D.
- The assessment of the pull-through of fixings through the fixing device. Test according to the method indicated in clause G.3 of Annex G. Only relevant for VETURE kits family A and C.

These pull-thorough resistances are representative of this essential characteristic for VETURE kits.

At least the worst case (e.g. minimum thickness and minimum tensile strength perpendicular to the faces of insulation product, minimum plate diameter of anchor, minimum plate stiffness of anchor, minimum load resistance of anchor) shall be tested.

When essential characteristic for “Pull-through resistance” will be assessed, the mean[4] value and the characteristic value according to Annex N shall be given.

2.2.13 Resistance of the grooves

The assessment of the kit grooves resistance is carried out by means of:

- The assessment of the resistance of the grooved thermal insulation product. Test according to the method indicated in clause H.1 of Annex H. Only relevant for VETURE kits family A.
- The assessment of the resistance of the grooved skin. Test according to the method indicated in clause H.2 of Annex H. Only relevant for VETURE kits family C.

These resistances of the kit grooves are representative of this essential characteristic for VETURE kits.

At least the worst case (e.g. minimum thickness and minimum tensile strength perpendicular to the faces of insulation product) shall be tested.

When essential characteristic for “Resistance of the grooves” will be assessed, the mean[4] value and the characteristic value according to Annex N shall be given.

2.2.14 Dead load behaviour

Dead load behaviour shall be tested according to the method indicated in Annex I.

At least the worst case (e.g. maximum thickness and minimum tensile strength perpendicular to faces of the insulation product, maximum thickness and weight of skin, maximum transverse deformation of the adhesives, minimum density of mechanical fixings, etc.) or the more representative case of the VETURE kit shall be tested.

When essential characteristic for “Dead load behaviour” will be assessed, the maximum deflection shall be given.

2.2.15 Displacement behaviour

Displacement behaviour shall be tested according to the method indicated in Annex J.

At least the worst case (minimum thickness of the thermal insulation product) shall be tested.

When essential characteristic for “Displacement behaviour” will be asssessed, the displacement U_e corresponding to the limit of elasticity determined according to section J.3 of Annex J shall be given.

2.2.16 Resistance to horizontal point loads

The resistance to horizontal points loads (e.g. one person standing on a ladder leaning against the VETURE kit) shall be tested according to the method given in Annex K.

At least the worst case (the mechanically weakest case) of the assembled kit shall be tested.

The VETURE kit shall be capable of accommodating the horizontally applied loads acting on its surface due to maintenance works without any reduction in its performance.

When essential characteristic for “Resistance to horizontal point loads” will be assessed, the description on if there is any permanent deformation (visible deformation) on any component shall be given.

2.2.17 Impact resistance

The impact resistance shall be tested according to the method given in Annex L.

At least the worst case (the mechanically weakest case) of the assembled kit shall be tested.

When essential characteristic for “Impact resistance” will be assessed, the hard body and soft body impact resistance shall be given.

Additionally, the degree of exposure according to the use categories defined in the table L.2.1 in clause L.3.1 of Annex L shall be given.

2.2.18 Airborne sound insulation

The improvement of airborne sound insulation shall be tested according to EN ISO 10140-1 Annex G.

At least the worst or the most representative assembled kit shall be tested. For the determination of the influence of the VETURE kit on the sound insulation of the external wall, parameters such as the dynamic stiffness of the insulation product, the mass/m^2 of the skin and the density of fixing devices must be known.

The ratings of airborne sound insulation shall be undertaken according to EN ISO 717-1.

When essential characteristic for “Airborne sound insulation” will be assessed, the weighted improvement ΔR_w, the sound reduction index R_w with and without the assembled kit and the spectrum adaptation terms C and C_{tr}, shall be given.

2.2.19 Thermal resistance

Thermal resistance (R-value) of the assembled kit shall be calculated according to EN ISO 6946, using the thermal resistance of the kit components obtained from the relevant European product standards (see table 1.1.2), or tested according to EN 12667, EN 12939 or EN 12664. The thermal resistance may be tested according to EN ISO 8990. Tabulated values of the kit components materials according to EN ISO 10456 may also be defined by the manufacturer.

The assembled kit thermal bridges shall be calculated according to EN ISO 10211.

At least, the worst or the most representative assembled kit shall be assessed.

When essential characteristic for “Thermal resistance” will be assessed, the thermal resistance value for the assembled kit shall be given.

This thermal resistance should exceed 0,5 m^2·K/W.

2.2.20 Durability

The assessment of the durability of the kit is carried out by means of the assessment of the following characteristics which are representative of this essential characteristic for the kit:

- Dimensional stability. See clause 2.2.20.1. and 2.2.20.1
- Thermal shock. See clause 2.2.20.3.
- Chemicals and biological resistance. See clause 2.2.20.4.
- Corrosion. See clauses 2.2.20.5.
- UV radiation resistance. See clause 2.2.20.6.

2.2.20.1 Dimensional stability by humidity

Dimensional stability of the kit shall be assessed by means of the dimensional stability of the kit components that are known to be or suspected of being sensitive to changes in environmental relative humidity.

The dimensional stability of the kit components associated with changes in relative humidity shall be assessed according to the relevant hEN (see table 1.1.2) or EAD.

Note: When available, performance included in the DoP regarding the relevant kit components shall be used as far as possible to avoid retesting or reassessment.

When the hEN or EAD does not give an assessment method or when there is no relevant hEN or EAD applicable, the dimensional variation by humidity of the kit components shall be assessed according to EN 318 or EN 1170-7.

When essential characteristic for “Dimensional stability by humidity” will be assessed, the maximum value for each sensitive kit component shall be given.

The values shall cover the range of density of the kit components.

2.2.20.2 Dimensional stability by temperature (Linear thermal expansion)

Dimensional stability of the kit shall be assessed by means of the dimensional stability of the kit components that are known to be or suspected of being sensitive to changes in environmental relative temperature

The dimensional stability of the kit components associated with changes in temperature shall be assessed according to the relevant hEN (see table 1.1.2) or EAD.

Note: When available, performance included in the DoP regarding the relevant kit components shall be used as far as possible to avoid retesting or reassessment.

When the hEN or EAD does not give an assessment method or when there is no relevant hEN or EAD applicable, the linear thermal expansion coefficient of the kit components shall be assessed according to clause 3.2.6 of EN 1993-1-1, clause 3.2.5 of EN 1999-1-1 or EN 14617-11.

When essential characteristic for “Linear thermal expansion” will be assessed, the maximum value for each sensitive kit component shall be given.

The values shall cover the range of density of the kit components.

2.2.20.3 Thermal shock

This characteristic is only relevant for kits with components that are known to be or suspected of being sensitive to thermal shock such as wood-based panels, plastics, laminates, fibre-cement, metal, etc.

This assessment is not necessary if the VETURE kit has already been assessed according to clause 2.2.7.

Thermal shock of the VETURE unit shall be tested according to the method given in Annex M.

If any of the following defects occur during or at the end of the thermal shock programme, it shall be described:

- deterioration such as cracking or delamination of the skin that allows water penetration to the insulation;
- deterioration or cracking of seals between VETURE units;
- detachment of the skin or the VETURE unit;
- irreversible deformation.

2.2.20.4 Chemical and biological resistance

This characteristic is only relevant for kits with skins that are known to be or suspected of being sensitive to chemical and biological attack such as wood-based panels, plastics, stones, etc.

The chemical and biological attack of the VETURE unit skin shall be assessed according to the relevant hEN (see table 1.1.2) or EAD.

Note: When available, performance included in the DoP regarding the skin component shall be used as far as possible to avoid retesting or reassessment.

2.2.20.5 Corrosion

The assessment of the kit corrosion is carried out by means of the assessment of the metal kit components corrosion, representative of this essential characteristic for VETURE kits.

The corrosion protection of the metal components of the kits shall be described according to the appropriate EN standard (e.g. EN 10346 for continuously hot-dip coated steels).

The choice of steel, aluminium and stainless steel grade shall be described according to the appropriate EN standards (e.g. EN 10346 for continuously hot-dip coated steel, EN 755-1 and EN 1999-1-1 for aluminium alloys, EN 10088-4 for stainless steels).

The steel or aluminium grade and the respective corrosion protection shall be described in function of the field of application and the corrosivity of atmospheres defined in EN ISO 9223 (e.g. marine atmosphere, industrial atmosphere, etc.). In particularly aggressive atmospheres with extreme chemical pollution (e.g. desulphurization plants, chloride atmosphere), special measures of corrosion protection shall be foreseen.

If necessary, the performance deterioration caused by corrosion should also be described.

2.2.20.6 UV radiation resistance

This characteristic is only relevant for kits with components that are known to be or suspected of being sensitive to UV radiation.

Kit components behaviour after UV radiation ageing shall be assessed according to the relevant hEN (see table 1.1.2) or EAD.

Note: When available, performance included in the DoP regarding the relevant kit components shall be used as far as possible to avoid retesting or reassessment.

When the hEN or EAD does not give an assessment method or when there is no relevant hEN or EAD applicable, the following standards shall be considered taking into account the component material:

- For plastic materials: EN ISO 877-1, EN ISO 877-3, EN ISO 4892-1, EN ISO 4892-2, EN ISO 4892-3, EN 927-2,
- For coating materials such as paints and varnishes: EN 13245-2 or,
- For organic coatings (coil coated): EN 10169.

When essential characteristic for “UV radiation resistance” will be assessed, test results shall be given according to the relevant hEN, EAD or standard listed above. Reference to the relevant hEN, EAD or standard used in the assessment shall be given in the ETA.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is Decision 2001/308/EC.

The applicable AVCP system is **3** for any use except for uses subject to regulations on reaction to fire (based on the Commission decision 2001/308/EC).

For uses subject to regulations on reaction to fire[6] the applicable AVCP systems regarding reaction to fire are 1, or 3, or 4 depending on the conditions defined in the said Decision.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in table 3.2.1a.

The actions to be undertaken by the manufacturer of the product for the different components of the kit are laid down in table 3.2.1b & 3.2.1c when the components are produced by the manufacturer himself and table 3.2.1d when the components are not produced by the manufacturer himself but by its supplier under the specifications of the manufacturer.

The manufacturer (regarding the components he buys from the market with DoP) shall to take into account the Declaration of Performance issued by the manufacturer of that component. No retesting is necessary.

Table 3.2.1a: Control plan for the manufacturer; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC)					
1	Components produced by the manufacturer himself:				
	▪ VETURE unit	See table 3.2.1b	See table 3.2.1b	See table 3.2.1b	See table 3.2.1b
	▪ VETURE fixing device	See table 3.2.1c	See table 3.2.1c	See table 3.2.1c	See table 3.2.1c
	▪ Supplementary thermal insulation product	relevant hEN or EAD	Control Plan	Control Plan	relevant hEN or EAD
	▪ Other ancillary components	Control Plan	Control Plan	Control Plan	Control Plan
2	Components not produced by the manufacturer himself (*)	See table 3.2.1d	See table 3.2.1d	See table 3.2.1d	See table 3.2.1d
(*) Components produced by the supplier under the specifications of the manufacturer.					

6 Including propensity to undergo continuous smouldering, where relevant.

Table 3.2.1b: Control plan when the VETURE unit is produced by the manufacturer himself; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC)					
Incoming component					
1	Receipt component	Delivery ticket or label on the package	Conformity with the order	---	Each delivey
2	Thermal insulation product	See table 3.2.1b.1	See table 3.2.1b.1	See table 3.2.1b.1	See table 3.2.1b.1
3	Skin	See table 3.2.1b.2	See table 3.2.1b.2	See table 3.2.1b.2	See table 3.2.1b.2
4	Skin-attachment	See table 3.2.1b.3	See table 3.2.1b.3	See table 3.2.1b.3	See table 3.2.1b.3
Finished VETURE unit					
1	Geometry (Length and width, thickness, squareness, flatness)	Test based on EN 822; EN 823; EN 824 & EN 825	Control plan agreed between the TAB and the manufacture	At least 3 units	Control Plan (*)
2	Weight per unit area or per VETURE unit	Test based on EN 1602		At least 3 units	Control Plan (*)
3	Bond strength	2.2.10		2.2.10	At least each 5 years (**)
4	Pull-through resistance	2.2.12		2.2.12	
5	Resistance to the grooves, if relevant	2.2.13		2.2.13	
6	Reaction to fire	2.2.1		2.2.1	

(*) The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.

(**) If no changes are presented at the VETURE unit, then these controls may not be necessary.

Table 3.2.1b.1: Control plan for incoming thermal insulation products; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC)					
Thermal insulation product – incoming component					
1	Density	Checking the supplier certificate or supplier test based on test acc. to EN 1602	Control plan agreed between the TAB and the manufacturer	---	Each delivey
		Test based on EN 1602			1 per month (*)
2	Length and width, thickness, squareness, flatness	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN			Each delivey
3	Tensile strength perpendicular to the faces in dry conditions				Control Plan (*)
4	Shear strength and shear modulus				
5	Thermal conductivity /Thermal resistance				
6	Reaction to fire				
7	Water absorption				
8	Water vapour permeability				
9	Heat of combustion	Checking the supplier certificate or supplier test based on test acc. to EN ISO 1716	Control plan agreed between the TAB and the manufacturer	---	At least each 5 years (**)
10	Tensile strength perpendicular to the faces in wet conditions	Checking the supplier certificate or supplier test based on test acc. to 2.2.11			

(*) The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.

(**) If no changes are presented at the thermal insulation product, then these controls may not be necessary.

Table 3.2.1b.2: Control plan <u>for incoming skin</u>; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC)					
Skin (cladding) - incoming component					
1	Geometry (form and dimensions)	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN. Otherwise based on test acc. to 3.4.2	Control plan agreed between the TAB and the manufacturer	---	Control Plan (*)
2	Density				
3	Bending strength, modulus of elasticity or modulus of rupture				
4	Water absroption				
5	Reaction to fire. Otherwise heat of combustion	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN. Otherwise based on test acc. to EN ISO 1716		---	At least each 5 years (**)
Skin (render) - incoming component					
1	Density	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN. Otherwise based on test acc. to 3.4.2	Control plan agreed between the TAB and the manufacturer	---	Control Plan (*)
2	Ash content at 450 ºC				
3	R eaction to fire. Otherwise heat of combustion	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN. Otherwise based on test acc. to EN ISO 1716	Acc. to the VETURE kit manufacturer specifications and to the control plan agreed between the TAB and the manufacturer	---	At least each 5 years (**)

(*) The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.

(**) If no changes are presented at the skin, then these controls may not be necessary.

Table 3.2.1b.3: Control plan <u>for incoming skin-attachment</u>; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC)					
Skin-attachment - Adhesive (if it exists) – incomming material					
2	Viscosity, pot life, curing time, handing time	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN. Otherwise based on test acc. to 3.4.2	Control plan agreed between the TAB and the manufacturer	---	Control Plan (*)
3	Specific mass				
4	Ash content at 450 ºC				
5	Reaction to fire. Otherwise heat of combustion	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN. Otherwise based on test acc. to EN ISO 1716	Control plan agreed between the TAB and the manufacturer	---	At least each 5 years (**)
Skin-attachment – Mechanical fixing (if it exists)					
1	Receipt component	Delivery ticket or label on the package	Conformity with the order	---	Each delivey
2	Geometry (form and dimensions)	Checking the supplier DoP, supplier certificates or supplier tests based on the relevant hEN. Otherwise based on measuring and visual check	Control plan agreed between the TAB and the manufacturer	---	Control Plan (*)
3	Mechanical properties of the fixing material				
(*) The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.					
(**) If no changes are presented at the skin-attachment, then these controls may not be necessary.					

Table 3.2.1c: Control plan when the <u>fixing devices</u> are produced by the manufacturer himself; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC)					
Incoming materials					
1	Receipt materials	Delivery ticket or label on the package	Conformity with the order	---	Each delivery
		Supplier certificates or supplier tests			
Finished component					
1	Geometry (form and dimensions)	Acc. to the relevant EAD, otherwise measuring and visual check	Control Plan	According to tests or control methods	Control Plan (*)
2	Mechanical characteristics	Acc. to the relevant EAD, otherwise manufacturer's internal test or control	Control Plan	According to tests or control methods	Control Plan (*)
(*) The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.					

Table 3.2.1d: Control plan <u>when the kit components are not produced by the manufacturer</u>; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC)					
1	Components belonging to Case 1 (*)	(1)	Conformity with the order	Testing is not required	Each delivery
		(2)	Control Plan	Testing is not required	Each delivery
2	Components belonging to Case 2 (*):	(1)	Conformity with the order	Testing is not required	Each delivery
	▪ Characteristics declared in DoP for the specific use within the kit.	(2)	Control Plan	Testing is not required	Each delivery
	▪ Characteristics not declared in DoP for the specific use within the kit.	(3)	Control Plan	Control Plan	Control Plan
3	Components belonging to Case 3 (*):	(1)	Conformity with the order	Testing is not required	Each delivery
		(3)	Control Plan	Control Plan	Control Plan
(1) Checking of delivery ticket and/or label on the package. (2) Checking of technical data sheet and DoP or, when relevant: supplier certificates or supplier tests or test or control acc. to tables 3.1a to 3.1c above. (3) Supplier certificates or supplier tests or Test or control acc. to tables 3.1a to 3.1c above.					
(*) Case 1: Component covered by a hEN or its own ETA for all characteristics needed for the specific use within the kit. Case 2: If the component is a product covered by a hEN or its own ETA which, however, does not include all characteristics needed for the specific use within the kit or the characteristic is presented as NPD option for the component manufacturer. Case 3: The component is a product not (yet) covered by a hEN or its own ETA.					

3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire[6] for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material).

The cornerstones of the actions to be undertaken by the notified body of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.3.1.

Table 3.3.1: Tasks of the notified body under AVCP system 1.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer limited to the constancy of performances of reaction to fire and taking into account the limit of organic material and/or the addition of fire retardants.	As defined in the control plan	As defined in the control plan	As defined in the control plan	When starting the production
Continuous surveillance, assessment and evaluation of factory production control					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer limited to the constancy of performances of reaction to fire and taking into account the limit of organic material and/or the addition of fire retardants.	As defined in the control plan	As defined in the control plan	As defined in the control plan	Once per year

3.4 Special methods of control and testing used for the verification of constancy of performance

This clause establishes special methods of components used for the verification of constancy of performance.

3.4.1 Skin-cladding

Table 3.4.1.1 shows the relevant test methods applicable to the skin-claddings by materials

Table 3.4.1.1 Skin-cladding test methods by materials

Skin-cladding material	**Test methods**			
	Water absorption	**Bending strength, Modulus of elasticity or Modulus of rupture**	**Dimensions**	**Specific mass or density**
Wood based	EN ISO 15148	EN 310	EN 325; EN 1309-1	EN 323
Fibre-cement Fibre reinforced cement	EN 12467; EN 492; EN 494; EN 1170-6; EN ISO 15148	EN 12467; EN 492; EN 494; EN 1170-4	EN 12467; EN 492; EN 494; EN 13369	EN 12467; EN 492; EN 494; EN 1170-6
Concrete	EN 491; EN ISO 15148	EN 491	EN 491; EN 13369	EN 491
Natural stone	EN 1925; EN ISO 15148	EN 12372	EN 13373	EN 1936
Terra cotta or ceramic	EN ISO 10545-3; EN ISO 15148	EN ISO 10545-4; EN 538	EN ISO 10545-2	EN ISO 10545-3
Metal	EN 14782; EN 14783; EN ISO 15148	EN 10346; EN 485-2	EN 10143; EN 485-4; EN 14782; EN 14783	EN 10346; EN 1396
HPL laminates	EN ISO 15148	EN ISO 178	EN 438-6	Method A EN ISO 1183-1
Plastic	EN ISO 15148	EN ISO 178	EN 16153; EN 1013	Method A EN ISO 1183-1; EN ISO 10352
Bituminous shingles or brick slips	EN 14223; EN ISO 15148	EN 12311-1; EN 12311-2; EN ISO 178	EN 1848-1; EN 1848-2; EN 16153; EN 1013	EN 1849; Method A EN ISO 1183-1; EN ISO 10352
Agglomerated stone	EN 14617-1	EN 14617-2	Annex A of EN 15286 or EN 14617-16	EN 14617-1
Wood-polymer composite (WPC) and Natural Fibre Composite (NFC)	EN 15534-1	EN 15534-1	EN 15534-1	EN 15534-1

3.4.2 Skin-render and skin-attachment adhesive

3.4.2.1 Density or specific mass (as delivered)

Pastes and liquids

This is measured at (23 ± 2) °C in a 1000 cm^3 cylinder.

Powders

This is measured at (23 ± 2) °C in a 500 cm^3 cylinder.

Method of operation

The results are recorded after maximum packing down on a vibrating table and levelling of the surface. The results are expressed in kg/m^3 (mean value of 3 tests).

3.4.2.2 Dry extract (only pastes and liquids)

Lime and polymer-based products

This is determined after placing the sample in a ventilated oven set at (105 ± 5) °C until a constant mass is obtained.

The mass is regarded as constant if the difference in mass between two successive weighing, one hour apart, does not exceed 0,1 g.

Initial weighing for testing:

- 2 g for liquid products (impression, etc.),
- 5 g for products in paste form.

The results are expressed as a percentage relative to the initial mass (mean value of 3 tests).

Alternative method according to EN 480-8 can be used.

Silicate based products

The dry extract is determined by the following method:

A - Initial weighing of approximately 5 g (product in the as-delivered state) on an aluminium sheet, approximately 100 mm x 100 mm, 2/3 covered.

B - Pre dry for 1 hour at (125 ± 10) °C. Dry for 2 hours at (200 ± 10) °C.

C - Final weighing.

Weighing accuracy shall be within 5 mg.

The difference in mass from the initial weighing is accounted for by volatile components including water of crystallization.

The results are expressed as a percentage relative to the initial mass (mean value of 3 tests).

Alternative method according to EN 480-8 can be used.

3.4.2.3 Ash content

Pastes and liquids

The ash content is determined on the same samples as those on which the dry extract has been measured (see clause 3.4.2.2).

Powders

The ash content is determined at 450 °C and 900 °C on a sample of approximately 5 g pre-dried at (100 ± 5) °C or at (200 ± 5) °C for silicate based products, to constant mass. The mass is regarded as constant if the difference in mass between two successive weightings, one hour apart, does not exceed 0,1 g.

Method of operation

- The sample is placed in a tared crucible either fitted with a lid or enclosed in a leak-tight container and the whole is weighed,
- After the lid has been removed, where necessary, the crucible is placed in the oven maintained at ambient temperature,
- The temperature of the oven is then raised to (450 ± 20) °C (ash content at 450 °C) or to (900 ± 20)°C (ash content at 900 °C) and maintained at that temperature for 5 hours,
- The crucible is allowed to cool down to room temperature in the desiccators before being weighed.

The results are expressed as a percentage relative to the initial mass after drying (mean value of 3 tests).

Note: the tolerances at 900 °C may become larger, taking account of the products' composition.

Glass fibre reinforcement mesh

The ash content is determined at (625 ± 20) °C on three 100 mm square samples, cut parallel to the yarn and at least 100 mm apart from the side to constant mass.

The result is expressed as a percentage relative to the initial mass.

Alternative method according to EAD 040016 can be used.

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ANNEX A – REACTION TO FIRE

A.1 General

A.1.1 Principle

The determination of reaction to fire of the VETURE kit is based on testing of “the worst case” - the most critical configuration in sense of reaction to fire. According to the rules described further in the text, the classification obtained on the most critical configuration of the VETURE kit is valid for all configurations having better performance in sense of reaction to fire.

For the particular parts of the VETURE kit, the following principles apply:

- Each combination of different types of VETURE kit components shall be tested separately, in particular:
- Each different type and material of thermal insulation product.
- Each different materials of the skin.
- Within a family of component material (skin, thermal insulation and adhesives) the component with the highest amount of organic content[7] (if there are only differences in the amount of organic content but no difference in the organic component himself) or the highest PCS value (according to EN ISO 1716) of this organic component shall be tested.
- In addition, each component selected for testing according to the previous point shall have the lowest amount of flame retardants.

A.1.2 Physical properties influencing the reaction to fire behaviour

- Type of insulation product (composition, thickness, density).
- Type of skin (composition, thickness, density).
- Type and nature of fixings and adhesives.
- The organic content of the binder and of any organic additive; this can be checked by providing the formulation of the skin, grout and adhesive, by performing suitable characterization tests or by determining the glow loss or net calorific value.
- Type and amount of flame retardant.

Note: fire breaks are important for the behaviour of the whole facade VETURE system and cannot be assessed on the basis of SBI-testing. The influence can only be observed during a large scale test. Therefore breaks are not included in the mounting and fixing rules for the SBI-test.

Although the rest of this annex applies the “worst case scenario” for deciding what to test, it is accepted that, where the manufacturer produces a range of VETURE kit having different overall classifications, it may group these together into a number of different sub-groups (e.g. each sub-group corresponding to a different overall classification) with the ‘worst case scenario’ being identified for each sub-group.

Components of an VETURE kit, where these require separate assessment (as opposed to being tested as part of the VETURE kit as a whole), which are classified A1 without testing according to Decision 96/603/EC (as amended) do not need to be tested.

[7] The manufacturer is responsible for the information on organic content per unit area. If the information is not available, the PCS value shall be tested to decide about the worst case.

A.2 Testing according to EN ISO 1182

This test method is relevant for classes A1 and A2.

Using this test method, only the substantial components of the VETURE kit need to be tested. 'Substantial components' are defined by thickness (≥ 1 mm) and/or mass per unit area (≥ 1 kg/m^2).

In the following, the insulation product, skin, grout and adhesives are considered as 'Substantial components'.

For these components, the principles specified in section A.1 shall be applied.

A.2.1 Insulation product

For VETURE kit expected to be classified as A1 or A2, it is anticipated that only insulation products with reaction to fire class A1 or A2 will form the insulation layer. For testing the insulation product reference shall be made to the relevant product standards or other relevant documents.

A.2.2 Skin-cladding

For VETURE kit expected to be classified as A1 or A2, it is anticipated that only skin materials with reaction to fire class A1 or A2 will form the skin. For testing the skin reference shall be made to the relevant product standards.

A.2.3 Skin-renders, grout and adhesives

The reaction to fire behaviour of the renders, grout and adhesives not falling under EC Decision 96/603/EC (as amended) shall be tested taking into account the principles indicated in section A.1.

The test results can be directly applied to all variants with the same render, grout and adhesive with a lower amount of organic components. When the subject of the directly applied result contains a flame retardant, it shall be of the same type and its content shall be at least that of the product tested.

Differences greater than tolerances ± 10 % concerning the density shall be considered by testing the lowest and the highest density.

A.3 Testing according to EN ISO 1716 (PCS-value)

This test method is relevant for classes A1 and A2.

This test method shall be performed to all components of the VETURE kit except for cases which are classified as A1 without testing.

Parameters relevant for this test method are: composition (when performing calculation of the PCS_S-value), density or mass per unit area and thickness. Mechanical fixings and ancillary materials which are not continuous but discrete components of VETURE kit do not need to be considered for testing and for the calculation of the PCS_S.

A.3.1 Insulation product

For testing the insulation product, reference shall be made to the relevant product standards or other related documents.

It is not realistic to require that each insulation product of the same type of material is tested within the classification of an VETURE kit. If the insulation products come from different manufacturers and/or are of different thickness, density and formulation from those used in the testing, these may be used subject to the requirements of class A1 and A2 still being fulfilled. It shall be proved by that the VETURE kit, together with the actual insulation product used in end use application, still fulfils the requirements concerning the PCS-value of the whole product. For example, it is sufficient to determine the PCS-value of the mineral wool and if this is lower than the originally tested product then it is acceptable to use the alternative mineral wool instead of that used in the original test.

Note: information relating to alternative insulation products of the same type of material to that originally tested may be evaluated on the basis of the supplier's evidence provided within the context of its CE marking.

A.3.2 Skin-claddings

For testing the skin, reference shall be made to the relevant product standards.

It is not realistic to require that each skin of the same material is tested within the classification of an VETURE kit. If the skin come from different manufacturers and/or are of different thickness, density and formulation from those used in the testing, these may be used subject to the requirements of class A1 and A2 still being fulfilled. It shall be proved by calculation that the VETURE kit, together with the actual skin used in end use application, still fulfils the requirements concerning the PCS-value of the whole product. For example, it is sufficient to determine the PCS-value of the ceramic tile and if this is lower than the originally tested product then it is acceptable to use the alternative ceramic tile instead of that used in the original test.

Note: information relating to alternative skin of the same material to that originally tested may be evaluated on the basis of the supplier's evidence provided within the context of its CE marking.

A.3.3 Skin-renders and grout

In general, when performing calculations of the unit area referred PCS_S-value (related to the surface) the variant that provides the highest PCS_S-value shall be considered.

The test shall be performed in accordance with the principles specified in section A.1 applied to each component.

It is not necessary to test a render or grout with different grain sizes if the organic content is the same as or lower than that of the tested component.

When the render include a reinforcement, it shall be tested according to EN ISO 1716. For reinforcement that is randomly dispersed (e.g. fibres) in the render then it shall be tested as part of the render.

The test results can be directly applied to all variants with the same render and grout but with a lower amount of organic components. When the subject of the directly applied result contains a flame retardant, it shall be of the same type and its content shall be at least that of the product tested.

A.3.4 Adhesive

For the adhesives of the VETURE kit, each product with a different formulation shall be tested for reaction to fire behaviour by selecting the variant with the highest amount of organic components. The test results can be directly applied to all variants with the same composition but lower amount of organic components. For the case where a mortar is used as the adhesive, the rules according to section A.3.3 shall be applied.

A.4 Testing according to EN 13823 (SBI-test)

This test method is relevant for classes A2, B, C and D (in some cases also for A1).

Mounting and fixing provisions for the SBI-test for VETURE kit are indicated in section A.4.1.

Parameters which are relevant for this test method:

- Type of skin (thickness, dimensions, density).
- Type of grout and adhesives (composition, thickness and mass per unit area).
- Type of insulation product (thickness and density).
- Type of reinforcement mesh (composition, thickness and mass per unit area).
- Amount of organic content of each component.
- Amount of flame retardant of each component, if any.

In principle, it is desirable to find the test specimen configuration that gives the worst case concerning the reaction to fire test results. In the test procedure according to EN 13823, values for the rate of heat release, total heat release, lateral flame spread, rate of smoke release, total smoke release and burning droplets are determined. Due to the possible effects of the insulation product, the following proposals are divided by considering separately the testing of VETURE kit with class A1 and A2 insulation products and the testing of VETURE kit with class B, C, D and E insulation products.

A.4.1 Mounting and fixing provisions for the SBI-test

In this test procedure the VETURE kit shall be tested. The VETURE kit is fixed to a substrate representing that on which the VETURE kit is fixed in the end use application (reference is made to EN 13238). The fixing shall be made using the mechanical fixings used in the end use application.

When a plastic mechanical fixing is used the test result is valid also for metallic anchors.

The maximum testable thickness of the test specimen, including a standard substrate according to EN 13238, is 200 mm. However, in practice, for many VETURE kit, the total overall thickness may be greater than 200 mm. In such cases, using a standard substrate, the thickness of the insulation product shall be reduced to provide for the maximum specimen thickness of 200 mm. Results obtained on an VETURE kit at 200 mm thickness are accepted for greater thicknesses.

The test specimen consists of a corner construction which shall be representative of the construction in practice. All edges can be covered with the skin excluding the bottom edge and the top of the specimen. The floor of the test trolley beneath the test specimen can be covered by an aluminium foil (see figure A.4.41).

It is recommended to prepare the specimens at the lab and then put it onto the trolley (with the foil on), or the manufacturer builds the wall at the factory and carries it to the lab where it is put onto the trolley. After preparation of the test specimens they shall be conditioned according to EN 13238.

A.4.2 Insulation product

For the testing of VETURE kit with insulation products with reaction to fire class A1 or A2 the insulation product with the highest thickness, the highest density (with a tolerance of $\pm$ 10 %) and the highest organic content (related to the mass in dried condition) has to be used for preparing the test specimen. The reaction to fire classes A1 or A2 of the insulation product shall be proven separately[8].

For the testing of VETURE kit with insulation products with reaction to fire class B, C, D or E, each type of insulation product material (i.e. EPS, XPS, PUR, PF and also MW in same cases) shall be tested within the system. For each type of insulation product material, the insulation product with the highest thickness and the highest density (with a tolerance of $\pm$10%) shall be used for preparing the test specimen. The reaction to fire class B, C, D or E of the insulation product shall be proven separately[8].

Note: Reaction to fire of the insulation product included in the DoP for the CE marking as individual component should be used as far as possible to avoid retesting or reassessment.

A.4.3 Skin

By testing one skin representing a range of different skins, the following rules should be applied to discriminate the composition, which is able to represent a range of skins:

- The skin, grout and adhesive, taking account of the permissible combination(s) allowed by the manufacturer, shall be determined in accordance with the principles specified in section A.1.
- The test specimen shall be prepared with the skin, grout and adhesive with the highest organic content or PCSs-value per unit area.

[8] In some Member States requirements might exist to demonstrate the behaviour of products with respect to continuous glowing combustion in the case of fire. The mandates for the product standards, therefore, are currently under revision. Additional national assessment e.g. on the basis of national procedures to demonstrate this behaviour might be required until a European harmonised procedure is available.

- For skin reaction to fire different to class A1 or A2, the skins with lowest and highest thickness and density have to be tested.
- For adhesives and grouts having an organic content less than or equal to 5% (related to the mass in dried condition as used in the end use application), only the lowest thickness needs to be used for preparing the test specimen.
- For adhesives and grouts having an organic content higher than 5%, both the lowest and the highest thickness of the layer of the adhesives and grouts shall be used for preparing the test specimens.

Regardless of the organic content, only the highest thickness of a adhesives and grouts shall be tested on insulation material with class A1 or A2-s1,d0.

A.4.4 Application of test results

The test result is valid for:

- insulation products:
  - of the same type,
  - with lower density,
  - with lower thickness or between those evaluated in the tests, provided that the worst result of the two thicknesses tested is used for intermediate thicknesses,
  - with equal or less organic content,
- skin:
  - of the same material of skin, grout and adhesive,
  - the range of skin between lowest and highest thickness / density, for skin reaction to fire different to class A1 or A2,
  - components with equal or lower organic content,
  - components with equal or lower PCS_S-value per unit area,
  - components with equal or higher content of the same type of flame retardants.

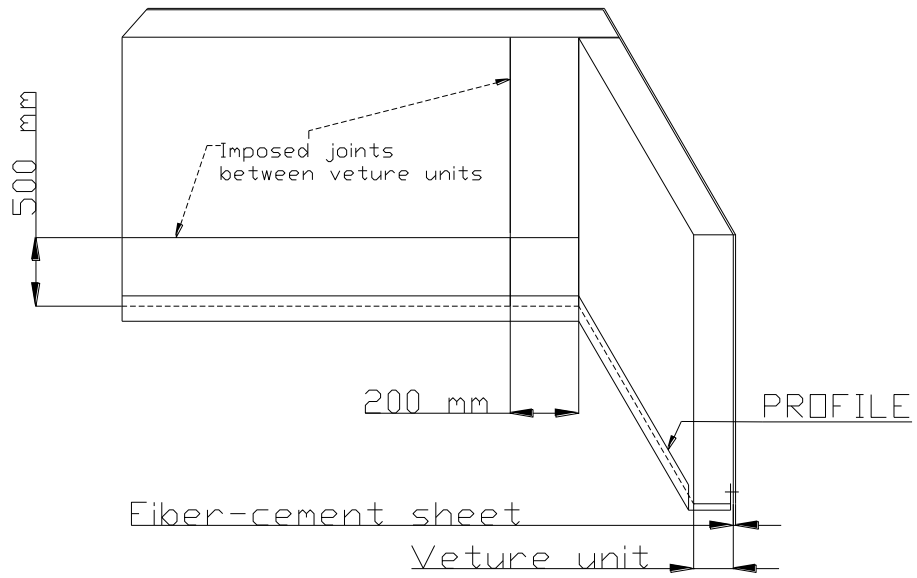


Figure A.4.4.1: Example of installation for VETURE kit.

Remark: This proposed test specimen arrangement is not in accordance with the standard due to the extended substrate of the small specimen wing, but is supposed to represent better the end use application.

A.5. Testing according to EN ISO 11925-2

This test method is relevant for the classes B, C, D and E.

In this test procedure, the VETURE kit is tested without using a substrate. The maximum thickness of the test specimen is 60 mm. In cases where the thickness of the VETURE kit is larger than 60 mm, the insulation product may be reduced for the purposes of testing. The results from the testing of specimens at 60 mm are applicable to greater thicknesses.

Parameters which are relevant for this test method:

- Type of skin (thickness, dimensions and density).
- Type of grout and adhesives (composition, thickness and mass per unit area).
- Type of insulation product (thickness and density).
- Type of reinforcement mesh (composition, thickness and mass per unit area).
- Amount of organic content of each component.
- Amount of flame retardant of each component, if any.

The specimens are prepared in such a way that the edges are not covered with the skin (cut edges). The tests are performed with surface flaming of the front side and possibly edge flaming of the test specimen turned by 90° according to the rules of standard EN ISO 11925-2.

A.5.1 Insulation product

An insulation product, representative in its characterisation (type, reaction to fire classification and density) for the end use application shall be used. The VETURE kit shall be evaluated incorporating the insulation product at the highest possible thickness and the highest and the lowest possible densities.

For VETURE kit with insulation products classified class E, the test results are valid only for the insulation products as used in the test. Manufacturer has the possibility of using insulation products from different manufacturers when the following additional tests are performed and conditions are fulfilled or the manufacturer provides the necessary evidence. For insulation products made of polystyrene or PUR, it shall be proven separately that the product fulfils the requirements for reaction to fire class E under the following conditions. Polystyrene insulation has to be tested with the highest density and at a thickness of 10 mm for expanded polystyrene foam and at the minimum thickness produced for extruded polystyrene. The test result is valid for lower densities and higher thicknesses. PUR insulation shall be tested at the density intended for the end use and at the highest thickness. The test result is valid for PUR insulation with the same density and for lower thicknesses.

A.5.2 Skin

For testing one specific skin representing a range of different skins, the rules as mentioned in section A.4.3 apply.

A.5.3 Application of test results

The test result covers end use application arrangements with the same type of insulation product (excluding insulation made of polystyrene or PUR) as used in the tests with thicknesses and densities as described in section A.5.1 and equal or lower organic content.

The test results from tests with insulation products made of polystyrene or PUR classified class E are valid for VETURE kit with insulation products as used in the test or for VETURE kit with any polystyrene and PUR insulation products classified class E when the test evidence according to section A.5.1 was provided.

For the direct application of test results regarding skin, grout and adhesives the same rules shall apply as given in section A.4.4.

ANNEX B – WATER ABSORPTION BY CAPILLARITY TEST

B.1 Preparation of the test specimen

Test shall be carried out on at least three specimens.

Specimens shall have a surface area of at least 200 mm x 200 mm, and installed according to the manufacturer's instructions.

The following aspects should be recorder in the test report:

- thickness of the VETURE unit and of each individual layer of the specimen;
- size of the VETURE unit;
- thickness of joints between skin pieces, if relevant;
- weigh of the whole specimen;
- summary of the manufacturer's instruction used for the specimen installation;
- technical information about the components considered in the test specimens (at least the water absorption of the skin materials, thermal insulation and grout/sealant should be known).

The edges of the specimens (including the insulation product) should be sealed against water, to ensure that during subsequent testing, only the front face of the VETURE unit is subject to water absorption.

B.2 Conditioning of the specimens

The prepared specimens are conditioned for 7 days at (23 ± 2) °C and (50 ± 5) % RH.

They are then subject to a series of 3 cycles comprising the following phases:

- Phase 1: 24 h partial immersion in a water bath (tap water) at (23 ± 2) °C.

  The specimens are immersed face downwards, to a depth of 2 to 10 mm, the depth of immersion depends upon surface roughness. To achieve complete wetting of rough surfaces, the specimens shall be tilted as they are introduced into the water. The depth of immersion can be regulated in the water tank by means of a height-adjustable slat.

- Phase 2: 24 h drying at (50 ± 5) °C.

  If interruptions are necessary, e.g. at weekends or holidays, the specimens are stored at (23 ± 2) °C and (50 ± 5) % RH after the drying at (50 ± 5) °C.

After the cycles, the specimens are stored for at least 24 h at (23 ± 2) °C and (50 ± 5) % RH.

B.3 Test procedure

To start the capillarity test the specimens are again immersed in a water bath as described above.

The specimens are weighed after 3 minutes immersion in the bath (reference weight) and then after 1 hour and 24 hours. Prior to the second and subsequent weighing, water adhering to the surface of the specimen is removed with a damp sponge cloth.

Note: if the VETURE kit is applied down to the ground and is therefore exposed to direct contact with earth and the risk of rising damp, the TAB may need to develop additional assessment in an appropriate way subject to consensus within EOTA. This use is not coverd by this EAD (see clause 1.2.1).

B.4 Test results

Calculation is undertaken to determine the mean value of water absorption per square metre after 1 hour and 24 hours of the three specimens.

ANNEX C – WATER VAPOUR PERMEABILITY

C.1 General

Input data for calculation is the water vapour permeability of the VETURE kit components.

Water vapour diffusion resistance of the VETURE kit components (thermal insulation product, skin, fixing device, and when relevant grout/sealant), should be obtained from the relevant hEN or EAD (see table 1.1.2).

Note: When available, performance included in the DoP regarding the relevant kit components could be used as far as possible to avoid retesting or reassessment.

When the hEN or EAD does not give an assessment method or when there is no relevant hEN or EAD applicable to an VETURE kit component, the water vapour permeability of this component shall be tested according to EN ISO 12572 if no tabulated values according to EN ISO 10456, EN 12524 or EN 1745 are available.

This data can be expressed by means of one of the following terms:

- Water vapour diffusion resistance factor, μ
- Water vapour diffusion-equivalent air layer thickness, S_d [m]
- Water vapour diffusion resistance, Z, in [$m^2 \cdot s \cdot Pa/kg$]
- Water vapour permeance, W, in [$kg/(m^2 \cdot s \cdot Pa)$]

The related equations are:

$Z = 1/W$; $Z = (d \cdot \mu)/\delta_a$; $Z = S_d/\delta_a$; $\mu = \delta_a/\delta$; $S_d = \mu \cdot d = \delta_a \cdot Z$;

where:

d = thickness of layer [m].

δ_a = water vapour permeability of the air [kg/(m·s·Pa)] See page 15 of EN ISO 12572 or section 6.2 of EN ISO 13788. $\delta_a = 2{,}0 \cdot 10^{-10}$ kg/(m·s·Pa) may be used as reference value.

δ = water vapour permeability [kg/(m·s·Pa)]

C.2 Calculation procedure

The water vapour diffusion resistance Z of VETURE units can be calculated by the addition of water vapour diffusion resistance of the different layers:

- In the case of continuous skin (render):

  $Z_{VET\text{-}unit} = Z_{skin} + Z_{insulation}$

- In the case of skin-claddings:

  $Z_{VET\text{-}unit} = Z_{skin} + Z_{skin\text{-}attachment} + Z_{insulation}$

  When relevant, because the skin may be configured of the cladding piece and the grout of the joints, the water vapour diffusion resistance, Z_{SKIN}, can be calculated by proportionality of the areas of both components.

  $$\frac{1}{Z_{skin}} = \frac{P_{cladd}}{Z_{cladd}} + \frac{P_{joint}}{Z_{grout}}$$

  Where:

  P_{cladd} = percentage surface of cladding piece (%)

  P_{joint} = percentage surface of joints (%)

The water vapour diffusion resistance Z of VETURE kit can be calculated by proportionality of the areas of both components (VETURE unit and fixing device).

$$\frac{1}{Z_{VETURE}} = \frac{P_{VET\text{-}unit}}{Z_{VET\text{-}unit}} + \frac{P_{Fixing}}{Z_{Fixing}}$$

Where:

$P_{VET\text{-}unit}$ = percentage surface of VETURE units (%)

P_{Fixing} = percentage surface of fixings (%)

ANNEX D – ACCELERATED AGEING PROCEDURES

This annex describes two types of accelerated ageing tests, which are:

1. Hygrothermal behaviour test (see clause D.1), which include:
    - Heat-rain cycles
    - Heat-cold cycles
2. Freeze-thaw behaviour test (see clause D.2).

When the manufacturer requires it, a combined hygrothermal and freeze-thaw cycles test may be carried out according to clause D.3.

The principle is to determine the effects of accelerated ageing procedures on the kit.

After the accelerated ageing procedures, bond strength tests (see clause 2.2.10) shall be carried out on samples taken of the test specimens.

D.1 - HYGROTHERMAL BEHAVIOUR TEST

D.1.1 Principles related to the preparation of the specimen

The kit must be installed, in accordance with the manufacturer's instructions, onto a sufficiently stabilised masonry or concrete substrate (minimum 28 days).

The test wall shall have one or two openings (depending on the number of rendering system configurations that are to be tested) positioned as given in the figures D.1.1. The dimension of the weather surface of the test wall shall be:

- width: ≥ 2,50 m (for one opening) or ≥ 3,00 m (for two openings)
- height ≥ 2,00 m

The openings shall be at the upper part of the test wall positioned at a distance ≥ 0,40 m from the edges (preferably positioned as shown in figures D.1.1, for one and two openings). The openings shall have a width and a height of (0,5 ± 0,1) m.

The configuration of the specimen shall be decided according to the following rules:

- At least the worst case (e.g. maximum water absorption, minimum bond strength, minimum thickness of the components, etc) or the most representative case of the kit shall be tested.
- As general rule, for each opening, only one thermal insulation material and one skin material shall be used for the specimen.
- At the very most two skins (different skin pieces size of the same material) can be applied per opening in the test wall (vertical divisions). Maximum two configurations in the case one opening (see figure D.1.1a) and maximum four configurations in the case of two openings (see figure D.1.1b).

Special methods for reinforcing corners of the opening are applied, if necessary.

Installation of the window sill and other ancillary materials is under responsibility of the manufacturer.

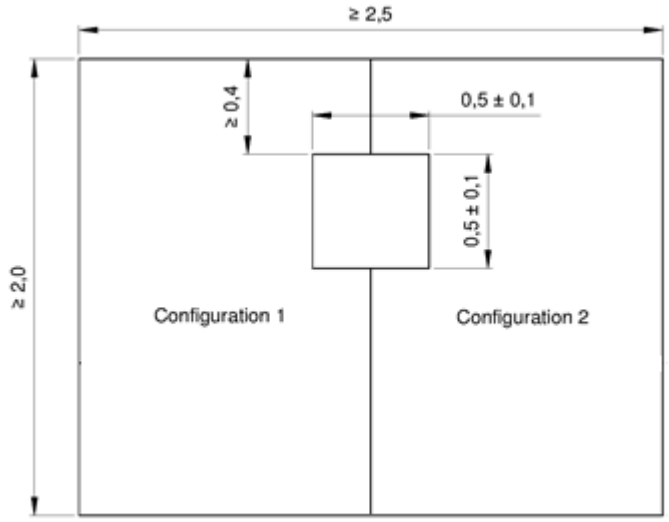


Figure D.1.1a: Example of hygrothermal behaviour test specimen with one opening (dimensions in metres).

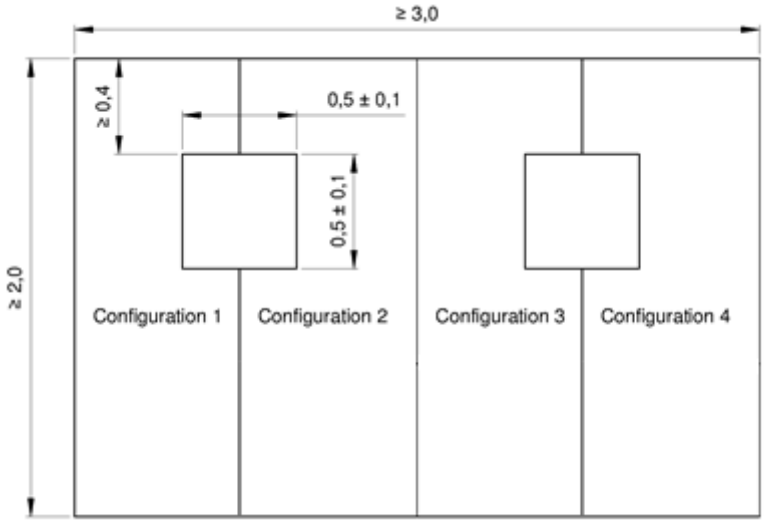


Figure D.1.1b: Example of hygrothermal behaviour test specimen with two openings (dimensions in metres).

D.1.2 Preparation of the specimen

The preparation of the specimen shall be carried out by the manufacturer and be supervised by the laboratory in charge of the test, regarding:

- Checking of the respective manufacturer prescriptions: all stages shall be in accordance with the technical documentation of the manufacturer.
- Registering of all the stages of the installation:
- the date and time of the various stages,
- temperature and % RH during the installation (every day – at least at the beginning),
- name and production lot of the components,
- figure describing the specimen (place of the kit and of the joints, …),
- use and position of accessories,
- any other relevant information.

D.1.3 Hygrothermal cycles

The test apparatus is positioned against the front face of the specimen, 0,10 m to 0,30 m from the edges.

The specified temperatures during the cycles are measured at the surface of the specimen. The regulation shall be obtained by adjustment of the air temperature.

Heat - rain cycles:

The specimen is subjected to a series of 80 cycles, comprising the following phases:

1. Heating to 70°C (rise for 1 hour) and maintaining at (70 + 5) °C and 10% to 30% RH for 2 hours (total of 3 hours).
2. Spraying for 1 hour, water temperature (15 ± 5) °C, amount of water (1,5 ± 0,5) l/m² min.
3. Leave for 2 hours (drainage) at (20 ± 5) °C.

Heat-cold cycles:

After at least 48 hours of subsequent conditioning at temperatures (20 ± 10) °C and a minimum relative humidity of 50%, the same test specimen is exposed to 5 heat/cold cycles of 24 hours comprising the following phases:

1. Exposure to (50 ± 5) °C (rise for 1 hour) and maximum 30% RH for 7 hours (total of 8 hours).
2. Exposure to (- 20 ± 5) °C (fall for 2 hours) for 14 hours (total of 16 hours).

D.1.4 Observations during the tests

At periods of every four cycles during the heat/rain cycles and at every cycle during the heat/cold cycles, observations relating to a change in characteristics or performance (blistering, detachment, crazing, loss of adhesion, formation of cracks, etc.) of the VETURE units are recorded as follows:

- the skin surface of the kit must be examined to establish whether any cracking has occurred. The dimensions and position of any cracks should be measured and recorded,
- the surface should also be checked for any blistering or peeling, and the location and extent should again be recorded,
- the sills and profiles should be checked for any damage/degradation together with any associated cracking of the finish. Again, the location and extent should be recorded.

Following the completion of the test, a further investigation is conducted involving removal of clauses containing cracks to observe any water penetration within the kit (e.g. back of the VETURE unit).

D.1.5 After the cycles

After the heat-rain and heat-cold cycles, bond strength tests (see clause 2.2.10) shall be carried out on samples taken from the test specimens.

These tests shall be performed after at least 7 days drying.

D.1.6 Test report

The test report shall detail the following:

- Observations recorded during the test (see clause D.1.4).
- Photos to detail the damages occurred on each specimen after the cycles and, if necessary, after each visual inspection.

D.2 FREEZE-THAW BEHAVIOUR TEST

The freeze-thaw test shall be carried out as determined by the analysis of the capillarity test (see clause 2.2.5), i.e. shall be carried out except when the water absorption after 24 hours is less than 0,5 kg/m².

D.2.1 Test specimen preparation

The test shall be carried out on either on a full-scale specimen or on a small-scale specimen.

In the case of full-scale, the specimen shall be carried out according to clauses D.1.1 and D.1.2.

In the case of small-scale specimens, samples 500 mm x 500 mm shall be prepared according to the manufacturer's instructions and then stored for at least 28 days at (23 ± 2) °C and (50 ± 5) % RH.

At least three specimens shall be tested for each case.

The edges of the specimens (including the thermal insulation) should be sealed against water.

VETURE unit quantities and dimensions shall be recorded.

D.2.2 Freeze-thaw cycles

The specimens are subjected to a series of 30 cycles comprising:

1. Exposure to water for 8 hours at (23 ± 4) °C by immersion of the specimens, with the skin submerged in a water bath, according to the method described in clause 2.2.5.
2. Freezing to (-20 ± 2) °C (fall for 2 hours) for 14 hours (total of 16 hours).

If the test is interrupted, because the specimens are handled manually and there are stops during weekends or holidays the specimens shall always be stored at a temperature of (- 20 ± 2) °C between the cycles.

Remark: the specified temperatures are measured at the surface of the samples. The regulation is obtained by conditioned air.

D.2.3 Observations

At the end of the test, observations relating to a change in characteristics of the surface or to the behaviour of the kit are recorded according to clause D.1.4.

Any distortion at the edges of the samples shall also be reported.

D.2.4 After the cycles

After the freeze-thaw cycles, bond strength tests (see clause 2.2.10) shall be carried out on each specimen submitted to freeze-thaw cycles.

These tests shall be performed after at least 7 days drying.

D.2.5 Test report

See clause D.1.6.

D.3 EQUIVALENT TEST WITH COMBINED HYGROTHERMAL AND FREEZE-THAW CYCLES

D.3.1 Principles related to the preparation of the samples

See clause D.1.1.

D.3.2 Preparation of the specimen

See clause D.1.2.

D.3.3 Ageing cycles

The test apparatus is positioned against the front face of the specimen, 0,10 m to 0,30 m from the edges.

The specified temperatures during the cycles are measured at the surface of the specimen. The regulation shall be obtained by adjustment of the air temperature.

Heat - rain cycles:

The specimen is subjected to a series of 80 cycles (6 hours each cycle), comprising the following phases:

1. Heating to 70°C (rise for 1 hour) and maintaining at (70 ± 5) °C and 10% to 30% RH for 2 hours (total of 3 hours).
2. Spraying for 1 hour, water temperature (15 ± 5) °C, amount of water (1,5 ± 0,5) l/m² min.
3. Leave for 2 hours (drainage) at (20 ± 5) °C.

Heat-cold cycles:

After at least 48 hours of subsequent conditioning at temperature (20 ± 10) °C and a minimum relative humidity of 50%, the same test specimen is exposed to 5 heat/cold cycles of 24 hours comprising the following phases:

1. Exposure to (50 ± 5) °C (rise for 1 hour) and maximum 30% RH for 7 hours (total of 8 hours).
2. Exposure to (-20 ± 5) °C (fall for 2 hours) for 14 hours (total of 16 hours).

Freeze-thaw cycles:

After at least 48 hours of subsequent conditioning at temperature (20 ± 10) °C and a minimum relative humidity of 50%, the same test specimen is exposed to:

- Conditioning the test specimen spraying for 8 hours, water temperature (15 ± 5) °C, amount of water (1,5 ± 0,5) l/m²·min.
- 30 freeze/thaw cycles of 8 hours comprising the following phases:
- Freeze the surface of the specimen at least 2 hours to (-20 ± 5) °C and maintain it for 4 hours (in total 6 hours).
- Thaw the specimen for 1 hour at temperature of (20 ± 5) °C.
- Spraying for 8 hours, water temperature (15 ± 5) °C, amount of water (1,5 ± 0,5) l/m²·min.

After the 30 cycles condition specimen at ambient temperature (20 ± 10) °C.

D.3.4 Observations during the tests

At periods of every four cycles during the heat/rain cycles and at every cycle during the heat/cold cycles and freeze-thaw cycles, observations relating to a change in characteristics or performance (blistering, detachment, crazing, loss of adhesion, formation of cracks, etc.) of the VETURE units are recorded as follows:

- the skin surface of the kit must be examined to establish whether any cracking has occurred. The dimensions and position of any cracks should be measured and recorded,
- the surface should also be checked for any blistering or peeling, and the location and extent should again be recorded,
- the sills and profiles should be checked for any damage/degradation together with any associated cracking of the finish. Again, the location and extent should be recorded.

Following the completion of the test, a further investigation is conducted involving removal of clauses containing cracks to observe any water penetration within the kit (e.g. back of the VETURE unit).

D.3.5 After the cycles

See clause D.1.5.

D.3.6 Test report

See clause D.1.6.

ANNEX E – WIND SUCTION AND PRESSURE LOAD TESTS

The principle is to establish the effects of wins loads on the assembled VETURE kit.

The number of tests depends on the combination of parameters presented for the assembled VETURE kit.

As a minimum, the mechanically weakest design shall be tested.

E.1 Wind suction test

E.1.1 Preparation of the test specimen

The test specimen shall be mounted in the test equipment in accordance with the manufacturer instructions.

The test specimen is defined as follows:

- A non-airtight substrate (test rig) such as wood or steel rigid frame. Masonry or concrete wall may also be used as substrate; however, they have to include at least one hole per square metre with a minimum diameter of at least 150 mm.
- The assembled VETURE kit must be fixed to the test rig.
- The dimensions of the test specimen depend on the size of VETURE unit and the specified fixings devices:
  - If the VETURE units are mechanically fixed independent of each other (e.g. Family B), at least one VETURE unit shall be tested.
  - If the VETURE units depend on each other vertically and horizontally (e.g. Family A or C), at least 3 x 3 VETURE units shall be tested.
  - If the VETURE units depend on each other vertically or horizontally (e.g. Family D), at least 4 VETURE units shall be tested.
- To define the mechanically weakest design the following aspects shall be considered:
  - The mechanically weakest skin and thermal insulation product (e.g. minimum thickness, minimum resistance of the grooves, etc.)
  - Density of VETURE fixing devices (e.g. minimum density).

The tolerances due to manufacturing and/or installation and deformations due to temperature and humidity variations have to be taken into account.

The mechanical properties of the components used for the test are to be known.

E.1.2 Test equipment

The test equipment consists of a suction/pressure chamber (see figure E.1.6.1) against which is placed the assembled VETURE kit. The depth of chamber shall be sufficient for a constant pressure or suction to be exerted on the test specimen applied to the assembled VETURE kit irrespective of its possible deformation. The chamber is mounted on a rigid frame. The assembled VETURE kit acts as the seal between the chamber and the environment. The connection between the assembled VETURE kit and the chamber shall be sufficient to allow a realistic deformation of the test specimen under the influence of simulated wind suction/pressure.

E.1.3 Test procedure

The uniformly distributed loads are exerted on the surface of the assembled VETURE kit.

The test is performed in successive steps (two steps of 300 Pa, one step of 500 Pa and one step of 1000 Pa, then steps of +200 Pa or +250 Pa thereafter, at each step the load is maintained constant for at least

10 seconds and returned to zero after each step; see figure E.1.6.2) until significant irreversible deformation (deformation which affects serviceability) or failure occurs.

The test is then continued until failure occurs.

The deflection shall be measured, at the relevant points (e.g. central point of the VETURE unit, border or corner of the VETURE unit, etc.), as a function of the load and reported in tabular or graphic form.

With the differential pressure reduced to zero, the permanent deflection shall be noted after 1 minute recovery. The pressure at which defect or damage occur shall be noted.

Additionally, if relevant, the permanent deflection 1 hour after failure occurs shall be noted.

The fixings between the assembled VETURE kit and the test equipment shall not constitute weak points and shall therefore be chosen accordingly.

E.1.4 Observations during the test

Failure is defined by any one of the following events:

- Any VETURE unit or fixing device breaks.
- Delamination occurs in the insulation product or in the skin-attachment.
- Any VETURE unit or fixing device presents a significant permanent deflection.
- Falling of detached components.
- Any VERUTE unit is pulled of a fastener.

E.1.5 Test results

The test result is:

- The failure load Q.
- The type of failure.
- The value of maximum permanent deflection (after 1 minute recovery), the maximum deflection of the test specimen and the load and sensor position for this maximum permanent deflection and maximum deflection.

E.1.6 Test specimen description

It is necessary to describe the test specimen by giving details about:

- VETURE units (materials and geometry).
- Fixing devices (material and geometry and number and disposition of fixings).
- Fixings between the test equipment and the assembled VETURE kit (position, generic type, material and geometry).
- Any type of grout or sealant used in the joints between the VETURE units.

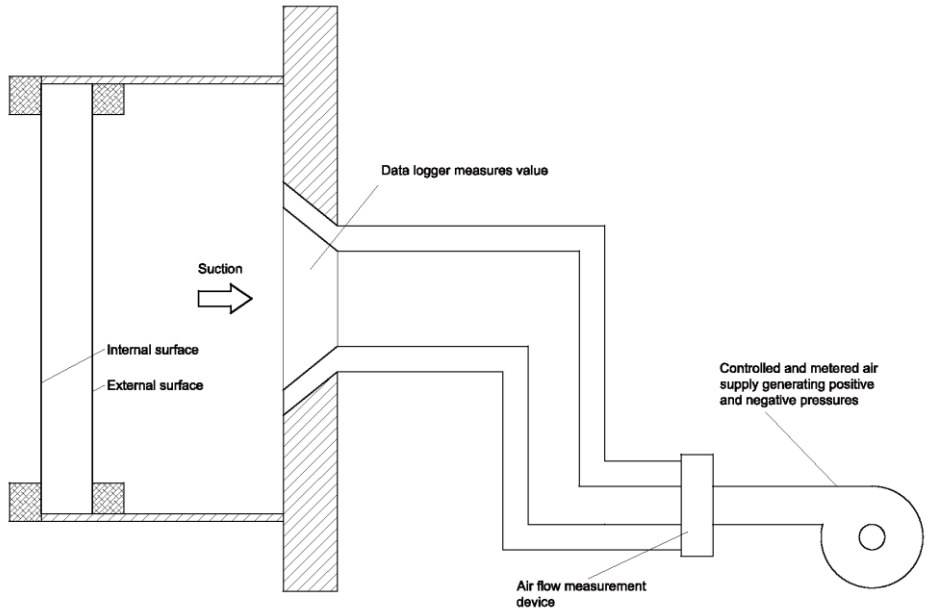


Figure E.1.6.1: Example of wind pressure and suction apparatus.

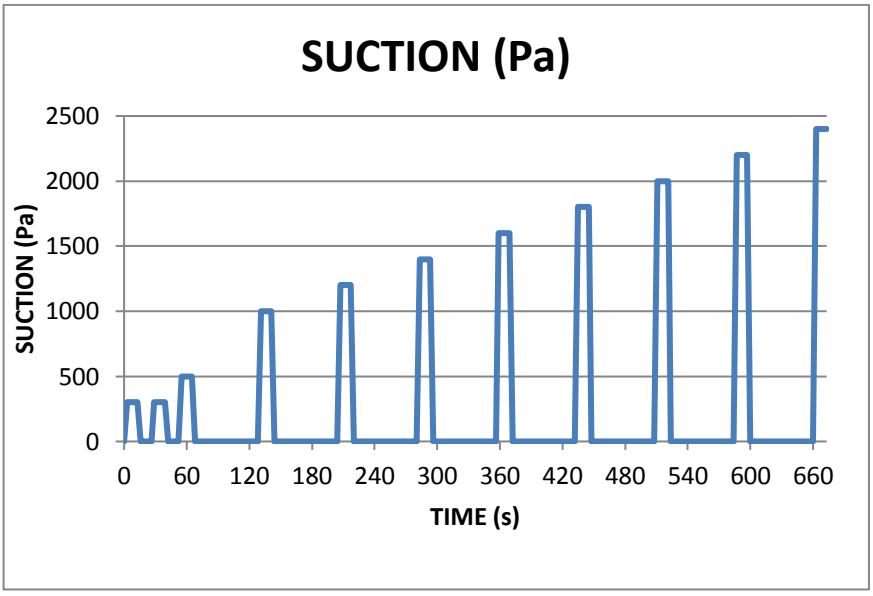


Figure E.1.6.2: Example of wind load steps.

E.2 Fatigue test

E.2.1 Preparation of the test specimen

See clauseE.1.1.

E.2.2 Test equipment

See clause E.1.2.

E.2.3 Test procedure

The loads shown in the figure E.2.1 are applied, each gust having the profile shown in

The maximum suction of each cycle is $W_{100\%}$ and is defined in the following table:

Table E.2.3.1: Maximum suction of the cycles $W_{100\%}$.

Number of cycles	Maximum suction in kPa
4	1,0
1	1,5
1	2,0
1	2,5
1	3,0
1	3,5
1	4,0
1	etc...

The specimen is tested until failure. Failure is defined by any one of the events defined in clause E.1.4.

E.2.4 Test results

The test result is:

- The failure load Q1 is the $W_{100\%}$ load in the cycle preceding that in which the test specimen fails.
- The type of failure.

E.2.5 Test specimen description

See clause E.2.5.

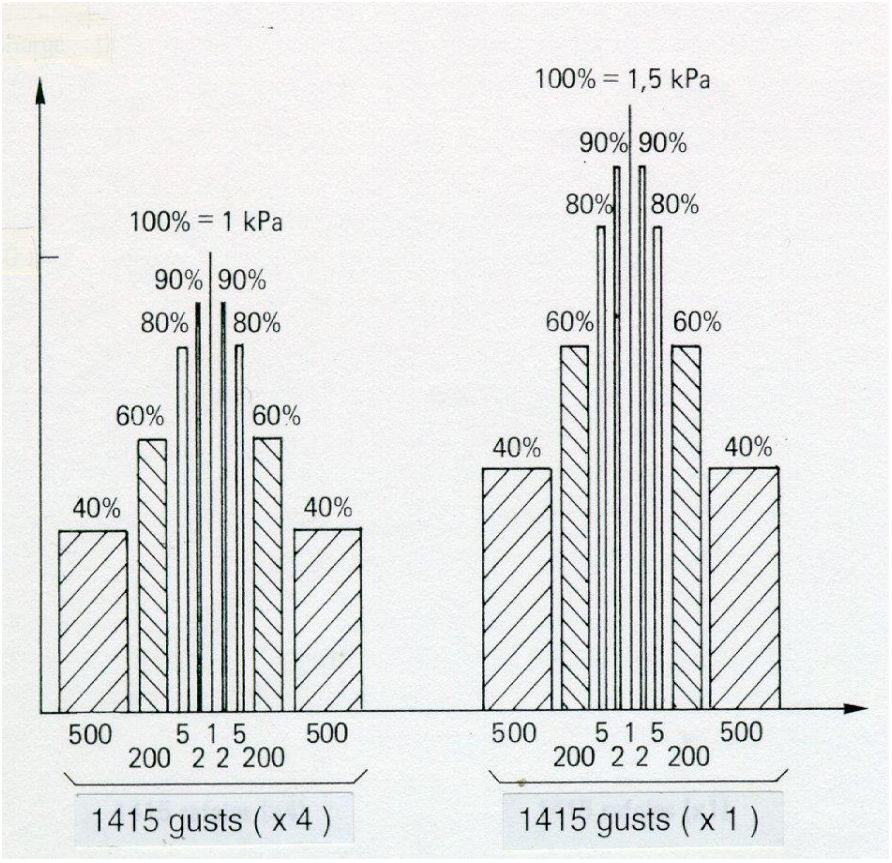


Figure E.2.5.1: Fatigue loads to be applied.

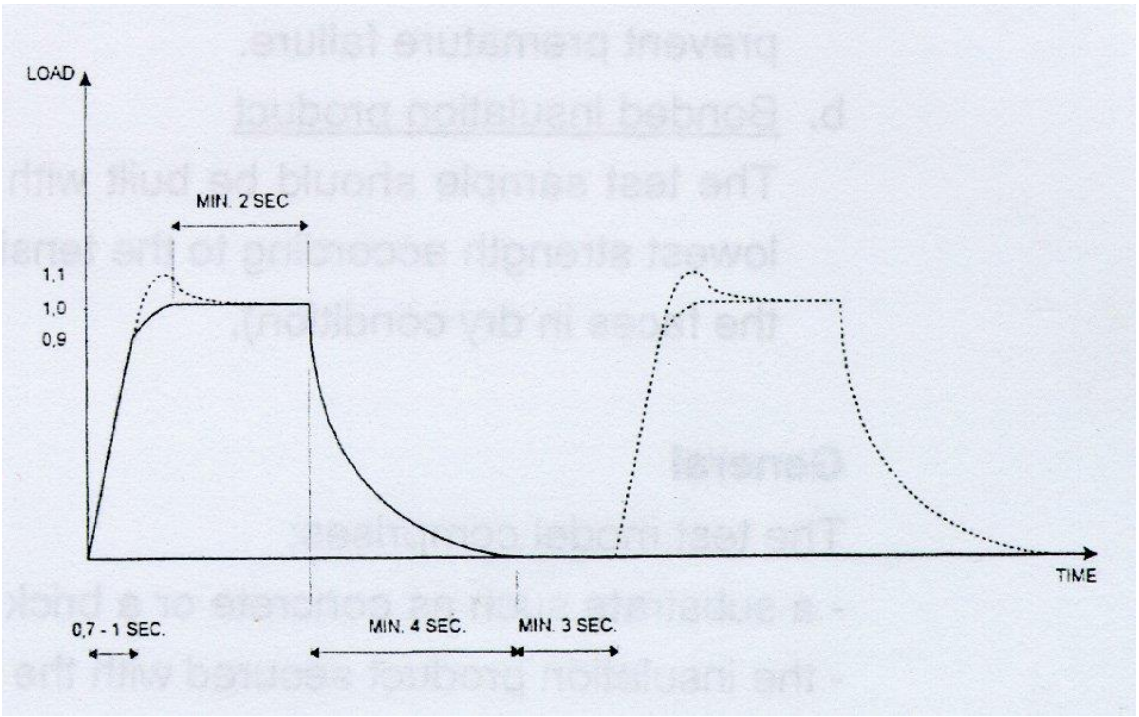


Figure E.2.5.2: Pressure/time profile of cyclic loads.

ANNEX F – BOND STRENGTH TEST

This test is only applicable to VETURE kits in which the VETURE unit is formed of a skin adhesively attached to the thermal insulation product (see clause 1.3.3.3).

This test shall be carried out in normal conditioning (without ageing) and, when relevant, after ageing cycles given in clause 2.2.7.

F.1. Preparation of the test specimen

VETURE units samples with appropriate size to obtain the cut specimens shall be prepared according to the manufacturer's instructions.

Samples are conditioning at (23 ± 2) ºC and (50 ± 5) % RH until constant mass.

Test shall be carried out on at least 5 specimens obtained by cut on the large sample size.

Each specimen shall have a square surface with the following dimensions depending on the thermal insulation product material used in the VETURE unit:

- For mineral wool: 200 mm x 200 mm.
- For cellular plastic (see table 1.1.2): 50 mm x 50 mm.

The square specimens are cut through the skin and just into the insulation product using an angle grinder. At least 50 mm of distance is necessary between each square specimen and with the border of the sample. Square metal plates of appropriate size are affixed to these areas with a suitable adhesive (see figure F.3.1).

F.2 Test procedure

The bond strength test (see figure F.3.1) is performed at a tensioning speed between 1 to 10 mm/minute.

F.3 Test results

The test results are:

- Each individual value R_i (in MPa).
- The mean[4] value, R_m (in MPa) and the characteristic value, R_C (in MPa) in accordance with Annex O.
- The type of failure (cohesive rupture and/or adhesive rupture).

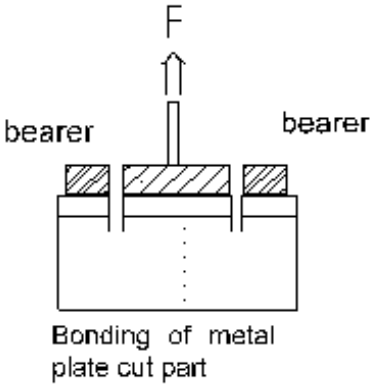


Figure F.3.1: Example of test device.

ANNEX G – PULL-THROUGH RESISTANCE TESTS

G.1. PULL-THROUGH RESISTANCE TEST THROUGH THE INSULATION PRODUCT

This test is only applicable for VETURE kits with mechanical fixings through the insulation product (family B).

The test is performed in ambient conditions.

At least 5 specimens shall be tested.

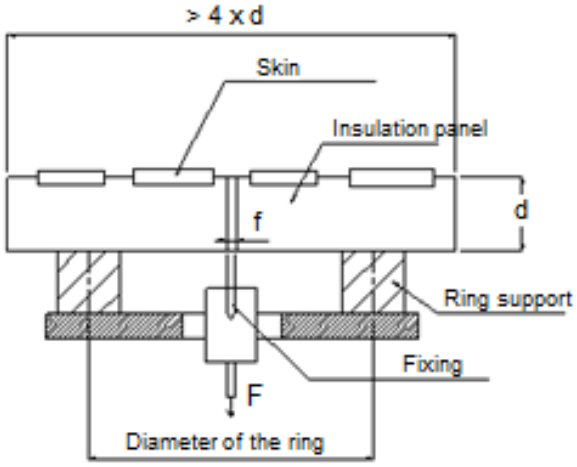
Specimens with a fixing driven through the centre of each sample are applied as show in figure G.1.1.

A force is exerted, at a speed rate of 10 mm/min on the fixing through the insulation product until failure. The force can be applied either by pushing on the head of the fixing or pulling the end of the fixing.

The test results are:

- Each individual value, F_i (in N).
- The mean[4] value, F_m (in N) and the characteristic value, F_C (in N) in accordance with Annex O.
- The mode of failure description.

The mechanical properties of the components used for the test is to be known.



d = thickness of the insulation product

f = diameter of the fixing

Diameter of the ring: > 3 x d + f and > 150 mm

Ring support width: ≥ 50 mm

Figure G.1.1: Example of test specimen.

G.2. PULL-THROUGH RESISTANCE TEST THROUGH THE SKIN

This test is only applicable for VETURE kits with mechanical fixings through the skin (family D).

The test is performed in ambient conditions.

At least 5 specimens shall be tested.

Specimens, measuring 200 mm x 100 mm x the thickness of skin, with a fixing are applied to a rigid substrate as show in figure G.2.1.

A force is exerted, at a speed rate of 10 mm/min on the fixing through the skin until failure. The force can be applied either by pushing on the head of the fixing or pulling the end of the fixing.

The test results are:

- Each individual value, F_i (in N).
- The mean[4] value, F_m (in N) and the characteristic value, F_C (in N) in accordance with Annex O.
- The mode of failure description.

The mechanical properties of the components used for the test is to be known.

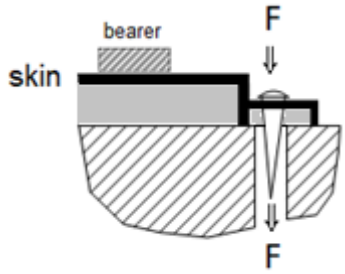


Figure G.2.1: Example of test specimen.

G.3. PULL-THROUGH RESISTANCE TEST THROUGH THE FIXING DEVICE

This test is only applicable for VETURE kits with mechanical fixing devices according to family A and C (see table 1.1.1).

This test establishes the pull-through resistance of an anchor through the perforation in the profile/rail fixing device.

At least 5 specimens shall be tested.

Specimens with an anchor placed perpendicular to the fixing device as described in figure figure G.3.1. The dimensions of the specimen depend on the type of fixing device:

- In the case of rail profiles or linear fixings: 300 mm ± 20 mm and perforated in the centre using a drill if no predrill hole is on the profile.
- In the case of small rails or punctual fixings: one complete fixing and perforated in the centre using a drill if no predrill hole is on the profile.

Test specimens shall be conditioned for at least 2 hours at (23 ± 2) °C before the test.

The apparatus consists of:

- A dynamometer,
- A test support as shown in figure G.3.1, depending on the type of test indicated above.

The test is performed in ambient conditions.

The test shall be carried out using a tensioning speed of 20 mm/min. When relevant, lower speed may be considered.

The test results are:

- Each individual value, F_i (in N).
- The mean[4] value, F_m (in N) and the characteristic value, F_C (in N) in accordance with Annex O.
- The mode of failure description.

The mechanical properties of the components used for the test is to be known.

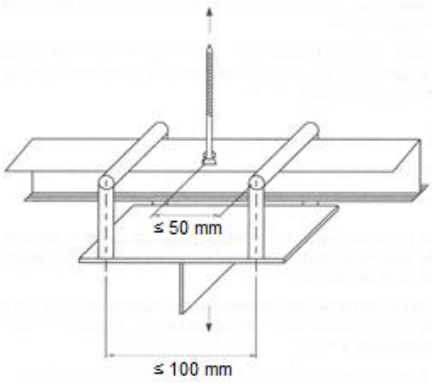


Figure G.3.1: Example of test specimen.

ANNEX H – RESISTANCE TESTS OF THE GROOVED KITS

H.1. RESISTANCE TEST OF THE GROOVED INSULATION PRODUCT

This test is only applicable for VETURE kits with a grooved insulation product which fits onto a fixing device as shown in figure H.1.1.

The test is performed in ambient conditions.

Specimens incorporating the fixing device are applied to a rigid substrate (see figure H.1.1).

A force is exerted, at a speed rate of 5 mm/min on the fixing device. The force is applied by pulling the head of the fixing device.

At least 5 specimens shall be tested.

The test results are:

- Each individual value, F_i (in N).
- The mean[4] value, F_m (in N) and the characteristic value, F_C (in N) in accordance with Annex O.
- The mode of failure description.

The mechanical properties of the components used for the test is to be known.

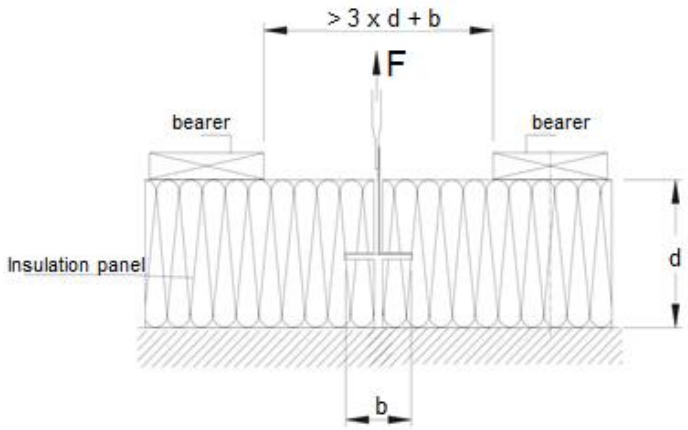


Figure H.1.1: Example of test specimen.

H.2. RESISTANCE TEST OF THE GROOVED SKIN

This test is only applicable for VETURE kits with a grooved skin which fits onto a fixing device as shown in figure H.2.1.

The test is performed in ambient conditions.

Specimens incorporating the fixing device are applied to a rigid substrate (see figure H.2.1).

A force is exerted, at a speed rate of 5 mm/min on the fixing device. The force is applied by pulling the head of the fixing device.

Length L = 100 mm, unless other fixing device (instead of profile) are used in which the length (L) may be < 100 mm.

At least 5 specimens shall be tested.

The test results are:

- Each individual value, F_i (in N).
- The mean[4] value, F_m (in N) and the characteristic value, F_C (in N) in accordance with Annex O.
- The mode of failure description.

The mechanical properties of the components used for the test is to be known.

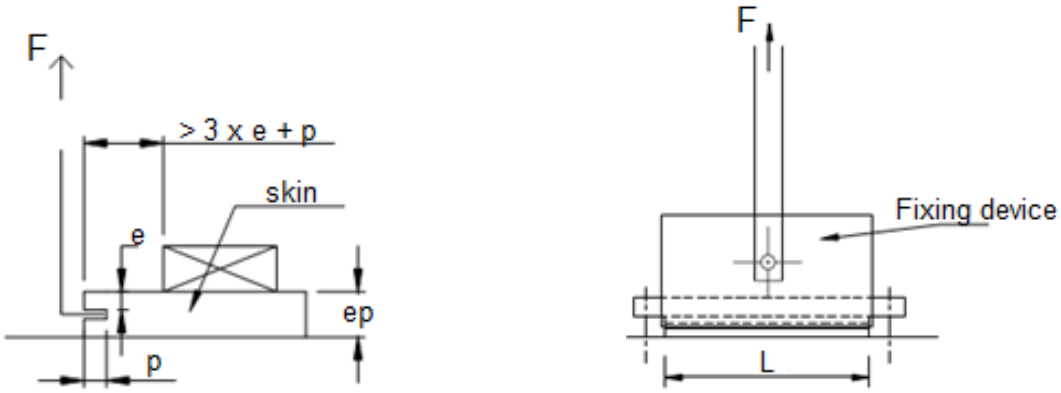


Figure H.2.1: Example of test specimen.

ANNEX I – DEAD LOAD TEST

This test is applicable to all families.

This test is performed in ambient conditions.

The principle is to establish the effect of an additional dead load equivalent to two VETURE units on the assembled VETURE kit.

At least, the mechanically weakest VETURE kit (e.g. maximum weight, minimum density of fixing devices, etc.) shall be tested.

The VETURE kit is fixed to the wall, in accordance with the manufacturer‘s instructions. The deflection of the fixing device or the VETURE unit shall be measured.

One VETURE unit is installed on the fixing devices and an additional dead load equivalent to two VETURE units is added on top of the first one.

The test can be stopped when the deflection, after adding the dead load, is less than 0,1 mm after 1 hour.

The test result is a deflection curve in function of the time and the maximum deflection.

The mechanical properties of the components used for the test is to be known.

ANNEX J – DISPLACEMENT TEST

J.1. Preparation of the test specimen

At least the thinnest insulation product considered for the VETURE unit shall be tested.

A reinforced concrete slab measuring 1,0 m x 2,0 m with a thickness of 100 mm is prepared with a smooth surface. A small layer of sand is placed on the top of the slab to allow the insulation product to slide.

The VETURE kit shall be fixed to the concrete slab with the minimum number of mechanical fixing devices according to the manufacturer's instructions.

This test is performed in ambient conditions.

Before testing, a foam block is bonded to the skin; the skin is fixed to the clamping jaws over its full length (see figure J.3.1).

J.2. Test procedure

A simulated wind suction load of 2,0 kPa is applied to the VETURE kit via the foam block. Simultaneously, a normal tensile load is applied to the skin as indicated in figure J.3.1.

At a tensioning speed of 1 mm/min the resulting displacement of the kit relative to the concrete slab and the corresponding load is measured.

Preferably, the concrete slab is placed on the top and the VETURE kit is applied under the slab.

J.3. Analysis of the results

The load/displacement curve is recorded until failure occurs and the displacement, U_e, corresponding to the limit of elasticity is determined (see figure J.3.2).

The length of the wall or the distance between expansion joints is calculated using the following equation as a function of the claimed ΔT:

$L = U_e / (\alpha_T \times \Delta T)$

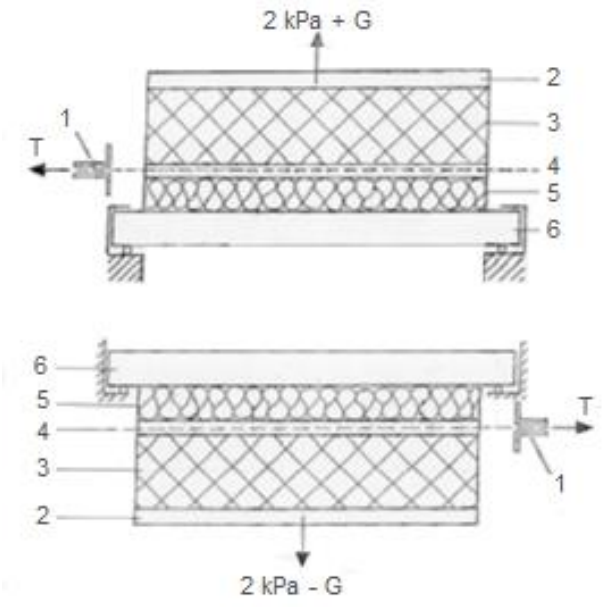
Where:

U_e = displacement corresponding to the elasticity limit.

α_T = coefficient of linear thermal elongation.

ΔT = temperature variations in the skin.

L = length of wall or distance between expansion joints.



1 – Clamping jaws

2 – Plywood panel

3 – Foam block

4 - Skin

5 – Insulation product

6 – Concrete slab

Figure J.3.1: Principle for displacement-test.

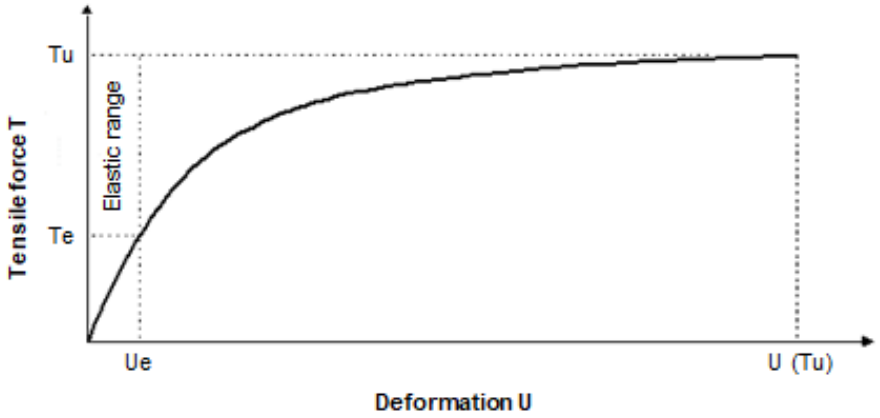


Figure J.3.2: Load-displacement curve.

ANNEX K – RESISTANCE TO HORIZONTAL POINT LOAD TEST

The VETURE kit shall be tested under a static load 500 N applied for one minute horizontally through two squares of 25 mm x 25 mm x 5 mm space apart (distance 440 mm) on any part of the VETURE unit (representing one person standing on a ladder leaning against the external surface) at room temperature and according to figure K.1.

To define the mechanically weakest case of the assembled kit the following aspects should be taken into account:

- The mechanically weakest VETURE unit (e.g. minimum thickness, minimum tensile strength of the insulation product, etc.).
- The mechanically weakest fixing devices (e.g. minimum thickness, minimum mechanical material characteristics, etc.).
- Minimum density of fixing devices.

The mechanical properties of the components used for the test is to be known.

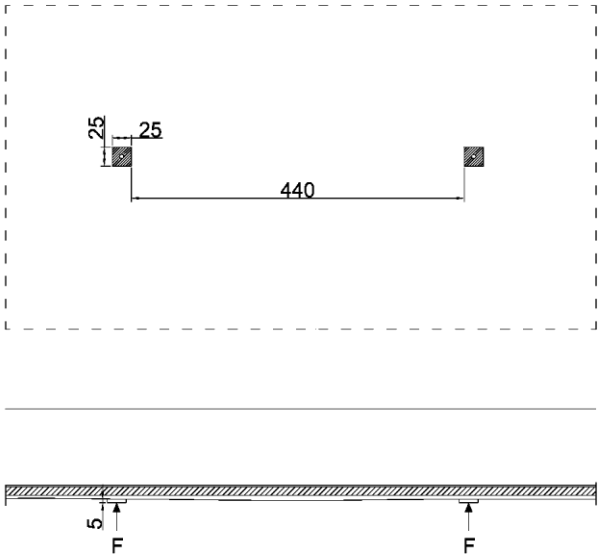


Figure K.1: Resistance to horizontal load test (dimensions in mm).

ANNEX L – IMPACT RESISTANCE TEST

L.1 General

The principle is to establish the impact resistance of the kit considering hard body and soft body impacts. Besides, it is established the impact use categories to correspond to the degree of exposure to impacts in use.

The bodies to impact and the test equipment are given in clause L.4. The points of impact shall be selected taking into account the behaviour of VETURE unit, varying according to whether the impact point is or is not located in an area of greater rigidity (at less than 50 mm from the edge of the VETURE unit).

Hard body impacts are:

- H1 and H2 (1 J and 3 J respectively), carried out with the steel ball weighing 0,5 kg and from a height of 0,20 m and 0,61 m respectively (at least in three locations).
- H3 (10 J), carried out with the steel ball weighing 1,0 kg and from a height of 1,02 m (at least in three locations).

Soft body impacts are:

- Small soft body S1 and S2 (10 J and 60 J respectively), carried out with the soft ball weighing 3,0 kg and from a height of 0,34 m and 2,04 m respectively (at least in three locations).
- Large soft body S3 and S4 (100 J and 400 J respectively), carried out with the spherical bag weighing 50,0 kg and from a height of 0,61 and 0,82 m respectively (at least in the space between two profiles).

Note: The manufacturer may consider other energy values for the hard and soft body impacts. Any change shall be given in the ETA.

At least, the mechanically weakest design shall be tested.

The size of the test specimen shall be chosen to carry out all the impacts given in table L.2.1.

The dimensions of any indentation and any damage caused shall be reported.

The presence of any sharp or cutting edges and if the VETURE kit surface could cause bodily injury should be noted before and after the impact test.

L.2 Test procedure

Test procedure can be carried out using one of following options:

1. When the impact resistance is chosen by the manufacturer or it is known, using the impact tests given in table L.2.1 for this impact resistance chosen or known.
2. When the impact resistance is not known, starting with lowest impact bodies and continue increasing the impacts, with the aim of obtaining the maximum impact resistance.

Table L.2.1: Hard and soft body impact tests.

External impacts and assessment						
			Category IV	**Category III**	**Category II**	**Category I**
Hard body impact	H1	• Weight: 0,5 kg • Impact: 1 J (height 0,20 m) • No. impacts: 5 • Position of impacts: three different locations	Not penetrated (2) Not perforated (3)	---	---	---
	H2	• Weight: 0,5 kg • Impact: 3 J (height 0,61 m) • No. impacts: 5 • Position of impacts: three different locations	---	Not penetrated (2) Not perforated (3)	No deterioration (1)	No deterioration (1)
	H3	• Weight: 1 kg • Impact: 10 J (height 1,02 m) • No. impacts: 5 • Position of impacts: three different locations	---	---	Not penetrated (2) Not perforated (3)	No deterioration (1)
Soft body impact	S1	• Weight: 3 kg • Impact: 10 J (height 0,34 m) • No. impacts: 3 • Position of impacts: three different locations	No deterioration (1)	No deterioration (1)	---	---
	S2	• Weight: 3 kg • Impact: 60 J (height 2,04 m) • No. impacts: 3 • Position of impacts: three different locations	---	---	No deterioration (1)	No deterioration (1)
	S3	• Weight: 50 kg • Impact: 300 J (height 0,61 m) • No. impacts: 1 • Position of impacts: At least in the centre point of a cladding element	---	---	No deterioration (1)	---
	S4	• Weight: 50 kg • Impact: 400 J (height 0,82 m) • No. impacts: 1 • Position of impacts: At least in the centre point of a cladding element	---	---	---	No deterioration (1)

(1) Superficial damage, provided there is no cracking, is considered as showing "no deterioration" for all the impacts. Collapse or any other dangerous failure is not allowed.

(2) The test result is assessed as being "penetrate" if there is any cracking penetrating as far as the insulation product is observed. Superficial cracking (no penetrating) is allowed. Collapse or any other dangerous failure is not allowed.

(3) The test result is assessed as being "perforated" if there is a destruction of the skin is shown up to a level in at least 3 of the 5 impacts. Collapse or any other dangerous failure is not allowed.

L.3 Definition of the impact use categories (informative)

The categories given in table L.3.1 correspond to the degrees of exposure in use. They do not include an allowance for acts of vandalism.

Table L.3.1: Impact use categories.

Category	Use
I	A zone readily accessible at ground level to the public and vulnerable to hard body impacts but not subjected to abnormally rough use. (e.g.: Façade bases in buildings sited in public locations, such as squares, schoolyards or parks. Cleaning gondolas may be used on the façade).
II	A zone liable to impacts from thrown or kicked objects, but in public locations where the height of the kit will limit the size of the impact; or at lower levels where access to the building is primarily to those with some incentive to exercise care (e.g.: Façade bases in buildings not sited in public locations (e.g. squares, schoolyards, parks) or upper façade levels in buildings sited in public locations that occasionally can be hit by a thrown object (e.g. ball, stone, etc.). Cleaning gondolas may be used on the façade).
III	A zone not likely to be damaged by normal impacts caused by people or by thrown or kicked objects (e.g.: Upper façade levels in buildings (not including base) not sited in public locations, that occasionally can be hit by a thrown object (e.g. ball, stone, etc.). Cleaning gondolas should not be used on the façade).
IV	A zone out of reach from ground level (e.g. High façade levels that cannot be hit by a thrown object. Cleaning gondolas should not be used on the façade).

L.4 Bodies to impact and test equipment

L.4.1 Soft body

Principle

The soft body impact test simulates an impact resulting from a person accidentally falling against the product.

The soft body is dropped from a height, creating an impact energy, which corresponds with the impact energy released by a person.

Test apparatus

The soft body impactor should be a spherical canvas bag of diameter 400 mm (± 40) (see figures L.4.2.1) filled with 3,0 mm (± 0,3) diameter glass spheres or equivalent material to give a total weight of 50 kg (± 0,5).

L.4.2 Hard body

Principle

The hard body impact test simulates the impact, resulting from an object accidentally falling against the product.

The hard body is dropped from a height, creating an impact energy, which corresponds with the impact energy released by hard objects.

Test apparatus

For safety in use, the hard body impactor should be a steel ball, with a diameter of 63,5 mm (± 1), with a mass of 1030 g (± 40) (1 kg steel ball).

For serviceability, it should be a steel ball, with a diameter of 50 mm (± 0,5), with a mass of 514 g (± 19) (0,5 kg steel ball).

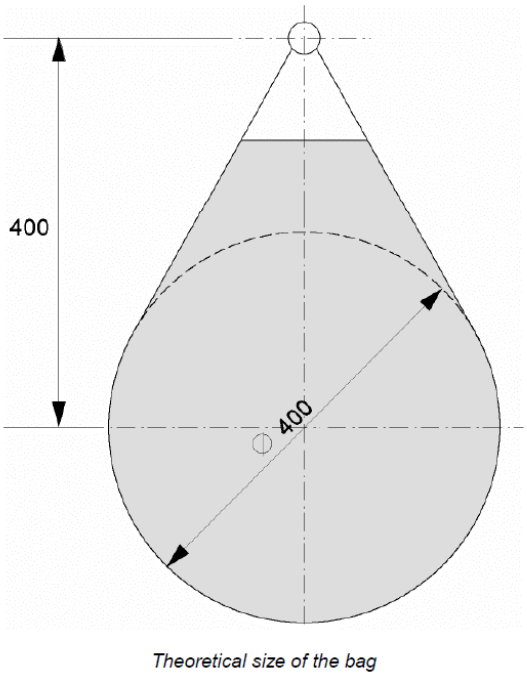


Figure L.4.2..1a: Theoretical size of the bag.

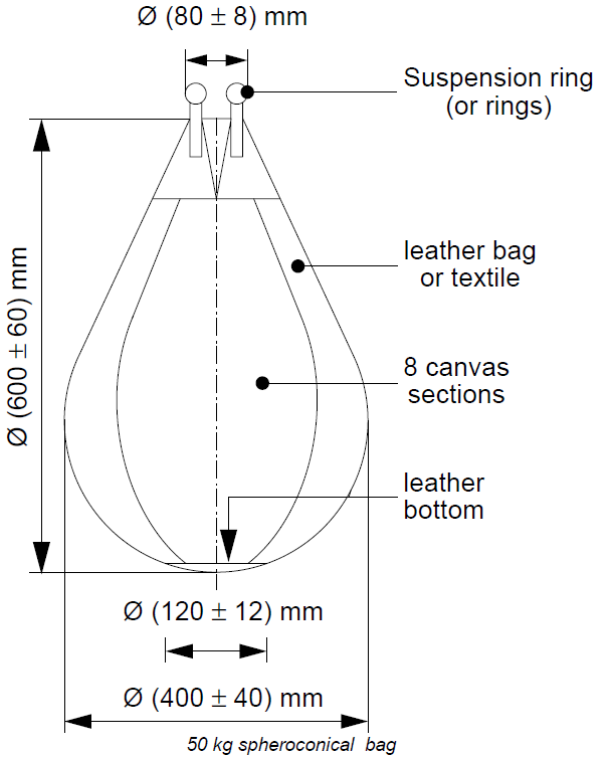


Figure L.4.2.1b: Soft body impactor.

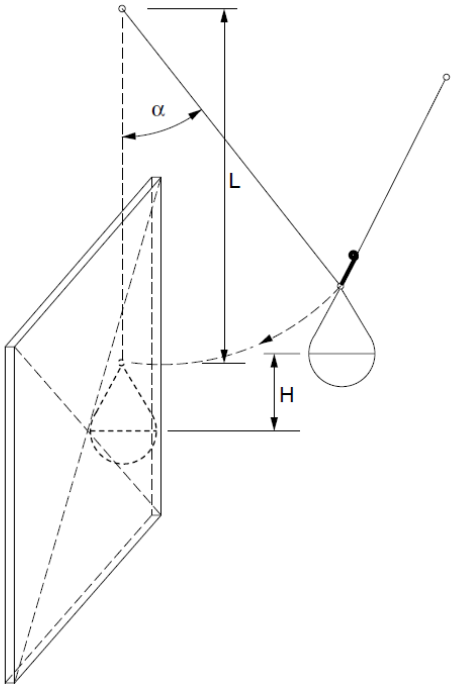


Figure L4.2.2: Soft body impact on vertical assembly.

ANNEX M – TERMAL SHOCK TEST

This test is not necessary if the VETURE kit has already been tested according to clause 2.2.7.

M.1. Preparation of the test specimen

The test specimen shall be mounted in the test rig in accordance with the manufacturer‘s instructions.

The test specimen comprises:

- a substrate (test rig) such as a timber or steel frame (which will not warp);
- the VETURE kit secured with the specified fixing devices for the kit (adapted to the frame).

M.2. Equipment

Equipment shall be provided to heat and cool the exterior face of the test specimen. It shall be designed to measure and record the interior and exterior VETURE unit surface temperatures at critical points of interest.

M.3. Test procedure

Thermal shock program consists of the following phases:

Phase I

The exterior of the test specimen is heated from ambient temperature (+20 ± 5°C) so that the average surface temperature of exterior test specimen surface reaches +70°C (± 3°C) if the sun absorption coefficient of the skin is less than 0,7 or +80 °C (± 3°C) if it’s more than 0,7.

Once these conditions are achieved, they are maintained for at least 4 hours.

Phase II

The heat equipment is turned off and the exterior of the specimen allowed cooling to ambient temperature without assistance. Once steady temperature is achieved, this shall be maintained for at least 1 hour.

Phase III

The exterior of the test specimen is heated from ambient temperature so that the average surface temperature of exterior test specimen surface reaches +70 or +80 °C. Once these conditions are achieved, they are maintained for at least 1 hour.

Phase IV

The heating equipment is turned off and the exterior of the specimen is cooled quickly (less than 20 min) to ambient temperature (+20 ± 5°C).

Once these conditions are achieved, they are maintained for only 1 minute.

A temperature cycle comprises one set of Phase III and IV involves three of these cycles.

M.4. Observations during the test

After each cycle, observations relating to a change in characteristics or performance (blistering, detachment, loss of adhesion, bowing, formation of cracks, efflorescence, colour change, etc ...) are recorded as follows:

- The surface finish of the kit is examined to establish whether any cracking has occurred. The dimensions and position of any cracks should be measured and recorded,
- The surface should also be checked for any blistering or peeling, and the location and extent should again be recorded,
- The sills and profiles should be checked for any damage/degradation together with any associated cracking of the finish. Again, the location and extent should be recorded.

ANNEX N – TEST RESULTS STATISTICAL DESCRIPTION

$F_{u,5} = F_{mean} - k_n \cdot S$

Where:

$F_{u,5}$ = the characteristic breaking force giving 75 % confidence that 95 % of the test results will be higher than this value

F_{mean} = the mean[4] breaking force, either under tension or shear

k_n = the variable as a function of the number of test specimens for 5 % (p = 0,95) with 75 % confidence level when the population standard deviation is unknown (see table O.1)

S = the standard deviation of series under consideration

Table N.1 – The variable kn as a function of the number of test specimens (see EN 1990 Eurocode: *Basis of structural design*, table D1, Vx, unknown).

Number of specimens	3	4	5	6	7	8	10	20	30	∞
Variable k_n	3,37	2,63	2,33	2,18	2,10	2,00	1,92	1,76	1,73	1,64

ANNEX O – FAÇADE FIRE PERFORMANCE ASSESSMENT METHODS

Country	**Assessment method**
Austria	ÖNORM B 3800-5
Czech Republic	ČSN ISO 13785-1
Denmark, Sweden, Norway	SP Fire 105
Finland	• SP Fire 105 • BS 8414
France	LEPIR 2
Germany	• DIN 4102-20 Complementary reaction-to-fire test for claddings of exterior walls, • Technical regulation A 2.2.1.5
Hungary	MSZ 14800-6:2009 Fire resistance tests. Part 6: Fire propagation test for building façades
Ireland	BS 8414 (BR 135)
Poland	PN-B-02867:2013
Switzerland, Lichtenstein	• DIN 4102-20 • ÖNorm B 3800-5 • Prüfbestimmung für Aussenwandbekleidungssysteme
UK	BS 8414 -1:2015 and BS 8414-2:2015