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European Assessment Document for

# Insulating boards made of recycled polyurethane to be used as acoustic and thermal insulation



CE

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

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## 1 SCOPE OF THE EAD

### 1.1 Description of the construction product

The insulating boards made of recycled PUR (polyurethane) to be used as acoustic and thermal insulation (in the following referred to as the insulating boards) are made from 100 % recycled polyurethane material with a poly-isocyanate bonding agent manufactured in a hot press process and with a thermal conductivity of  $> 0.06$  W/mK.

The recycled polyurethane materials are residual materials (milling and cutting residues) from manufacturing of virgin material boards.

The product is in terms of dimensions described in accordance with sections 4.2.2, 4.2.3, 4.2.4 and 4.2.5 EN 13165<sup>1</sup>.

The product is not fully covered by harmonised European standard EN 13165, since this standard does not cover rigid boards made from recycled material, and in addition, the standard does not cover products having a thermal conductivity of  $> 0.06$  W/mK).

Concerning product packaging, transport, storage, maintenance, replacement and repair, it is the responsibility of the manufacturer to undertake the appropriate measures and issue – when necessary - adequate advice to the clients.

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 professional building practices.

Relevant manufacturer's information 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 use(s) of the construction product

#### 1.2.1 Intended use(s)

The intended use is thermal insulation for walls, ceiling and roofs similarly to section 1 of EN 13165. The boards are not subject to weathering.

#### 1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written to take into account a working life of the insulating boards for an intended use of 25 years when installed in the works, provided that the insulating board is subject to appropriate installation (see clause 1).

These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works<sup>2</sup>.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

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

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

## 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 insulating boards is assessed in relation to the essential characteristics.

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

No	Essential characteristic	Assessment method	Type of expression of product performance
<b>Basic Works Requirement 2: Safety in case of fire</b>			
1	Reaction to fire	2.2.1	Class
<b>Basic Works Requirement 5: Protection against noise</b>			
2	Airflow resistance	2.2.2	Level
3	Sound absorption	EN 13165 section 4.3.10	Level
<b>Basic Works Requirement 6 : Energy economy and heat retention</b>			
4	Thickness	2.2.3	Level
5	Compressive strength	2.2.4	Class
6	Water vapour transmission	2.2.5	Level
7	Dimensional stability	2.2.6	Class
8	Water permeability	2.2.7	Level
9	Thermal conductivity	2.2.8	Level
10	Deformation under specified load and temperature	2.2.9	Level
11	Compressive creep	EN 13165 section 4.3.6	Level
12	Tensile / Flexural strength	EN 13165 section 4.3.5	Level
13	Content, emission and/or release of dangerous substances	2.2.10	Description
<b>Aspects of durability</b>			
14	Durability of thermal resistance against high temperature	2.2.8	Level
15	Durability of thermal resistance against ageing/degradation	2.2.8	Level

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

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

### **2.2.1 Reaction to fire**

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

For mounting and fixing of the boards as well as for the extended application of the test results the provisions given in EN 15715, cl. 5 and tables A.16 and A.17 shall apply accordingly for products covered by this EAD.

When using the test method according to EN ISO 11925-2 the product shall be tested with both surface exposure and edge exposure as well.

The class shall be stated in the ETA.

### **2.2.2 Airflow resistance**

Airflow resistance shall be determined in accordance with EN ISO 9053-1. 3 samples are tested.

The specific airflow resistance,  $R_s$ , shall be expressed in levels using steps of 1 kPa.s/m, and shall be stated in the ETA. mentioned frequencies.

### **2.2.3 Thickness**

The thickness,  $d$ , is determined in accordance with section 4.2.3 of EN 13165 with a pressure of 50 Pa ( $\pm 1,5$  Pa) and at least 3 test specimens.

The thickness of the insulating boards shall be stated in the ETA as described in section 4.2.3 of EN 13165.

### **2.2.4 Compressive strength**

The compressive strength of the insulating boards shall be determined in accordance with section 4.3.4 in EN 13165 and the classification shall be stated in the ETA.

### **2.2.5 Water vapour transmission**

Water vapour transmission properties of the product including facings or coatings shall be determined in accordance with EN 12086, method A, and determined as the water vapour diffusion resistance factor for homogeneous products,  $\mu$ , shall be given in the ETA.

### **2.2.6 Dimensional stability**

Dimensional stability shall be determined in accordance with section 4.3.2 in EN 13165. The classes, test conditions, test methods and maximum values of relative changes in length  $\Delta\varepsilon$  and width  $\Delta\varepsilon$  are stated in the ETA.

### **2.2.7 Water absorption**

The short-term water absorption by partial immersion,  $W_p$ , shall be determined in accordance with section 4.3.7.1 in EN 13165 (EN 1609, method B) and the performance shall be stated in the ETA.

### 2.2.8 Thermal conductivity and thermal resistance

The thermal conductivity at a temperature of 10 °C shall be determined in accordance with EN 12667 or EN 12939 for thick products in accordance with section 4.2.1 of EN 13165, but without aging according to Annex C of EN 13165, The aging procedure is not considered because it is assumed that the product does not contain cell gas.. At least 10 measurements shall be performed and the performance is assessed in accordance with annex A of EN 13165..

The influence of humidity on the thermal conductivity is determined by storing the specimen in a climate of 23 °C and 80 % relative humidity followed by measurements with at least 3 specimens in accordance with EN 12667 or EN 12939 for thick products until mass equilibrium has been reached.

The thermal conductivity ( $\lambda_{10,(23,80)}$ ) and the moisture content mass by mass ( $u_{23,50} / u_{23,80}$ ) are determined.

The mass-related moisture conversion coefficient  $f_u$  is calculated by the following formula (derived from EN ISO 10456, formula 4) by using the average for  $\lambda$  and  $u$ :

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

The moisture conversion factor  $F_m$  is calculated according to EN ISO 10456, formula 4.

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 %, is determined on the basis of the measuring results in accordance with EN ISO 10456 and shall be stated in the ETA.

The mass-related moisture conversion coefficient  $f_u$  for the conversion of  $\lambda_{23,50}$  to  $\lambda_{23,80}$  as well as the moisture content mass by mass (m/m) at 23 °C and 50 % relative humidity and 23 °C and 80 % relative humidity are given in the ETA.

The moisture conversion factor  $F_m$  for the conversion of  $\lambda_{23,50}$  to  $\lambda_{23,80}$  is given in the ETA.

*Note. Durability of thermal resistance against high temperature and durability of thermal resistance against ageing/degradation is not considered relevant, since the product is made from recycled PUR and after milling and bonded with high pressure, there is only a negligible amount of remaining cell gas present.*

### 2.2.9 Deformation under specified load and temperature

The dimensional stability of the insulating boards under specified temperature and humidity shall be tested in accordance with section 4.3.3 of EN 13165, and the class depending on the relative change in thickness shall be stated in the ETA as described in table 7 of EN 13165.

### 3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

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

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

The system is: **3**.

In addition, with regard to reaction to fire for products covered by this EAD the applicable European legal act is: Decision 1999/91/EC as amended by Decision 2001/596/EC.

The systems to be applied are: **1, 3, 4**.

#### 3.2 Task of the manufacturer

The corner stones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

**Table 3.2.1: Control plan for the manufacturer; cornerstones**

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Factory production control (FPC)</b>					
1	Reaction to fire	See 2.2.1 and EN 13165 table B.2	To be defined in control plan	1	Every five years indirect testing
2	Airflow resistance	See 2.2.3	To be defined in control plan	4	Every two years
3	Sound absorption	EN 13165 section 4.3.10	To be defined in control plan	4	Every five years
4	Length	EN 13165	To be defined in control plan	4	Every two hours
	Width				Every two hours
	Thickness				Every two hours
	Squareness				Every eight hours
	Flatness				Every eight hours
5	Density	EN 13165	To be defined in control plan	4	Every eight hours
6	Water vapour transmission	See 2.2.5	To be defined in control plan	4	Once per 5 years
7	Dimensional stability	See 2.2.6	To be defined in control plan	4	Once per 5 years
8	Water absorption	See 2.2.7	To be defined in control plan	4	Once every year
9	Thermal conductivity	See 2.2.8	To be defined in control plan	10	Twice per year, indirect testing <sup>1</sup> per 24 h for the density

<sup>1)</sup> indirect verification / testing is done via determination of the density

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



### 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 are laid down in Table 3.3.1.

The intervention of the notified body under AVCP system 1 are necessary for resistance to fire and reaction to fire for products for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in table 3.3.1.

**Table 3.3.1 Control plan for the notified body under AVCP system 1; corner stones**

Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Initial inspection of the manufacturing plant and of factory production control</b>				
The Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing related to reaction to fire, taking into account productions stages limiting of organic material and/or the addition of fire retardants.	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
<b>Continuous surveillance, assessment and evaluation of factory production control</b>				
The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan related to resistance to fire and reaction to fire, taking into account productions stages limiting of organic material and/or the addition of fire retardants.	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in table 3.2.1	According to Control plan	According to Control plan	1/year

## 4 REFERENCE DOCUMENTS

EN 13165:2012 +A2:2016	Thermal insulation products for buildings – Factory made rigid polyurethane foam (PU) products – Specification
EN 13501-1:2018	EN13501-1 Fire classification of construction products and building elements - Part 1: Classification using test data from fire reaction to fire tests
EN ISO 11925-2:2010	Reaction to fire tests – Ignitability of products subjected to direct impingement of flame – Part 2: Single-flame source test
CDR (EU) 2016/364	Classification of the reaction to fire performance of construction products pursuant to Regulation (EU) No 305/2011
EN 15715:2010	Thermal insulation products – Instructions for mounting and fixing for reaction to fire testing – Factory made products
EN ISO 9053-2:2018	Acoustics – Determination of airflow resistance – Part 1: Static airflow method
EN ISO 354:2003	Acoustics – Measurement of sound absorption in a reverberation room
EN ISO 11654:1997	Acoustics – Sound absorbers for use in buildings – Rating of sound absorption
EN 1602:2013	Thermal insulating products for building applications – Determination of the apparent density
EN 12086:2013	Thermal insulating products for building applications – Determination of water vapour transmission properties
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 12939:2001	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 ISO 10456:2008	Building materials and products. Procedures for determining declared and design thermal values