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ETAG 016

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GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL

of

SELF-SUPPORTING COMPOSITE LIGHTWEIGHT PANELS

PART 3:

Specific aspects relating to Self-supporting composite lightweight panels for use in external walls and claddings

Kunstlaan 40 Avenue des Arts, B - 1040 Brussels

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Section one :
INTRODUCTION

1. PRELIMINARIES

1.1. Legal basis

The legal basis of the ETA Guidelines is given in Part 1 - "General" - clause 1.1.
No existing ETA-Guideline is superseded.

1.2. Status of ETAG
The status of the ETA-Guidelines is given in Part 1 - "General" - clause 1.2 .

2. SCOPE

2.1 Scope
This Part 3 shall be used in conjunction with Part 1 – General.
This complementary Part (ETA Guideline Part 3) “Specific aspects relating to self-supporting composite lightweight panels for use in external walls and claddings” specifies the terminology, definitions, methods and the specific criteria for the assessment of the panels.

This part only covers self-supporting light weight composite panels, intended to be used as self-supporting exterior wall panels (see Figure 1), or as self-supporting cladding panels (see Figure 2); panels fixed at the edges or by punctual fixing devices to the supporting wall (see Figure 3) are covered by this ETA Guideline; fully bonded (glued) uses are not covered by this ETA-Guideline (see Figure 4).
Soffit panels are considered to be covered by the assessment of walls.
With reference to the ETAG “vetures kits” and “kits for external wall claddings”, this ETA-Guideline is intended to be used to issue ETAs, where the product under assessment is a composite panel alone. However, in some cases the ETA-applicant will refer to other "auxiliary" components required to assemble the product into an assembly, e.g. fixings, supporting frame and joint material, identified by reference to detailed specifications or to minimum performance characteristics, to which these generic products have to conform.
If a manufacturer wishes to put his product on the market with a very specific intended use (e.g. vetures) then the Approval Body should verify the relevant ETAG for more specific assessments.

Figure 1

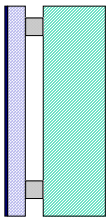

Figure 2

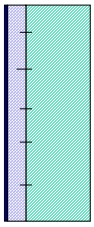

Figure 3

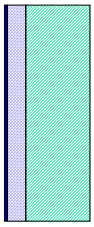

Figure 4

3. TERMINOLOGY

3.1. Common terminology and abbreviations
For the purpose of this Complementary Part of the ETA Guideline the common terminology and abbreviations as stated in Part 1 - Annex A, apply.

3.2. Terminology and abbreviations specific to this ETAG
For the purpose of this ETA-Guideline Part 3, the following definitions apply:

Backing boards
Calcium silicate panel used to back the specimen that can be placed directly against a free-standing test specimen or at a distance from it.

Soffit
The underside of a horizontal surface which projects beyond a wall line, such as an overhanging roof.

Section two :

GUIDANCE FOR THE ASSESSMENT OF THE FITNESS FOR USE

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4 REQUIREMENTS

The performance requirements shall be in accordance with ETAG 016 Part 1 - chapter 4.

5. SPECIFIC METHODS OF VERIFICATION

5.0 General

The methods of verification given in ETAG 016, Part 1 - chapter 5 shall be applied, except where identified below.

5.1 Mechanical resistance and stability

5.1.1 Mechanical resistance

As the panels are non-loadbearing parts of the work, mechanical resistance is considered under ER4 Safety in use. See §5.4.1.

5.2 Safety in case of fire

5.2.1 Reaction to fire

See Annex C1 for specific details.

Note: A European fire scenario for facades has not been laid down. In some Member States, the classification of the self supporting composite lightweight panels according to EN 13501-1: 2002 might not be sufficient for the use in facades. An additional assessment of the self supporting lightweight panels according to national provisions (e.g. on the basis of a large-scale test) might be necessary to comply with Member States' regulation until the existing European classification system has been completed.

5.2.2 Fire resistance

See ETAG 016, Part 1: General.

5.3 Hygiene, health and environment

5.3.1 Water permeability

The water permeability of the panels shall be assessed by testing according to EN 12865.

The test assembly shall be the most onerous one**,** with the following provisions:

- At least two vertical joints between panels;
- Minimum thickness;
- Maximum span.
- A horizontal joint, if this is part of the manufacturer's specifications.

5.3.2 Vapour permeability

See ETAG 016, Part 1: General.

5.3.3 Release of dangerous substances

See ETAG 016, Part 1: General.

5.3.4 Dimensional variation (related to water penetration)

The watertightness of the panels, including joints between the panels, shall be assessed according to §5.3.1, after a thermal shock (see Annex C2 for specific details).

The test is relevant only where the panel is the external layer of the wall and ensures the watertightness of the complete wall.

5.4 Safety in use
5.4.1 Mechanical resistance

5.4.1.1 Test to determine the mechanical strength of a simply supported panel subject to positive load
See ETAG 016, Part 1: General.

5.4.1.2 Test to determine the mechanical strength of a fixed panel charged with negative load
See ETAG 016, Part 1: General.

5.4.1.3 Thermal effect
See Annex C4 for specific details on the test method.

5.4.2 Impact resistance
5.4.2.1 Resistance to impact from soft body
See EOTA TR 01 " Determination of Impact Resistance of panels and panel assemblies".

5.4.2.2 Resistance to impact from hard body
See EOTA TR 01 " Determination of Impact Resistance of panels and panel assemblies".

5.4.3 Resistance to fixings
5.4.3.1 Resistance of the panels at fixing devices and joints
See ETAG 016, Part 1: General.

5.4.3.2 Resistance to eccentric loads due to objects fixed to the panel
The resistance to the point loads acting parallel or perpendicular to the surface of the panel shall be determined in accordance with Annex C6.

5.5 Protection against noise
5.5.1 Direct airborne sound insulation
See ETAG 016, Part 1: General.

5.5.2 Sound absorption
See ETAG 016, Part 1: General.

5.6 Energy economy and heat retention
5.6.1 Thermal insulation
See ETAG 016, Part 1: General.

5.6.2 Air permeability
See ETAG 016, Part 1: General.

5.7 Aspects of durability, serviceability and identification of the products
5.7.1 Durability
Where the durability of the specific materials is not covered by harmonised European standards or European Technical Approvals, it shall be precisely verified, when relevant, in accordance with appropriate CEN, EOTA, ISO or accepted international (such as UEAtc, RILEM) test methods as far as they exist.

5.7.1.1 Thermal Agents
5.7.1.1.1 Climatic testing cycles.
The appropriate test(s) shall be chosen according to Table 1.

Core	Cycle 1	Cycle 2	Cycle 3	EN 29142
MW, EPS, XPS		X		
PUR (adhesive and auto-adhesive)	X			
Others Insulating materials	X	X	X	
Others				X

Table 1: Use of the climatic cycles

The Approval Body may require more appropriate tests for the evaluation of products not yet considered in this table.

See Annex C3 for specific details of the test method.

5.7.1.1.2 Thermal shock
See Annex C5 for specific details of the test method.

5.7.1.2 Biological agents
The durability of wood-based materials shall be established in accordance with ETAG XXX: prefabricated wood-based load-bearing stressed skin panels.

5.7.1.3 Finishes
The durability of coil coated metal finishes shall be established in accordance with the following test methods:
- Salt spray test in accordance with EN 13523-8
- Resistance to humidity in accordance with EN 13523-10
- Resistance to immersion in accordance with EN 13523-9
- Resistance to ageing in accordance with EN 13523-13

Other similar tests shall be used for other finishes.

5.7.2 Serviceability
5.7.2.1 Resistance to impact from hard body
See EOTA TR 01 " Determination of Impact Resistance of panels and panel assemblies".

5.7.2.2 Resistance to impact from soft body
See EOTA TR 01 " Determination of Impact Resistance of panels and panel assemblies".

5.7.2.3 Finishes
The serviceability of coil coated metal finishes shall be established in accordance with the following test methods:
- Coating hardness in accordance with EN 13523-4
- Resistance to cracking on bending in accordance with EN 13523-7
- Impact resistance in accordance with EN 13523-5
- Adhesion in accordance with EN 13523-6
- Resistance to staining in accordance with EN 13523-18
- Resistance to chalking in accordance with EN 13523-14
- Pencil hardness with EN 13523-4.

Other similar test shall be used for other finishes.

5.7.3 Aspects of identification of materials and products
See ETAG 016, Part 1: General.

6. ASSESSING AND JUDGING THE FITNESS OF PRODUCTS FOR INTENDED USE.

6.0 General
The requirements given in Part 1 - chapter 6 shall be applied, except where identified below, or where the test has been identified as being not required in chapter 5 of this Complementary Part.

6.1 Mechanical resistance and stability
6.1.1 Mechanical resistance
As the panels are non-loadbearing parts of the works, mechanical resistance is considered under ER4 safety in use. See §6.4.1.

6.2 Safety in case of fire
6.2.1 Reaction to fire
See ETAG 016, Part 1: General.

6.2.2 Fire resistance
See ETAG 016, Part 1: General.

6.3 Hygiene, health and the environment
6.3.1 Water permeability
See ETAG 016, Part 1: General.

6.3.2 Vapour permeability
See ETAG 016, Part 1: General.

6.3.3 Release of dangerous substances:
See ETAG 016, Part 1: General.

6.3.4 Dimensional variations
See ETAG 016, Part 1: General.

6.4 Safety in use

6.4.1 Mechanical resistance:
6.4.1.1 Test to determine the mechanical strength of a simply supported panel subject to positive load
See ETAG 016, Part 1 General.

6.4.1.2 Test to determine the mechanical strength of a fixed panel subject to negative load
See ETAG 016, Part 1 General.

6.4.1.3 Thermal effect
The radius of curvature and the reaction on the intermediate support, as a function of the temperature difference between the two skins, shall be declared.

6.4.2 Impact resistance
6.4.2.1 Resistance to impact from soft body
The Approval Body shall take into account the criteria for the evaluation as specified in the EOTA TR 01 " Determination of Impact Resistance of panels and panel assemblies".
For panels fixed to a load-bearing wall, the criteria "no penetration" and "no projection" shall not be considered.
The NPD Option is allowed.

6.4.2.2 Resistance to impact from hard body
The Approval Body shall take into account the criteria for the evaluation as specified in the EOTA TR 01 " Determination of Impact Resistance of panels and panel assemblies".
For panels fixed to a load-bearing wall, the criteria "no penetration" and "no projection" shall not be considered.
The NPD Option is allowed.

6.4.3 Resistance to fixings
6.4.3.1 Resistance of the panels at fixing devices and joints
See ETAG 016, Part 1 General.

6.4.3.2 Resistance to eccentric loads due to objects fixed to the panel
The Approval body shall check the influence of the fixing system on the other performance characteristics (e.g. fire resistance, watertightness, etc.). The solution shall be indicated in the ETA.

6.5 Protection against noise

6.5.1 Direct airborne sound insulation
See ETAG 016, Part 1: General.

6.5.2 Sound absorption
See ETAG 016, Part 1: General.

6.6 Energy economy and heat retention

6.6.1 Thermal insulation
See ETAG 016, Part 1: General.

6.6.2 Air permeability
See ETAG 016, Part 1: General.

6.7 Aspects of durability, serviceability and identification of the products

6.7.1 Aspects of durability

6.7.1.1 Thermal Agents

6.7.1.1.1 Climatic testing cycle
6.7.1.1.1.1 Cycle 1
The criteria for acceptance are:
- R_{CYCLE1} shall not be less than 50% of the initial tensile strength value R_0.
- The 5 % characteristic value of tensile strength R_{24} of the samples with 90 °C shall be not less than 0,04 MPa.
- The change of thickness of the sections at 90 °C in test procedure cycle 1 shall not be greater than 5 %, in the central and edge regions.

The results of the tests shall be declared.

6.7.1.1.1.2 Cycle 2
The criteria for acceptance are that R_7-R_{28} shall be equal to or smaller than 3*(R_0-R_7)
and that R_{28} shall not be less than 40% of R_0.
If this is not fulfilled, specimens shall be exposed to the cycle 2 test for 56 days. The criteria for acceptance shall be that R_{28}-R_{56} shall be less than R_7-R_{28} and $R_{56} \geq 40$ % of R_0.
The results of the tests shall be declared.

6.7.1.1.1.3 Cycle 3
The criteria for acceptance are that R_1-R_5 shall be equal to or smaller than 4*(R_0-$R_{1)}$
and that R_5 shall not be less than 40% of R_0
If this is not fulfilled, specimens shall be exposed to 10 further cycles. The criteria for acceptance shall be that R_5-R_{10} shall be less than R_1-R_5 and $R_{10} \geq 40$ % of R_0.
The results of the tests shall be declared.

6.7.1.1.2 Thermal shock
The Approval Body shall define the number of cycles (see Table 2) with reference to the assumed working life of the panel:

Assumed working life (years)	**N° of cycles**
10	5
25	15

Table 2: Thermal shock cycles

The deterioration of mechanical resistance of the panels after ageing tests shall be declared.
The decrease of the mechanical strength of the panel (ultimate state) should be lower than 40 **%** of the corresponding initial value (see §6.4.1).
The classification criteria with reference to the working life shall be as follows (see Table 3).

	Thermal shock		
	Fail (5 cycles)	Pass (5 cycles)	Pass (15 cycles)
Climatic cycle Pass	10	10	25
Climatic cycle Fail	10	10	10

Table 3: Working life classification

If a panel with a declared working life of 25 years does not retain its performance after 15 cycles, the working life indicated in the ETA shall be 10 years.
If the panel with a declared working life of 10 years does not retain its performance after 5 cycles, the working life indicated in the ETA is still 10 years, only if the ETA applicant is able to present significant and well documented experience with an appropriate maintenance plan, to confirm the assumed working life; in this case the experience and the maintenance plan will be laid down in the evaluation report accompanying the draft ETA.

6.7.1.2 Biological agents
The durability of wood-based products, shall be declared in the ETA according to ETAG XXX: prefabricated wood-based load-bearing stressed skin panels.

6.7.1.3 Finishes
The results of the tests shall be declared.

6.7.2 Aspects of serviceability
6.7.2.1 Resistance to impact from hard body
The test results, according to EOTA TR 01 " Determination of Impact Resistance of panels and panel

assemblies", shall be declared in the ETA.

6.7.2.2 Resistance to impact from soft body
The test results, according to EOTA TR 01 " Determination of Impact Resistance of panels and panel assemblies", shall be declared in the ETA.

6.7.2.3 Finishes
The results of the tests shall be declared.

6.7.3 Aspects of identification of materials and products
See ETAG 016, Part 1: General.
Auxiliary components, required to assemble the product into an assembly, e.g. fixings, supporting frame and joint material, shall be identified by reference to detailed specifications or to minimum performance characteristics, to which these products have to conform.

7. ASSUMPTIONS AND RECOMMENDATIONS UNDER WHICH THE FITNESS FOR USE OF THE PRODUCTS IS ASSESSED

This chapter sets out the assumptions and recommendations for design, installation and execution, packaging, transport and storage, use, maintenance and repair under which the assessment of the fitness for use according to the ETAG can be made (only when necessary and where they have a bearing on the assessment or on the products).

7.1 Design of works
See ETAG 016, Part 1: General.

7.2 Packaging, transport and storage
See ETAG 016, Part 1: General.

7.3 Execution of works
See ETAG 016, Part 1: General.

7.4 Maintenance and repair
See ETAG 016, Part 1: General.

Section three :

ATTESTATION AND EVALUATION OF CONFORMITY (AC)

8. ATTESTATION AND EVALUATION OF CONFORMITY

8.1 **EC decision**
The decision is given in ETAG 016 Part 1, General.

8.2 **Responsibilities**
This Complementary Part of the ETA-Guideline does not contain supplementary or modified procedures with regard to Part 1 – General.

8.3 **Documentation**
This Complementary Part of the ETA-Guideline does not contain supplementary or modified procedures with regard to Part 1 – General.

8.4 **CE-marking and information**
This Complementary Part of the ETA-Guideline does not give additional or different information and/or requirements for CE-marking than those given in Part 1 – General.

Section four:

9. THE ETA CONTENT

9.1 **Exceptions**
This Complementary Part of the ETA-Guideline has no supplementary or modified procedures with regard to Part 1 – General.

Annex A
COMMON TERMINOLOGY

See ETAG 016, Part 1: General.

Annex B
LIST OF REFERENCE DOCUMENTS (STANDARDS)

Reference documents used for the ETAG:

prEN 14509 Self-supporting double skin metal faced insulating sandwich panels - Factory made products - Specification
EN 12865: 2001 Watertightness for external walls
ISO DIS 8414 Performance standards in building. Facades made from components. Tests for ability to withstand static loads suspended from the interior face.
EOTA TR 01: 2003 Determination of Impact Resistance of panels and panel assemblies

Annex C
Test methods

C.1 Test arrangement for reaction to fire test EN13823 [SBI]

1.1 Test arrangement for reaction to fire test [Single Burning Item]
All panels shall be tested vertically in the test rig with a vertical panel-to-panel joint on the long wing.
The dimensions of the specimens shall be:

Short wing:	Panel size:		(495 ± 5)mm	x 1.5m ± 5mm (height)
Long wing:	Panel sizes	a)	(200 +t ±5)mm	x 1.5m ± 5mm (height)
		b)	(800 ± 5)mm	x 1.5m ± 5mm (height)

Where t = thickness of panel

Maximum thickness that can be accommodated in the rig is 145 mm. This is measured at the thickest point of the panel and allows for a gap and backing board behind the panel.

1.1.2 Preparation and mounting of test specimens
The assembly and corner detail shall be as close as possible to the end use conditions as specified by the manufacturer. When different configurations are possible, the Approval Body shall carry out the test on the most onerous one. The ETA applicant has the possibility to test additional assemblies if he claims better performance.
For corner flashing (i.e. steel, aluminium, plastic, etc.) one possible configuration is shown in Figure 5 with the guidance notes.
The type of materials, dimensions, fixing centres, coatings etc shall be recorded in the test report.

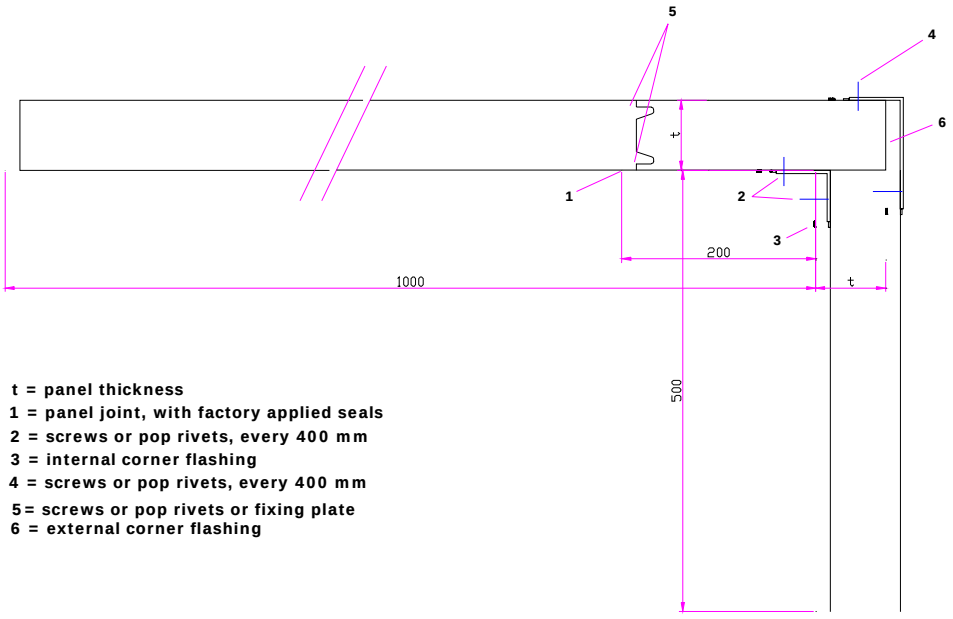


Figure 5: Assembly and corner detail

The following principles shall apply when securing the panel joint on the long wing:
panels in end use fixed to a structural framework shall be mounted in one of the following way:

- by using rivets or screws to hold the panel joint in place. This represents the tight joint achieved in end use. Fixings shall be placed 40mm from the top and bottom of the specimen.
- Both internal and external facings shall be secured. The internal face shall be fixed first (see Figure. 5).

For panels where the joint design does not allow a screw type of fixing to be used, a thin plate of 100mmx20mmx2mm (max) may be used (see Figure. 7).

Panels that are normally held together with an internal locking system, (i.e. some cold store panels), shall be fixed together using the locking method.

Note: If the locking system does not hold the joint together over the whole length of the specimen, an additional fixing as in Figure. 6 and Figure. 7 above may be used at either the top or bottom of the specimen.

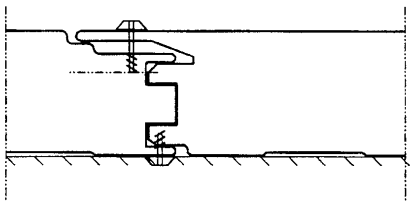
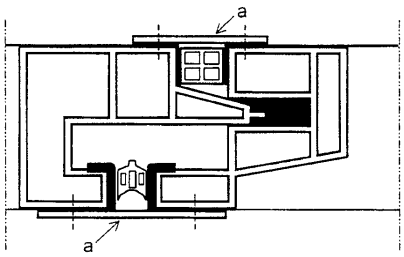


Figure 6: Example joint fixing using screws



key: a= thin plate fixing

Figure 7: Example joint fixing using thin plates

1.1.3 Assembly

The two panels forming the long wing shall be assembled with the joint secured as follows:

- The cut edge of the short wing panel shall be placed against the long wing assembly to form an internal corner so that the vertical joint on the long wing is 200mm from the internal corner. The two wings shall then be secured at 90° to each other using internal and external corner flashings, if relevant, and screws or 'pop' type rivets at 400mm spacing (see Figure 5).
- The corner flashings shall have the following dimensions:
  Internal flashing: 50 x 50mm x 0.5mm or 0.6 mm thickness
  External flashing: 50 x [t+50]mm x 0.5mm or 0.6 mm thickness
- The internal corner flashing shall have the same coating as the panel specimen.
- The cut panel edges at the top and sides of the specimen shall not be covered by flashings, foil or other materials.

Backing boards shall be placed in accordance with EN13823 with a minimum 40mm distance between board and the panel sample using a spacer bar at top and bottom. The frame between backing board and specimen shall be open at the sides to allow ventilation into the gap.

1.1.4 Direct field of application with respect to the Single Burning Item (EN13823)

The field of application in the following clauses covers composite panels of the same family, i.e. which have the same:

- thickness and profile of facings
- type and thickness of coating (when colours are considered to have different properties, the test shall be carried out on the most onerous colour)
- of panel to panel joint design (shape and configuration)
- core material.

1.1.4.1 Thickness

Where panels of the same family are produced with different thicknesses, the maximum and minimum thickness shall be tested.

When the testing on the maximum thickness is not possible, the Approval Body shall work in consultation with a notified fire laboratory, for the definition of the test assembly.
The ETA shall contain at least both classifications. A classification, together with related thickness may be declared, if such is possible.

1.1.4.2 Density
Where panels of the same family are produced with different densities the maximum and minimum densities shall be tested.
The ETA shall contain at least both classifications. A classification, together with related density may be declared, if such is possible.

1.1.4.3 Sealant
Where sealants are incorporated during the manufacture of the sandwich panel they shall be tested as part of the product under EN 13823.
Tests on an assembly incorporating additional sealant (i.e. cold store vapour sealant) are representative for that assembly only and the classification shall be accompanied by the test report reference giving the restricted application for that classification.

1.2 Test arrangement for reaction to fire test EN ISO 11925-2 [Ignitability Test]
The flame shall be applied either to the end (cut edge) representing all applications, or to the surface of the specimen representing the majority of end use applications where the cut edge is protected with site applied flashings.
Note: depending on national regulations the flame shall be applied to the cut edge, even if it is protected with site applied flashings in the end use application.

Where the EN ISO 11925-2 test has been carried out on the surface, this shall be part of the product marking and the Classification shall be accompanied with the words 'with (insert type, i.e. steel, aluminium, plastic, etc.) flashing details'.
The manufacturer may declare the two alternative classification values with associated definitions.

Note: A European fire scenario for facades has not been laid down. In some Member States, the classification of the self supporting composite lightweight panels according to EN 13501-1: 2002 might not be sufficient for the use in facades. An additional assessment of the self supporting lightweight panels according to national provisions (e.g. on the basis of a large-scale test) might be necessary to comply with Member States' regulation until the existing European classification system has been completed.

C2 Dimensional variation

2.1 Principle
This test has the aim of evaluating the effect of a dimensional variation with regard to the water permeability performance of the assembly.

2.2 Test conditions
The test shall be carried out in laboratory circumstances, at a temperature of 23 ± 5°C.

2.3 Test procedure
The test is performed according to the following steps:
a) the assembly is tested through a thermal shock: this test shall be carried out according to the test procedure described in Annex C5, applying three cycles;
b) a water permeability test according to §5.3.1 is carried out.

2.4 Test report
The test report shall include the following information:

- reference to this EOTA ETA-guideline, Annex C2
- the name of the testing laboratory
- the name of the ETA-applicant (and manufacturer of the composite panel)
- date of the test
- description of the test instruments
- identification of the product tested (designation, dimensions and any relevant identification characteristic)
- description of the sample tested, and reference to its marking

- description of conditioning and preparation of the sample (if any)
- description of test conditions (temperature and RH)
- results of the water permeability test after thermal shock, including the presence of water (if any).

C3 Climatic testing cycles (*Note: in accordance with prEN 14509***)**

3.1 General

The influence of ageing on panels or their constituent materials is tested by measuring changes in the tensile strength across the depth of the panel on different specimen set subjected to climatic test cycles denoted as Cycle 1and Cycle 2 and Cycle 3. Cycle 1 is defined in 3.4.2, Cycle 2 in 3.4.3, Cycle 3 in 3.4.4.

3.2 Test apparatus

3.2.1 Test apparatus needed for the ageing test in accordance with Cycle 1

A test chamber set at a constant temperature of (90 ± 2)°C and dry conditions.
(Relative humidity not greater than 15%)

3.2.2 Test apparatus needed for the ageing test in accordance with Cycle 2

A test chamber with constant conditions: temperature of air (65 ± 3) ^{o}C and relative humidity of 100 % achieved by heating water at the bottom of the chamber.
The test chamber consists of a box in which the water at the bottom of the box is heated roughly up to +70 ^{o}C (if the box is heated), (see Figure 8). Uniform temperature shall be achieved before starting the test.

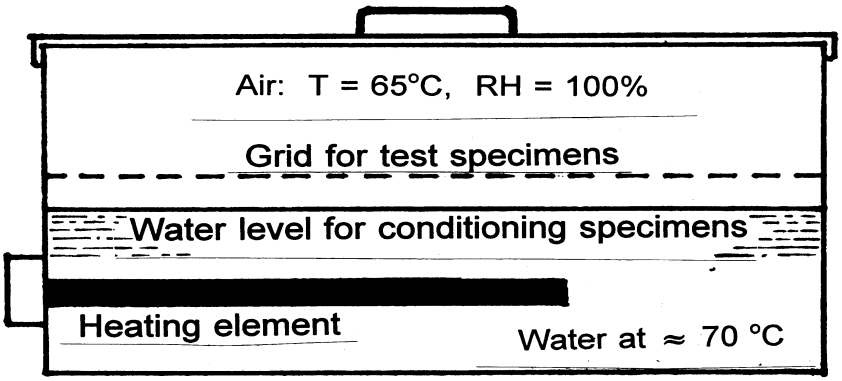


Figure 8: Test chamber for durability test cycle 2.

Note: Normally it is not necessary to provide accelerated thermal exchange with fans in the test chamber. However, circulation of the water may be required.

3.2.3. Test apparatus needed for the cyclical ageing test in accordance with Cycle 3

A test chamber with constant conditions: temperature (70 ±2) ^{o}C and relative humidity ≥ 90 %.
A test chamber with constant temperature of (90 ± 2) ^{o}C and dry conditions.
(i.e. relative humidity not greater than 15%).
A test chamber set at a constant temperature of (–20 ± 2) $^{\circ}$C.

NOTE: The three different conditions may be achieved in a single chamber.

3.3 Test specimens

3.3.1 Dimensions of test specimens

The thickness of the specimens shall be the full product thickness including, where applicable, any irregular profile.
Specimens taken from mineral wool panels shall have a side width of 150 mm or 200 mm providing the side width is at least twice the thickness (d) of the core up to a maximum of 200 mm. For mineral wool lamellas the specimens shall be taken close to each other to eliminate inconsistent spread of results.
Specimens taken from panels with other core materials shall have a square plan form with cut edges in accordance with EN 12085 having sides of 100 mm and an accuracy of 0,5 %.

3.3.2 Number of test specimens

Six test specimens shall be used for the determination of the initial tensile strength.
A minimum of five test specimens shall be used for each subsequent part of the test sequence:
Cycle 1: Initial set + 3 sets of 5+ specimens.
Cycle 2: Initial set + 5 sets of 5+ specimens.
Cycle 3: Initial set + 3 sets of 5+ specimens.
All test specimens for the required durability test shall be cut from the same panel. For new panels to be tested under all three test methods, the specimens for all the tests shall be taken from the same panel.

3.3.3 Preparation of test specimens
When relevant, the cut edges of the facing in the samples shall be protected from the effects of corrosion by the application of a layer of water resistant silicone.
Before commencing the tests, the specimens shall be stored for at least 24 h at (23 ± 5) °C under normal laboratory conditions.

3.4 Test procedure
3.4.1 General
The dimensions of all test specimens shall be measured before and after the tests and the dimensional changes for all three directions shall be according to EN 12085.
The tensile strength of the product shall be determined in accordance with Annex C.3 of ETAG 016, Part 1 General, using one set of the test specimens in §3.3. The strength value obtained shall be denoted R0 and shall be determined as the average strength of the tested specimens.
After testing, the specimens shall be visually inspected paying special attention to the failure type (cohesive failure of the core, adhesive bond failure in any of the bonded surfaces, proportional area of the adhesive failure etc.). A description of the results of these observations shall be included in the test report.
If the metal faces of any of the specimens have suffered from general edge corrosion during exposure, and if the corrosion has propagated deeper than 10 mm into the joint between the surface sheet and the core over an edge length longer than 50 % of the specimen perimeter, the specimen shall be rejected and its results shall not be included in the calculation of the test results. A note on this rejection shall be included in the test report.
Tensile strength statistics shall refer to 'mean' values.

3.4.2 Cycle 1 Temperature Test
3.4.2.1 Test conditions
Testing of tensile strength shall be carried out on core specimens of 100 mm x 100 mm, except for samples taken from mineral wool panels where the side width shall be 150 mm or 200 mm, providing the side width is at least twice the thickness *(*d) of the core up to a maximum of 200 mm. For mineral wool lamellas the specimens shall be taken close to each other to eliminate inconsistent spread of results.
The specimens shall be cut from sandwich panel sections of 500 mm x 500 mm, taken from the central area of the panels 4 weeks after production.

3.4.2.2 Cycle 1 testing procedure
The tensile strength tests shall be conducted under normal laboratory conditions. The tensile strength shall be determined with both faces.
The test programme shall be as follows:
Initial 1: Test in original condition after one week stored in normal laboratory conditions
Sample 2: Test after storing for 1 week at 90 °C
Sample 3 Test after storing for 3 weeks at 90 °C
Sample 4: Test after storing for 6 weeks at 90 °C
Sample 5: Test after storing for 12 weeks at 90 °C
Sample 6: Test after storing for 24 weeks at 90 °C
If panels are produced in more than one thickness, the tests shall be conducted with samples from panels of both maximum and minimum thickness. The worst result shall apply to panels of all intermediate thicknesses.

3.4.2.3 Test results and acceptance criteria – Cycle 1
NOTE The minimum tensile strength obtained is RCycle 1. This minimum value is usually observed after 24 weeks but can be found earlier in the test. It is therefore necessary to conduct the intermediate tests at 3, 6 and 12 weeks and plot the changes in tensile strength.
— RCycle 1shall not be less than 50 % of the initial tensile strength value R_0.
— The 5 % characteristic value of tensile strength R24 of the samples with 90 °C shall be not less than 0,04 MPa.
— The change of thickness of the sections at 90 °C in test procedure Cycle 1 shall not be greater than 5 %, in the central and edge regions.

3.4.3 Cycle 2 Humidity Test

3.4.3.1 Test conditions
The test specimens shall be maintained under constant conditions for 28 days at (65 ± 3) °C and 100 % RH.

3.4.3.2 Cycle 2 testing procedure

One set of test specimens shall be exposed to the basic Cycle 2 test cycle for seven days. After this ageing test, the samples shall be stored until the mass has stabilised under ambient laboratory conditions. For the purpose of this test constant mass shall be deemed to have been reached, when the change in mass between two subsequent weighings with a 24 h interval is smaller than 1 % of the total mass.
The tensile strength value obtained shall be denoted as *R*7.
A second set of test specimens shall be exposed to the Cycle 2 test cycle for 28 days. These specimens shall then be conditioned and the tensile strength of the product measured as described in §3.4.1. The tensile strength value obtained shall be denoted as *R2*8.
If the test results illustrate a continuing decline in tensile strength with time (see §3.4.3.3), a further set of test specimens shall be exposed to the Cycle 2 test cycle for 56 days. These specimens shall then be conditioned and the tensile strength of the product measured as described in §3.4.1. The strength value obtained shall be denoted as R56.

3.4.3.3 Test results and acceptance criteria – Cycle 2
— R7 - R28 shall be equal to or smaller than 3(R0 - R7).
— R28 shall not be less than 40% of R0
If this is not fulfilled, specimens shall be exposed to the Cycle 2 test for 56 days. The criteria for acceptance shall be that R28 - R56 shall be less than R7 - R28 and R56 40 % of R0.

3.4.4 Cycle 3 Humidity and temperature cycle test
3.4.4.1 The test cycle
The climatic testing cycle shall be defined as follows:
5 days at +70 °C and 90 % R.H.
1 day at –20 °C
1 day at +90 °C under dry conditions
NOTE The term day means a time period of (24 ± 1) h.
The transfer time from one set of exposure conditions to the next shall not be greater than five minutes.
If equipment is used in which the conditions are changed in the same chamber, the change from one condition to another shall be made within one hour when the temperature is rising and within two hours when the temperature is decreasing.

3.4.4.2 Cycle 3 testing procedure
One set of test specimens shall be exposed to the test cycle. After this ageing test, the samples shall be stored until the mass has stabilised under ambient laboratory conditions. For the purpose of this test constant mass shall be considered to have been reached, when the change in mass between two subsequent weightings with a 24 h interval is smaller than 1 % of the total mass.
The tensile strength of the product shall then be determined as described in §3.4.1. The strength value obtained shall be denoted as R1.
A second set of test specimens shall then be exposed to five test cycles. These specimens shall be conditioned and the tensile strength of the product measured as described in §3.4.1. The strength value obtained shall be denoted as *R*5.
If the test results illustrate a continuing decline in tensile strength with time (see §3.4.4.3), a further set of test specimens shall be exposed to 10 test cycles. These specimens shall then be conditioned and the tensile strength of the product measured. The strength value obtained shall be denoted as R_{10}.

3.4.4.3 Test results and acceptance criteria – Cycle 3
— R1 - R5 shall be equal to or smaller than 4(R0 - R1).
— R5 shall not be less than 40% of R0
If this is not fulfilled, specimens shall be exposed to 10 further cycles. The criteria for acceptance shall be that R5 -R10 shall be less than R1 - R5 and R10 ≥.40 % of R0.

3.5 Test report on durability tests
The test report shall include the following information:

- Reference to this EOTA Guideline, Annex C3
- The name of the testing laboratory
- The name of the ETA applicant (and manufacturer of the panel)
- Date of the test
- Description of test instruments

b. Product identification
•1) product name, factory, manufacturer and supplier;

•2) type of product;
•3) packaging;
•4) the form in which the product arrived at the laboratory;
•5) presence of facing or coating;
•6) other information as appropriate, e.g. nominal thickness, nominal density, the conditions under which the product was stored and transported before arriving at the laboratory;

c. Test procedure
•1) pre-test history and sampling, e.g. Manufacturer and product type**.**
•2) conditioning;
•3) any deviations from the procedure described in this Annex;
•4) date of testing;
•5) general information related to the testing:
•5.1) the basic test cycle used
•5.2) use, where applicable, of the additional 56 days exposure
•6) factors which may have affected the results:
•6.1) corrosion of the exposed samples
•6.2) interruptions in the cycling test programme and the treatment of specimens during these
•6.3) rejection of individual test specimens due to the failure of the edge corrosion protection
Information about the apparatus and identity of the technician shall be available in the laboratory, but does not need to be recorded in the test report

d. Results
•1) all individual and mean values
•2) any visual observations of the specimens after testing:
•2.1) type of failure of the specimens in tensile testing (cohesive failure of the core, adhesive failure between the surface sheet and core, failure between the surface sheet and its coating, etc.)
•2.2) any corrosion of the test specimens
•3) a statement as to whether the product has passed or failed the acceptance criteria.

C4 Thermal effect

4.1 Principle
This test represents the action of thermal stresses due to climatic effects and to the equipment used, which induce deformations and forces in the panels and in the joints.

4.2 Test apparatus
The test shall be performed using the following equipment:
- Non-deformable metal frame, metal supports to allow the units to be fixed horizontally
- The apparatus must incorporate three adjustable supports capable of providing the maximum span foreseen for the panel to be tested.
- An array of infra-red lamps for artificially irradiating the external skin of the test panel.
- Contact thermocouples set on the internal and external skins to allow control of surface temperatures
- The intermediate support connected to the test frame through a load cell.

4.3 Test specimen
The panel (maximum thickness of panel and minimum thickness of facings, maximum span) shall be fixed only at its edges.

4.4 Test conditions
The test shall be carried out in laboratory circumstances, at a temperature of 23 $\pm$ 5°C.

4.5 Test method
The external face temperature (t_e) shall be taken as follows:

(i)	light colours	R_G = 75-90	t_e = +55°C
(ii)	medium colours	R_G = 40-74	t_e = +65°C
(iii)	dark colours	R_G = 8-39	t_e = +80°C

where R_G = degree of reflection relative to magnesium oxide = 100%.

The increase of temperature on the external skin from ambient to the maximum test temperature (t_e) is effected in increments of 10°C at approximately five minute intervals.

The test consists of two phases:
The first phase consists of measuring the deformations of the panel, fixed to the end supports only (see Figure 9), as a function of the temperature difference.
Deflection (f) is measured and the radius of curvature is calculated using the formula: $l^2/8f$

The second phase consists of measuring the deflection of each span and the reaction H on the intermediate support, when the panel is fixed to the three supports, as a function of the temperature difference
(see Figure 10).

4.6 Test report
The test report shall include the following information:

- Reference to this EOTA Guideline, Annex C4
- The name of the testing laboratory
- The name of the ETA applicant (and manufacturer of the panel)
- Date of the test
- Description of test instruments
- Product identification
- Description of conditioning and preparation (if any)

Result of the test, including:
the deflection across the intermediate support when t_e is reached and maintained,
the calculated radius of curvature R,
the force H daN/m on intermediate support

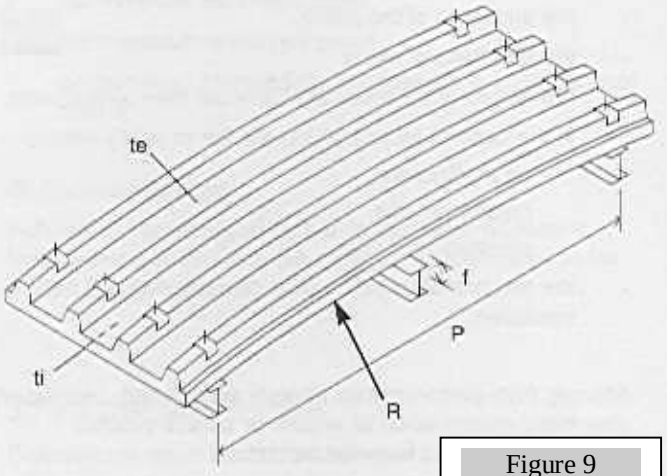


Figure 9

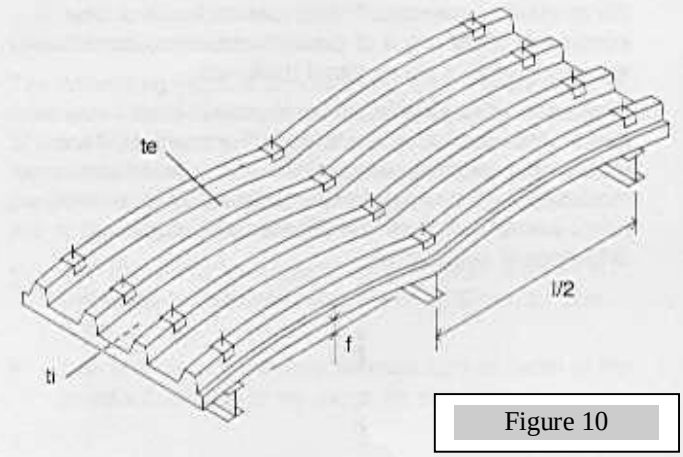


Figure 10

C5 Thermal shock

5.1 Principle
The aim is to assess the performance of panels under the effect of thermal shock.
5.2 Test apparatus
The performance is examined experimentally on the apparatus described in C4, the panel being fixed as indicated in Figure 9 (maximum thickness of panel, minimum thickness of facings and maximum span).

5.3 Test conditions
The test shall be carried out in laboratory circumstances, at a temperature of 23 $\pm$ 5°C.

5.4 Test procedure
The external face temperature (t_e) shall be taken as follows:

(i) light colours R_G = 75-90 t_e = +55°C
(ii) medium colours R_G = 40-74 t_e = +65°C
(iii) dark colours R_G = 8-39 t_e = +80°C

where R_G = degree of reflection relative to magnesium oxide = 100%.

The cycle is applied in the following manner:

- increase temperature to t_e, in 10°C increments
- maintain t_e for three hours
- switch off the radiation system and induce thermal shock by applying cold water spray at temperature between 10° and 15°C
- stabilise at ambient conditions for a minimum of 2 h.

5.5 Test report
The test report shall include the following information:

- Reference to this EOTA Guideline, Annex C5
- The name of the testing laboratory
- The name of the ETA applicant (and manufacturer of the panel)
- Date of the test
- Description of test instruments
- Product identification
- Description of conditioning and preparation (if any)
- Result of the test, including:

· detachments,
· curling of the skin,
· residual deformation of the panel after the test cycles.

C6 Resistance to fixings (suspended loads)

6.1 Principle of the test
The test consists in submitting the panel to eccentric or non-eccentric loads fixed to the interior face of a test specimen, recording the deformations measured and any damage observed

6.2 References
ISO 7892:1988 Vertical Building Components - Impact Resistance - Impact Bodies and general Test Procedures
ISO DIS 8413: 1990 Performance standards in buildings – Partitions made from components test for ability to withstand suspended static loads.

6.3 Test apparatus
The test apparatus shall comprise the following:

- Rigid frame conforming to ISO 7892 suitably equipped to enable the attachment of the proposed fixings and adaptable to the characteristic dimensions of the specimen. This frame shall be able to reproduce the permitted deviations in the dimensions of actual. structures, both horizontally and vertically.

- Devices for measuring the frontal displacements of the specimen to the nearest 0,1 mm (reversible frontal displacements in the direction of impact and in the opposite direction and any permanent deformation) and means for allowing the positioning of these devices and for ensuring their stability during the test.

6.4 Test specimen

6.4.1 Preparation and composition of the specimen for testing

Specimen shall comprise the number of components necessary to represent the joints in current use and all the devices in current use for fixing the element onto the structure and onto adjacent components.

As an example, since there are numerous possible combinations, and if a panel is a component or an assembly of components constituting one complete functional part of the facade (e.g. a basement, a window and an overpanel) the specimen might comprise the following:

- one panel, if it is intended to be inserted on all four sides (Figure. 11)
- three panels, if they are intended to be inserted between floors (Figure. 12)

All transparent or opaque filling components shall comply with the supplier's specifications regarding type, composition and the method of fixing.

6.4.2 Fixing of the specimen

The specimen shall be fixed onto the frame so as to reproduce operating conditions, particularly with respect to the nature, type and position of the fixings and the distance between them. The devices which ensure that the specimen is fixed shall be adjusted so that it is in a vertical plane and its constituent elements are assembled in the appropriate planes.

The devices ensuring the facade is properly fixed shall be assembled so as to make maximum use of their adjustment capacity, i.e. the deviations on the load-bearing frame shall be the maximum allowed

If the panels include expansion joints or devices to compensate for deviations of the fixings, these joints and devices shall be included in the specimen

Note. where re permitted deviations are given in standards, the adjustment capacity of the fixings shall correspond to these values; where relevant standards are not available, these values must be given in the test instruction.

6.5 Test procedure

6.5.1 Horizontal loads

The Loading point shall be selected according to the manufacturer specifications

A load of 250N acting at right angles to the plane of the assembly shall be applied and maintained over a period of 24 hours. Any reversible deformations and those still in evidence after 24 hours and any deterioration shall be recorded.

The load shall then be increased in increments of 50 N at intervals of one minute until failure.

The manufacturer has the possibility to test assemblies with higher loads, if he claims better performance.

6.5.2 Vertical loads

The Loading point shall be selected according to the manufacturer specifications.

A load of 100 N acting parallel to the plane of the assembly shall be applied and maintained over a period of 24 hours. Any reversible deformations and those still in evidence after 24 hours and any deterioration shall be recorded.

The load shall then be increased in increments of 50 N at intervals of 5 minutes until failure.

The manufacturer has the possibility to test assemblies with higher loads, if he claims better performance.

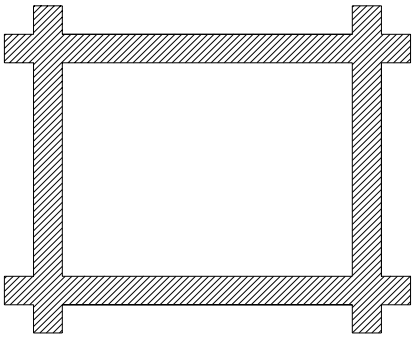


Figure 11: Panel inserted on four sides

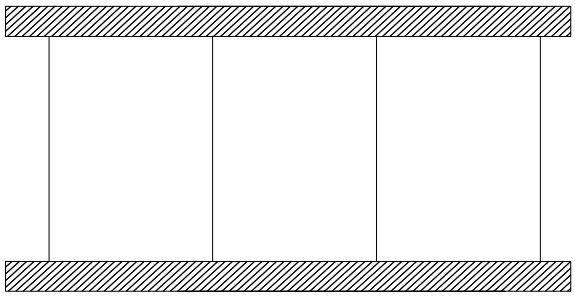


Figure 12: Panel inserted between floors

6.6 Test report

The test report shall include the following information:

- reference to this EOTA ETA-Guideline, Annex C6
- the name of the testing laboratory
- the name of the ETA-applicant (and manufacturer of the composite panel)
- date of the test
- description of the test instruments
- identification of the product tested (designation, dimensions and any relevant identification characteristic)
- surface structure (e.g. smooth, profiled, structured, …)
- description of the sample tested, and reference to its marking
- description of conditioning and preparation of the sample (if any)
- description of test conditions (temperature and RH)
- results of the test, including the deformations and the failure load.