
Toplotnoizolacijski proizvodi za stavbe – Razsuti celulozni proizvodi za oblikovanje na mestu vgradnje – 1. del: Specifikacija za proizvode pred vgradnjo

Thermal insulation products for buildings - In-situ formed loose-fill cellulose products - Part 1: Specification for the products before installation

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Thermal insulation products for buildings - In-situ formed loose-fill cellulose products - Part 1: Specification for the products before installation

Produits d'isolation thermique pour les bâtiments - Produits isolants cellulosiques en vrac mis en forme sur place - Partie 1 : Spécification des produits avant la mise en place

Wärmedämmstoffe für das Bauwesen - An der Anwendungsstelle hergestellte Wärmedämmung aus Zellulosefasern (LFCI) - Teil 1: Spezifikation für die Produkte vor dem Einbau

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 88.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Foreword

This document (prEN 15101-1) has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, B, C or D, which is an integral part of this document.

This European Standard is one of a series for mineral wool, expanded clay, expanded perlite, exfoliated vermiculite, polyurethane/polyisocyanurate, cellulose and urea formaldehyde in-situ formed insulation products used in buildings, but this standard may be used in other areas where appropriate.

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1 Scope

This document specifies requirements for in-situ formed loose-fill cellulose thermal insulation products when installed in internal walls, external walls, floors, galleries, roofs and ceilings.

This Part 1 of the document is a specification for the loose-fill cellulose products before installation.

Part 1 of this document describes the product characteristics and includes procedures for testing, marking and labelling and the rules for evaluation of conformity.

This document does not specify the required level of all properties that should be achieved by a product to demonstrate fitness for purpose in a particular application. The required levels are to be found in regulations or non-conflicting standards.

Products covered by this document may also be used in pre-fabricated thermal insulation systems and composite panels; the structural performance of systems incorporating these products is not covered.

Products with a declared thermal conductivity at 10 °C greater than 0,060 W/(m·K) or a declared thermal resistance lower than 0,25 m²/k/W are not covered by this standard.

This document does not cover factory made cellulose products intended to be used for the insulation of buildings or in-situ cellulose products for the insulation of building equipment and industrial installations.

This Standard does not specify performance requirements for loadbearing, direct airborne sound and acoustic absorption applications.

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2 Normative references

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The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1609:1997, *Thermal insulating products for building application — Determination of short term water absorption by partial immersion*

EN 12086:2001, *Thermal insulating products for building application — Determination of water vapour transmission properties*

EN 12667, *Building materials — Determination of thermal resistance by means of guarded hot plate and heat flow meter method — Products of high and medium thermal resistance*

EN 13172:2001, *Thermal insulating products for building applications — Evaluation of conformity*

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*

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 29053:1993, *Acoustics — Materials for acoustical applications — Determination of airflow resistance*

EN ISO 11925-2, *Reaction to fire tests. Ignitability of building products subjected to direct impingement of flame — Single-flame source test*

ISO 12491, *Statistical methods for quality control of building materials and components*

prEN ISO 9229, *Thermal insulation — Definitions of terms*

prEN 15101-2, *Thermal insulation products for buildings — In-situ formed loose-fill cellulose products — Part 2 Specification for the installed product*

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of this standard, the following definitions apply.

3.1.1 Definitions as given in prEN ISO 9229

3.1.1.1

installed insulation thickness

insulation thickness as installed by the installer

3.1.1.2

frame construction

walls with wood or metal studs, sloping roof with insulation between rafters

3.1.1.3

settlement

the decrease of installed insulation thickness in lofts or height in cavities and frame constructions with time, expressed as a percentage of the initial installed thickness (after compaction if prescribed)

3.1.1.4

coverage

mass of insulation per unit area

3.1.1.5

performance chart

a table giving thickness and coverage requirements for different values of declared thermal resistance

3.1.2 Additional definitions

3.1.2.1

level

the given value, which is the upper or lower limit of a requirement. The level is given by the declared value of the characteristic concerned

3.1.2.2

class

a combination of two levels of the same property between which the performance shall fall, where the levels are given by the declared value of the characteristic concerned

3.1.2.3

loose fill cellulose insulation product

a fibrous or granulated natural cellulose product with or without additives, installed either by dry blowing, dry injection or by wet spray, either on-site or in a factory

3.2 Symbols and abbreviations

Symbols used in this standard:

| | | |
|-------------------|---|---------------------|
| $\lambda_{90/90}$ | is the 90 % fractile with a confidence level of 90 % for the thermal conductivity | W/(m·K) |
| λ_D | is the declared thermal conductivity | W/(m·K) |
| λ_i | is one test result of thermal conductivity | W/(m·K) |
| λ_{mean} | is the mean thermal conductivity | W/(m·K) |
| μ | is the water vapour diffusion resistance factor | - |
| n | is the number of test results | - |
| $R_{90/90}$ | is the 90% fractile with a confidence level of 90% for the thermal resistance | m ² K/W |
| R_D | is the declared thermal resistance | m ² K/W |
| R_{mean} | is the mean thermal resistance | m ² K/W |
| ρ | is the bulk density before settlement test | kg/m ³ |
| s_λ | is the estimate of the standard deviation of the thermal conductivity | W/(m·K) |
| W_p | is the short term water absorption | kg/m ² |
| s_i | is the initial height in the settlement tests | mm |
| s_a | is the final height in the settlement tests | mm |
| s_D | is the mean declared settlement value | mm |
| R_a | is the level of airflow resistivity | kPas/m ² |
| P_s | is the settled density after testing | kg/m ³ |
| S | is the symbol of the declared class for settlement | |
| WS | is the symbol of the declared level for short-term water absorption | |
| CR | is the symbol for the declared class for corrosion | |
| BA | is the symbol for the declared class for resistance to biological agents | |
| AF | is the symbol for airflow resistivity | |

Abbreviations used in this standard:

ITT is Initial Type Test

LFCI is Loose-Fill Cellulose Insulation

4 Requirements

4.1 General

Product properties shall be assessed in accordance with clause 5. To comply with this standard, products shall meet the requirements of 4.2, and the requirements of 4.3 as appropriate.

This standard gives performance charts for three different applications:

- loft insulation
- masonry cavity wall, and floor insulation
- frame construction

NOTE The three applications may require different classes for settlement.

One test result on a product property is the average of the measured values on the number of test specimens given in Table 6.

4.2 For all applications

4.2.1 Thermal conductivity and thermal resistance

Thermal conductivity and thermal resistance shall be based upon measurements carried out in accordance with EN 12667.

The thermal values shall be determined in accordance with Annex A, 5.1.1 and 5.3.2 and declared by the manufacturer, according to the following:

- the reference mean temperature shall be 10 °C;
- the measured values shall be expressed with three significant values;
- the declared thermal values, shall be given as limit values representing at least 90 % of the production determined with a confidence level of 90 %;
- the declared thermal resistance, R_D , shall be calculated from the insulation thickness and the declared thermal conductivity, λ_D (See note);
- the value of thermal conductivity λ_D shall be rounded upwards to the nearest 0,001 W/(m·K) and declared in levels with steps of 0,001 W/(m·K);
- the value of thermal resistance, R_D , shall be rounded upward to the nearest 0,05 m² K/W and declared in levels with steps of 0,05 m² K/W.

NOTE The declaration of thermal resistance for installed loose-fill cellulose is described in Part 2 of this standard (prEN 15101-2).

4.2.2 Settlement

4.2.2.1 Horizontal applications, loft and floors

Settlement shall be classified and declared in accordance with Table 1. The classification shall be based on the long-term settlement experience after installation or measurements made in accordance with the laboratory method A given in Annex B.

Table 1 — Classes for settlement for horizontal applications, lofts and floors

| Class | Requirement |
|-------|--------------------------|
| SH1 | No measurable settlement |
| SH2 | ≤ 5 % |
| SH3 | ≤ 10 % |
| SH4 | ≤ 15 % |
| SH5 | ≤ 20 % |
| SH6 | ≤ 25 % |
| SH7 | > 25 % |

4.2.2.2 Cavity insulation, frame constructions and cavity walls

Settlement shall be classified and declared in accordance with Table 2. The classification shall be based on the long-term settlement experience after installation or measurements made in accordance with the laboratory method B given in Annex B.

Table 2 — Classes for settlement for cavity insulation, frame constructions and cavity walls

| Class | Requirement |
|-------|---------------|
| SCO | No settlement |

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4.2.3 Reaction to fire

Reaction to fire classifications (Euroclasses) shall be determined in their end-use applications and if required as placed on the market in accordance with EN 13501-1. Mounting and fixing details are specified according to end-use in Annex C.

4.2.4 Durability characteristics

4.2.4.1 General

The appropriate durability characteristics have been considered and are covered in 4.2.4.2, 4.2.4.3, 4.2.4.4 and 4.2.4.5.

4.2.4.2 Durability of reaction to fire against ageing/degradation

There is no change in reaction to fire for LFCI products with time as the contents of additives do not change with time.

4.2.4.3 Durability of reaction to fire against biological agents

There is no change with time of the reaction to fire as a result of biological action.

4.2.4.4 Durability of thermal resistance against biological agents

There is no change with time of the thermal performance as a result of biological action.

4.2.4.5 Durability of thermal resistance against ageing/degradation

The thermal conductivity (4.2.1) of LFCI products does not change with time. Account is taken of settlement (4.2.2) (classes given in Table 1) in stating the declared thermal resistance values.

4.3 For specific applications

4.3.1 General

If there is no intended requirement for a property, described in 4.3, for a product in its end-use application, then the property need not be determined and declared by the manufacturer

4.3.2 Short-term water absorption

Short-term water absorption, W_p , shall be determined in accordance with EN 1609: 1997, method A with specimen preparation in accordance with Annex D. Test results shall be classified according to Table 3:

Table 3 — Classes of short-term water absorption

| Class | Requirements |
|-------|---------------------------|
| WS1 | No requirements |
| WS2 | $\leq 1,0 \text{ kg/m}^2$ |
| WS3 | $> 1,0 \text{ kg/m}^2$ |

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4.3.3 Water vapour diffusion resistance factor

Loose-fill products have a structure that is highly permeable to water vapour. The water vapour resistance factor, μ , may be assumed to be 1 if no measurements are available. If measurements are undertaken the product shall be tested in accordance with EN 12086

4.3.4 Release of dangerous substances

NOTE See Annex ZA.

4.3.5 Corrosion resistance

Corrosion resistance shall be classified and declared in accordance with Table 4 after testing in accordance with Annex E.

Table 4 — Classes of corrosion resistance

| Class | Requirements |
|-------|---|
| CR0 | No requirement or no performance determined |
| CR1 | Test passed |

4.3.6 Resistance to biological agents

Resistance to biological agents shall be classified and declared in accordance with Table 5 after testing in accordance with the procedure given in Annex F.

Table 5 — Classes for resistance to biological agents

| Class | Requirements |
|-------|---|
| BA0 | No requirement or no performance determined |
| BA1 | Test passed |

4.3.7 Airflow resistivity

Airflow resistivity, R_a , shall be determined in accordance with EN 29053:1993, method A using a specimen prepared in accordance with Annex G. The value of airflow resistance shall be declared in levels with steps of $1 \text{ kPa}\cdot\text{s}/\text{m}^2$. No test result shall be lower than the declared value.

NOTE Airflow resistivity can be used when estimating the risk for reduced thermal resistance caused by convection.

5 Test methods

5.1 Sampling

5.1.1 Sampling for measuring thermal conductivity

For information on sampling, preparation and conditioning of the samples for measuring thermal conductivity see Annex H.

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5.2 Conditioning

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No special conditioning of the test specimens is needed unless otherwise specified in the Annexes to this standard or other test standards. In case of dispute, the test specimens shall be stored at $(23 \pm 2) \text{ }^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity for at least 24 hours prior to testing.

5.3 Testing

5.3.1 General

Table 6 gives the dimensions of the test specimens, the minimum number of measurements required to get one test result and any other specific conditions which are necessary.

Table 6 — Test methods, test specimens and conditions

Dimensions in millimetres

| Clause | Title | Test method | Test specimen | | Specific conditions |
|--------|---|----------------------------|------------------------------|-----------------------|---|
| | | | Dimensions | No. to get one result | |
| 4.2.1 | Thermal conductivity and thermal resistance | EN 12667 | ≥ (800 x 800 x 100) | 1 | Measuring area: ≥ (500 x 500) ≥ (250 x 250) |
| | | | ≥ (500 x 500 x 100) | 1 | |
| 4.2.2 | Settlement | | | | |
| | Lofts and floors | Annex B Method A | 550 x 550 x 330 | 1 | |
| 4.2.3 | Frame construction and cavity walls | Annex B, Method B | 1000 x 625 x 160 minimum | 1 | |
| | Reaction to fire ¹⁾ | See EN13501-1 and Annex C | | | |
| 4.3.2 | Short-term water absorption | EN 1609:1997 Method A | 200 x 200 x 50 | 4 | |
| 4.3.3 | Water vapour diffusion resistance factor | EN 12086:2001:Annex B | Maximum thickness 100 | 5 | |
| 4.3.5 | Corrosion resistance | Annex E | 20 g test specimens | 4 | |
| 4.3.6 | Resistance to biological agents | Annex F | Diameter 150 Thickness 20 | 2 | |
| 4.3.7 | Airflow resistivity | EN 29053: 1993 Method A | 500 x 500 x 100 | | |

5.3.2 Thermal conductivity

Thermal resistance and thermal conductivity shall be determined in accordance with EN 12667 and under the following conditions:

- at a mean temperature of $(10 \pm 0,30)$ °C;
- after conditioning in accordance with 5.2;
- after preparation in accordance with the procedure given in Annex H.

6 Designation code

The manufacturer shall give a designation code for a LFCI product. The following shall be included except when there is no requirement for a property described in 4.3:

- Loose-fill cellulose (LFCI)
- This EN standard number
- Declared settlement class for horizontal applications SHi
 Declared settlement class for cavity insulation SCi
- Declared water absorption class WSi
 Declared corrosion resistance class CRi
- Declared class for resistance to biological agents BAi
- Declared airflow resistivity AFi

where „i” shall be used to indicate the relevant class or level.

The designation code for a loose-fill cellulose product declared for use as cavity insulation is illustrated by the following example:

LFCI EN 15101—SC0 – WS2 – CR1 – BA1

7 Evaluation of conformity

The manufacturer or his authorized representative shall be responsible for the conformity of his product with the requirements of this European Standard. The evaluation of conformity shall be carried out in accordance with EN 13172 and shall be based on factory production control and tests on samples taken at the factory.

Clause 7 of EN 13172: 2001 applies to LFCI-products with the following modifications:

- Note 2 of clause 7 of EN 13172: 2001 does not apply.
- The maximum acceptable failure of anyone measurement is 10 %.
- In case of an up to 10 % failure of the first measurement, two other samples shall be taken and measured.

The two additional measurements must meet the declared value, and the average of the three measurements taken must also be on the positive side of the declared value.

If a manufacturer decides to group his products it shall be done in accordance with EN 13172.

The minimum frequencies of tests in the factory production control shall be in accordance with Annex J of this standard. When indirect testing is used, the correlation to direct testing shall be established in accordance with EN 13172.

NOTE 1 The system of attestation of conformity for the CE marking of the product is chosen in accordance with Annex ZA of this standard (See ZA.2.2). For in-situ formed loose-fill cellulose insulation (LFCI) products the footnote * of Table ZA.2.2 applies except when it can be demonstrated to the notified body for a particular product that no stage in the production process will result in an improvement of the reaction to fire classification (see Table ZA.2.2, footnote **).