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European Assessment Document for

# Load-bearing sandwich panels with foam or polymeric core and skins of structural cement bonded particle boards



CE

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

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# 1 SCOPE OF THE EAD

## 1.1 Description of the construction product

This EAD covers the assessment of loadbearing sandwich panels with foam or polymeric core and skins of structural cement bonded particle boards (in the following referred to as “sandwich panel(s)”). The sandwich panels have an interlocking mechanism to connect the sandwich panels.

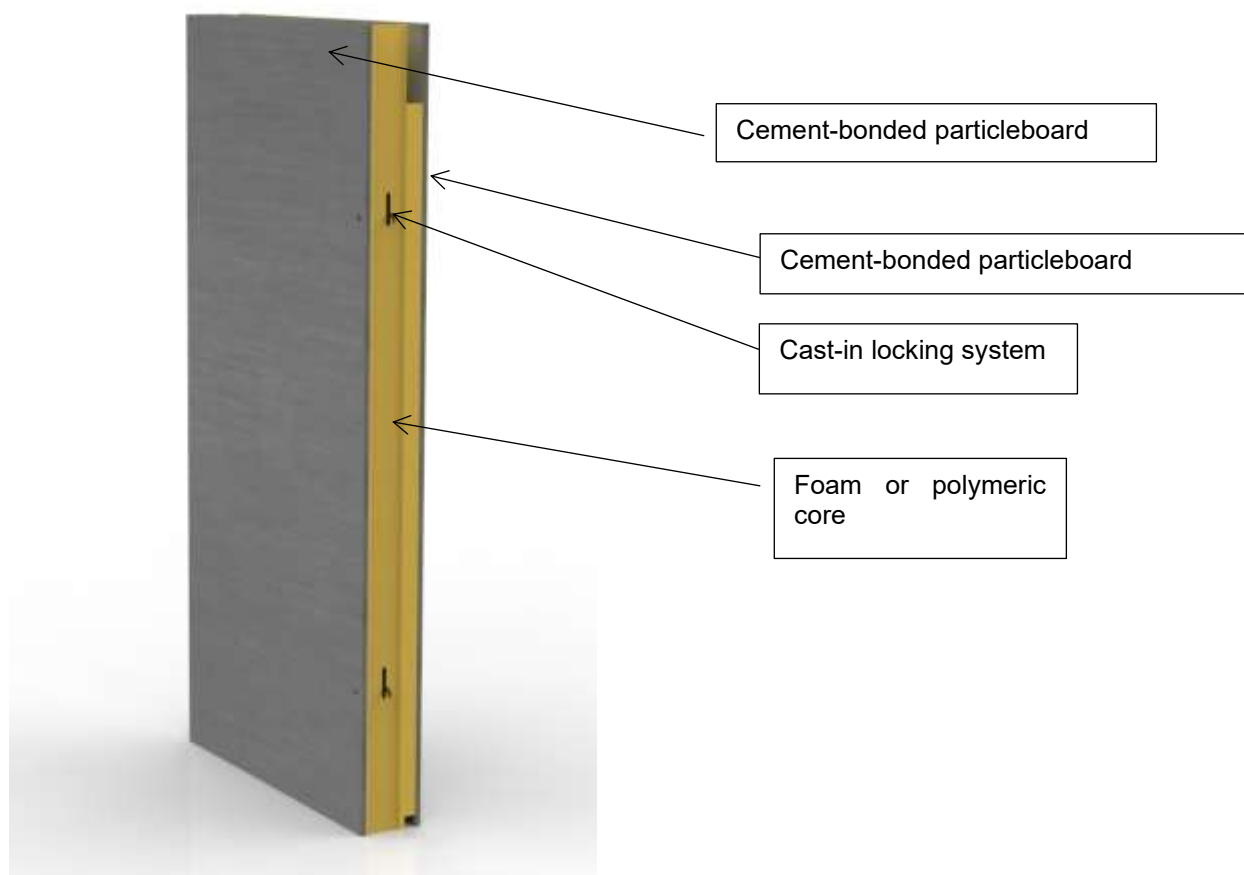


Figure 1.1.1 example of the sandwich panel

The sandwich panels are fixed to a supporting structure – plinth on the foundation – and works as simply supported panel. The sandwich panels are fixed with an L-profile or a U-profile. Assessment of the L- and U-profiles is not covered by the EAD and any stiffening effect of sandwich panel when connected to the support is not considered and therefore not covered by the EAD.

The panel is described in accordance with EN 14509<sup>1</sup> with the dimensional tolerances given in EN 14509 table 4.

The sandwich panels are made in an auto adhesion process, where self-adhesion of the core to the face(s) occurs automatically without the use of an adhesive (see 3.1 of EN 14509).

The product is not fully covered by a harmonized European standard, EN 14509, as this standard covers only sandwich panels with metal skins and sandwich panels only for non-loadbearing use. From table ZA.1.1 of EN 14509, the following essential characteristic have been omitted as it is not applicable; Flexural tensile

<sup>1</sup> All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4

strength, since in EN 14509 it is indicated that the characteristics applies only to panels used for ceilings which is not covered by this EAD. The following characteristics have been added in this EAD in order to assess the loadbearing performance of the sandwich panel: Racking resistance and stiffness and compressive load capacity for wall panel.

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 they consider 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 sandwich panels are used as loadbearing, fire resistant sandwich panels for vertical applications – internal and external walls in buildings.

### **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 sandwich panel for the intended use of 50 years when installed in the works (provided that the sandwich panel is subject to appropriate installation (see 1.1)). 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<sup>2</sup>.

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.

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<sup>2</sup> 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 the assumed working life.

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the panel is established in relation to the essential characteristics.

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.

No	Essential characteristic	Assessment method	Type of expression of product performance
<b>Basic Works Requirement 1: Mechanical resistance and stability</b>			
1	Racking resistance and stiffness	2.2.1	Level
2	Creep coefficient	EN 14509, section 5.2.1.3, and A.6	Level
3	Shear strength after long-term loading	EN 14509, section 5.2.1.5, and A.3.6	Level
4	Shear strength and modulus	EN 14509, section 5.2.1.2, and A.3	Level $f_{cv, char}$ [MPa] $G_{C, char}$ [MPa]
5	Compressive strength and modulus	EN 14509, section 5.2.1.4 and A.2	Level
6	Cross panel tensile strength	EN 14509, section 5.2.1.6 and A.1	Level
7	Bending moment capacity and wrinkling stress	EN 14509, section 5.2.1.7, and A.5 and figure A.8.	Level
8	Bending moment capacity and wrinkling stress over a central support	EN 14509, section 5.2.1.2, and A.7 and figures A.14 and A.15	Level
9	Compressive load capacity for wall panel	2.2.2	Level
<b>Basic Works Requirement 2: Safety in case of fire</b>			
10	Reaction to fire	2.2.3	Class
11	Resistance to fire	2.2.4	Class
<b>Basic Works Requirement 3: Hygiene, health and the environment</b>			
12	Water permeability	EN 14509 section 5.2.6 and A.11	Class
13	Water vapour permeability	2.2.5	Level
14	Content, emission and/or release of dangerous substances	2.2.6	Level

No	Essential characteristic	Assessment method	Type of expression of product performance
<b>Basic Works Requirement 4: Safety and accessibility in use</b>			
15	Impact resistance	EAD 210005-00-0505 section 2.2.6	Level
<b>Basic Works Requirement 5: Protection against noise</b>			
16	Direct airborne sound insulation	2.2.7	Level
15	Sound absorption	EN 14509 section 5.2.10	
<b>Basic Works Requirement 6: Energy economy and heat retention</b>			
17	Thermal conductivity/resistance	EN 14509 section 5.2.2 and A.10	Level
18	Air permeability	EN 14509 section 5.2.7 and A.12	Level
19	Thermal inertia	2.2.8	Level
<b>Aspects of durability</b>			
20	Durability	EN 14509 section 5.2.3.1 (DUR1 only) and annex <ul style="list-style-type: none"> <li>• B.5 wedge test</li> <li>• B.6 repeated loading test and</li> <li>• B.7 thermal shock test depending on the core material</li> </ul>	Description

## **2.2 Methods and criteria for assessing and classification of 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.

If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant essential characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required

### **2.2.1 Racking resistance and stiffness**

The racking resistance and stiffness shall be tested in accordance with clause 2.2.17 and annex A.9 of EAD 340179-00-0203 and the characteristic racking stiffness  $R$  and racking resistance  $F_{max}$  shall be stated in the ETA.

### **2.2.2 Compressive load capacity for wall panel**

The compressive load capacity of the panel is determined in accordance with clause 2.2.17 and annex A.1.1 and A.1.2 of EAD 340179-00-0203, and the values compression strength and the compression strength combined with a lateral force shall be stated in the ETA.

### **2.2.3 Reaction to fire**

The sandwich panel shall be tested, using the method(s) relevant for the corresponding reaction to fire class according to EN 13501-1 taking into account annex C.1 of EN 14509. The sandwich panels shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

The class and the corresponding field of application shall be stated in the ETA.

### **2.2.4 Resistance to fire**

The sandwich panel shall be tested, using the test method relevant for the corresponding fire resistance class, in order to be classified in accordance with EN 13501-2 taking into account annex C2 of EN 14509.

The description of the tested construction, the corresponding classification and field of application shall be stated in the ETA.

### **2.2.5 Water vapour permeability**

The water vapour permeability (water vapour diffusion resistance factor) of the sandwich panel shall be tested in accordance with EN 12086 climatic condition A. Prior to the test, the specimens shall be stored at 23 °C and 50 % relative humidity till mass is constant.

The water vapour diffusion resistance factor  $\mu$  shall be stated in the ETA.

## 2.2.6 Content, emission and/or release of dangerous substances

The performance of the product 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<sup>3</sup> 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
- IA2: Product with indirect contact to indoor air (e.g., covered products) but possible impact on indoor air
- S/W2 Product with indirect contact to soil, ground and surface water

### SVOC and VOC

If the intended use is covered by the release scenarios IA1 and/or IA2 semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC) are to be determined in accordance with EN 16516.

The loading factor to be used for emission testing is for walls 1.0

The test specimen presents the maximum thickness and is appropriate to the size of the test chamber. Every product variant (e.g., plastered, coated or painted products) is to be tested. The edges of the product should be sealed with self-adhesive, VOC-free aluminium foil or using a suitable frame. It has to be ensured that no emission derives from the back side.

Once the test specimen has been produced, as described above, it should immediately be placed in the emission test chamber. This time is considered the starting time of the emission test.

The test results have to be reported for the relevant parameters (e.g. chamber size, temperature and relative humidity, air exchange rate, loading factor, size of test specimen, conditioning, production date, arrival date, test period, test result) after 3 and 28 days testing.

The relevant test results shall be expressed in [mg/m<sup>3</sup>] and stated in the ETA

#### 2.2.6.1 Emission of formaldehyde

The emission of formaldehyde shall be determined in accordance with section 5.7 of EN 13986 based on EN 717-1.

The formaldehyde emission in [mg/m<sup>3</sup>] and the corresponding formaldehyde classification shall be stated in the ETA.

### Leachable substances

For the intended use covered by the release scenario S/W2 the performance of the product concerning leachable substances shall be assessed, if the product contains protective agents for root penetration. A leaching test with subsequent eluate analysis shall take place, each in duplicate. Leaching tests of the membrane contained agents for root penetration are conducted in accordance with EN 16637-2. The

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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 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 according to 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.

leachant shall be pH-neutral demineralised water and the ratio of liquid volume to surface area must be  $25 \pm 5 \text{ l/m}^2$ .

The membrane shall be applied to a glass plate by heating. The edges are not sealed. The cut edges of the membrane strip exposed to the eluent should be included in the calculation as a leachable area. The eluates taken after 6 hours / 1 day / 2 days and 6 hours / 4 days / 9 days / 16 days / 36 days / 64 days shall be analysed for all environmentally relevant parameters, presumably at least the following:

- TOC in accordance with EN 1484,
- pH-value in accordance with EN ISO 10523,
- electrical conductivity in accordance with EN 27888,
- agents for root penetration concentration [ $\mu\text{g/L}$ ], agents for root penetration release [ $\mu\text{g/m}^2$ ]
- and the cumulative agents for root penetration release [ $\text{g/m}^2$ ] according to appropriate test
- method

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 8692
- Luminescent bacteria test in accordance with EN ISO 11348-1, EN ISO 11348-2 or EN ISO 11348-3, which are considered to be equivalent
- For each biological test, EC20-values shall be determined for dilution ratios 1:2, 1:4, 1:6, 1:8 and 1:16.

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

- Biological degradation in accordance with OECD Test Guideline 301 parts A, B or E.

Determined toxicity in biological tests 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.

### 2.2.7 Direct airborne sound insulation

The airborne sound insulation of the sandwich panel is tested in accordance with EN ISO 10140-2 including the additional provisions described in section A.13 of EN 14509. The rating of airborne sound insulation shall be done in accordance with EN ISO 717-1.

The airborne sound insulation of the sandwich panel shall be stated in the ETA as a level together with a detailed description of the configuration for which the values are valid.

### 2.2.8 Thermal inertia

The thermal inertia of the materials used for the sandwich panel are calculated on the basis of the following information taken from the manufacturer's product installation information (MPII) or from the specifications of the materials used:

- total mass,  $m$ , per unit area (in  $\text{kg/m}^2$ ) for the assembled kit,
- density,  $\sigma$ , of materials used for the core (in  $\text{kg/m}^3$ ),
- heat capacity,  $c$ , of materials used (in  $\text{J/kg K}$ ),
- thermal conductivity ( $\text{W m}^{-1} \text{K}^{-1}$ ).

The information given on the total mass per unit area, the density, the heat capacity and the thermal conductivity of each material used for the sandwich panel shall be given in the ETA. If the information is not available from the MPII or from the material specification, the information shall be determined by testing in accordance with the relevant clauses of EN 14509 (clause A.8 of EN 14509 for mass and density and clause A.10 for heat capacity and thermal conductivity). The total thermal inertia shall be calculated as  $I$  in [ $\text{J m}^{-2} \text{K}^{-1} \text{s}^{-1/2}$ ] from the following formula and given in the ETA.

$$I = \sqrt{\rho c k}$$

where  $k$  is the thermal conductivity ( $\text{W m}^{-1} \text{K}^{-1}$ ),  $\rho$  the bulk density ( $\text{kg/m}^3$ ), and  $c$  the specific heat capacity ( $\text{J kg}^{-1} \text{K}^{-1}$ ) of the bulk soil material.

### 3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

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

For the products covered by this EAD the applicable European legal act is Decision 2018/779.

The applicable AVCP system is 2+ for any use except for uses subject to regulations on reaction to fire.

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

#### 3.2 Tasks of the manufacturer

The corner stones of the actions to be undertaken by the manufacturer of the sandwich panel 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
<b>Factory production control (FPC)</b>					
1	Reaction to fire *	2.2.2 EN 14509, 6.3.5.3 a) Table 8 Minimum testing frequency for components	As defined in control plan	As defined in control plan	Specification record
2	Dimensional tolerances	EN 14509 Test method according to Annex D	As defined in control plan	1	1 per shift
3	Density of core material	EN 14509 Test method according to A.8	As defined in control plan	3	1 per shift
4	Cross panel tensile strength	2.2.1.4 EN 14509 Test method according to A.1	As defined in control plan	3	1 per shift
5	Compressive strength and modulus of core material	2.2.1.3 EN 14509 Test method according to A.2	As defined in control plan	3	1 per week
6	Shear strength and modulus of core material	2.2.1.2 EN 14509 Test method according to A.3	As defined in control plan	3	1 per week
7	Tensile strength of face material, supplier's declaration	EN 13986	As defined in control plan	3	All deliveries
8	Shear strength and modulus of the core material based on testing of the complete panel	EN 14509 Test method according to A.4	As defined in control plan	1	1 per 2 weeks
9	Thermal insulation performance	EN 14509 Test method according to A.10.2.1.1	As defined in control plan	1	1 per month
10	Water permeability, EN 14509 5.2.6 Air permeability, EN 14509 5.2.7 Water vapour permeability, EN 14509 5.2.8	Visual inspection	As defined in control plan	As defined in control plan	-

\*) indirect testing in accordance to the manufacture's methods

### 3.3 Tasks of the notified body

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

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products 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 3.3.1.

**Table 3.3.1: Control plan for the notified body; cornerstones;**

	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Initial inspection of the manufacturing plant and of factory production control</b>					
1	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the sandwich panel	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
<b>Continuous surveillance, assessment and evaluation of factory production control</b>					
2	The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan.	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	According to Control plan	According to Control plan	1 per year

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 actions 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; cornerstones**

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>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</b> <i>(for system 1 only)</i>					
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
<b>Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire</b> <i>(for system 1 only)</i>					
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	1/year

## 4 REFERENCE DOCUMENTS

EN 14509:2013	Self-supporting double skin metal faced insulating panels – Factory made products – Specifications
EN13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using test data from fire reaction to fire tests
EN 13501-2:2023	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 12086:2013	Thermal insulating products for building applications – Determination of water vapour transmission properties
EN 13986:2004+A1:2015	Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking
EN 717-1:2004	Wood-based panels – Determination of formaldehyde release – Part 1: Formaldehyde emission by the chamber method
EN ISO 10140-2:2021	Acoustics – Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation
EN ISO 717-1:2020	Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation
EAD 210005-00-0505	Internal partition kits for use as non-loadbearing walls
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 1484:1997	Water analysis – Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)
EN ISO 10523:2012	Water quality – Determination of pH
EN 27888:1993	Water quality – Determination of electrical conductivity
EN ISO 6341:2012	Water quality – Determination of the inhibition of the mobility of <i>Daphnia magna</i> Straus (Cladocera, Crustacea) – Acute toxicity test
EN ISO 8692:2012	Water quality – Fresh water algal growth inhibition test with unicellular green algae
EN ISO 11348-1:2008/A1:2018	Water quality – Determination of the inhibitory effect of water samples on the light emission of <i>Vibrio fischeri</i> (Luminescent bacteria test) – Part 1: Method using freshly prepared bacteria
EN ISO 11348-2:2008/A1:2018	Water quality – Determination of the inhibitory effect of water samples on the light emission of <i>Vibrio fischeri</i> (Luminescent bacteria test) – Part 2: Method using liquid-dried bacteria
EN ISO 11348-3/A1:2018	Water quality – Determination of the inhibitory effect of water samples on the light emission of <i>Vibrio fischeri</i> (Luminescent bacteria test) – Part 3: Method using freeze-dried bacteria
OECD Test Guideline 301:1992	OECD Guideline for testing of chemicals
EAD 340179-00-0203	Structural panelled building kit