



www.eota.eu

EAD 170018-00-0305

October 2018

European Assessment Document for

Thermally-insulating and loadbearing units made of cellular glass



The reference title and language for this EAD is English. The applicable rules of copyright refer to the document elaborated in and published by EOTA.

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.....	4
1.1	Description of the construction product	4
1.2	Information on the intended use(s) of the construction product	5
1.2.1	Intended use(s)	5
1.2.2	Working life / durability	5
1.3	Specific terms used in this EAD	5
1.3.1	Thermal break	5
1.3.2	Cellular glass.....	6
1.3.3	Long term compressive strength.....	6
2	Essential characteristics and relevant assessment methods and criteria.....	7
2.1	Essential characteristics of the product	7
2.2	Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product	8
2.2.1	Compressive strength as part of masonry with a layer made out of thermally-insulating and loadbearing units made of cellular glass	8
2.2.2	Shear strength as part of masonry with a layer of thermally-insulating and loadbearing units made of cellular glass	9
2.2.3	Compressive strength and normalised compressive strength of thermally-insulating and loadbearing units made of cellular glass	10
2.2.4	Creep long term behaviour	10
2.2.5	Eccentric loading behaviour	11
2.2.6	Long term compressive strength.....	11
2.2.7	Reaction to fire.....	12
2.2.8	Propensity to undergo continuous smouldering.....	12
2.2.9	Dimensional stability at specified temperature and humidity	13
2.2.10	Water absorption by immersion – Long term	13
2.2.11	Water absorption by capillarity.....	13
2.2.12	Water vapour resistance	13
2.2.13	Release of dangerous substances	14
2.2.14	Geometry	14
2.2.15	Density	14
2.2.16	Thickness of liner.....	14
2.2.17	Sound insulation.....	15
2.2.18	Thermal resistance	15
2.2.19	Thermal linear transmittance.....	16
2.2.20	Durability.....	16
3	ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE	17
3.1	System(s) of assessment and verification of constancy of performance	17
3.2	Tasks of the manufacturer	18
3.3	Tasks of the notified body	20
3.4	Special methods of control and testing used for the verification of constancy of performance	21
3.4.1	Thickness of liner.....	21
4	Reference documents	22
Annex A:	GUIDANCE FOR TEST OF REACTION TO FIRE.....	24

1 SCOPE OF THE EAD

1.1 Description of the construction product

This EAD specifies assessment methods for factory-made thermally-insulating and loadbearing units, made of cellular glass, with liner(s) on the bed faces.

The geometry of the units is adapted to the masonry unit types used in the various Member States.

Products covered by this EAD have a thermal conductivity smaller or equal to 0,060 W/m.K and a compressive strength larger or equal to 1,8 N/mm². Different product types may have different levels of compressive strength. The long-term water absorption by partial immersion does not exceed 0,5 kg/m².

The product is not fully covered by EN 13167¹, because that standard does not address the following characteristics that are relevant for the intended use as a loadbearing unit:

- compressive strength as part of masonry with a layer made out of thermally-insulating and loadbearing units made of cellular glass,
- shear strength as part of masonry with a layer of thermally-insulating and loadbearing units made of cellular glass,
- compressive strength and normalised compressive strength of thermally-insulating and loadbearing units made of cellular glass,
- eccentric loading behaviour,
- water absorption by capillarity;
- geometry (length, width, thickness, squareness, flatness and density; c.f. the series of harmonised standards EN 771, parts 1 to 6),
- thickness of liner (c.f. the series of harmonised standards EN 771, parts 1 to 6),
- thermal linear transmittance.

The tensile/flexural strength and the deformation under point load are covered by EN 13167, but are not relevant for the intended use (see 1.2.1).

Furthermore, long-term compressive strength and creep-long term behaviour are covered by EN 13167, but the assessment methods are modified in this EAD, compared with EN 13167, due to the nature of the product.

The product is not covered by any of the EN 771-series of harmonised standards because these standards cover clay, calcium silicate, aggregate concrete, autoclaved aerated concrete, manufactured stone or natural stone masonry units and, thus, the assessment methods for cellular glass differs from those covered by that series of standards.

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 the absence of such instructions, according to the usual practice of the building professionals.

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

This EAD does not address the assessment of ancillary products, such as mortar, as a part of installation provisions or in the framework of assessing the performance of the product. Nevertheless, as far as they might have an influence on the product performance, they are to be taken into account and described as conditions under which the product performance has been achieved.

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

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

1.2.1 Intended use(s)

The product is used in masonry constructions to eliminate structural thermal bridging, reduce the risk of condensation and mould growth. The thermally-insulating and loadbearing units made of cellular glass with liner on the bed faces is intended to be used with mortar according to EN 998-2.

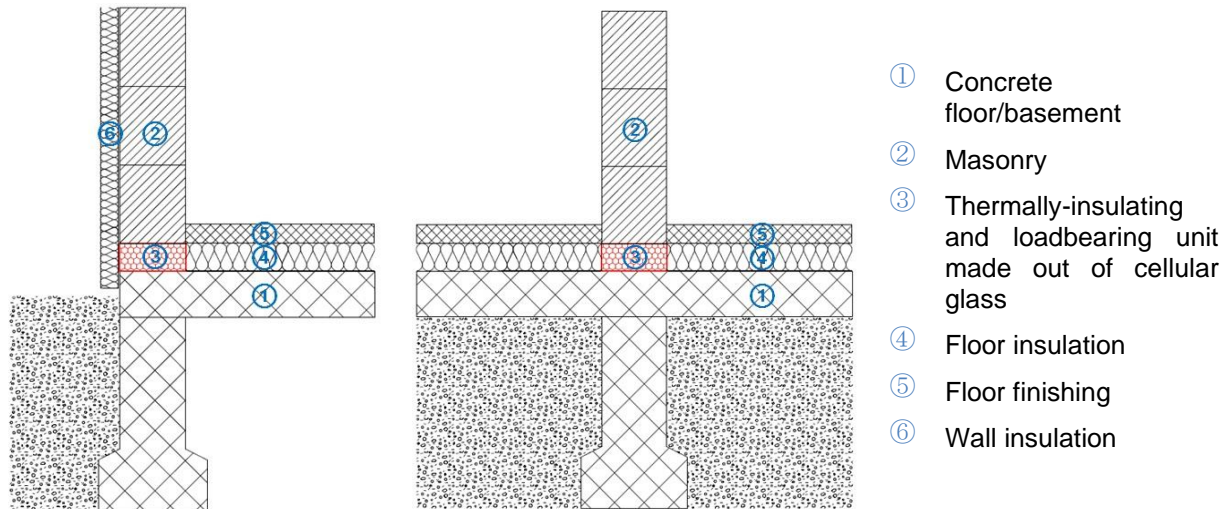


Figure 1.2.1.1: Example of the application of thermally-insulating and loadbearing units made of cellular glass

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 product for the intended use of 50 years when installed in the works, provided that the thermally-insulating and loadbearing units made of cellular glass are 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 works².

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 Thermal break

A thermal break is intended to prevent heat losses on junctions between building elements (e.g., a wall, flooring, etc.), dividing environments with different temperatures and humidity conditions.

² The real working life of a product incorporated in a specific works depends on the environmental conditions the works is subjected to, as well as on the particular conditions of the design, execution, use and maintenance of those works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than those referred to.

The inverse of a thermal break is a thermal bridge. The consequences of thermal bridges compared with those of the unbridged structure are a change in heat flow rate and a change in internal surface temperature.

A thermal bridge usually gives rise to two- or three-dimensional heat flows, which may be precisely determined in accordance with EN ISO 10211 and/or EN ISO 14683.

Thermal bridges may also give rise to low internal surface temperatures, with an associated risk of surface condensation or mould growth. Therefore, the thermally-insulating and loadbearing units made of cellular glass shall resist to water absorption.

1.3.2 Cellular glass

Cellular glass in the context of this EAD is a rigid insulation material made from expanded glass³, with a closed cell structure (cf. EN 13167). As part of masonry elements, and for the conveniences of this end-use, the thermally-insulating and loadbearing units made of cellular glass are faced with liner(s) on the bed faces. The liner(s) shall be described in the ETA.

1.3.3 Long term compressive strength

The long term compressive strength $f_{b,LT}$ is the normalised mean compressive strength of the unit measured on specimens which have been subjected to the test according EN 1606 for a given time.

³ Glass used for expansion is made of raw materials and secondary glass, which may include secondary or recycled glass.

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 thermally-insulating and loadbearing units made of cellular glass is assessed in relation to the essential characteristics.

Table 2.1.1 - Essential characteristics of the product and assessment methods and criteria for the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Compressive strength as part of masonry with a layer made out of thermally-insulating and loadbearing units made of cellular glass	2.2.1	Level
2	Shear strength as part of masonry with a layer of thermally-insulating and loadbearing units made of cellular glass	2.2.2	Level
3	Compressive strength and normalised compressive strength of thermally-insulating and loadbearing units made of cellular glass	2.2.3	Level
4	Creep-long term behaviour	2.2.4	Level
5	Eccentric loading behaviour	2.2.5	Level
6	Long term compressive strength	2.2.6	Level
Basic Works Requirement 2: Safety in case of fire			
7	Reaction to fire	2.2.7	Class
8	Propensity to undergo continuous smouldering	2.2.8	Description
Basic Works Requirement 3: Hygiene, health and the environment			
9	Dimensional stability at specified temperature and humidity	2.2.9	Level
10	Water absorption by immersion - long term	2.2.10	Level
11	Water absorption by capillarity ⁴	2.2.11	Level
12	Water vapour resistance	2.2.12	Level
13	Release of dangerous substances	2.2.13	Description
Basic Works Requirement 4: Safety and accessibility in use			
14	Geometry (length, width, thickness, plane parallelism, squareness and flatness)	2.2.14	Level
15	Density	2.2.15	Level
16	Thickness of liner	2.2.16	Level
Basic Works Requirement 5: Protection against noise			
17	Sound insulation	2.2.17	Level
Basic Works Requirement 6: Energy economy and heat retention			
18	Thermal resistance	2.2.18	Level
19	Thermal linear transmittance	2.2.19	Level
Aspects of durability			
20	Durability	2.2.20	Description

⁴ May also be relevant for Basic Works Requirement 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 Compressive strength as part of masonry with a layer made out of thermally-insulating and loadbearing units made of cellular glass

The compressive strength of masonry with a layer of thermally-insulating and loadbearing units made of cellular glass, shall be assessed in accordance with EN 1052-1 taking into account the following conditions:

- On a rigid beam (e.g., concrete or steel) a layer of normal purpose mortar according to EN 998-2 shall be placed (thickness in end condition between 6 mm and 15 mm according to EN 1996-1-1; clause 8.1.5), followed by a layer of thermally-insulating and loadbearing units made of cellular glass, followed by a layer of the same normal purpose mortar, followed by the set-up of a masonry specimen with masonry units according to one of the product standards EN 771-1 to 6 and a mortar according to EN 998-2.
- The dimensions of the part of the test specimen, built up masonry units according to one of the product standards EN 771-1 to 6 shall be in accordance with EN 1052-1, Table 2. The width of the thermally-insulating and loadbearing units made of cellular glass shall be the same as the width of the upper masonry and the length of the thermally-insulating layer of cellular glass shall be the same as the length of the upper masonry specimen. An example is given in Figure 2.2.1.1.
- In order to avoid a collapse of the masonry units or the mortar earlier than the thermally-insulating and loadbearing units made of cellular glass, the compressive strength of the masonry units and of the mortar shall be higher than the compressive strength of the thermally-insulating and loadbearing units made of cellular glass;
- Complementary to EN 1052-1, clause 8.3 “Measurements”, the load at which the first crack occurs in the upper masonry and the load at which the first crack occurs in the thermally-insulating and loadbearing units made of cellular glass shall be recorded, if this occurs before the maximum load is reached.
- If the upper masonry collapses before the thermally-insulating and loadbearing units made of cellular glass, the test result is not valid for the assessment of the thermally-insulating and loadbearing units made of cellular glass in masonry. In this case other specimens shall be prepared for testing using masonry with a higher compressive strength.

Number of specimen, expression of the results and evaluation of results shall be in accordance with EN 1052-1.

The ETA shall specify the characteristic compressive strength for specific combinations of thermally-insulating and loadbearing units made of cellular glass with types of masonry units and mortars. The normalised mean compressive strength of the units according to EN 772-1 shall be also specified. The compressive strength/class of the corresponding mortars according to EN 1015-11, clauses 1 to 7, 9 and 10 or to EN 998-2, clause 5.4.1 shall be specified as well. The results are valid for the combinations of the same thermally-insulating and loadbearing units made of cellular glass with masonry units from the same product group (see definition in EN 771-1 to 6) for compressive strength and configuration and mortars with the same or higher compressive strength.

Limitations on the established performance of the product resulting from interpretation and commenting test results shall be given in the ETA.



Figure 2.2.1.1: Examples of specimen for the compressive strength test, including details for deformation measurements

2.2.2 Shear strength as part of masonry with a layer of thermally-insulating and loadbearing units made of cellular glass

The characteristic shear strength of masonry with a layer of thermally-insulating and loadbearing units made of cellular glass shall be assessed according to EN 1052-3, taking into account the following conditions:

- The preparation of the specimens shall be done according to EN 1052-3, clause 7.1, type A, in the combination of (whichever is the weakest combination)
 - 1st layer of concrete;
 - 2nd layer of normal purpose mortar (with a thickness in end use between 6 mm and 15 mm according to EN 1996-1-1);
 - 3rd layer of thermally-insulating and loadbearing units made of cellular glass;
 - 4th layer of the same normal purpose mortar;
 - 5th layer of masonry units according to EN 771-1 to 6, intended to be used.

or

- 1st layer of a masonry units according to EN 771-1 to 6, intended to be used;
- 2nd layer of normal purpose mortar (with a thickness between 6 mm and 15 mm according to EN 1996-1-1);
- 3rd layer of thermally-insulating and loadbearing units made of cellular glass;
- 4th layer of the same normal purpose mortar;
- 5th layer of masonry units according to EN 771-1 to 6, intended to be used.
- According to this EAD, clause 2.2.1, the used mortar and masonry units shall have a compressive strength that is higher than the compressive strength of the thermally-insulating and loadbearing units made of cellular glass.
- The width of the thermally-insulating and loadbearing units made of cellular glass shall be the same as the width of the masonry units and the length of the thermally-insulating layer of cellular glass shall be the same as the length of the masonry units.

Expression of the results and evaluation of results shall be in accordance with EN 1052-3.

The value of the characteristic initial shear strength under zero compressive stress of specific types of masonry f_{vk0} with a layer of thermally-insulating and loadbearing units made of cellular glass and the characteristic value of the coefficient of friction, α , shall be specified in the ETA. The compressive strength/class of the corresponding mortars according to EN 1015-11, clauses 1 to 7, 9 and 10, or to EN 998-2, clause 5.4.1, shall be also specified in the ETA. The normalised mean compressive strength of the specific masonry units, in the direction of the precompression loads effect, according to EN 772-1 shall be specified in the ETA as well.

The results are valid for the combinations of the same thermally-insulating and loadbearing units made of cellular glass with masonry units with a higher compressive strength and a lower water absorption by capillarity and mortars with the same or higher compressive strength.

Limitations on the established performance of the product resulting from interpretation and commenting test results shall be given in the ETA.

2.2.3 Compressive strength and normalised compressive strength of thermally-insulating and loadbearing units made of cellular glass

The compressive strength of the thermally-insulating and loadbearing units made of cellular glass shall be assessed as a mean value in accordance with EN 772-1 and specified in the ETA.

When not using whole thermally-insulating and loadbearing units made of cellular glass, these shall be squarely cut from the whole unit and have sizes with 200 mm length x 200 mm width. The length and width of the cut specimen shall be greater or equal to the thickness of the cut specimen.

Surface preparation shall be in accordance with EN 772-1, clause 7.2.5.1 (mortar capping). Conditioning of the specimens before testing shall be in accordance with EN 772-1, clause 7.3.2 a). The number of specimens shall be 10.

When the thermally-insulating and loadbearing units made of cellular glass are sampled from consignment in accordance with EN 771-1, Annex A, and tested in accordance with EN 772-1, then:

- mean compressive strength of the specified number of thermally-insulating and loadbearing units made of cellular glass from a consignment shall be not less than the assessed value (similar to masonry units according to EN 771-1 to 6);
- individual strengths of specimens measured within the test sample shall be not less than 80 % of the assessed value.

The compressive strength of the thermally-insulating and loadbearing units made of cellular glass specified in the ETA shall be such that provision on the mean compressive strength and on individual strengths are both fulfilled.

The normalised compressive strength, f_b , of the thermally-insulating and loadbearing units made of cellular glass is the compressive strength of the thermally-insulating and loadbearing units made of cellular glass converted to the air-dried compressive strength of an equivalent 100 mm wide x 100 mm high loadbearing unit made of cellular glass (see also definition in EN 771-1 to 6). The normalised compressive strength, conditioning factor and the shape factor to realise the conversion shall be specified in the ETA.

2.2.4 Creep long term behaviour

The creep deformation, X_{ct} , under compression load and total thickness reduction, X_t , of the thermally-insulating and loadbearing units made of cellular glass shall be assessed according to EN 1606. The specimens have sizes with 200 mm length x 200 mm width. The test shall be executed during at least one year on the thermally-insulating and loadbearing units made of cellular glass under a specified load stress, expressed as a percentage of the assessed normalised compressive strength, f_b . The test results have to be extrapolated to become the estimated creep and total thickness reduction values after 50 years.

The applied load stress, the compressive creep and the total thickness reduction, with steps of 0,1 mm, at the load stress applied during the test shall be specified in the ETA.

2.2.5 Eccentric loading behaviour

The eccentric loading behaviour of the thermally-insulating and loadbearing units made of cellular glass shall be assessed by tests on the thermally-insulating and loadbearing units made of cellular glass according EN 772-1 at different levels of eccentricity as shown in figure 2.2.5.1. The tests have to be done at relative eccentricities (e/t): 0,1 – 0,15 – 0,20 – 0,25 – 0,30.

Where

- e = eccentricity
- t = width of the thermally-insulating and loadbearing units made of cellular glass.

The specimens shall have dimensions corresponding to those tested to assess the compressive strength of the thermally-insulating and loadbearing units made of cellular glass, see clause 2.2.3 of this EAD.

The surface preparation shall be done according to EN 772-1, clauses 7.2.5.1 and 7.2.5.4. The conditioning of the specimens before testing shall be in accordance with EN 772-1, clause 7.3.2.a.

The specimens shall be placed into the testing machine in the way as shown in Figure 2.2.5.1. The number of specimens per level of eccentricity shall be at least 2.

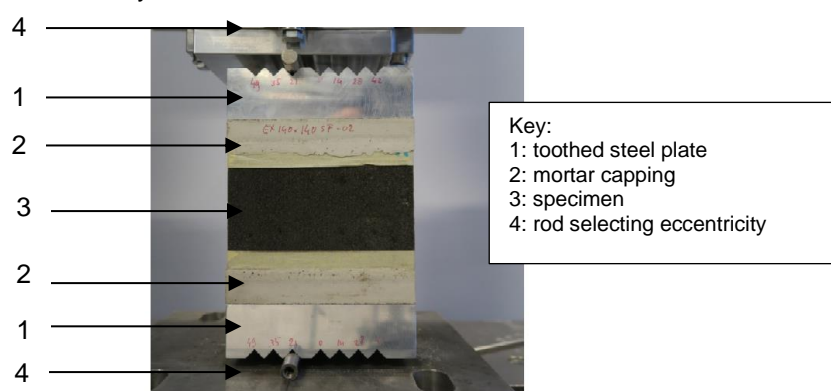


Figure 2.2.5.1: Example of test set-up

The eccentric loading behaviour shall be described in terms of a capacity reduction factor \emptyset of the compressive strength of the thermally-insulating and loadbearing units made of cellular glass.

The capacity reduction factor \emptyset shall be expressed as a table and, optionally, as a formula in function of the relative eccentricities (e/t).

Note: A standard set-up of formula is $\emptyset = \left(a \left(1 - b \frac{e}{t} \right) \right)^c$ where e is the eccentricity, t is width of the thermally-insulating and loadbearing units made of cellular glass, a , b are two parameters to be determined and c is equal to 1 or -1. Different values of a , b , and c are possible in function of the relative eccentricities (e/t).

The capacity reduction factor \emptyset shall be specified in the ETA.

2.2.6 Long term compressive strength

The mean value of the residual compressive strength of the thermally-insulating and loadbearing units made of cellular glass, which have been subjected to the test for creep behaviour during 1 year (see clause 2.2.4 of this EAD), shall be assessed in accordance with EN 772-1, with mortar capping on both sides. The test has to be done under the same conditions as the one, used for the assessment of the short-term compressive strength in accordance with Clause 2.2.3.

The mean value of the long term normalised compressive strength of the thermally-insulating and loadbearing units made of cellular glass, $f_{b,LT}$, shall be specified in the ETA.

2.2.7 Reaction to fire

The thermally-insulating and loadbearing units made of cellular glass shall be tested according to the method(s) referred to in EN 13501-1 and relevant for the corresponding reaction to fire class. The product shall be classified according to the Commission Delegated Regulation (EU) No 2016/364⁵ in connection with EN 13501-1.

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

Mounting and fixing conditions for SBI test to EN 13823 and product parameters to be considered for reaction to fire are given in Annex A.

2.2.8 Propensity to undergo continuous smouldering

The propensity to undergo continuous smouldering of the thermally-insulating and loadbearing units made of cellular glass shall be tested and assessed in accordance with EN 16733.

In accordance with EN 16733, clause 11, the ETA shall specify the following information, for the thermally-insulating and loadbearing units made of cellular glass, depending on the out-come of the assessment:

Performance according to EN 16733, clause 11, of the product as given in its own DoP or after testing	Description of the performance of the thermally-insulating and loadbearing units made of cellular glass regarding the characteristic Propensity to undergo continuous smouldering to be stated in the ETA
The product does not show propensity to undergo continuous smouldering (NoS).	The thermally-insulating and loadbearing units made of cellular glass do not show propensity to undergo continuous smouldering.
The product shows propensity to undergo continuous smouldering (S).	The thermally-insulating and loadbearing units made of cellular glass show propensity to undergo continuous smouldering.
Assessment of the propensity for continuous smouldering combustion is not possible (ANP).	Assessment of the propensity to undergo continuous smouldering is not possible

Note: In absence of relevant provisions in EN 13167, EN 16733 applies and in addition, the following provisions:

Sample taking

In addition to EN 16733, the following conditions and parameters shall be considered when performing sampling and preparing test samples:

- the product-variations of a product family (as defined by a certain combination of raw materials and other additives and produced in a certain production process)⁶;
- the product or product variant with the highest organic content (in percentage per mass), determined according to EN 13820;
- the product or product variant with the highest density as well as a density of about 100 kg/m³ (± 15 %); if the highest density is lower than 115 kg/m³, then only the product or product variant with the highest density. (density determined in accordance with EN 1602);
- the product or product variant with the highest thickness (the thickness of the sample is the direction of the height as shown in Figure 1.2.1.1). If the highest thickness is greater than 100 mm, then the specimen thickness shall be reduced from the reverse (non-exposed) side to the maximum testable thickness of about 100 mm. (thickness determined in accordance with EN 823 on at least three specimens).

⁵ See Official Journal L68 15.3.2016, p.4

⁶ *To permit the TAB to apply EXAP-rules for test results within the assessment, it is recommended that the manufacturer should provide (but he is not obliged to do it) sufficient information (e. g., on the basis of the composition of the product in question), allowing the TAB to determine which products or product variants shall be submitted to testing and to reduce the number of tests required."*

- without any facings, coatings (or similar) – existing facings or coatings shall be removed when preparing the test specimens; this also applies to the liner on the top and bottom (when positioned as shown in Figure 1.2.1.1) of the product.

Preparation of test specimen

The tests shall be done on free-hanging specimens without consideration of the intended end-use conditions, because propensity to undergo continuous smouldering is hardly affected by end-use conditions, and without any joints (see further).

If the thermally-insulating and loadbearing units made of cellular glass are only available in lengths lower than 800 mm, the test specimens shall be prepared by using two (or more) smaller pieces of the thermally-insulating and loadbearing units made of cellular glass, which shall be put together with a butt joint. This joint shall be positioned in the maximum possible distance to the bottom edge of the test specimens. Connection of the pieces of the test specimens shall be carried out in such a manner that a permanent and close contact is ensured between both pieces at the joint for the entire testing and monitoring time.

Extended application of test results

The test results considering the aforementioned parameters are also valid for products:

- of the same defined product- family,
- with lower organic content,
- with all lower densities,
- with lower thickness and also with higher thickness when 100 mm thick specimens were tested,
- with any facings or coatings and
- for any end-use conditions.

2.2.9 Dimensional stability at specified temperature and humidity

The dimensional stability under specified temperature and humidity conditions of the thermally-insulating and loadbearing units made of cellular glass shall be assessed in accordance with EN 1604 for storage during 48 h at (70 ± 2) °C and (90 ± 5) % relative humidity.

The level of dimensional stability at specified temperature and humidity DS(70,90) according to EN 13167 shall be specified in the ETA. The level shall be in accordance with EN 13167, Table 1.

2.2.10 Water absorption by immersion – Long term

The long-term water absorption by partial immersion, W_{ip} , of the thermally-insulating and loadbearing units made of cellular glass shall be assessed in accordance with EN ISO 16535, Method B, and specified in the ETA.

2.2.11 Water absorption by capillarity

The water absorption by capillarity of the bed faces shall be assessed according to EN 772-11 for an immersion time of $(10 \pm 0,2)$ min. The minimum number of specimens is six. EN 772-11, clause 6.2, applies for a temperature of $70^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The performance shall be given in $\text{g/m}^2\text{s}$, using formula of EN 772-11, clause 8.1.

2.2.12 Water vapour resistance

The water vapour diffusion resistance, μ , of the thermally-insulating and loadbearing units made of cellular glass shall be given, using the tabulated value for cellular glass products in accordance with EN ISO 10456.

2.2.13 Release of dangerous substances

The provisions of EN 13167, clauses 4.3.12, are also applicable for the products covered by this EAD and shall be specified in the ETA.

2.2.14 Geometry

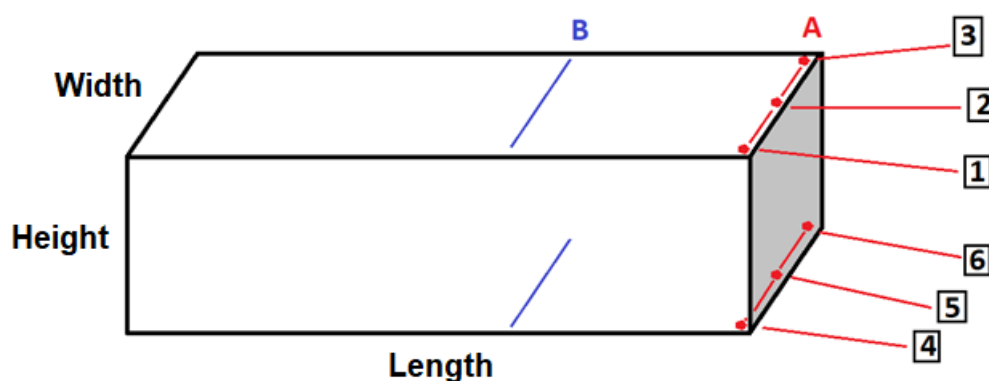
The geometry (length, width, height (thickness), plane parallelism of the bed faces, squareness and flatness of the bed faces) of the thermally-insulating and loadbearing units made of cellular glass shall be assessed according to EN 772-16, EN 824 and EN 772-20 and specified in the ETA. The minimum number of specimens is ten.

2.2.15 Density

The density of the thermally-insulating and loadbearing units made of cellular glass shall be assessed according to EN 1602, including removal of the liner according to EN 1602, clause 6.3, and specified in the ETA.

2.2.16 Thickness of liner

The thickness of the liner of the thermally-insulating and loadbearing units made of cellular glass shall be assessed according to clause 3.4.1 and Figure 2.2.15.1 of this EAD and specified in the ETA.



Key :

1. Position line "A"- red colour: thickness measurement liner on the 2 edges-in total 6: top & bottom + corner and centre position
2. Position line "B"- blue colour: thickness measurement liner in the middle of the unit – in total 6: top & bottom + corner - & centre position

Figure 2.2.15.1 : Thickness of the liner

2.2.17 Sound insulation

The influence of the thermally-insulating and loadbearing units made of cellular glass on the airborne sound insulation shall be assessed according to EN ISO 10140-2.

Two test samples shall be prepared in accordance with EN ISO 10140-2. A wall section with dimensions 1900 x 1095 mm shall be made from masonry units according to one of the product standards EN 771-1 to 6, with dimensions and density assessed in accordance with EN 772-16 and EN 772-13 respectively, and normal purpose mortar according to EN 998-2. The top row masonry units of one of the two test samples shall be substituted with the thermally-insulating and loadbearing units made of cellular glass in width corresponding to the masonry units used in the wall. The test samples can be made with or without a render.

The airborne sound insulation of the test sample without the thermally-insulating and loadbearing units made of cellular glass, R_{masonry} , shall be determined according to EN ISO 10140-2.

The airborne sound insulation of the test sample with the thermally-insulating and loadbearing units made of cellular glass, $R_{\text{masonry},1}$, shall be determined according to EN ISO 10140-2.

The results shall be expressed as a single number rating for each test sample in accordance with EN ISO 717-1 ($R_{w,\text{masonry}}$ and $R_{w,\text{masonry},1}$) and shall be given in the ETA together with information on the specification of the test wall, i.e., dimensions of the masonry units, density of the masonry units, specification of the used mortar, thickness and volume of the used render. The ratio $R_{w,\text{masonry},1} / R_{w,\text{masonry}}$ shall be also specified in the ETA to describe the influence of the thermally-insulating and loadbearing units made of cellular glass on the airborne sound insulation.

2.2.18 Thermal resistance

The thermal resistance and thermal conductivity of the thermally-insulating and loadbearing units made of cellular glass shall be assessed on the basis of measurements carried out in accordance with EN 12667. According to EN 12664, which is the reference method for EN 1745, where values for the thermal conductivity of less than 0.5 m²K/W are expected, EN 12667 is the recommended method. The assessed thermal values shall be specified in the ETA according to EN ISO 10456.

Each test specimen is assembled from six thermally-insulating and loadbearing units made of cellular glass of the same type and having dimensions after removal of the liner: ± 450 mm x ± 100 mm x ± 100 mm each. Two additional pieces of the same material are placed against the edges of the six units in order to obtain final dimensions of ± 600 mm x ± 60 mm x ± 100 mm as shown in Figure 2.2.17.1. The surfaces contacting the guarded plates shall be rectified to fulfil the requirements of EN 12667, clauses A6 and A7.

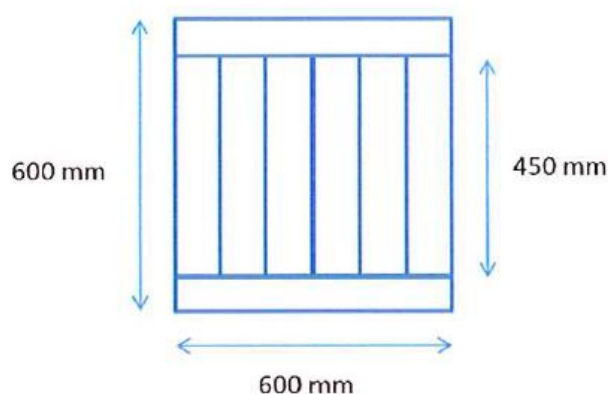


Figure 2.2.17.1 : test specimen – assembly of several units

The dimensions of the specimen being 600 mm x 600 mm, the metering dimensions shall be ± 305 mm x ± 305 mm. The statistical evaluation shall be based on EN 1745, method S2, or alternatively on direct test results of thermal values.

2.2.19 Thermal linear transmittance

In order to calculate heat losses according EN ISO 6946, the thermal linear transmittance of the thermally-insulating and loadbearing units made of cellular glass shall be calculated in accordance with EN ISO 10211 or in accordance with the simplified method EN ISO 14683. The ETA shall specify the method used. Default values for several building junctions and compositions may be specified in the ETA.

2.2.20 Durability

The provisions of EN 13167, clauses 4.2.7.2 and 4.2.7.3, are also applicable for the products covered by this EAD.

In the ETA it shall be stated whether the performance of the product with regard to the essential characteristics 'reaction to fire' and 'thermal resistance' changes over time.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance

For the products covered by this EAD the applicable European legal act is Commission Decision 97/740/EC⁷ of the European Commission for masonry and related products, as amended by Commission Decision 2001/596/EC⁸ taking into account Commission Delegated Regulation (EU) 2016/364⁹. The systems to be applied for the products covered by this EAD have been specified in 3.1.1.

Table 3.1.1 - System of assessment and verification of constancy of performance applicable to products covered by this EAD

Intended use(s)	Level(s) or class(es)	AVCP system(s) ^a
For uses subject to reaction to fire regulations ^b	(A1, A2, B, C)*	1
	(A1, A2, B, C)**, D, E	3
	(A1 to E)***, F	4
Units with a specified mean compressive strength with a probability of failure to reach it not exceeding 5 %	Category I	2+
^a	See Annex V to Regulation (EU) N° 305/2011	
^b	including propensity to undergo continuous smouldering	
*	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).	
**	Products/materials not covered by footnote (*).	
***	Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of Class A1 according to Commission Decision 96/603/EC, as amended by 2000/605/EC and 2003/424/EC).	

⁷ Commission Decision 97/740/EC of 14 October 1997 on the procedure for attesting the conformity of construction products pursuant to Article 20 (2) of Council Directive 89/106/EEC as regards masonry and related products (OJ L 299, 4.11.1997, p. 42)

⁸ Commission Decision 2001/596/EC of 8 January 2001 amending Decisions 95/467/EC, 96/578/EC, 96/580/EC, 97/176/EC, 97/462/EC, 97/556/EC, 97/740/EC, 97/808/EC, 98/213/EC, 98/214/EC, 98/279/EC, 98/436/EC, 98/437/EC, 98/599/EC, 98/600/EC, 98/601/EC, 1999/89/EC, 1999/90/EC, 1999/91/EC, 1999/454/EC, 1999/469/EC, 1999/470/EC, 1999/471/EC, 1999/472/EC, 2000/245/EC, 2000/273/EC and 2000/447/EC on the procedure for attesting the conformity of certain construction products pursuant to Article 20 of Council Directive 89/106/EEC (OJ L209, 2.8.2001, p. 42)

⁹ OJEU, L 68, 15.3.2016, p. 4

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.

Alternative methods agreed between the manufacturer and the TAB and other than the reference methods specified in this EAD may be adopted except for assessing the performance of the product and in case of dispute, provided that these alternative methods satisfy the following:

- a correlation can be shown to exist between the results from the reference method and those from the alternative method; or
- a safe relationship can be demonstrated when using alternative method compared to the reference methods and
- the information on which the relationship is based is available.

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]					
<u>Production phases:</u>					
1	Melter-glass powder: Composition	According to control plan	According to control plan	Per unit	Each batch
2	Melting – cellulating/foaming – Annealing: process parameters (temp, pull)				Continuously
3	Carbon content				Daily
<u>Finished product:</u>					
4	Length	2.2.14	According to control plan	Per unit	Per 1 h
5	Width				
6	Thickness				
7	Plane parallelism of the bed faces				
8	Squareness				
9	Flatness of the bed faces				
10	Density	2.2.15			
11	Thickness of liner	2.2.16			
12	Compressive strength of masonry with a thermal break layer	2.2.1	According to control plan	3 per type of brick/mortar	Yearly
13	Compressive strength per unit with mortar capping	2.2.3	According to control plan	Per unit	Monthly
14	Compressive strength per slab ⁽¹⁾	(2)	According to control plan	Per slab ⁽¹⁾	Per 1 h
15	Compressive creep	2.2.4	According to control plan	Per slab ⁽¹⁾ /per unit	5-yearly

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
16	Eccentric loading behaviour	2.2.5	According to control plan	2 per relative eccentricity	
17	Reaction to fire - Determination of total carbon content by burning in pure oxygen	According to control plan	According to control plan	1	2-yearly
18	Reaction to fire test according to EN 13501-1	2.2.7	According to control plan	Per unit	
19	Dimensional stability at 70°C / 90%RH	2.2.92.2.8	According to control plan	Per slab ⁽¹⁾	Yearly
20	Water absorption by immersion – Long term	2.2.10	According to control plan		
21	Thermal resistance	2.2.18	According to control plan		Daily
22	Thermal linear transmittance	2.2.19	According to control plan	Per unit	5-yearly
23	Finishing-cutting: On-line visual control	According to control plan	According to control plan	Per slab ⁽¹⁾	Continuously
24	Package control	According to control plan	According to control plan	Per unit	Each shift
<p>(1) During production, one slab is divided into a number of units</p> <p>(2) For FPC purposes, as an alternative method, these tests may be performed on slabs, rather than on units, provided that a correlation may be shown between the results from the reference method on units and those from the alternative method and provided that the information on which the relationship is based is available</p> <p>(3) Where relevant, the test methods shall correspond to those included in clause 2 of this EAD, but different equipment may be used, as long as a correlation may be established. The manufacturer may use external laboratories for these tests. Frequencies apply, as long as production is considered to be as usual for the production facility concerned during that period.</p>					

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 product covered by this EAD are laid down in Table 3.3.1 and Table 3.3.2.

In this case of AVCP system 2+ applies the cornerstones of the tasks to be undertaken by the notified body are laid down in Table 3.3.1.

Table 3.3.1 - Control plan for the notified body under AVCP system 2+; corner stones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Initial inspection of the manufacturing plant and of the factory production control carried out by the manufacturer regarding the constancy of performance of the brackets defined in the control plan (except reaction to fire)	Verification of the complete factory production control, to be implemented by the manufacturer, as defined in the control plan	According to Control plan	According to Control plan	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer regarding the constancy of performance of the brackets defined in the control plan (except reaction to fire)	Verification of the controls carried out by the manufacturer on the raw materials, on the process and on the product as indicated in table 3.2.1 and as defined in the control plan	As defined in the control plan	As defined in the control plan	Twice a year

Regarding reaction to fire the involvement of the notified body is required only under the conditions defined in 99/90/EC amended by 2001/596/EC – in case of reaction to fire class A1, A2, B, C of the product for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an additional of fire retardants or a limiting of organic material).

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

Table 3.3.2 - Control plan for the notified body under AVCP system 1; corner stones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Initial inspection of the manufacturing plant and of the factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire (including propensity to undergo continuous smouldering) and taking into account a limiting of organic material and/or the addition of fire retardants.	Verification of the complete factory production control, to be implemented by the manufacturer, as defined in the control plan	According to Control plan	According to Control plan	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire (including propensity to undergo continuous smouldering) and taking into account a limiting of organic material and/or the addition of fire retardants.	Verification of the controls carried out by the manufacturer on the raw materials, on the process and on the product as indicated in table 3.2.1 and as defined in the control plan	As defined in the control plan	As defined in the control plan	Twice a year

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

3.4.1 Thickness of liner

Thickness to be determined by use of digital callipers (accuracy of 0,01 mm) in combination with a microscope. Thickness measurement to be performed on the upper- and lower side of the unit in the area of the edges (distance to edge 0,5 cm) as well as in the middle of the unit, on three different places.

4 REFERENCE DOCUMENTS

EN 771-1:2011+A1:2015	Specification for masonry units - Part 1: Clay masonry units
EN 771-2:2011+A1:2015	Specification for masonry units - Part 2: Calcium silicate masonry units
EN 771-3:2011+A1:2015	Specification for masonry units - Part 3: Aggregate concrete masonry units (Dense and lightweight aggregates)
EN 771-4:2011+A1:2015	Specification for masonry units - Part 4: Autoclaved aerated concrete masonry units
EN 771-5:2011+A1:2015	Specification for masonry units - Part 5: Manufactured stone masonry units
EN 771-6:2011+A1:2015	Specification for masonry units - Part 6: Natural stone masonry units
EN 772-1:2011+A1:2015	Methods of test for masonry units - Part 1: Determination of compressive strength
EN 772-11:2011	Methods for tests for masonry – Part 11: Determination of water absorption of aggregate concrete, autoclaved aerated concrete, manufactured stone and natural stone masonry units due to capillary action and the initial rate of water absorption of clay masonry units
EN 772-13:2000	Methods of test for masonry units – Part 13: Determination of net and gross dry density of masonry units (except for natural stone)
EN 772-16:2011	Methods of test for masonry units – Part 16: Determination of dimensions
EN 772-20:2000+A1:2005	Methods of test for masonry units – Part 16: Determination of flatness of faces of masonry units
EN 823:2013	Thermal insulating products for building applications - Determination of thickness
EN 824:2013	Thermal insulating products for building applications - Determination of squareness
EN 998-2:2016	Specification for mortar for masonry - Part 2: Masonry mortar
EN 1015-11:2019	Methods of test for mortar for masonry - Part 11: Determination of flexural and compressive strength of hardened mortar
EN 1052-1:1998	Methods of test for masonry - Part 1: Determination of compressive strength
EN 1052-3:2002+A1:2007	Methods of test for masonry - Part 3: Determination of initial shear strength
EN 1602:2013	Thermal insulating products for building applications - Determination of the apparent density
EN 1604:2013	Thermal insulating products for building applications - Determination of dimensional stability under specified temperature and humidity conditions
EN 1606:2013	Thermal insulating products for building applications - Determination of compressive creep
EN 1745:2020	Masonry and masonry products - Methods for determining thermal properties
EN 1996-1-1:2005+A1:2012	Eurocode 6 - Design of masonry structures - Part 1-1: General rules for reinforced and unreinforced masonry structures
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 12667:2001	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance
EN 13167:2012+A1:2015	Thermal insulation products for buildings - Factory made cellular glass (CG) products – Specification
EN 13238:2010	Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13501-2:2016	Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 13820:2003	Thermal insulating materials for building applications - Determination of organic content
EN 13823:2020	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 16733:2016	Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering
EN ISO 717-1:2020	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation
EN ISO 1182:2020	Reaction to fire tests for products - Non-combustibility test
EN ISO 1716:2018	Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value)
EN ISO 6946:2017	Building components and building elements - Thermal resistance and thermal transmittance - Calculation methods
EN ISO 10140-2:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation
EN ISO 10211:2017	Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations
EN ISO 10456:2007	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values
EN ISO 11925-2:2020	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test
EN ISO 13788:2012	Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods
EN ISO 14683:2017	Thermal bridges in building construction - Linear thermal transmittance - Simplified methods and default values
EN ISO 16535:2019	Thermal insulating products for building applications - Determination of long-term water absorption by immersion

ANNEX A: GUIDANCE FOR TEST OF REACTION TO FIRE

A.1 Thermally-insulating and loadbearing unit made of cellular glass

A.1.1 Testing in accordance with EN ISO 1182 and EN ISO 1716

These methods are needed to determine classes A1 and A2. The specimens shall be prepared and tested in accordance with the provisions given in test standards EN ISO 1182 and EN ISO 1716. All specimens shall be conditioned in accordance with provisions given in EN 13238 before testing. Each different chemical composition has to be considered when testing. In case of products with the same composition but different densities and different amount of organic compound, the variation with the lowest density of the thermally-insulating and loadbearing unit made of cellular glass and the highest amount of organic components shall be tested. If the product contains flame retardant the variation with the lowest amount of the flame retardant shall be tested.

The test result is valid for that variation tested and all of the following variations of the product:

- with the same product variations / part of a product family (as defined by a specific combination of raw materials and a specific type of production process)
- with higher densities,
- of any dimensions,
- with lower amounts of organic components and
- with higher amounts of the same type of flame retardant as the one which has been tested.

A.1.2 Testing in accordance with EN 13823 (SBI)

This method is relevant for determining classes A2, B, C and D as well as for the additional classifications s1, s2, s3, d0, d1 and d2 regarding smoke production and flaming droplets. The specimens shall be prepared and tested in accordance with the provisions given in test standard EN 13823. All specimens shall be conditioned in accordance with provisions given in EN 13238 before testing.

The corner specimen consists of two wings, designated the short and long wings.

The specimens shall have the following dimensions:

- a) short wing: 495 ± 5 mm (length) x 1500 ± 5 mm (height)
- b) long wing: 1000 ± 5 mm (length) x 1500 ± 5 mm (height)

As thermally-insulating and loadbearing units made of cellular glass are used encapsulated (covered with mortar, between floor, masonry units, screed, cavity insulation material) in their end use application, they shall be tested without air gap directly in front of the backing board.

For thermally-insulating and loadbearing units made of cellular glass with a width (b) greater than 200 mm, the width shall be reduced to 200 mm by cutting away the unexposed surface. Length (a) and height (c) of the masonry units shall be cut to fit the size of the test rig. The long wing of the specimen shall be made with staggered vertical joints. If the length (a) of the unit is less than or equal to 500 mm, the short wing shall be made from one piece. Otherwise, staggered vertical joints shall be made in the short wing as well.

The cut thermally-insulating and loadbearing units made of cellular glass are simply stacked on top of each other dry without any adhesive.

A typical example of the test assembly is shown in Figure A.1 below.

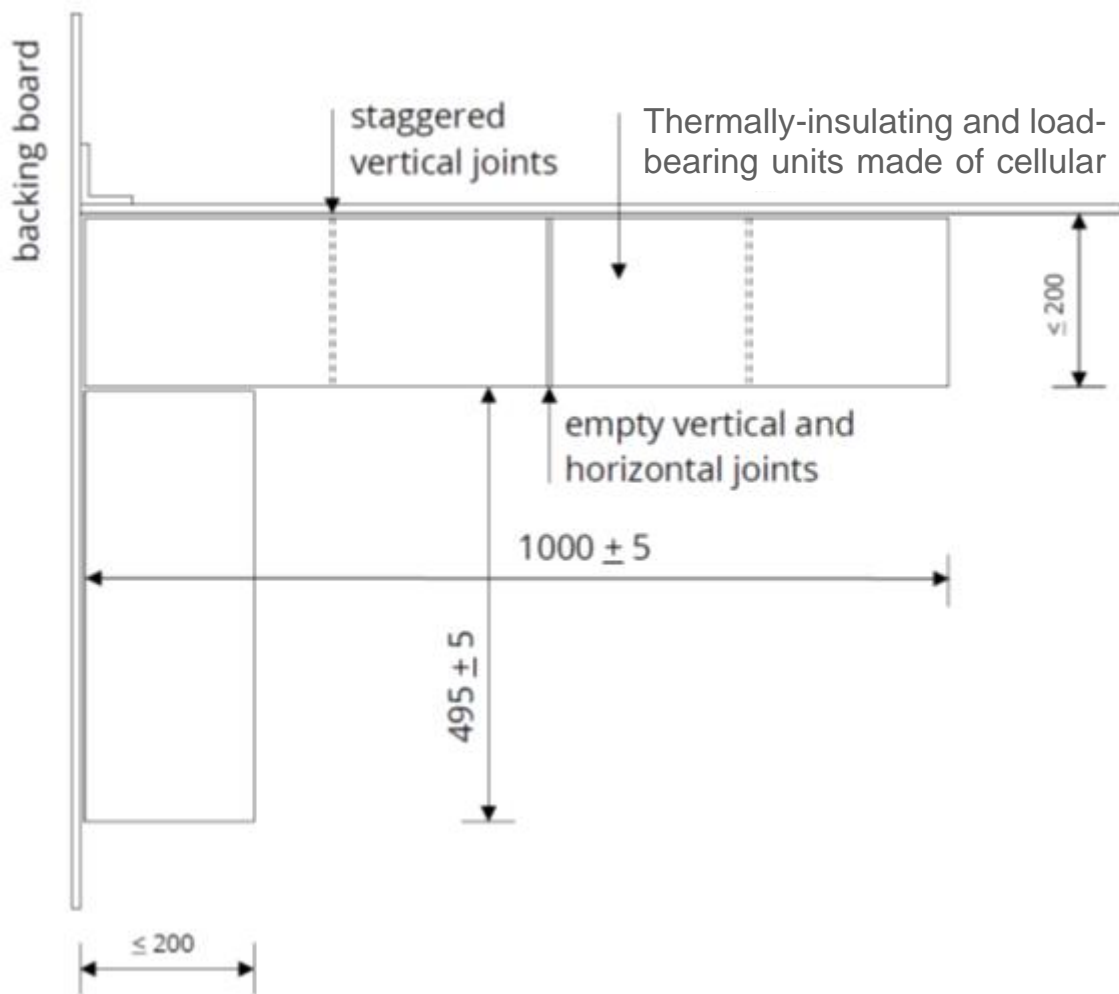


Figure A.1 Test rig configuration for loadbearing units

The assembly may be prepared away from the test chamber. The complete assembly can then be transported to the chamber.

The following parameters of the thermally-insulating and loadbearing units made of cellular glass material shall be taken into account when conducting the SBI tests:

- each different product variation / part of a product family (as defined by a specific combination of raw materials and a specific type of production process)
- the greatest and lowest width (for product ranges including loadbearing units with a width less than 200 mm),
- the lowest density,
- the highest amount of organic components and
- the lowest amount of flame retardant.

The test results are valid for the variation tested and all of the following variations of the product:

- with the same product variations / part of a product family (as defined by a specific combination of raw materials and a specific type of production process)
- with all widths between those tested (for product ranges including masonry units with a width less than 200 mm),
- with all other unit lengths and heights,
- with higher densities,
- with lower amounts of organic components and
- with higher amounts of the same type of flame retardant as the one which has been tested.

A.1.3 Testing in accordance with EN ISO 11925-2

This method is relevant for determining the reaction to fire classes B, C, D and E. The specimens shall be prepared and tested in accordance with the provisions given in test standard EN ISO 11925-2. All specimens shall be conditioned in accordance with provisions given in EN 13238 before testing. All tests shall be conducted on free-standing specimens without any substrate behind.

The following parameters shall be taken into account when preparing the specimens:

- each different product variation / part of a product family (as defined by a specific combination of raw materials and a specific type of production process)
- the greatest width (usually that means the greatest testable width of 60 mm)
- the lowest density,
- the highest amount of organic components and
- the lowest amount of flame retardant.

The test results are valid for the variation tested and all of the following variations of the product:

- with the same product variations / part of a product family (as defined by a specific combination of raw materials and a specific type of production process)
- with higher densities,
- with lower amounts of polystyrene and additional organic components,
- with higher amounts of the same type of flame retardant as the one which has been tested and
- of any width, if the maximum testable width of 60 mm was tested (if a width lower than 60 mm was used for testing, test results are valid for lower width).