



SLOVENSKI STANDARD SIST EN 12467:2005

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Fibre-cement flat sheets - Product specification and test methods

Faserzement-Tafeln - Produktspezifikation und Prüfverfahren

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

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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 21 May 2004.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This document (EN 12467:2004) 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 IBN.

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of an identical text or by endorsement, at the latest by June 2005, and conflicting national standards shall be withdrawn at the latest by June 2005.

This document supersedes EN 12467:2000.

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 and ZB, which is an integral part of this document.

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

A distinction has been made between product appraisal (type tests) and factory production control requirements (acceptance tests).

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Attention is drawn to the need for observance of EU and/or EFTA and national legal requirements restricting the use of certain materials e.g. asbestos and to the related marking and labelling requirements.

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.

1 Scope

This document 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 document can be used for other purposes provided they comply with the relevant application standard, e.g. rigid underlays.

NOTE prEN (WI 128087) "Roof covering products for discontinuous laying and products for wall cladding - Rigid underlays - Rigid underlays for discontinuously laid roof coverings – Product specification and test methods" is under preparation.

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

This document does not cover sheets for fire protection purposes.

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

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2 Normative references

[SIST EN 12467:2005](#)

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 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 test*.

EN ISO 12572, *Hygrothermal performance of building materials and products - Determination of water vapour transmission properties (ISO 12572:2001)*.

ISO 390, *Products in fibre-reinforced cement - Sampling and inspection*.

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, *Sampling procedures and charts for inspection by variables for percent non-conforming*.

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. The test is performed on samples drawn either from continuous production or from a consignment (ISO 390)

NOTE Test methods, specifications and limit values are specified in this document. Sampling levels and acceptance criteria are specified in 6.3.2.

3.2

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 method of manufacture, the effects of which cannot be predicted on the basis of previous experience. 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. 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

NOTE 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. 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

4 Symbols and abbreviations

- | | |
|----------|--|
| <i>a</i> | Nominal length or width of the sheet |
| <i>b</i> | 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) |
| <i>d</i> | Apparent density of the sheet in grams per cubic centimetre |
| <i>e</i> | 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
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
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_0	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_0	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

5.1 General

5.1.1 Composition

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.

Two types of fibre-reinforced sheets are included in this document:

- Type AT (Asbestos Technology) for sheets the formulation of which contains chrysotile asbestos,
- Type NT (Non-Asbestos Technology) for sheets the formulation of which does not contain asbestos.

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.

5.2 Classification

5.2.1 General

Sheets covered by this document are divided into:

- two types in accordance with their composition (see 5.1.1);
- four categories in accordance with their weather resistance (see 5.2.2 – 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 (6.2.1).

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.

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.

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 $< 0,4 \text{ m}^2$ 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

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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.

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	$\pm 0,3\% a$	$\pm 0,5\% a$
1 600 mm $< a$	± 5 mm	± 8 mm
^a a is the nominal width or length		

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	$\pm 0,6$ mm
6 mm $< e \leq 20$ mm	$\pm 10\% e$
$e > 20$ 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.

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.

¹ For certain applications, tighter tolerances are required and should be agreed on between the manufacturer and the purchaser.

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%

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

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.

5.4.2 Apparent density

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

For type AT sheets, the apparent density shall be greater than 1,0 g/cm³.

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

5.4.3 Mechanical characteristics – Bending strength

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.

Category C and D sheet strengths are specified in the ambient condition.

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.

Table 6 — Minimum modulus of rupture (MOR)

min. MOR in the wet condition MPa		min. MOR in the ambient condition 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

NOTE 1 Where manufacturers state minimum product MOR this should be at the 4% acceptable quality level (AQL).
NOTE 2 For textured sheets the MOR cannot be used for calculating mechanical performance.

5.4.4 Water impermeability for Categories A, B and D

When tested in accordance with 7.3.3, traces of moisture may appear on the under surface of the sheet, but in no instance shall there be any formation of drops of water.

5.4.5 Water vapour permeability for Category D

For flat sheets used as rigid underlays, the water vapour resistance value μ shall be determined according to 7.3.4 and shall be specified in the manufacturer's literature.

The μ value obtained from the test shall not be higher than the value specified by the manufacturer.

5.5 Durability requirements

5.5.1 General

Mechanical and material properties are normally determined for sheets as delivered. The results shall be identified as applying to coated or uncoated material. The performance of the coating in the following tests shall not be considered in the assessment of the product.

5.5.2 Freeze-thaw for Categories A, B and D

When tested in accordance with 7.4.1, after 100 freeze-thaw cycles for Category A and 25 cycles for Category B and D, the ratio R_L as defined in 7.4.1.4 shall be not less than 0,75.

5.5.3 Heat-rain for Categories A and B

When tested in accordance with 7.4.2, after 50 heat-rain cycles for Category A and 25 cycles for Category B, any visible cracks, delamination, warping and bowing or other defects in the sheets shall not be of such a degree as to affect their performance in use.

- (a) Water tightness is tested according to 5.4.4.
- (b) Warping and bowing are visually assessed.

5.5.4 Warm water for Categories A, B, C and D

When tested in accordance with 7.3.5, after 56 days at 60 °C, the ratio R_L as defined in 7.3.5.4 shall be not less than 0,75.

5.5.5 Soak-dry for Categories A, B, C and D

When tested in accordance with 7.3.6, after 50 soak-dry cycles for Category A and 25 cycles for Categories B, C and D the ratio R_L as defined in 7.3.6.4 shall be not less than 0,75.

5.6 Fire and safety

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5.6.1 Reaction to fire

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When subject to regulatory requirements, the reaction to fire of the sheets shall be declared in accordance with 7.5.

5.6.2 Release of dangerous substances

5.6.2.1 Release of asbestos

Two types of fibre content exist: Type "AT" and type "NT" as defined in 5.1.1. The relevant type of sheet shall be declared in the information accompanying the marking (see 5.7).

For product type AT a declaration of the asbestos content shall be made by the manufacturer.

5.6.2.2 Release of other dangerous substances

For products containing substance(s) defined in Council Directive 76/769/EEC, the content shall be declared by the manufacturer. This applies to substances contained in the original formulation or created during the manufacturing process. In addition see Annex ZA.

5.7 Product information

The manufacturer shall include the following in his literature:

- a) designation of the sheet:
 - type of product (see 5.1.1),