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European Assessment Document for

Lightweight composite panels with expanded polymer or aluminium honeycomb core

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) 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

The EAD covers lightweight composite panels with expanded polymer or aluminium honeycomb core (in the following referred to as “lightweight composite panels”), consisting of a self-supporting panel made of the following different layers (see Figure 1.1.1 and Figure 1.1.2): a stainless-steel backing plate, a structural central core enclosed between two layers of glass fibre and polyurethane adhesive mats, and an external facing layer. The structural core can be an expanded polymer core (option 1, Figure 1.1.1) or an aluminium honeycomb core (option 2, Figure 1.1.2). The EAD covers only the panel itself but it does not cover panel assemblies.

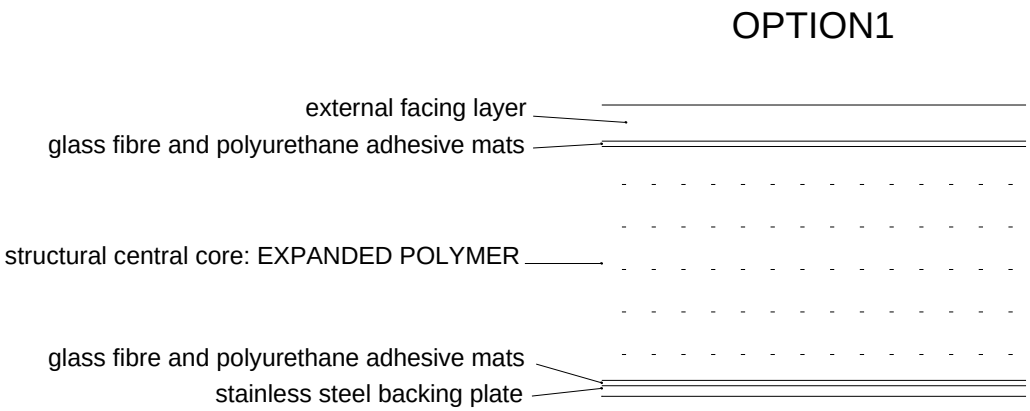

Figure 1.1.1: Lightweight composite panel with expanded polymer core (option 1)

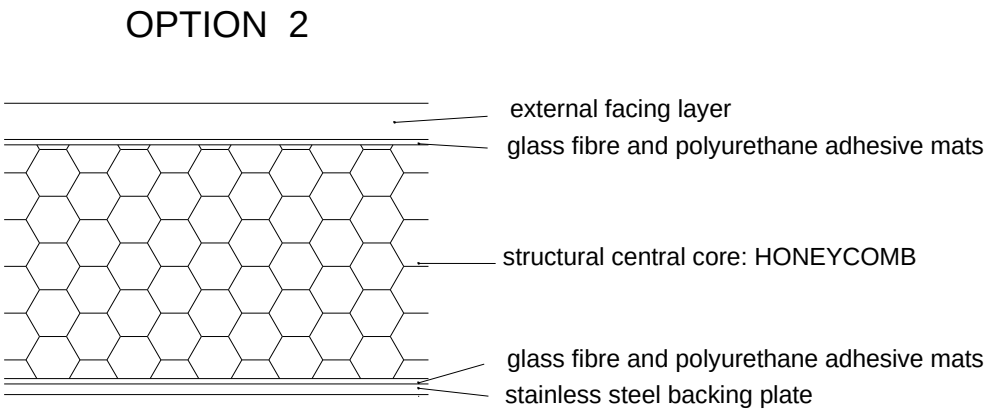

Figure 1.2.2: Lightweight composite panel with aluminium honeycomb core (option 2)

The facing layer of the lightweight composite panels are supplied with different finishes, such as metallic layer (steel, aluminium), ceramic, porcelain, quarried natural stone (limestone, marble, granite), glass, GFRC, mosaic tile and brick.

The lightweight composite panels do not contribute to the load-bearing capacity of the works, neither to the works stiffness.

The product is not fully covered by the following harmonised technical specifications:

- EN 14509[1], since the product has no insulation core, instead it has an expanded polymer core (option 1) or a metallic honeycomb core (option 2);
- EAD 090058-00-0404, since the product is not a kit consisting in brackets, fastenings and claddings elements, but it is a single panel;
- EAD 210046-00-1201, since the product has different stratigraphy and materials.

Due to the differences in the central structural core, material and layers or because the product is a single panel and not a kit, the assessment methods in this EAD are partially different in comparison to the previous mentioned EAD or harmonised standard.

In particular, compared to EN 14509:

- Mechanical resistance has been articulated in different essential characteristics with specific methods related to the central core (i.e., tensile strength perpendicular to the faces of the panel, shear strength).
- Resistance to fire, including the fire-separating function (compartmentation) and fire protection ability, has not been considered because this intended use has been explicitly excluded for the lightweight composite panels.
- Content, emission and/or release of dangerous substance has been developed
- Airborne sound insulation and sound absorption have not been considered since in the harmonised standard they are related to the kit assembly (joints and fixings) and this EAD covers only the lightweight composite panel itself.
- Water permeability has not been considered, as it is in the harmonised standard related to the joints of the kit assembly and this EAD covers only the lightweight composite panels itself, so it has been replaced by “water impermeability”.
- Water vapour permeability has not been considered, as in this EAD the determination of moisture movement has been introduced instead (clause 2.2.11), which is considered more suitable for the stratigraphy of the product at hand. In the harmonised standard, the water vapour permeability is given without testing, since the water vapour transmission coefficient for the double metal facings of the sandwich panel is considered to be infinity.
- Durability has been articulated in different essential characteristics with specific methods related to the central core and the facing layer (Resistance to thermal shock, Salt spray resistance, Resistance to ageing by UV radiation).

Compared to EAD 090058-00-0404:

- Reaction to fire is differently determined being a single panel and not a kit.
- Drainability has not been considered being a single panel, not having joints as in a kit assembly.
- Wind load resistance, Mechanical resistance of the combination of fixing devices, Shear resistance of fixing from panel, Combined tension and shear resistance of fixing from panel, Resistance to horizontal point loads, Pulsating load, Corrosion of metal components (except cladding element) have not been considered being a single panel and not a kit.
- Tensile strength perpendicular to the faces of the panel, Compression strength perpendicular to the faces of the panel, Shear strength, Peeling strength and Durability of the adherence of the core panel to the external layers are covered using the same assessment method as in EAD 090058-00-0404, only detailing specifically the expression of results to be given in the ETA.
- Impact resistance has been adapted to single panel instead of kits.
- Corrosion of cladding element and resistance to ageing by UV radiation of cladding element have been considered as Salt spray resistance and Resistance to ageing by UV radiation detailing the most consistent method considering the specific materials.

Compared to EAD 210046-00-1201:

- Durability has been articulated in different essential characteristics considering the different composition and thickness of the products, taking into account weather conditions, introducing assessment methods related to the action of water/humidity (i.e., water impermeability, water absorption, determination of moisture movement), the action of air (uniform static air pressure difference/air permeability) and, more severely, of the maintenance of mechanical characteristics

1 All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4.

after heat-rain and heat-cold cycles, after freeze-thaw cycles, thermal shock, salt spray resistance and resistance to ageing by UV radiation. Some of these characteristics have also been considered for internal use, to consider the possible application of the panel in internal conditions of high humidity in particular internal environments such as swimming pools (see 1.2.1).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he 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, e.g., with regard to the intended end use conditions, 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 as long as the details of the assessment methods as laid down in this EAD are respected.

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

1.2.1 Intended use(s)

The lightweight composite panels are intended to be used both in internal and external applications, without stiffening function and excluding the use of this product for fire compartmentation. In particular, the lightweight composite panels are intended to be used in:

- external wall claddings and curtain walling (use 1);
- brise soleil sunshades (use 2);
- internal claddings and partition walls (use 3), also under conditions of high humidity (e.g., swimming pools);
- ceilings, where the facing layer of the panel does not act simultaneously as flooring (use 4), also under conditions of high humidity (e.g., swimming pools).

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 lightweight composite panels for the intended use of 50 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[2].

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 his 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

1.3.1 Specific terms

Emission test chamber concentration: mass concentration of a specific vapour phase organic compound (VOC or SVOC) or group of compounds in test

[2] 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.

chamber air measured at the emission test chamber outlet [µg/(m^3)]

Mass concentration of the compound: calculated concentration of a specific vapour phase organic compound (VOC or SVOC) or group of vapour phase organic compounds in the reference room air

Product loading factor: ratio of exposed dimension of the test specimen to the empty test chamber volume

Specific emission rate: mass of a vapour phase organic compound emitted (VOC or SVOC) per unit of product per unit of time at a given time from the start of the test. When it is related to area, it is indicated with SER_A

1.3.2 Acronyms

DSLT	Dynamic Surface Leaching Test
NSS	Neutral Salt Spray
QUV	Q-panel Laboratory Ultra Violet
SER	Specific Emission Rate [µg/h]
SER_A	Specific Emission Rate related to Area [µg/(m^2*h)]
SVOC	Semi-Volatile Organic Compound
VOC	Volatile Organic Compound

1.3.3 Symbols

A	percentage of the total area of the specimen which shows basis metal corrosion in the salt spray resistance test [%]
C	flow coefficient: air flow throughout the specimen with Δp equal to 1 Pa in the air permeability test [m^3/(s Pa^n)]
c_i	mass concentrations in the air of the reference room in determination of SVOC and VOC content, emission and/or release of dangerous substances [µg/m^3]
$d_{Fu,c}$	deflection at the maximum applied load $F_{u,c}$ in the bending moment capacity test with central support [mm]
$d_{Fu,c,FT}$	deflection at the maximum applied load $F_{u,c,FT}$ in the bending moment test with central support after freeze-thaw cycles [mm]
$d_{Fu,c,hy}$	deflection at the maximum applied load $F_{u,c,hy}$ in the bending moment test with central support after hygrometric cycles (heat-rain and heat-cold cycles) [mm]
$d_{Fu,sp}$	deflection at the maximum applied load $F_{u,sp}$ in the bending moment capacity test in span [mm]
$d_{Fu,sp,hy}$	deflection at the maximum applied load $F_{u,sp,hy}$ in the bending moment test in span after hygrometric cycles (heat-rain and heat-cold cycles) [mm]
$d_{Fu,sp,FT}$	deflection at the maximum applied load $F_{u,sp,FT}$ in the bending moment test in span after freeze-thaw cycles [mm]
E_{hi}	impact energy (hard body impactor) in the impact resistance test [J]
E_{si}	impact energy (soft body impactor) in the impact resistance test [J]

E_v	water absorption [%]
F_c	ultimate load in the compression strength test perpendicular to the faces of the panel [kN]
F_G	self-weight of the panel in the bending moment capacity test [kN]
F_s	load at failure in the shear strength test [kN]
F_t	load at failure in the tensile strength test [kN]
$FD_{s,av}$	force-deflection coefficient in the shear strength test [kN/mm]
$F_{u,c}$	maximum applied load in the bending moment capacity test with central support [kN]
$F_{u,c,FT}$	maximum applied load in the bending moment capacity test with central support after freeze-thaw cycles [kN]
$F_{u,c,hy}$	maximum applied load in the bending moment capacity test with central support after hygrometric cycles (heat-rain and heat-cold cycles) [kN]
$F_{u,sp}$	maximum applied load in the bending moment capacity test in span [kN]
$F_{u,sp,FT}$	maximum applied load in the bending moment capacity test in span after freeze-thaw cycles [kN]
$F_{u,sp,hy}$	maximum applied load in the bending moment capacity test in span after hygrometric cycles (heat-rain and heat-cold cycles) [kN]
l	length of the specimen in the bending moment capacity test [mm]
L	length of the span in the bending moment capacity test of the panel [mm]
L_f	loading factors for emission testing in the determination of SVOCs and VOCs in test chamber air [m^2/m^3]
$M_{u,c}$	bending moment capacity of the panel with central support [kNm]
$M_{u,sp}$	bending moment capacity of the panel in span [kNm]
$M_{u,c,FT,ret}$	retained bending moment capacity of the panel with central support after freeze-thaw cycles (average ratio for exposed specimens with respect to the values recorded for unexposed specimens) [%]
$M_{u,c,hy,ret}$	retained bending moment capacity of the panel with central support after hygrometric cycles (heat-rain and heat-cold cycles), average ratio for exposed specimens with respect to the values recorded for unexposed specimens) [%]
$M_{u,sp,FT,ret}$	retained bending moment capacity of the panel in span after freeze-thaw cycles (average ratio for exposed specimens with respect to the values recorded for unexposed specimens) [%]
$M_{u,sp,hy,ret}$	retained bending moment capacity of the panel in span after hygrometric cycles (heat-rain and heat-cold cycles), average ratio for exposed specimens with respect to the values recorded for unexposed specimens) [%]
n	flow exponent in the air permeability test [-]
R	thermal resistance [m^2K/W]
t	thickness of the panel [mm]
V’	air loss in the air permeability test [m^3/h]
w	width of the specimen in the bending moment capacity test [mm]

α_l	linear thermal expansion coefficient [10^{-6} °C^{-1}]
λ	thermal conductivity [W/mK]
$\Delta l_g/l$	coefficient of expansion due to humidity in the moisture movement test [mm/m]
$\Delta l_r/l$	shrinkage coefficient following drying in stove in the moisture movement test [mm/m]
$\Delta l_c/l$	total coefficient of variation in the moisture movement test [mm/m]
Δp	pressure difference between the opposite faces of the specimen in the air permeability test [Pa]
$\Delta\sigma_{c,s}$	retained shear strength after the cyclic temperature exposure between – 30°C and + 60°C, in the durability of the adherence of the central core to the external layers test [%]
$\Delta\sigma_{70,s}$	retained shear strength after the exposure in water at a temperature of 70°C for 1000 hours, in the durability of the adherence of the central core to the external layers test [%]
$\Delta\sigma_{100,s}$	retained shear strength after the exposure at a temperature of 100°C for 1500 hours under dry conditions, in the durability of the adherence of the central core to the external layers test [%]
σ_c	compressive strength in the compression strength test perpendicular to the faces of the panel [kPa]
σ_s	shear strength of the adherence of the central core to the external layers in the shear strength test [kPa]
σ_t	tensile strength of the adherence of the central core to the external layers in the tensile strength test perpendicular to the faces of the panel [kPa]
τ_p	peeling strength [N/mm]

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1, Table 2.1.2, Table 2.1.3 and Table 2.1.4 show how the performance of the lightweight composite panels is assessed in relation to the essential characteristics for uses 1, 2, 3 and 4.

Table 2.1.1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics (use 1, external wall claddings and curtain walling)

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
Basic Works Requirement 3: Hygiene, health and the environment			
2	Content, emission and/or release of dangerous substances - Leachable substances	2.2.2	Description and level - EC20-values for each dilution ratio - [% within … hours/days]
3	Water impermeability	2.2.3	Description
Basic Works Requirement 4: Safety and accessibility in use			
4	Bending moment capacity of the panel in span	2.2.4.1	Level $F_{u,sp}$ [kN],$d_{Fu,sp}$ [mm], $M_{u,sp}$ [kNm]
5	Bending moment capacity of the panel with central support	2.2.4.2	Level $F_{u,c}$ [kN], $d_{Fu,c}$ [mm], $M_{u,c}$ [kNm]
6	Bending moment of the panel after heat-rain and heat-cold cycles in span	2.2.5	Level and description $F_{u,sp,hy}$ [kN], $d_{Fu,sp,hy}$ [mm], $M_{u,sp,hy,ret}$ [%]
7	Bending moment of the panel after heat-rain and heat-cold cycles with central support	2.2.5	Level and description $F_{u,c,hy}$ [kN], $d_{Fu,c,hy}$ [mm], $M_{u,c,hy,ret}$ [%]
8	Bending moment of the panel after freeze-thaw cycles in span	2.2.6	Level and description $F_{u,sp,FT}$ [kN], $d_{Fu,sp,FT}$ [mm], $M_{u,sp,FT,ret}$ [%]
9	Bending moment of the panel after freeze-thaw cycles with central support	2.2.6	Level and description $F_{u,c,FT}$ [kN], $d_{Fu,c,FT}$ [mm], $M_{u,c,FT,ret}$ [%]

No	Essential characteristic	Assessment method	Type of expression of product performance
10	Tensile strength perpendicular to the faces of the panel	2.2.7	Level F_t [kN], σ_t [kPa]
11	Compression strength perpendicular to the faces of the panel	2.2.8	Level F_c [kN], σ_c [kPa]
12	Shear strength	2.2.9	Level F_s [kN], σ_s [kPa], $FD_{s,av}$ [kN/mm]
13	Peeling strength	2.2.10	Level τ_p [N/mm]
14	Water absorption	2.2.11	Level E_v [%]
15	Determination of moisture movement	2.2.12	Level $\Delta l_g/l$ [mm/m], $\Delta l_f/l$ [mm/m], $\Delta l_c/l$ [mm/m] (external facing layer and structural core)
16	Linear thermal expansion	2.2.13	Level α_l [10^{-6} °C^{-1}] (external facing layer and structural core)
17	Impact resistance	2.2.14	Level E_{hi} [J], E_{si} [J]
18	Resistance to uniform static air pressure difference/air permeability	2.2.15	Level Δp_{max} [Pa], V' [m^3/h], n, C [$m^3/(s\ Pa^n)$]
19	Durability of the adherence of the core panel to the external layers	2.2.16	Level and description $\Delta\sigma_{c,s}$ [%], $\Delta\sigma_{100,s}$ [%], $\Delta\sigma_{70,s}$ [%]
Basic Works Requirement 6: Energy economy and heat retention			
20	Thermal resistance / Thermal conductivity	2.2.17	Level R [m^2K/W] / λ [W/mK]
Aspects of durability			
21	Resistance to thermal shock	2.2.18	Description
22	Salt spray resistance	2.2.19	Level and description
23	Resistance to ageing by UV radiation	2.2.20	Description

Table 2.1.2 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics (use 2, brise soleil sunshades)

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
Basic Works Requirement 3: Hygiene, health and the environment			
2	Content, emission and/or release of dangerous substances - Leachable substances	2.2.2	Description and level - EC20-values for each dilution ratio - [% within … hours/days]
3	Water impermeability	2.2.3	Description
Basic Works Requirement 4: Safety and accessibility in use			
4	Bending moment capacity of the panel in span	2.2.4.1	Level $F_{u,sp}$ [kN], $d_{Fu,sp}$ [mm], $M_{u,sp}$ [kNm]
5	Bending moment capacity of the panel with central support	2.2.4.2	Level $F_{u,c}$ [kN], $d_{Fu,c}$ [mm], $M_{u,c}$ [kNm]
6	Bending moment of the panel after heat-rain and heat-cold cycles in span	2.2.5	Level and description $F_{u,sp,hy}$ [kN], $d_{Fu,sp,hy}$ [mm], $M_{u,sp,hy,ret}$ [%]
7	Bending moment of the panel after heat-rain and heat-cold cycles with central support	2.2.5	Level and description $F_{u,c,hy}$ [kN], $d_{Fu,c,hy}$ [mm], $M_{u,c,hy,ret}$ [%]
8	Bending moment of the panel after freeze-thaw cycles in span	2.2.6	Level and description $F_{u,sp,FT}$ [kN], $d_{Fu,sp,FT}$ [mm], $M_{u,sp,FT,ret}$ [%]
9	Bending moment of the panel after freeze-thaw cycles with central support	2.2.6	Level and description $F_{u,c,FT}$ [kN], $d_{Fu,c,FT}$ [mm], $M_{u,c,FT,ret}$ [%]
10	Tensile strength perpendicular to the faces of the panel	2.2.7	Level F_t [kN], σ_t [kPa]
11	Compression strength perpendicular to the faces of the panel	2.2.8	Level F_c [kN], σ_c [kPa]
12	Shear strength	2.2.9	Level F_s [kN], σ_s [kPa], $FD_{s,av}$ [kN/mm]
13	Peeling strength	2.2.10	Level τ_p [N/mm]
14	Water absorption	2.2.11	Level E_v [%]

No	Essential characteristic	Assessment method	Type of expression of product performance
15	Determination of moisture movement	2.2.12	Level $\Delta l_g/l$ [mm/m], $\Delta l_r/l$ [mm/m], $\Delta l_c/l$ [mm/m] (external facing layer and structural core)
16	Linear thermal expansion	2.2.13	Level α_l [10^{-6} °C^{-1}] (external facing layer and structural core)
17	Impact resistance	2.2.14	Level E_{hi} [J], E_{si} [J]
18	Durability of the adherence of the core panel to the external layers	2.2.16	Level and description $\Delta\sigma_{c,s}$ [%], $\Delta\sigma_{100,s}$ [%], $\Delta\sigma_{70,s}$ [%]
Aspects of durability			
19	Resistance to thermal shock	2.2.18	Description
20	Salt spray resistance	2.2.19	Level and description
21	Resistance to ageing by UV radiation	2.2.20	Description

Table 2.1.3 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics (use 3, internal claddings and partition walls, also under conditions of high humidity, e.g., swimming pools)

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
Basic Works Requirement 3: Hygiene, health and the environment			
2	Content, emission and/or release of dangerous substances - SVOC and VOC	2.2.2	Description and level Specific emission rates SER_A [µg/(m^2*h)] and mass concentrations in the reference room c_i [µg/m^3] of the compounds (*)
3	Water impermeability	2.2.3	Description
Basic Works Requirement 4: Safety and accessibility in use			
4	Bending moment capacity of the panel in span	2.2.4.1	Level $F_{u,sp}$ [kN], $d_{Fu,sp}$ [mm], $M_{u,sp}$ [kNm]
5	Bending moment capacity of the panel with central support	2.2.4.2	Level $F_{u,c}$ [kN], $d_{Fu,c}$ [mm], $M_{u,c}$ [kNm]
6	Bending moment of the panel after heat-rain and heat-cold cycles in span	2.2.5	Level and description $F_{u,sp,hy}$ [kN], $d_{Fu,sp,hy}$ [mm], $MR_{u,sp,hy,ret}$ [%]
7	Bending moment of the panel after heat-rain and heat-cold cycles with central support	2.2.5	Level and description $F_{u,c,hy}$ [kN], $d_{Fu,c,hy}$ [mm], $M_{u,c,hy,ret}$ [%]
8	Tensile strength perpendicular to the faces of the panel	2.2.7	Level F_t [kN], σ_t [kPa]
9	Compression strength perpendicular to the faces of the panel	2.2.8	Level F_c [kN], σ_c [kPa]
10	Shear strength	2.2.9	Level F_s [kN], σ_s [kPa], $FD_{s,av}$ [kN/mm]
11	Peeling strength	2.2.10	Level τ_p [N/mm]
12	Water absorption	2.2.11	Level E_v [%]
13	Determination of moisture movement	2.2.12	Level $\Delta l_g/l$ [mm/m], $\Delta l_f/l$ [mm/m], $\Delta l_c/l$ [mm/m] (external facing layer and structural core)
14	Linear thermal expansion	2.2.13	Level α_l [10^{-6} °C^{-1}]

No	Essential characteristic	Assessment method	Type of expression of product performance
			(external facing layer and structural core)
15	Impact resistance	2.2.14	Level E_{hi} [J], E_{si} [J]
16	Durability of the adherence of the core panel to the external layers	2.2.16	Level and description $\Delta\sigma_{c,s}$ [%], $\Delta\sigma_{100,s}$ [%], $\Delta\sigma_{70,s}$ [%]
Aspects of durability			
17	Resistance to ageing by UV radiation	2.2.20	Description

(*) accompanied by the information about the product loading factor used L_f [m^2/m^3] (see Clause 1.3.1)

Table 2.1.4 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics (use 4, ceilings, where the facing layer of the panel does not act simultaneously as flooring, also under conditions of high humidity, e.g., swimming pools)

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
Basic Works Requirement 3: Hygiene, health and the environment			
2	Content, emission and/or release of dangerous substances - SVOC and VOC	2.2.2	Description and level Specific emission rates SER_A [µg/(m^2*h)] and mass concentrations in the reference room c_i [µg/m^3] of the compounds (*)
3	Water impermeability	2.2.3	Description
Basic Works Requirement 4: Safety and accessibility in use			
4	Bending moment capacity of the panel in span	2.2.4.1	Level $F_{u,sp}$ [kN], $d_{Fu,sp}$ [mm], $M_{u,sp}$ [kNm]
5	Bending moment capacity of the panel with central support	2.2.4.2	Level $F_{u,c}$ [kN], $d_{Fu,c}$ [mm], $M_{u,c}$ [kNm]
6	Bending moment of the panel after heat-rain and heat-cold cycles in span	2.2.5	Level and description $F_{u,sp,hy}$ [kN], $d_{Fu,sp,hy}$ [mm], $M_{u,sp,hy,ret}$ [%]
7	Bending moment of the panel after heat-rain and heat-cold cycles with central support	2.2.5	Level and description $F_{u,c,hy}$ [kN], $d_{Fu,c,hy}$ [mm], $M_{u,c,hy,ret}$ [%]
8	Tensile strength perpendicular to the faces of the panel	2.2.7	Level F_t [kN], σ_t [kPa]
9	Compression strength perpendicular to the faces of the panel	2.2.8	Level F_c [kN], σ_c [kPa]
10	Shear strength	2.2.9	Level F_s [kN], σ_s [kPa], $FD_{s,av}$ [kN/mm]
11	Peeling strength	2.2.10	Level τ_p [N/mm]
12	Water absorption	2.2.11	Level E_v [%]
13	Determination of moisture movement	2.2.12	Level $\Delta l_g/l$ [mm/m], $\Delta l_r/l$ [mm/m], $\Delta l_c/l$ [mm/m] (external facing layer and structural core)
14	Linear thermal expansion	2.2.13	Level α_l [10^{-6} °C^{-1}] (external facing layer and structural core)
15	Impact resistance	2.2.14	Level E_{hi} [J], E_{si} [J]
16	Durability of the adherence of the core panel to the external layers	2.2.16	Level and description $\Delta\sigma_{c,s}$ [%], $\Delta\sigma_{100,s}$ [%], $\Delta\sigma_{70,s}$ [%]

(*) accompanied by the information about the product loading factor used L_f [m^2/m^3] (see Clause 1.3.1)

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.

2.2.1 Reaction to fire

Purpose of the assessment

The purpose of the assessment is the evaluation of the reaction to fire of lightweight composite panels.

Assessment method

The lightweight composite panels shall be tested, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1. The product shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

For the relevant classes, the single burning item test (SBI test, EN 13823) and the small ignition source test (EN ISO 11925-2) shall be performed on specimen panels with both different central cores (expanded polymer core and aluminium honeycomb core) and different external finishes when it may influence the reaction to fire performances, using the mounting and fixing provisions given in Annex B. The SBI test shall be conducted at least on the worst case (see Annex A). The internal face and/or the external face shall be tested, considering the end use conditions and the regulatory requirements at the place where the product is intended to be used.

Expression of results

The reaction to fire class shall be given in the ETA.

2.2.2 Content, emission and/or release of dangerous substances

The performance of the lightweight composite panels regarding the emissions and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer[3] after identifying the release scenarios taking into account the intended use(s) of the product and the Member States where the manufacturer intends his product to be made available on the market.

The identified intended release scenarios for this product and intended use with respect to dangerous substances are:

IA1: Product with direct contact to indoor air

3 The manufacturer may be asked to provide to the TAB the REACH related information which shall accompany the DoP (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
- provide a written declaration to the TAB stating whether the product (or constituents of the product) contain(s) substances which are classified as dangerous in accordance with Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the SGDS, taking into account the installation conditions of the construction product and the release scenarios resulting from there.

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

IA2: Product with indirect contact to indoor air (e.g., covered products) but possible impact on indoor air

S/W1: Product with direct contact to soil, ground and surface water

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

2.2.2.1 Leachable substances

This characteristic is only relevant for Uses 1 and 2 (see clause 1.2.1).

For the intended uses covered by the release scenarios S/W1 and/or S/W2, the performance of the lightweight composite panels regarding leachable substances shall be assessed.

Assessment method

A dynamic surface leaching test (DSLT) with subsequent eluate analysis shall take place in order to determine compound release, each in duplicate. Leaching tests of the lightweight composite panels shall be conducted in accordance with EN 16637-2. The leachant shall be pH-neutral demineralised water and the ratio of liquid volume to surface area shall be (80 ± 10) l/m².

Specimens shall be prepared in accordance with clause 8.2 of EN 16637-2.

In eluates of „6 hours “and „64 days“, the following biological tests shall be conducted:

- acute toxicity test with Daphnia magna Straus in accordance with EN ISO 6341;
- toxicity test with algae in accordance with EN ISO 15799;
- luminescent bacteria test in accordance with 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.

Expression of results

Determined toxicity in the leaching test (biological tests) of the lightweight composite panels shall be expressed as EC20-values for each dilution ratio. Maximum determined biological degradability shall be expressed as "…% within … hours/days “. The respective test methods for analysis shall be specified.

2.2.2.2 SVOC and VOC

This characteristic is only relevant for Uses 3 and 4 (see clause 1.2.1).

For the intended uses covered by the release scenarios IA1 and IA2, the performance of the lightweight composite panels regarding SVOC and VOC shall be assessed.

Assessment method

Volatile organic compounds and semi-volatile organic compounds (respectively: VOC and SVOC) shall be determined in accordance with EN 16516. In particular, clause 8.2 of EN 16516 which describes the determination of VOCs and SVOCs in test chamber air, is of concern.
The loading factors for emission testing L_f for the intended uses of the lightweight composite panels, in accordance with clause 4.2.2 of EN 16516, shall be 1,0 m^2/m^3 for walls and 0,4 m^2/m^3 for floors and ceilings, in order to determine the emission test chamber concentration.
The installation of the test specimen in the test chamber shall be done in accordance with the manufacturer’s product installation instructions, whenever possible; in absence of such instructions, with the usual practice of the building professionals.

Expression of results

A description of specific emission rates related to area SER_A [µg/(m^2*h)] and respective calculated mass concentrations in the reference room air c_i [µg/m^3] of all the compounds, together with the information regarding the product loading factor used L_f [m^2/m^3], related to the intended use for which the results are representative (walls, ceilings), in accordance with clause 10.6 of EN 16516, shall be reported in the ETA.

2.2.3 Water impermeability

Purpose of the assessment

The purpose of the assessment is the evaluation of the water impermeability on the under surface of lightweight composite panels set horizontally when its external upper surface is covered by still water.

Assessment method

The water impermeability of the lightweight composite panels shall be determined in accordance with clause 7.3.3 of EN 12467 on 3 panel specimens (see Annex A). The lightweight composite panels shall be examined after cutting it perpendicularly in the middle, in order to observe the presence or absence of water both inside the core and on the four edges in thickness.

Expression of results

It shall be stated in the ETA whether traces of moisture or water drops inside the core or under the surface of one or more of the lightweight composite panels have been detected or not.

2.2.4 Bending moment in span and with central support

Purpose of the assessment

The purpose of the assessment is the evaluation of the bending moment of lightweight composite panels when a bending failure occurs, both in span and with central support.

2.2.4.1 Bending moment capacity of the panel in span

Assessment method

The bending moment of the lightweight composite panels shall be determined on 10 panel specimens (see Annex A) at standard laboratory conditions (temperature of (23 ± 2) °C and relative humidity of (50 ± 5) %), after a pre-conditioning for at least 12 h before the test at a temperature of (23 ± 5) ºC.
If *t* is the nominal thickness of the panel, the dimensions of the test specimen (length, *l* and width, w) and the test span L shall be such that:

- L/t ≥ 15,
- *l* ≥ L+ 40 mm, and
- w ≥ 5 t.

The dimensions of the test specimen shall be chosen such to give a bending failure.
The test shall be carried out by subjecting the simply supported panel to a uniform distributed load across the full width of the panel itself (see Figure 2.2.4.1.1). This test shall be carried out on both orientations of the panel (10 specimens with the external facing uppermost and 10 specimens with the steel backing plate uppermost). The support conditions shall be such as to apply no restraint to the rotation of the panel about the lines of support. The loading rate shall be uniform and such as to result in failure between 5 min and 15 min after the commencement of the test. During the test, the load and central deflection shall be recorded. Displacement transducers shall have an accuracy of 0,1 mm. The load shall be increased until failure occurs and the load-deflection curve shall be drawn for the central (middle of span) displacement.

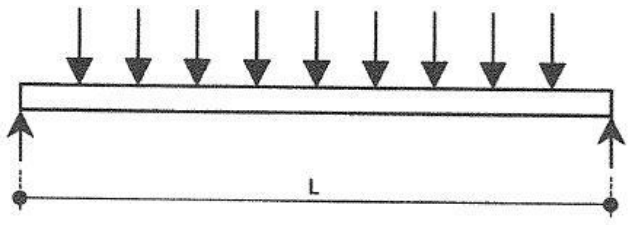

Figure 2.2.4.1.1: Scheme of application of the load – bending moment capacity in span

Expression of results

The average values (arithmetic mean) and the standard deviations of:

- the maximum applied load $F_{u,sp}$ [kN],
- the deflection at $F_{u,sp}$, $d_{Fu,sp}$ [mm],

and the average value and the characteristic value of the bending moment capacity of the panel $M_{u,sp}$ [kN m] shall be given in the ETA, for the two tested orientations.
For each test, the bending moment capacity of the panel $M_{u,sp}$ [kN m] shall be calculated as

$$M_{u,sp} = \frac{F_{u,sp} \cdot L}{8} \quad (2.2.4.1.1)$$

with L span of the panel [mm]. The span L [mm] of the panel shall also be reported in the ETA.
The characteristic value shall be determined by using the appropriate value of k_n for unknown V_X reported in Table D1, Annex D, of EN 1990.

2.2.4.2 Bending moment capacity of the panel with central support

Assessment method

The bending moment of the lightweight composite panels shall be determined on 10 panel specimens (see Annex A) at standard laboratory conditions (temperature of (23 ± 2) °C and relative humidity of (50 ± 5) %), after a pre-conditioning for at least 12 h before the test at a temperature of (23 ± 5) ºC.
The dimensions of the test specimen are those indicated in clause 2.2.4.1.
The test shall be carried out by subjecting the simply supported panel to a line load, applied in the middle of the span of the panel. This test shall be carried out on both orientations of the panel (10 specimens with the external facing layer uppermost and 10 specimens with the steel backing plate uppermost). The test shall be performed with a downward load as schematically shown in Figure A.14 of EN 14509 clause A.7.2. The loading rate shall be uniform and such as to result in failure between 5 min and 15 min after the commencement of the test. During the test, the deflection at load position shall be recorded. The load shall be increased until failure occurs and the load deflection curve shall be drawn for the displacement at the load position.

Expression of results

The average values (arithmetic mean) and the standard deviations of:

- the maximum applied load $F_{u,c}$ [kN],
- the deflection at $F_{u,c}$, $d_{Fu,c}$ [mm],

and the average value and the characteristic value of the bending moment capacity of the panel $M_{u,c}$ [kN m] shall be given in the ETA for the two tested orientations.
For each test, the bending moment capacity of the panel $M_{u,c}$ [kN m] shall be calculated as

$$M_{u,c} = \left(\frac{F_{u,c}}{4} + \frac{F_G}{8}\right) \cdot L \quad (2.2.4.2.1)$$

where F_G is the self-weight of the panel [kN]. The span of the panel L [mm] shall also be reported in the ETA.
The characteristic value shall be determined by using the appropriate value of k_n for unknown V_X reported in Table D1, Annex D, of EN 1990.

2.2.5 Bending moment of the panel after heat-rain and heat-cold cycles in span and with central support

Purpose of the assessment

The purpose of the assessment is the evaluation of the influence of heat-rain and heat-cold cycles in the efficiency of lightweight composite panels.

Assessment method

The resistance to heat-rain and heat-cold cycles of the lightweight composite panel shall be determined on 20 panel specimens with the dimensions as indicated in clause 2.2.4 (10 for span and 10 for central support for each orientation of the panel, see Annex A), subjected to the following hygrothermal cycles:

- Heat-rain cycles: series of 80 cycles, each comprising the following 6 hours-long phases: heating to +70°C (rise for 1 h) and maintaining at (+70 ± 5) °C and 10 to 30% relative humidity for 2 h (total

of 3 h), then spraying for 1 h at water temperature (+15 ± 5) °C and amount of water 1 l/m²min, finally leaving for 2 h (drainage);
- Conditioning at least for 48 h at temperatures between +10 and +25 °C and a minimum relative humidity of 50%;
- Heat-cold cycles: series of 5 cycles, each comprising the following 24 hours-long phases: exposure to (+50 ± 5) °C (rise for 1 h) and maximum 30% relative humidity for 7 h (total of 8 h), then exposure to (-20 ± 5) °C (fall for 2 h) for 14 h (total of 16 h).

At the end of this test, a bending test shall be conducted on panels in accordance with clause 2.2.4 of this EAD (in span and with central support, clauses 2.2.4.1 and 2.2.4.2 respectively).

Expression of results

Conditioned specimens after exposure shall be visually examined to describe surface changes, such as cracking, blistering or delamination. The observations shall be stated in the ETA.
The average values (arithmetic mean) and the standard deviation of:
- the maximum applied loads $F_{u,sp,hy}$ and $F_{u,c,hy}$ [kN] for exposed specimens,
- the deflections at $F_{u,sp,hy}$, $d_{Fu,sp,hy}$ and at $F_{u,c,hy}$, $d_{Fu,c,hy}$ [mm],

and the percentages of average bending moment capacity of the panel $M_{u,sp,hy,ret}$ and $M_{u,c,hy,ret}$ [%], retained by exposed specimens with respect to the values recorded for unexposed specimens, shall be given in the ETA (in span and with central support, see clauses 2.2.4.1 and 2.2.4.2 respectively), for each tested orientation.
These percentages are calculated on the basis of average results for the set of tested specimens. Specifically, the generic retained property X_{ret} [%] shall be determined by using the following expression:

$$X_{ret} = \frac{m_X^{exp}}{m_X^{unexp}} \cdot 100 \qquad (2.2.5.1)$$

where m_X^{exp} represents the average value of the property X assessed for the exposed specimens and m_X^{unexp} represents the average value of the property X assessed for the unexposed specimens.

2.2.6 Bending moment of the panel after freeze-thaw cycles in span and with central support

Purpose of the assessment

The purpose of the assessment is the evaluation of the influence of freeze-thaw cycles in the efficiency of lightweight composite panels.

Assessment method

The resistance to freeze-thaw cycles of the lightweight composite panels shall be determined in accordance with clause 7.4.1 of EN 12467 on 20 panel specimens with the dimensions as indicated in clause 2.2.4 (10 for span and 10 for central support for each orientation of the panel, see Annex A). At the end of this test, a bending test shall be conducted on panels in accordance with clause 2.2.4 of this EAD (in span and with central support, clauses 2.2.4.1 and 2.2.4.2 respectively).

Expression of results

Conditioned specimens after exposure shall be visually examined to describe surface changes, such as cracking, blistering or delamination. The observations shall be stated in the ETA.
The average values (arithmetic mean) and the standard deviation of:
- the maximum applied loads $F_{u,sp,FT}$ and $F_{u,c,FT}$ [kN] for exposed specimens,
- the deflections at $F_{u,sp,FT}$, $d_{Fu,sp,FT}$ and at $F_{u,c,FT}$, $d_{Fu,c,FT}$ [mm],

and the percentages of average bending moment capacity of the panel $M_{u,sp,FT,ret}$ and $M_{u,c,FT,ret}$ [%], retained by exposed specimens with respect to the values recorded for unexposed specimens, shall be given in the ETA (in span and with central support, see clauses 2.2.4.1 and 2.2.4.2 respectively), for each tested orientation.
These percentages are calculated on the basis of average results for the set of tested specimens in accordance with equation 2.2.5.1.

2.2.7 Tensile strength perpendicular to the faces of the panel

Purpose of the assessment

The purpose of the assessment is the evaluation of the tensile strength perpendicular to the faces of lightweight composite panels, attached between two rigid blocks, fastened in a tensile strength machine.

Assessment method

The tensile strength perpendicular to the faces of the lightweight composite panel shall be determined in accordance with clause 2.2.6 and Annex E of EAD 090058-00-0404 on 5 panel specimens (see Annex A).

Expression of results

The average value (arithmetic mean) and standard deviation of the load at failure F_t [kN], the average value and the characteristic value of the tensile strength of the adherence of the central core to the layers in which it is inserted σ_t [kPa] shall be given in the ETA.
The characteristic value shall be determined by using the appropriate value of k_n for unknown V_X reported in Table D1, Annex D, of EN 1990.

2.2.8 Compression strength perpendicular to the faces of the panel

Purpose of the assessment

The purpose of the assessment is the evaluation of the compression strength perpendicular to the faces of lightweight composite panels, when a compressive force is applied at a given rate of displacement in axial direction (perpendicular to the panel) at the ultimate load at failure.

Assessment method

The compression strength perpendicular to the faces of the lightweight composite panel shall be determined in accordance with clause 2.2.5 and Annex D of EAD 090058-00-0404 on 5 panel specimens (see Annex A).

Expression of results

The average value (arithmetic mean) and standard deviation of the ultimate load F_c [kN], the average value and the characteristic value of the compressive strength σ_c [kPa] shall be given in the ETA.
The characteristic value shall be determined by using the appropriate value of k_n for unknown V_X reported in Table D1, Annex D, of EN 1990.

2.2.9 Shear strength

Purpose of the assessment

The purpose of the assessment is the evaluation of the shear strength of lightweight composite panels, by means of a four-point bending test.

Assessment method

The shear strength of the lightweight composite panel shall be determined in accordance with clause 2.2.8 of EAD 090058-00-0404 and Annex G of EAD 090058-00-0404 on 5 panel specimens (see Annex A).

Expression of results

The average value (arithmetic mean) and the standard deviation of the load at failure F_s [kN], the average value and the characteristic value of the shear strength of the adherence of the central core to the layers in which it is inserted σ_s [kPa] and the force-deflection coefficient $FD_{s,av}$ [kN/mm] shall be given in the ETA.
The characteristic value shall be determined by using the appropriate value of k_n for unknown V_X reported in Table D1, Annex D, of EN 1990.

2.2.10 Peeling strength

Purpose of the assessment

The purpose of the assessment is the evaluation of peeling strength of the bond between the core panel of the lightweight composite panels and the external layers, by measuring the peeling force in a peeling jig fastened in a tensile machine and pulled apart. The test is applicable only for external metallic layers.

Assessment method

The peeling strength of the lightweight composite panel shall be determined in accordance with clause 2.2.7 and Annex F of EAD 090058-00-0404 on 5 panel specimens (see Annex A), with the exception that the peeling jig shall be as specified in clause 6.1.2 of EN 2243-3.

Expression of results

The average value (arithmetic mean) and the characteristic value of the peeling strength τ_p [N/mm] shall be given in the ETA.
The characteristic value shall be determined by using the appropriate value of k_n for unknown V_X reported in Table D1, Annex D, of EN 1990.

2.2.11 Water absorption

Purpose of the assessment

The purpose of the assessment is the evaluation of the water absorption of lightweight composite panels by the principle of impregnation of the dry slab with water.

Assessment method

The water absorption of the lightweight composite panels shall be determined in accordance with EN ISO 10545-3 on 5 specimens with minimum dimensions 200 x 200 mm (see Annex A). The cutting of the specimens from the lightweight composite panel shall be done vertically, taking care to respect the full orthogonality.

Expression of results

The individual values and the average value (arithmetic mean) of the water absorption E_v [%] shall be given in the ETA.

2.2.12 Determination of moisture movement

Purpose of the assessment

The purpose of the assessment is the evaluation of the moisture movement of lightweight composite panels between two specified moisture conditions, after immersion in water and after drying in stove.

Assessment method

The moisture movement of the lightweight composite panel shall be determined in accordance with EN 772-14 on 5 specimens with minimum dimensions 200 x 200 mm (see Annex A). The cutting of the specimens shall be done taking care to respect the orthogonality with an admissible tolerance of 1%. The moisture movement shall be measured in the direction of length, in the centreline of the short side of the panel.

Expression of results

The individual and average values (arithmetic mean) of:

- the coefficient of expansion due to humidity $\Delta l_g/l$ [mm/m],
- the shrinkage coefficient following drying in stove $\Delta l_r/l$ [mm/m],

and the total coefficient of variation $\Delta l_c/l$ [mm/m] shall be given in the ETA, following the indication given in clause 9 and 10 of EN 772-4.

2.2.13 Linear thermal expansion

Purpose of the assessment

The purpose of the assessment is the evaluation of the linear thermal expansion of lightweight composite panels for the temperature range from ambient temperature to 100°C.

Assessment method

The linear thermal expansion of the lightweight composite panels shall be determined in accordance with EN ISO 10545-8 on 5 specimens with minimum dimensions 200 x 200 mm and at least the minimum thickness (see Annex A). The cutting of the specimens shall be done taking care to respect the orthogonality with an admissible tolerance of 1%. To determine the coefficient of linear thermal expansion, three measurements shall be taken in the direction of the panel length, i.e., along the centre and the two sides of the panel (plan view). These measurements shall be taken both in correspondence of the external facing layer and of the structural core, in order to determine the linear thermal expansion coefficients of the coupled elements.

Expression of results

The average value (arithmetic mean) and the standard deviation of the linear thermal expansion coefficient α_l [10^{-6} °C^{-1}] shall be given in the ETA, both for the external facing layer and the structural core.

2.2.14 Impact resistance

Purpose of the assessment

The purpose of the assessment is the evaluation of the impact resistance of lightweight composite panels, by means of hard body and soft body.

Assessment method

The test shall be conducted on the lightweight composite panels considering the most unfavourable geometric characteristics (panel with the highest ratio length over width in its minimum thickness) on at least one specimen considering each different facing layers (see Annex A). The panel specimen shall be fixed to a retaining frame that does not allow for lateral or vertical movement and it shall be mounted:
- vertically (for soft body with regard to the intended uses 1, 2 or 3) or
- horizontally (for soft body for intended use 4 and for hard body for all the intended uses). In this last case the panel shall be horizontally positioned on supports, to allow, in case of an unfavourable test result, the possibility of the impactor going completely through the panel.

The impact resistance of the lightweight composite panels shall be determined in the centre of the panel by means of a:

- Soft body: The test shall be carried out with 3 impacts on one specimen put vertically (pendulum test, for intended uses 1, 2 and 3) or horizontally (drop test, for intended use 4), by means of a 50 (± 0,5) kg canvas bag impactor, with mass (m) dropped from a height (h) so that the total impact energy (E = g x h x m) corresponds with one of the following increasing energies E_{si}: 60, 100, 120, 130, 200, 240, 300, 400, 500, 600, 700, 900 and 1200 J. In order to decrease the number of tests, the manufacturer may propose the starting energy, then the test shall be repeated with the next higher energy of the sequence until failure. The height (h) is measured between the designated point of impact and the height of release of the soft body impactor.
- Hard body: the test shall be carried out with 3 impacts on one specimen put horizontally by means of a 1 kg steel ball (63,5 mm (± 1) diameter and 1030 g (± 40) mass) and by means of a 0,5 kg steel ball (50 mm (± 0,5) diameter and 514 g (± 19) mass). The total impact energy (E_{hi} = g x h x m) shall correspond with 3 or 10 J for 1 kg steel ball and 1,3, 2,5, 3,75 or 6 J for 0,5 kg steel ball. The height (h) is measured between the designated point of impact and the height of release of the hard body impactor.

  Note: g= 9,81 m/s

Expression of results

The lightweight composite panels shall be evaluated considering these criteria: no collapse (maintaining of mechanical integrity of the product), no penetration (no passage of the impactor through the specimen), no projection (no creation of parts projecting out from the panels on the other side or sharp cutting surfaces likely to cause personal injury by contact) and no degradation (no visible cracks or depressions or protuberances or any other defects which may influence the fitness for use of the panel).
The energy levels at which there is no damage under hard body impactor E_{hi} [J] and soft body impactor E_{si} [J] shall be given in the ETA.

2.2.15 Resistance to uniform static air pressure difference/air permeability

Purpose of the assessment

The purpose of the assessment is the evaluation of air permeability of the lightweight composite panels assembly, subjected to uniform static air pressure differences.

Assessment method

The air permeability of the lightweight composite panels assembly shall be determined in accordance with EN 12114 on at least one specimen (see Annex A), with further specifications as given in Annex A.12 of EN 14509.

Expression of results

The Δp_{max} [Pa], the air loss V' [m^3/h] and the n and C [$m^3/(s\ Pa^n)$] values shall be given in the ETA. In particular, for the regression technique to be used for the assessment of n and C values, Annex B of EN 12114 shall be used.

2.2.16 Durability of the adherence of the core panel to the external layers

Purpose of the assessment

The purpose of the assessment is the evaluation of durability of adherence of the core panel of the lightweight composite panels to the external layers in which it is inserted, by measuring the change in shear strength when the specimen is subjected to three different exposures.

Assessment method

The durability of adherence of the core panel of the lightweight composite panels shall be determined in accordance with clause 2.2.19 and Annex N of EAD 090058-00-0404 on 5 specimens (see Annex A), regarding the following three exposures:

- a cyclic temperature exposure of 50 cycles at a temperature between – 30°C and + 60°C,
- an exposure at a temperature of 100° C for 1500 hours under dry conditions,
- an exposure in water at a temperature of 70°C for 1000 hours.

Note: Please consider that in Annex N of EAD 090058-00-0404 the correct reference is clause 2.2.8.

Expression of results

The average value (arithmetic mean) of the change of shear strength in percentage after each exposure and the exposure conditions shall be given in the ETA:

- $\Delta\sigma_{c,s}$ [%], after the cyclic temperature exposure between – 30°C and + 60°C,
- $\Delta\sigma_{100,s}$ [%], after the exposure at a temperature of 100° C for 1500 hours under dry conditions,
- $\Delta\sigma_{70,s}$ [%], after the exposure in water at a temperature of 70°C for 1000 hours,

where the average value of the initial shear strength shall be the one determined in clause 2.2.8 of this EAD.

2.2.17 Thermal resistance / Thermal conductivity

Purpose of the assessment

The purpose of the assessment is the evaluation of thermal resistance and the thermal conductivity of lightweight composite panels, by means of the guarded hot plate or heat flow meter methods. The two methods are considered equivalent.

Assessment method

The thermal resistance and the thermal conductivity of the lightweight composite panels shall be determined in accordance with EN 12664 on at least 3 specimens (see Annex A), where the open edges of specimens shall be wrapped to PVC foil before test.

Expression of results

The individual and average value (arithmetic mean) of the thermal resistance R [m^2K/W] and of the thermal conductivity λ [W/mK] shall be given in the ETA, together with densities of the conditioned material as tested, relative mass changes during the test (in accordance with clause 8.1 of EN 12664) and thickness and volume changes during the test (clause 7.3.9 of EN 12664).

2.2.18 Resistance to thermal shock

Purpose of the assessment

The purpose of the assessment is the evaluation of resistance to thermal shock of lightweight composite panels, subjected to a cyclic procedure.

Assessment method

The resistance to thermal shock of the lightweight composite panels shall be determined in accordance with clause B.7.4 of EN 14509 on at least 1 specimen (see Annex A), consisting of a single simply supported panel with the maximum length and width of the product family and the minimum thickness of the external facing layer, without considering the optional measurements of stresses and displacements cited in B.7.4 note 2, which are not strictly part of the thermal shock test as also stated in B.7.5 of EN 14509, note 1.

Expression of results

Conditioned specimens after exposure shall be visually examined to describe surface changes and the observations shall be given in the ETA. The panel shall be assessed considering these criteria: absence of shear failure, blistering or delamination.

2.2.19 Salt spray resistance

Purpose of the assessment

The purpose of the assessment is the evaluation of the salt spray resistance of lightweight composite panels on the metallic layers (stainless-steel backing plate or metallic facing layer, when relevant), subjected to a neutral salt spray (NSS) test.

Assessment method

The salt spray resistance of the lightweight composite panels shall be determined on the metallic layers (stainless-steel backing plate and metallic facing layer, when relevant) in accordance with clause 5.2.2 of EN ISO 9227, on at least 3 specimens (see Annex A), subjected for 24 hours to a neutral 5% sodium chloride solution (NSS test), at the operating conditions summarized in clauses 9 and 10.1, Table 3.

Expression of results

The percentage of the total area of the specimen which shows basis metal corrosion, A [%], determined following the method of inspection of clauses 4 and 5 of EN ISO 10289 and the type of deterioration in accordance with table 2 of EN ISO 10289 shall be given in the ETA.

2.2.20 Resistance to ageing by UV radiation

Purpose of the assessment

The purpose of the assessment is the evaluation of resistance to ageing by UV radiation of lightweight composite panels, when the external layer is known to be sensitive to UV radiation.

Assessment method

The resistance to ageing by UV radiation of the lightweight composite panels shall be determined in accordance with EN ISO 4892-3 on at least 3 specimens (see Annex A), exposing specimens for 1600 hours to fluorescent UV radiation (QUV test), heat, humidity and water spray under controlled environmental conditions, following the exposure cycles of method A (EN ISO 4892-3, Table 4) with UVA 340 lamp (EN ISO 4892-3, Table 1), in order to consider outdoor daylight ultraviolet and visible region of the spectrum.

Expression of results

The absence or the determination of changes in appearance (colour change, cracking, delamination, warping) after exposure shall be stated 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 Commission Decision 98/437/EC, as amended by Commission Decision 2001/596/EC.

The applicable AVCP systems, except for uses subject to regulations on reaction to fire, are:

- Panels (internal or external wall finishes) and suspended ceiling finishes subject to regulations on dangerous substances: **3**;
- Panels and suspended ceilings finishes for other uses: **4**.

For uses subject to regulations on reaction to fire, the applicable AVCP systems 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 3.2.1.

Table 3.2.1 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	*Incoming materials:* single materials and components (i.e., steel backing plate, central core, glue, different facing layers)	Check of delivery ticket or label on the package / Supplier documents or supplier tests' check	Conformity with the order and according to the control plan	Each delivery	Each delivery
2	*Incoming materials:* - quantity, - geometry (form and dimensions), - absence of defects or superficial damages, - expiry date where relevant (glues or resins)	Visual check / Measuring (meter / calliper) / Supplier documents' check	Conformity with the order and according to the control plan	Each delivery	Each delivery / each slab
3	*Incoming materials:* - properties and mechanical characteristics, in particular for the central core (expanded polymer core and aluminium honeycomb core), including the apparent core density of the core panel	Check of delivery ticket or label on the package/Supplier documents or supplier test's check / According to Tables 2.1.1, 2.1.2, 2.1.3 and 2.1.4, where relevant	Conformity with the order and according to the control plan	Each delivery	Each delivery
4	*Production process:* - assembly of the different layers with glues, - adherence and - pressing	According to control plan / Measuring / Manual and visual checks / Machinery control	According to control plan	1 sample per criterion	Each batch
5	*Production process:* external finishing layers plating	According to control plan / Measuring / Manual and visual checks / Machinery control	According to control plan	1 sample per criterion	Each batch
6	*Production process:* cut	According to control plan / Measuring / Manual and visual checks / Machinery control	According to control plan	1 sample per criterion	Each batch

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
7	*Production process:* - additional processing and - drilling	According to control plan / Measuring / Manual and visual checks / Machinery control	According to control plan	1 sample per criterion	Each batch
8	*Production process:* - grouting and - assembly	According to control plan / Measuring / Manual and visual checks	According to control plan	1 sample per criterion	Each batch
9	*Finished product:* lightweight composite panels: - form, - geometry and - absence of defects	According to control plan / Visual check / Manual check/ Production drawings	According to control plan	1 sample per criterion	Each batch
10	Reaction to fire	Indirect tests: Check that all relevant indirect parameters as determined within the reaction to fire tests are fulfilled (e.g., dimensions, weight per unit area, applied quantity per unit area, organic content / mass loss of components, as well as of the finished panel)	According to control plan	1 sample per criterion	Each batch
		Direct tests: 2.2.1	According to control plan	1 sample per criterion	Once per two years

3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire 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).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.2.

Table 3.3.2 Control plan for the notified body in cases of AVCP 1 for reaction to fire; cornerstones

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 carried out by the manufacturer regarding the constancy of performance related to reaction to fire					
1	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire					
2	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1.	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	Once per year

4 REFERENCE DOCUMENTS

EAD 090058-00-0404	Ventilated external wall cladding kit comprising a metallic honeycomb panel and its associated fixings
EAD 210046-00-1201	Thin metal composite sheet
EN 772-14:2001	Methods of test for masonry units - Part 14: Determination of moisture movement of aggregate concrete and manufactured stone masonry units
EN 1990:2023	Eurocode - Basis of structural and geotechnical design
EN 2243-3:2005	Aerospace series - Non-metallic materials - Structural adhesives - Test method - Part 3: Peeling test metal-honeycomb core
EN 12114:2000	Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method
EN 12467:2012 + A2:2018	Fibre-cement flat sheets - Product specification and test methods
EN 12664:2001	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13823:2020+A1:2022	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 14509:2013	Self-supporting double skin metal faced insulating panels - Factory made products - Specifications
EN 16516:2017+A1:2020	Construction products: Assessment of release of dangerous substances – Determination of emissions into indoor air
EN 16637-2:2023	Construction products: Assessment of release of dangerous substances – Part 2: Horizontal dynamic surface leaching test
EN ISO 4892-3:2016	Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps (ISO 4892-3:2016)
EN ISO 6341:2012	Water quality. Determination of the inhibition of the mobility of Daphnia magna Straus (Cladocera, Crustacea). Acute toxicity test (ISO 6341:2012)
EN ISO 9227:2022+A1:2024	Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227:2022+A1:2024)
EN ISO 10289:2001	Methods for corrosion testing of metallic and other inorganic coatings on metallic substrates - Rating of test specimens and manufactured articles subjected to corrosion tests (ISO 10289:1999)
EN ISO 10545-3:2018	Ceramic tiles - Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density (ISO 10545-3:2018)
EN ISO 10545-8:2014	Ceramic tiles - Part 8: Determination of linear thermal expansion (ISO 10545-8:2014)
EN ISO 11348-1:2008+A1:2018	Water quality. Determination of the inhibitory effect of water samples on the light emission of Vibrio fischeri (Luminescent bacteria test). Part 1: Method using freshly prepared bacteria (ISO 11348-1:2007/Amd 1:2018)

EN ISO 11348-2:2008+A1:2018	Water quality. Determination of the inhibitory effect of water samples on the light emission of Vibrio fischeri (Luminescent bacteria test). Part 2: Method using liquid-dried bacteria (ISO 11348-2:2007/Amd 1:2018)
EN ISO 11348-3:2008+A1:2018	Water quality. Determination of the inhibitory effect of water samples on the light emission of Vibrio fischeri (Luminescent bacteria test). Part 3: Method using freeze-dried bacteria (ISO 11348-3:2007/Amd 1:2018)
EN ISO 11925-2:2020	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)
EN ISO 15799:2022	Soil quality – Guidance on the ecotoxicological characterization of soils and soil materials (ISO 15799:2019)

ANNEX A – SUMMARY OF TESTS

BWR	TYPE	ESSENTIAL CHARACTERISTIC	TEST TYPE (clauses)	MINIMUM NUMBER OF SPECIMENS
BWR2	Safety in case of fire	Reaction to fire	2.2.1	In accordance with relevant standards in connection with Commission Delegated Regulation (EU) No 2016/364
BWR3	Hygiene, health and the environment	Water impermeability	2.2.3	3
BWR3	Hygiene, health and the environment	Bending moment of the panel in span and with central support	2.2.4	10 (span) + 10 (central support) for each panel orientation
		Bending moment of the panel after heat-rain and heat-cold cycles in span and with central support	2.2.5	10 (span) + 10 (central support) for each panel orientation
		Bending moment of the panel after freeze-thaw cycles in span and with central support	2.2.6	10 (span) + 10 (central support) for each panel orientation
		Tensile strength perpendicular to the faces of the panel	2.2.7	5
		Compression strength perpendicular to the faces of the panel	2.2.8	5
		Shear strength	2.2.9	5
		Peeling strength	2.2.10	5
		Water absorption	2.2.11	5
		Determination of moisture movement	2.2.12	5
		Linear thermal expansion	2.2.13	5
		Impact resistance	2.2.14	1
		Resistance to uniform static air pressure difference/air permeability	2.2.15	1
		Durability of the adherence of the core panel to the external layers	2.2.16	5
BWR3	Energy economy and heat retention	Thermal resistance / Thermal conductivity	2.2.17	3
-	Aspects of durability	Resistance to thermal shock	2.2.18	1
		Salt spray resistance	2.2.19	3
		Resistance to ageing by UV radiation	2.2.20	3

ANNEX B – MOUNTING AND FIXING PROVISIONS AS WELL AS EXTENDED APPLICATIONS RULES FOR THE RELEVANT REACTION TO FIRE TESTS

B.1 Single burning item test (EN 13823)

B.1.1 Dimensions of the test rig

The test rig consists of a corner with a short and a long wing. The dimensions of the specimens shall be:

	Assembly dimensions (mm – nominally)	
	Length	**Height**
Short wing	500	1500
Long wing	1000 + t	1500
Where t = thickness of the panels		

On the long wing of the test specimen at least one vertical and one horizontal joint shall be considered as prescribed in the test standard (200 mm away from the inner corner of the test specimen and 500 mm above the floor of the specimen trolley).

B.1.2 Test specimen

The lowest total thickness of the panels shall be used for preparing the test specimens.

The panels used in the test assembly shall always include all external facing layers that are applied to the product as it is placed onto the market. Each different facing layer type requires new tests using the variant with the highest application rate/weight per unit area (in dry condition).

Each different adhesive, connecting the structural core (expanded polymer core or aluminium honeycomb core) to its outer skins in the lightweight composite panels, requires new tests using the variant with the highest application rate/weight per unit area (in dry condition).

Influences of different colours of facings may be determined by performing indicative SBI tests on a light colour, a dark colour and red. The complete SBI test shall be conducted at least on the worst case. If the colour leads to different class or sub-class (smoke and droplets) the worst case for each one shall be tested to obtain each class or sub-class.

The assembly, including the joint detail and corner detail, shall be in accordance with end use conditions as specified by the ETA-applicant. For a most unfavourable situation, do not use a protecting profile in the vertical corner of the test assembly, where the panels create a vertical closed joint.

B.1.3 Mounting and fixing of the test assembly

Panels shall be mounted and fixed freely suspended in accordance with EN 13823, clause 5.2.2, mounting assembly a), with a distance of 80 mm to the backing board.

B.1.4 Extended applications of test results

The results of tests considering the parameters of the specimen are also valid for panels with:

- the same external facing layer,
- the same adhesive with lower application rate/weight per unit area (in dry condition),
- other metallic skins (material, thickness, etc.) with higher melting point and higher thickness than tested,
- other metallic honeycomb core (material, thickness, etc.) or expanded polymer core, with higher melting point than tested,
- for equal or higher total thickness.

B.2 Small ignition source test (EN ISO 11925-2)

B.2.1 Dimensions of the test specimen

The dimensions of the test specimens shall be as prescribed in clause 5.2 of EN ISO 11925-2.

B.2.2 Test specimen

The panels used in the test assembly shall always include all external facing layer that are applied to the product, as it is placed onto the market. Each different external facing layer type requires new tests using the variant with the highest application rate/weight per unit area (in dry condition).

When testing on the cut edge of the specimen, each different adhesive connecting the core to the outer skins requires new tests using the variant with the highest application rate/weight per unit area (in dry condition).

Influences of different colours of facings or coatings may be determined by testing two specimens for each relevant colour with the small ignition source tests (i.e., on a light colour, a dark colour and red). The complete small ignition source test (four further specimens) shall be conducted at least on the worst case.

B.2.3 Mounting and fixing of the test assembly

Panels shall be mounted and fixed in accordance with EN ISO 11925-2 as free-hanging specimens without consideration of a substrate behind. The flame is applied on the surface of the panel, in accordance with clause 7.3.3.1 of EN ISO 11925-2. When relevant, panels shall be tested on the cut edges in accordance with clause 7.3.3.2 of EN ISO 11925-2.

B.2.4 Extended applications of test results

The results of tests considering the parameters of the specimen are also valid for panels with:

- the same external facing layer,
- the same adhesive with lower application rate/weight per unit area (in dry condition),
- other metallic honeycomb core (material, thickness, etc.) or expanded polymer core, with higher melting point than tested.