SLOVENSKI STANDARD
SIST EN 12467:2013+A2:2018

01-junij-2018

Nadomešča:
SIST EN 12467:2013+A1:2016

Vlaknato-cementne ravne plošče - Specifikacija za izdelek in preskusne metode

Fibre-cement flat sheets - Product specification and test methods

Faserzement-Tafeln - Produktspezifikation und Prüfverfahren

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Plaques planes en fibres-ciment - Spécifications du produit et méthodes d'essai

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Ta slovenski standard je istoveten z: **EN 12467:2012+A2:2018**

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ICS:

91.100.40	Cementni izdelki, ojačani z vlakni	Products in fibre-reinforced cement

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2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12467:2012+A2

April 2018

ICS 91.100.40

Supersedes EN 12467:2012+A1:2016

English Version

Fibre-cement flat sheets - Product specification and test methods

Plaques planes en fibres-ciment - Spécifications du produit et méthodes d'essai

Faserzement-Tafeln - Produktspezifikation und Prüfverfahren

This European Standard was approved by CEN on 24 November 2015 and includes Amendment 2 approved by CEN on 9 November 2017.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 12467:2012+A2:2018) has been prepared by Technical Committee CEN/TC 128 "Roof covering products for discontinuous laying and products for wall cladding", the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2018, and conflicting national standards shall be withdrawn at the latest by January 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1, approved by CEN on 24 November 2015 and Amendment 2, approved by CEN on 9 November 2017.

This document supersedes [A2] EN 12467:2012+A1:2016 [/A2].

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] [/A1] and [A2] [/A2].

[A1] In comparison with EN 12467:2004, the following sections in EN 12467:2012 had been changed or added: [/A1] 3.9, 3.10, 4, 5.1.1, 5.4.3, 5.4.4, Table 7, Table 8, 7.3.2, 7.3.2.4.2, 7.3.3.3, 7.3.3.4, 7.3.7, 7.5.2.2 and Annex C.

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Annex ZB concerning the EC Directive 76/769/EEC [A1] had been deleted [/A1].

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This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with [A2] EU Regulation No 305/2011 [/A1], see informative Annex ZA, which is an integral part of this document.

A distinction [A1] had been made [/A1] between product appraisal (type tests) and factory production control requirements (acceptance tests).

The performance of a building part constructed with these sheets depends not only on the properties of the product as required by this document, but also on the design, construction and installation of the component as a whole in relation to the environment and conditions of use.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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1 Scope

This European Standard specifies the technical requirements and establishes methods of inspection and test as well as acceptance conditions for fibre-cement flat sheets, siding shingles and planks (referred to as sheets later in this document) for one or more of the following uses:

— internal wall and ceiling finishes;

— external wall and ceiling finishes.

Products covered by this European Standard can be used for other purposes provided they comply with the relevant application standard, e.g. rigid underlays.

This European Standard covers sheets reinforced with fibres of different types as specified in 5.1.1.

This European Standard does not cover sheets for fire protection purposes.

This European Standard does not include calculations with regard to works, design requirements, installation techniques, wind uplift or rain proofing of the installed sheets.

2 Normative references

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

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EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

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

EN ISO 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716)*

EN ISO 12572, *Hygrothermal performance of building materials and products — Determination of water vapour transmission properties — Cup method (ISO 12572)*

ISO 2602, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3951-1, *Sampling procedures for inspection by variables — Part 1: Specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection for a single quality characteristic and a single AQL*

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
acceptance test
test to establish whether a batch of sheets conforms to a specification and which is performed on samples drawn either from continuous production or from a consignment

Note 1 to entry: Test methods, specifications and limit values are specified in this document. Sampling levels and acceptance criteria are specified in 6.3.2.

3.2
initial type test
test carried out to demonstrate conformity with the requirements of this document or for the approval of a new product and/or when a fundamental change is made in formulation and/or [A2) manufacturing process (A2], the effects of which cannot be predicted on the basis of previous experience

Note 1 to entry: The test is performed on the as delivered product, but is not required for each production batch.

3.3
acceptable quality level (AQL)
quality level which in a sampling plan corresponds to a specified, relatively high probability of acceptance

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Note 1 to entry: It is the maximum percent defective (or maximum number of defects per 100 units) that for purposes of sampling inspection can be considered satisfactory as a process average.

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Note 2 to entry: A sampling scheme with an AQL of 4 % means that batches containing up to 4 % defective items have a high probability of acceptance.

3.4
apparent density
density based on the external dimensions of the sample to calculate the volume

Note 1 to entry: This is an average density of material and pores.

3.5
as delivered
same condition as the producer intends to supply the product after completing all aspects of the process including maturing and, when appropriate, painting

3.6
upper face
face normally exposed

3.7
under face
reverse of upper face

3.8
textured sheets
sheets which have a relief pattern embossed or applied as a coating on their upper face before delivery

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3.9
NT
type of fibre-cement flat sheets which cover products made using a non-asbestos technology

3.10
ambient laboratory conditions
ambient laboratory conditions which are a temperature of (23 ± 5) °C and a relative humidity of (50 ± 20) %

4 Symbols and abbreviations

a	nominal length or width of the sheet
b	1. dimension of the specimen (length or width) measured parallel to the test machine supports, in millimetres
	2. one of the coefficients of the regression line (see Annex B)
d	apparent density of the sheet in grams per cubic centimetre
e	thickness of the sheet, in millimetres
F	breaking load, in newtons
l	length, in millimetres
l_S	span between the centres of the test machine supports in the bending strength test, in millimetres
m	mass of the specimen after drying, in grams
n	number of paired specimens
MOE	modulus of elasticity, in Gigapascals or megapascals
MOR	modulus of rupture, in megapascals
MOR_{fi}	modulus of rupture of the i^{th} exposed specimen after the type test
MOR_{fci}	modulus of rupture of the i^{th} unexposed reference specimen
MR_i	individual ratio of the modulus of rupture of the i^{th} pair of exposed and unexposed specimens
R	average ratio of the modulus of rupture of exposed and unexposed specimens
R_L	lower estimate of the mean of the ratios at 95 % confidence level of the modulus of rupture of exposed and unexposed specimens
s	standard deviation of the values in the appropriate calculation
μ	water vapour resistance value
V	volume of the specimen, in cubic centimetres

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w width, in millimetres

x_i individual value of the i^{th} specimen tested dry

x_{std} minimum value to be used as the specification for the dry method of test. This value is calculated at the 97,5 % lower confidence level from the value specified for the wet method of test in this document (see B.5)

y_{std} minimum value specified in the standard for wet testing (see B.5)

x_o actual result obtained when dry testing (see B.4)

$\bar{x}$ mean of the values of x_i for i = 1 to n

y_i individual value of the i^{th} specimen tested wet

y_o value calculated from the value obtained from a specimen tested dry, which is the estimate at the 97,5 % lower confidence level of the value expected from a specimen tested wet (see B.4)

$\bar{y}$ mean of the values of y_i for i = 1 to n

5 Requirements

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5.1 General

5.1.1 Composition

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Sheets shall consist essentially of cement or a calcium silicate formed by a chemical reaction of a siliceous and a calcareous material, reinforced by fibres. The cement shall comply with EN 197-1 or with technical specifications relevant in the country of use. [A2] The cement shall comply with EN 197-1 or an agreed technical specification relevant in the country of use provided the cement compound composition is in accordance with EN 197-1. [/A2]

This European Standard covers fibre-reinforced cement flat sheets of type NT. The reinforcing fibres shall be one or more of the following forms:

— discrete elements randomly dispersed;

— continuous strands or tapes;

— nets or webs.

Process aids, fillers, aggregates and pigments may be added.

5.1.2 Appearance and finish

The exposed face of the sheets can be with or without texture. The sheets can be coloured or left in their natural colour. The sheets can also receive adherent coloured or uncoloured coatings on their surface. Variations of the surface appearance which do not impair the fitness for purpose of the sheets are permitted.

The sheets may be supplied with holes for fixing and/or cut to size.

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5.2 Classification

5.2.1 General

Sheets covered by this document are divided into:

— four categories in accordance with their weather resistance (see 5.2.2 to 5.2.5);

— five classes in accordance with their bending strength (see 5.4.3);

— two groups of sizes in accordance with their method of installation (see 5.2.6);

— two levels in accordance with their dimensional tolerances (see 5.3.4).

Type tests for each category are specified in Table 7.

5.2.2 Category A

Sheets which are intended for applications where they may be subjected to heat, high moisture and severe frost.

5.2.3 Category B

Sheets which are intended for applications where they may be subjected to heat, moisture and occasional frost, e.g. where they are either protected from or not subjected to severe weathering conditions.

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5.2.4 Category C

Sheets which are intended for internal applications, where they may be subjected to heat and moisture, but not to frost.

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5.2.5 Category D

Sheets for rigid underlayer applications.

5.2.6 Groups of sizes

5.2.6.1 Small size sheets

Sheets for which the method of installation includes horizontal overlap. Their dimensions are generally such that their area is < 0,4 m^2 and have a length/width relation ≤ 3.

5.2.6.2 Large size sheets

Sheets which do not correspond to indicators for small size sheets. Large sheets may be declared as "small size sheets" provided tolerances for small size sheets apply and are specified in the manufacturer's literature.

5.3 Dimensions and tolerances

5.3.1 General

There are two levels of tolerances for length, width, straightness and squareness of edges. Sheets shall comply with the requirements of the same level for the four sets of tolerances.

5.3.2 Nominal length and width

The manufacturer shall specify the nominal length and width of the sheets.

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NOTE Sheets are normally available in nominal lengths up to 3 000 mm and nominal width up to 1 250 mm. Greater nominal lengths and widths can be supplied.

5.3.3 Thickness

The manufacturer shall specify the nominal thickness of the sheets.

For non-textured sheets, the nominal thickness refers to the average thickness. For textured sheets, the nominal thickness refers to the maximum thickness.

NOTE 1 The nominal thickness of textured sheets cannot be used for the calculation of mechanical performance.

Sheets are normally available in thickness from 3 mm to 30 mm.

NOTE 2 Thicker sheets can be supplied.

5.3.4 Tolerances on nominal dimensions[1)]

5.3.4.1 Tolerances on length and width

Tolerances on length and width shall be in accordance with Table 1, for the appropriate level.

Table 1 — Tolerances on nominal dimensions in accordance with value and level

Nominal dimension a[a]	Level I	Level II
$a \leq 600$ mm	± 3 mm	± 4 mm
600 mm < $a \leq 1\,000$ mm	± 3 mm	± 5 mm
1 000 mm < $a \leq 1\,600$ mm	± 0,3% a	± 0,5% a
1 600 mm < a	± 5 mm	± 8 mm
[a] a is the nominal width or length.		

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These tolerances are not applicable to oversize sheets.

The method of measurement is given in 7.2.3.1.

5.3.4.2 Tolerances on thickness

For non-textured sheets, tolerances shall be in accordance with Table 2.

Table 2 — Tolerances on thickness for non-textured sheets

$e \leq 6$ mm	± 0,6 mm
6 mm < $e \leq 20$ mm	± 10 % e
$e > 20$ mm	± 2 mm

For sheets without texture, the maximum difference between extreme values of the thickness measurements within one sheet shall not exceed 10 % of the maximum measured value.

For textured sheets, tolerances shall be in accordance with Table 3.

1) For certain applications, tighter tolerances could be demanded.

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Table 3 — Tolerances on thickness for textured sheets

$e \leq 6$ mm	- 0,6 mm + 0,9 mm
6 mm < $e \leq 20$ mm	- 10 % e + 15 % e
$e > 20$ mm	- 2 mm + 3 mm

For textured sheets, the maximum difference between extreme values of the eight thickness measurements within one sheet shall not exceed 15 % of the maximum measured value.

The method of measurement is given in 7.2.3.2.

5.3.5 Tolerances on shape[2)]

5.3.5.1 Straightness of edges

Tolerances are applicable only to large size sheets.

The tolerances on the straightness of edges are defined as a percentage of the length of the edge of the relevant dimensions (length or width), and shall be in accordance with Table 4 for the appropriate level.

Table 4 — Tolerances on straightness of edges

Level I	Level II
0,1 %	0,3 %

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The method of measurement is given in 7.2.3.3. These tolerances are not applicable for oversize sheets.

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5.3.5.2 Squareness of edges

The tolerances on squareness of sheets shall be in accordance with Table 5 for the appropriate level.

Table 5 — Tolerances on squareness of edges

Level I	Level II
2 mm/m	4 mm/m

The method of measurement is given in 7.2.3.4.

These tolerances are not applicable for oversize sheets.

5.4 Physical requirements and characteristics

5.4.1 General

Mechanical and material properties are normally determined on sheets as delivered. The results shall be identified as applying to coated or uncoated material.

NOTE See Annex B for statistic interpretation.

2) For certain applications, tighter tolerances are demanded and should be agreed on between the manufacturer and the purchaser.

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5.4.2 Apparent density

The manufacturer shall specify in his literature the minimum apparent density for each category and each class of sheet. When tested in accordance with the method specified in 7.3.1, the density shall be not less than this value.

5.4.3 Moisture movement

The manufacturer's literature shall state the percentage value of linear sheet moisture movement measured when the sheet is exposed to a relative humidity change from 30 % to 90 %. The stated value shall be determined in accordance with 7.3.7 using the test method given in Annex C.

5.4.4 Mechanical characteristics – Bending strength (*MOR*) – Modulus of elasticity (*MOE*)

When tested as specified in 7.3.2, the minimum modulus of rupture of the sheets, expressed in megapascals, shall be as specified in Table 6. The *MOR* shall be the average of the values obtained from testing the samples in both directions.

NOTE For non-homogeneous e.g. coated sheets, Table 6 refers to the apparent *MOR.*

Category A and B sheet strengths are specified in the wet condition (see Table 10).

Category C and D sheet strengths are specified in the ambient condition (see Table 10).

The manufacturer shall specify the characteristic value for mechanical strength. Characteristic values of bending strength are based on statistical data on results of tests in ambient conditions. The statistical interpretation of test results is based on the procedure prescribed in EN 1990:2002, *Eurocode — Basis of structural design*, Table D.1, $V_{x,\text{unknown}}$).

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If a correlation has been established (see Annex B) between the *MOR* from production control and the *MOR* from products as delivered, the k-value of $V_{x,\text{known}}$ can be used. The minimum modulus of rupture of the sheets in the weaker direction shall be not less than 70 % of the specified value in Table 6 for the average of the two directions. This requirement does not apply to textured sheets.

The modulus of elasticity of the sheets, expressed in Giga- or Megapascals, shall be specified on test results of tests in ambient conditions. The *MOE* shall be the average of the values obtained from testing the sampling in both directions with indication of the standard deviation.

It is up to the manufacturer to determine the *MOE* for information purposes, i.e. with type testing.

Table 6 — Minimum modulus of rupture (*MOR*)

min. *MOR* in the wet condition MPa		min. *MOR* in the ambient laboratory conditions MPa	
Classes	Category A & B	*Classes*	Category C & D
1	4	1	4
2	7	2	7
3	13	3	10
4	18	4	16
5	24	5	22
Where manufacturers state minimum product *MOR* this should be at the 4 % acceptable quality level (AQL).			
NOTE For textured sheets, the *MOR* cannot be used for calculating mechanical performance.			