EUROPEAN ASSESSMENT DOCUMENT

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IN-SITU FORMED LOOSE FILL THERMAL AND/OR ACOUSTIC INSULATION PRODUCT MADE OF GRANULATED EXPANDED CORK

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

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The construction product consists of loose fill granulated expanded cork, without any additives. The product is delivered in plastic fabric sacks with a nominal volume of 0.25 m^3.

The product is obtained from in-house recycling of recirculated expanded cork waste resulting from the current manufacture process of naturally agglomerated (no added binding agents) expanded cork blocks and boards. The granules are obtained by grinding and/or milling factory made products of expanded cork to different fragment sizes which are mixed to meet the desired final particle size distribution (2/9 mm).

The construction product is hereinafter referred to as loose fill insulation product.

The ETA will be issued for the product on the basis of agreed data/information, deposited with the Technical Assessment Body, which identifies the product that has been assessed.

The product is not covered by a harmonised European standard (hEN).

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 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.

1.2 Information on the intended uses of the construction product

1.2.1 Intended uses

The product has the following intended uses in buildings:

- Thermal insulation and/or acoustic insulation (sound absorption, airborne sound insulation) of horizontal or low sloped surfaces of flat or pitched roofs, inside cavities, or exposed on non-habitable attic floors;

- Thermal insulation and/or acoustic insulation (sound absorption, airborne/impact sound insulation) of ground or raised floors, inside cavities between beams, joist battens, and similar substructures.

The construction product shall not be used in places where it may be exposed to wetting or weathering, or exposed to compression loads.

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 loose fill granulated expanded cork for the intended use of 50 years when installed in the works (provided that the loose fill granulated expanded cork 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[1].

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 to be 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 Cork

Protective layer of the cork oak tree (*Quercus suber* L.) which may be periodically removed from its trunk and branches to provide the raw material for cork products

1.3.2 Granulated cork

Fragments of cork obtained by grinding and/or milling raw or manufactured cork

1.3.3 Naturally agglomerated expanded cork

Pre-formed product made from ground granulated cork expanded and bonded exclusively with its own natural binder exuded from cork cell walls by heating under pressure

1 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 working life referred to above.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of the thermal and/or acoustic insulation product is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class
2	Continuous smouldering	2.2.2	Description
Basic Works Requirement 3: Hygiene, health and the environment			
3	Biological resistance (growth of mould fungus)	2.2.3	Level
Basic Works Requirement 4: Safety and accessibility in use			
4	Corrosion developing capacity	2.2.4	Description
Basic Works Requirement 5: Protection against noise			
5	Sound absorption	2.2.5	Level
6	Specific airflow resistivity	2.2.6	Level
7	Airborne sound insulation	2.2.7	Level
8	Impact sound reduction	2.2.8	Level
Basic Works Requirement 6: Energy economy and heat retention			
9	Thermal conductivity	2.2.9	Level
10	Water absorption (short term, partial immersion)	2.2.10	Level
11	Water vapour diffusion resistance	2.2.11	Level
12	Loose bulk density	2.2.12	Level
13	Settlement	2.2.13	Level

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

Characterisation of the product to be assessed shall be done in accordance with available specifications, notably material properties as listed, and procedures defined in separate annexes.

2.2.1 Reaction to fire

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

For the product specific arrangement of the specimens for the reaction to fire test(s) see Annex A of the EAD.

2.2.2 Continuous smouldering

The performance of the product's propensity to undergo continuous smouldering combustion shall be assessed in accordance with EN 16733.

The smouldering behaviour of a loose fill product depends on the density, thickness and composition of the product. The test results are only valid for the product tested and shall be expressed as stated in EN 16733, clause 11. If the test sample is tested with a thickness of 100 mm, then the test results are also valid for greater thicknesses.

The specimen holder shall be used with a wire mesh, as defined in EN 16733, clause 5.1.2. The dimensions of the wire mesh may be reduced in order to retain products with smaller size particles. The density of the test sample on the specimen holder shall correspond to the density specified by the manufacturer.

2.2.3 Biological resistance

The determination of the growth of mould fungus shall be carried out according to Annex B (method A) and/or according to EN 15101-1, Annex F (method B).

The growth of mould fungus shall be expressed according to Table 4 of EN ISO 846 (in case of method A) and/or Table 5 of EN 15101-1 (in case of method B).

It shall be stated in the ETA to which method the characteristic expressed refers.

2.2.4 Corrosion developing capacity

The corrosion developing capacity on metal construction shall be assessed on the basis of the composition of the insulation product.

If such an assessment is not feasible the test according to Annex E of EN 15101-1 shall be applied.

The test according to Annex E of EN 15101-1 is *pass* if no notches or perforations occur within the central zone (3 mm off the edge of a coupon).

2.2.5 Sound absorption

The determination of the sound absorption coefficient shall be performed according to EN ISO 354, using Type I (Annex B, B.6) test specimen mounting. Manual installation of the loose fill insulation shall be done according to manufacturer´s recommendation for end use application. Sound absorption depends on the thickness of the loose fill thermal insulation layer. A minimum thickness of 80 mm shall be used as a reference value.

The sound characteristics shall be calculated according to EN ISO 11654, using the values for the sound absorption coefficient α_p, at the frequencies 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz, and the single number value for the weighted sound absorption coefficient α_w.

The obtained values for α_p and α_w shall be rounded to the nearest 0.05 (α_p larger than 1 shall be expressed as $\alpha_p = 1$).

The values for α_p and α_w shall be expressed in levels with steps of 0.05.

2.2.6 Specific airflow resistivity (resistance)

The determination of the specific airflow resistivity (resistance) shall be carried out according to EN 29053 (ISO 9053), method A.

The test specimen density shall be within the tolerances stated for the nominal bulk density of the loose fill insulation (clause 2.2.12).

The specific airflow resistance, R_s, shall be expressed in levels using steps of 1 kPa.s/m.

2.2.7 Airborne sound insulation

The airborne sound insulation, R, depends on the specific end use floor or ceiling built up solution, including, namely, the loose fill thermal/acoustic insulation layer or filled cavities, the type of structural elements and the floor or ceiling finishes, including any additional acoustic layers.

The determination of the airborne sound insulation shall be performed according to EN ISO 10140--2. The test arrangement is the *full-size test opening* referred to in clause 6.2 of EN ISO 10140-2.

The test sample shall reproduce the specific complete end use constructive solution and the result is valid only for the tested solution(s).

Otherwise, the reference solution is the *Lightweight reference floor C1* described in EN ISO 10140-5 (Annex C, clause C.3.3.2).

The corresponding weighted airborne sound insulation R_w shall be calculated and rated according to EN ISO 717-1.

2.2.8 Impact sound reduction

The impact sound reduction, ΔL, depends on the specific end use floor built up solution, including, namely, the loose fill thermal/acoustic insulation layer or filled cavities, the type of structural elements and the floor finishing, including any additional acoustic layers.

The determination of the impact sound reduction shall be performed according to EN ISO 10140--3. The test arrangement is the *full-size test opening* referred to in clause 4.2 of EN ISO 10140-5.

The test sample shall reproduce the specific complete end use constructive solution and the result is valid only for the tested solution.

Otherwise, the reference solution is the standard *Lightweight reference floor C1* described in EN ISO 10140-5 (Annex C, clause C.3.3.2).

The corresponding weighted impact sound reduction ΔL_w shall be calculated and rated according to EN ISO 717-2.

2.2.9 Thermal conductivity

The determination of the thermal conductivity shall be performed according to clause 2.2.9.1 or clause 2.2.9.2 alternatively.

2.2.9.1 Lambda declared – Category 1 (based on $\lambda_{10,dry,90/90}$)

2.2.9.1.1 Lambda fractile value at 10 °C, at dry conditions

The determination of the lambda fractile value at 10 °C, at dry conditions ($\lambda_{10,dry,90/90}$), representing at least 90% of the production with a confidence limit of 90%, shall be carried out in accordance with Annex C, clause C.1.

At least 4 measurements shall be performed at a notified testing laboratory.

2.2.9.1.2 Mass-related moisture conversion coefficient ($f_{u,1}$)

The mass-related moisture conversion coefficient ($f_{u,1}$) for the conversion of $\lambda_{10,dry}$ to $\lambda_{23,50}$ shall be determined in accordance with Annex C, clause C.2.

2.2.9.1.3 Lambda declared at 23 °C and 50% relative humidity $\lambda_{D(23,50)}$ - Category 1

The calculation of the lambda declared at 23 °C and 50% relative humidity shall be carried out in accordance with Annex C, clause C.3.

2.2.9.2 Lambda declared – Category 2 (based on $\lambda_{10,dry,limit}$)

2.2.9.2.1 Lambda limit value at 10 °C, at dry conditions

The lambda limit value at 10 °C, at dry conditions ($\lambda_{10,dry,limit}$), shall be laid down by the Technical Assessment Body on the basis of at least 4 measurements performed at a notified testing laboratory. The measurements shall be carried out in accordance with Annex C, clause C.1.

The lambda limit value shall be stated by the manufacturer in such a way that no lambda value exceeds the limit value during production. The manufacturer is responsible for keeping the limit value.

Note: If the lambda value is laid down according to the procedure of Category 2, it should be representative for the total production. The test samples shall be taken from different production runs. The tests shall be performed on samples which cover the whole density range and different thicknesses. The limit value shall be a value on the safe side taking into account the worst case.

The Technical Assessment Body shall know the production procedure of the product and the factory production control of the manufacturer very well.

2.2.9.2.2 Mass-related moisture conversion coefficient ($f_{u,1}$)

See clause 2.2.9.1.2.

2.2.9.2.3 Lambda declared at 23 °C and 50% relative humidity $\lambda_{D(23,50)}$ - Category 2

The calculation of the lambda declared at 23 °C and 50% relative humidity shall be carried out in accordance with Annex C, clause C.3.

2.2.9.3 Mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$)

The determination of the mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$) shall be carried out in accordance with Annex C, clause C.4.

2.2.9.4 Moisture conversion factor (dry-23/50 and 23/50-23/80)

The moisture conversion factor F_{m1} for the conversion of $\lambda_{10,dry}$ to $\lambda_{23,50}$ and F_{m2} for the conversion of $\lambda_{23/50}$ to $\lambda_{23,80}$ shall be determined in accordance with EN ISO 10456, equation (4).

2.2.9.5 Declaration of thermal conductivity

The declaration of the thermal conductivity shall be performed according to Category 1 and/or Category 2. It shall be stated in the ETA to which category the declared value refers.

2.2.9.5.1 Lambda declared – Category 1 (based on $\lambda_{10,dry,90/90}$)

The calculated value of the lambda declared at 23 °C and 50% relative humidity $\lambda_{D(23,50)}$, representing at least 90% of the production with a confidence level of 90%, shall be stated in the ETA.

2.2.9.5.2 Lambda declared – Category 2 (based on $\lambda_{10,dry,limit}$)

The calculated value of lambda declared at 23 °C and 50% relative humidity $\lambda_{D(23,50)}$, based on a limit value, which must not be exceeded, shall be stated in the ETA. In addition the lambda limit value at 10 °C, at dry conditions ($\lambda_{10,dry,limit}$) shall be stated in the ETA.

2.2.9.6 Declaration of moisture related conversion coefficients ($f_{u,1}$ and $f_{u,2}$) and factors (F_{m1} and F_{m2})

The mass-related moisture conversion coefficient ($f_{u,1}$) for the conversion of $\lambda_{10,dry}$ to $\lambda_{23,50}$ shall be declared in the ETA.

The mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$), and the moisture content mass by mass (m/m) at 23 °C and 50% relative humidity and 23 °C and 80% relative humidity shall be given in the ETA.

The moisture conversion factors F_{m1} and F_{m2} shall be given in the ETA. It is also possible to give a summarized / accumulated moisture conversion factor F_m (dry-23/80) in the ETA.

2.2.10 Water absorption

The determination of short term water absorption by partial immersion shall be carried out according to EN 1609:2013, section, 7.2.2 method A (drainage).

The loose fill insulation shall be tested inside a steel mesh cage with dimensions (200 ± 1) mm × x (200 ± 1) mm and a minimum height (specimen thickness) of (100 ± 1) mm. The mesh size shall be compatible with (retain) the minimum nominal particle size of the loose fill insulation and present an uniform open surface of at least 50%.

The water absorption level, W_p, in kg/m² shall be calculated using steps of 1 kg/m².

2.2.11 Water vapour diffusion resistance

The determination of the water vapour diffusion resistance factor (μ) shall be carried out according to EN 12086:2013, section 7.1, table 1, set A and/or set C.

The loose fill insulation shall be tested inside a suitable specimen holder (*e.g.* metal cylinder with height equal to testing thickness and diameter equal or greater than height). A minimum height/thickness of 80 mm is used as a reference value. The loose fill insulation shall completely fill up the specimen holder and the surface shall be leveled off without compacting the sample.

The bottom surface of the specimen holder must be a steel mesh which must be compatible with (retain) the minimum nominal particle size of the loose fill insulation and must present a uniform open surface of (90 ± 5)%.The test atmospheres (set A and/or set C) according to EN 12086 used for testing and the corresponding obtained water vapour diffusion resistance factor(s) (μ) shall be given in the ETA.

2.2.12 Loose bulk density

The determination of the loose bulk density shall be carried out according to EN 1097-3.

The nominal value of the loose bulk density and the corresponding tolerance, expressed in percentage (%) shall be calculated and stated in the ETA.

2.2.13 Settlement

The settlement depends on the density of the product, the thickness of the *in situ* formed insulation and the application. Therefore the settlement should be assessed for different nominal densities, at different thicknesses covering the intended use conditions. Per settlement, the following characteristics shall be determined:

- the settlement S
- the bulk density ρ
- the settled density ρ_S

The determination of the settlement of loose fill insulation under cyclical temperature and humidity conditions (S_{cyc}) shall be carried out according to EN 15101-1, Annex B, method B.1.

Three test specimens shall be used. The density of the specimens shall approximately correspond to the minimum density covering in the ETA. The loose insulation product is manually laid into the test box.

The settlement in % shall be given in the ETA based on the test results of the settlement tests.

The settlement under cyclical temperature and humidity conditions, S_{cyc}, shall be given in the ETA using the classes (SH) according to EN 15101-1, clause, 4.2.2.2, Table 1.

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 product covered by this EAD the applicable European legal act is: Decision 1999/91/EC as amended by 2001/596/EC.

The applicable AVCP system is **3** 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 thermal insulation product in the procedure of assessment and verification of constancy of performance are laid down in Table 2.

Table 2 Control plan for the manufacturer; corner stones

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	Reaction to fire	2.2.1	2.2.1	1	Once a month or once per year and indirect testing** 1/day
2	Continuous smouldering	2.2.2	2.2.2	1	Once a year
3	Biological resistance (growth of mould fungus)	2.2.3	2.2.3	4	Methods A or B Once a year
4	Corrosion developing capacity	2.2.4	2.2.4	1	Once a year
5	Sound absorption	2.2.5	2.2.5	1	Once a year
6	Specific airflow resistivity	2.2.6	2.2.6	9	Once a year
7	Thermal conductivity	2.2.9	2.2.9	1	Once a month or bulk density twice a week + manufacturer's method 1/day
7	Water absorption (short term, partial immersion)	2.2.10	2.2.10	4	Quarterly
8	Water vapour diffusion resistance (μ)	2.2.11	2.2.11	5	Once a year
9	Loose bulk density	2.2.12	2.2.12	3	Twice a week
10	Settlement	2.2.13	2.2.13	3	Once a year (S_{cyc})
11	Particle size distribution	3.4.1	3.4.1	1	Once a week

* In case of discontinuous production these minimum frequencies should be adapted to an equivalent frequency.

** Indirect test shall be based on current FPC particle size distribution and density results and a simplified ignitability test (same specimen holder as defined in clause A.2 and a simplified ignition source/small flame). Validation of indirect test method´s screening ability to differentiate class E from a casual F performance of the loose fill insulation product shall be previously verified by an accredited reaction to fire testing laboratory against standard EN ISO 11925-2 tests. The manufacturer will describe the indirect method he is using based on the validation performed.

3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire if the conditions foreseen in the relevant Commission legal act defining the applicable AVCP are satisfied.

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.

Table 3 Tasks for the notified body

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				
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 and taking into account a limiting of organic material and/or the addition of fire retardants.	As defined in clause 2.2.1 of the EAD	As defined in clause 2.2.1 of the EAD	As defined in clause 2.2.1 of the EAD	When starting the production
Continuous surveillance, assessment and evaluation of factory production control				
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 and taking into account a limiting of organic material and/or the addition of fire retardants.	As defined in clause 2.2.1 of the EAD	As defined in clause 2.2.1 of the EAD	As defined in clause 2.2.1 of the EAD	1 per year

For the products falling under systems 3 or 4 (see clause 3.1), there is no involvement of a notified body after the ETA has been issued.

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

3.4.1 Particle size distribution

The determination of the dimensions of the particle size distribution of the loose fill insulation product shall be carried out in accordance with EN 933-1.

The nominal range of particle (granule) sizes and the corresponding tolerances shall be stated.

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment is of relevance.

EN 933-1	*Tests for geometrical properties of aggregates – Part 1: Determination of particle size distribution – Sieving method*
EN 1097-3	*Tests for mechanical and physical properties of aggregates – Part 3: Determination of loose bulk density and voids*
EN 1609	*Thermal insulating products for building applications – Determination of short term water absorption by partial immersion*
EN 12086	*Thermal insulating products for building applications – Determination of water vapour transmission properties*
EN 12667	*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 12939	*Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Thick products of high and medium thermal resistance*
EN 13170	*Thermal insulation products for buildings. Factory made products of expanded cork (ICB). Specification.*
EN 13238	*Reaction to fire tests for building products. Conditioning procedures and general rules for selection of substrates.*
EN 13501-1	*Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests*
EN 13823	*Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*
EN 15101-1	*Thermal insulation products for buildings – In-situ formed loose fill cellulose (LFCI) products – Part 1: Specification for the products before installation*
EN 16733	*Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering*
EN 29053	*Acoustics - Materials for acoustical applications - Determination of airflow resistance*
EN ISO 354	*Acoustics – Measurement of sound absorption in a reverberation room*
EN ISO 717-1	*Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation*
EN ISO 717-2	*Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation*
EN ISO 846	*Plastics – Evaluation of the action of microorganisms*
EN ISO 10140-2	*– Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation*
EN ISO 10140-3	*Acoustics – Laboratory measurement of sound insulation of building elements – Part 3: Measurement of impact sound insulation*
EN ISO 10140-5	*Acoustics - Laboratory measurement of sound insulation of building elements - Part 5: Requirements for test facilities and equipment*
EN ISO 10456	*Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values*

EN ISO 11654	*Acoustics – Sound absorbers for use in buildings – Rating of sound absorption*
EN ISO 11925-2	*Reaction to fire tests – Ignitability of products subjected to direct impingement of flame – Part 2: Single-flame source test*

ANNEX A REACTION TO FIRE TESTS

A.1 Product and installation parameters

Test specimens shall be conditioned in accordance with EN 13238.
Tables A.1 and A.2 give the parameters that shall be taken into account when determining a product's reaction to fire performance and the field of application of the test results.
Due to the organic nature of the product, classes A1 and A2 are not a possibility. Therefore, test methods according to EN ISO 1182 and EN ISO 1716 are not applicable to the product.

Table A.1 – Product parameters

Product parameter	EN ISO 11925-2 (Euroclass E or F)	EN ISO 13823 (Euroclasses B to D)
Thickness	X	X
Density	X	X

Note *Ageing procedures are not applicable for the test specimens.*

Table A.2 – Installation parameters

Installation parameter	EN ISO 11925-2	EN ISO 13823
Exposure to thermal attack (surface only)	X	X
Substrate	—	X
Air gaps/cavities	—	—
Joints/edges	—	—
Size and positioning of test specimen	—	—
Product orientation and geometry	—	—
Fixing of the test specimen	—	—

A.2 EN ISO 11925-2

The product shall be tested with a thickness of 40 mm, directly exposed to surface flame attack. Edge flame attack is not necessary, as mentioned in clause 4.5 of EN ISO 11925-2.

The results obtained are valid for thicknesses equal to or greater than 40 mm.

Test shall be carried out with specimens of the highest and lowest nominal loose bulk density. The test results are valid for the whole range of densities between those evaluated.
The mounting and fixing of loose fill material shall be carried out according to EN ISO 11925-2, clause 4.5.

The specimen holder for testing the loose fill insulation product shall be similar to the one defined in Figure 3 c) of EN 11925-2, except the size of the mesh, that may be reduced in order to retain the small size particles.

A.3 EN 13823

The mounting and fixing of loose fill product shall be made using cages made of a galvanized steel frame (built up with steel angles 25 mm x 25 mm x 3 mm) and galvanized steel mesh.

The mesh size shall be 4 mm x 4 mm, which may be reduced in order to retain smaller size particles. and wire thickness of 0,5 mm. To avoid moulding of the cages, a reinforcement by a second mesh layer with a mesh size of 50 mm x 50 mm and wire thickness of 2 mm shall be used.

The general substrate to be used to test the product as placed on the market is calcium silicate board. (according to EN 13238) and is to be formed by the SBI backing board.

The thickness of the product giving the worst test result shall be determined. If the worst test is not known minimum and maximum thickness shall be tested.

The test results are valid for:

- higher densities,

- all thickness between those evaluated in the tests,

- greater thicknesses if test results are obtained on 180 mm thick test specimens,

- higher amounts of the same type of flame retardant as the one which has been tested, if applicable.

ANNEX B Determination of resistance of mould fungus (method A)

B.1 Principle

A test specimen is exposed for a defined period of time at a constant temperature to a saturated atmosphere.
After this period of time the test specimen is visually inspected for the presence of mould fungus.

B.2 Apparatus

B.2.1 Desiccator, of sufficient size, that can contain a test specimen of 50 mm x 20 mm x 30 mm or for loose fill material a cage of wire according to B.2.2.

B.2.2 Cage made of stainless steel with an internal volume of approx. 0.05 litres for loose fill materials.

Cage A, for large particles, with a mesh size of 10 mm x 10 mm and a wire thickness of 0.4 mm.

Cage B, for small particles, with a mesh size of 1 mm x 1 mm and a wire thickness of and a wire thickness of 0.25 mm

B.3 Testing conditions

The exposure shall be performed at a constant temperature of (23 ± 2) °C.

Note*: This constant temperature is necessary to avoid any condensation during the exposure period.*

B.4 Procedure

- The desiccator is filled at the bottom with water;
- The sample is then put in the desiccator, taking care that no part of the sample can come into contact with the water;
- The desiccator is then closed tightly and put in the temperature-conditioned room for a period of four weeks;
- After four weeks the desiccator is opened and the sample visually inspected on the presence of mould fungus according to EN ISO 846:1997, clause 9.1.

ANNEX C Determination of declared thermal conductivity and the mass-related moisture conversion coefficient to high moisture content

C.1 Determination of the λ fractile value at 10 °C, at dry conditions ($\lambda_{10,dry,90/90}$)

C.1.1 Measurement of the λ_{dry} at 10 °C

C.1.1.1 Test specimens for the determination of the thermal conductivity λ at 10 °C shall be conditioned to dryness after storage for at least 72 hours at (65 ± 2) °C in an oven ventilated with air taken at (23 ± 2) °C and (50 ± 5)% relative humidity.

C.1.1.2 The thermal conductivity of the test specimens conditioned according to C.1.1.1 shall be measured according to EN 12667 or EN 12939 for thick products at a mean temperature of (10 ± 0.3) °C.

During the measurement, precaution shall be taken to avoid moisture absorption by the specimen. It is acceptable, for instance, to put the test specimen into a thin plastic bag.

C.1.2 Calculation of the λ fractile value at 10 °C, at dry conditions ($\lambda_{10,dry,90/90}$)

C.1.2.1 The λ fractile value at 10 °C, at dry conditions ($\lambda_{10,dry,90/90}$) representing at least 90% of the production with a confidence limit of 90% shall be calculated using the principles as detailed in EN 13170, Annex A.

C.2 Determination of the mass-related moisture conversion coefficient ($f_{u,1}$)

For the determination of the mass-related moisture conversion coefficient $f_{u,1}$, two sets of measurements are needed.

Set 1

At least three measurements on dry test specimens, to determine $\lambda_{10,dry}$ and u_{dry} (moisture content mass by mass).

Set 2

At least three measurements on test specimens conditioned at (23 ± 2) °C and (50 ± 5)% relative humidity, to determine $\lambda_{10,(23,50)}$ and $u_{23,50}$ (moisture content mass by mass).

C.2.1 Procedure

C.2.1.1 Set 1

C.2.1.1.1 Dry the test specimens following the procedure in C.1.1.1.

C.2.1.1.2 Determine for each test specimen the mass in dry condition. Average the values to determine the m_{dry}. The u_{dry}, being the moisture content in dry condition, is by definition set to 0.

C.2.1.1.3 Determine for each test specimen the λ value at 10 °C following the procedure in C.1.1.2. Average the values to determine the $\lambda_{10,dry}$.

C.2.1.2 Set 2

C.2.1.2.1 Condition the test specimens at (23 ± 2) °C and (50 ± 5)% relative humidity following the procedures detailed in EN 13171:2013, clause 5.2, step 2.

C.2.1.2.2 Determine for each test specimen the mass at (23 ± 2) °C and (50 ± 5)% relative humidity.

Average the values to determine the mass at 23 °C and 50% relative humidity as $m_{23,50}$.

C.2.1.2.3 Calculate $u_{23,50}$ by the following formula:

$$u_{23,50} = \frac{m_{23,50} - m_{dry}}{m_{dry}}$$

where,

$m_{23,50}$ is the mass at 23 °C and 50% relative humidity according to C.2.1.2.2

m_{dry} is the mass according to C.2.1.1.2

C.2.1.2.4 Determine for each test specimen conditioned according to C.2.1.2.1 the λ value in accordance with EN 12667 or EN 12939 for thick products at a mean temperature of (10 ± 0.3) °C.

Average the values to determine $\lambda_{10,(23,50)}$.

C.2.1.3 Calculation of the mass-related moisture conversion coefficient ($f_{u,1}$)

The mass-related moisture conversion coefficient $f_{u,1}$ shall be calculated by the following formula (derived from ISO 10456, formula 4):

$$f_{u,1} = \frac{\ln \frac{\lambda_{10,(23,50)}}{\lambda_{10,dry}}}{u_{23,50} - u_{dry}}$$

where,

$\lambda_{10,(23,50)}$ is determined according to C.2.1.2.4;

$\lambda_{10,dry}$ is determined according to C.2.1.1.3;

$u_{23,50}$ is determined according to C.2.1.2.3;

u_{dry} is determined according to C.2.1.1.2 and is defined to be 0.

C.3 Calculation of the declared thermal conductivity λ_D

The declared thermal conductivity λ_D shall be calculated using the following formula:

Category 1 (based on $\lambda_{10,dry,90/90}$):

$$\lambda_{(23,50)} = \lambda_{10,dry,90/90} * e^{f_{u,1}(u_{23,50} - u_{dry})}$$

Category 2 (based on $\lambda_{10,dry,limit}$):

$$\lambda_{(23,50)} = \lambda_{10,dry,limit} * e^{f_{u,1}(u_{23,50} - u_{dry})}$$

where,

$\lambda_{10,dry,90/90}$ is determined according to C.1.2;

$\lambda_{10,dry,limit}$ is determined according to clause 2.2.9.2.1of the EAD;

$f_{u,1}$ is determined according to C.2.1.3;

$u_{23,50}$ is determined according to C.2.1.2.3;

u_{dry} is determined according to C.2.1.1.2 and is defined to be 0.

The calculated value $\lambda_{(23/50)}$ shall be rounded upwards to the nearest 0.001 W/(m.K) and declared as $\lambda_{D(23,50)}$.

C.4 Determination of the mass-related moisture conversion coefficient ($f_{u,2}$) to high moisture content

For the determination of the mass-related moisture conversion coefficient to high moisture content $f_{u,2}$, two sets of measurements are needed.

Set 1

At least three measurements on test specimens conditioned at (23 ± 2) °C and (50 ± 5)% relative humidity, to determine $\lambda_{10,(23,50)}$ and $u_{23,50}$ (moisture content mass by mass).

Set 2

At least three measurements on test specimens conditioned at (23 ± 2) °C and (80 ± 5)% relative humidity, to determine $\lambda_{10,(23,80)}$ and $u_{23,80}$ (moisture content mass by mass).

C.4.1 Procedure

C.4.1.1 Set 1

Determine the $\lambda_{10,(23,50)}$ and $u_{23,50}$ in accordance with C.2.1.2

C.4.1.2 Set 2

C.4.1.2.1 Condition the test specimens at (23 ± 2) °C and (80 ± 5)% relative humidity until stabilization at constant weight is achieved, Stabilisation is obtained when the relative change in weight does not exceed 0.5% between two consecutive daily measurements.

C.4.1.2.2 Determine for each test specimen the mass at (23 ± 2) °C and (80 ± 5)% relative humidity.

Average the values to determine the mass at 23 °C and 80% relative humidity as $m_{23,80}$.

C.4.1.2.3 Calculate $u_{23,80}$ by the following formula:

$$u_{23,80} = \frac{m_{23,80} - m_{dry}}{m_{dry}}$$

where,

$m_{23,80}$ is the mass at 23 °C and 80% relative humidity according to C.4.1.2.2

m_{dry} is the mass according to C.2.1.1.2

C.4.1.2.4 Determine for each test specimen conditioned according C.4.1.2.1 the λ value in accordance with EN 12667 or EN 12939 for thick products at a mean temperature of (10 ± 0.3) °C.

Average the values to determine $\lambda_{10,(23,80)}$.

C.4.1.3 Calculation of the mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$)

The mass-related moisture conversion coefficient to high moisture content $f_{u,2}$ shall be calculated by the following formula (derived from ISO 10456, formula 4):

$$f_{u,2} = \frac{\ln \frac{\lambda_{10,(23,80)}}{\lambda_{10,(23,50)}}}{u_{23,80} - u_{23,50}}$$

where,

$\lambda_{10,(23,80)}$ is determined according to C.4.1.2.4;

$\lambda_{10,(23,50)}$ is determined according to C.2.1.2;

$u_{23,80}$ is determined according to C.4.1.2.3.

$u_{23,50}$ is determined according to C.2.1.2.

Note 1*: For the determination of the mass-related moisture conversion coefficient $f_{u,1}$ and the mass-related moisture conversion coefficient to high moisture content $f_{u,2}$, the test specimens shall be taken from the same production run.*

Note 2*: Thermal conductivity may also be measured at mean temperatures other than 10 °C, providing that the accuracy of the relationship between the temperature and thermal properties is well documented.*