SLOVENSKI STANDARD
SIST EN 492:2013+A2:2018

01-junij-2018

Nadomešča:
SIST EN 492:2013+A1:2016

Vlaknato-cementne strešne plošče in fazonski kosi - Specifikacija za izdelek in preskusne metode

Fibre-cement slates and fittings - Product specification and test methods

Faserzement-Dachplatten und dazugehörige Formteile - Produktspezifikation und Prüfverfahren

Ardoises en fibres-ciment et leurs accessoires en fibres-ciment - Spécification du produit et méthodes d'essai

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

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 492:2012+A2

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ICS 91.100.40

Supersedes EN 492:2012+A1:2016

English Version

Fibre-cement slates and fittings - Product specification and test methods

Ardoises en fibres-ciment et leurs accessoires en fibres-ciment - Spécification du produit et méthodes d'essai

Faserzement-Dachplatten und dazugehörige Formteile - Produktspezifikation und Prüfverfahren

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 492:2012+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of an identical text or by endorsement, at the latest by October 2018, and conflicting national standards shall be withdrawn at the latest by January 2020.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 492:2012+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].

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

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

[A1] In comparison with EN 492:2004, the following sections in EN 492:2012 had been changed or added: [/A1] Clause 2, 3.6, 3.7, 5.1.1, 5.3.3, 5.5.3, 6.3.2, 6.4, 7.3.4.4, 7.3.5.4, 7.5.1.2, 7.5.2.2, Annex A, Annex D.

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

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

The performance of a roof or another building part constructed with these products depends not only on the properties of the product as required by this standard, but also on the design, construction and installation of the components 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.

1 Scope

This European Standard specifies the technical requirements and establishes methods of control and test as well as acceptance conditions for fibre-cement slates and their fibre-cement fittings for one or more of the following uses:

— roofing;

— internal wall finishes;

— external wall and ceiling finishes.

This European Standard applies to fibre-cement slates with a height dimension *h* (see Clause 4) not exceeding 850 mm for overlapping assembly. For the purpose of this European Standard, fibre-cement slates have been classified according to their bending moment.

This European Standard covers fibre-cement slates reinforced with fibres of different types as specified in 5.1.1.

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

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.

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

CEN/TS 1187:2012, *Test methods for external fire exposure to roofs*

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

EN 13501-5, *Fire classification of construction products and building elements — Part 5: Classification using data from external fire exposure to roofs 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 ISO 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716)*

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*

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 products 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 and specification limit values are specified in this standard. Sampling levels and acceptance criteria are given in 6.3.2.

3.2
type test
test carried out to demonstrate conformity with the requirements of this standard 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 product as delivered, 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

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.

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
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

3.5
upper face
face normally exposed to the weather

3.6
under face
reverse of upper face

3.7
NT
fibre-cement slates and fittings of type NT cover products made using a non-asbestos technology

3.8
ambient laboratory conditions
laboratory conditions which are a temperature of (23 ± 5) °C and a relative humidity of (50 ± 20) %

4 Symbols and abbreviations

b dimension of the specimen (length or width) measured parallel to the test machine supports in millimetres

one of the coefficients of the regression line (Annex B)

d apparent density of the fibre-cement slate in grams per cubic centimetre

e thickness of the fibre-cement slate in millimetres

F load at rupture in newtons

h dimension of the fibre-cement slate measured perpendicular to the line of fixing which is at or nearest to the horizontal plane of the roof (see Annex C, Figures C.1 and C.2), in millimetres

l_s span between the centres of the test machine supports in the bending moment test in millimetres

m mass of the specimen after drying in grams

M bending moment at rupture in newton metres per metre

M_{fi} bending moment (average of both directions) at rupture of the specimen from the i^{th} pair tested after the type test (second lot) in newton metres per metre

M_{fci} bending moment (average of both directions) at rupture of the specimen from the i^{th} pair tested for reference in the type test (first lot) in newton metres per metre

R average ratio of the bending moments at rupture before and after the type test

R_i individual ratio of the bending moments at rupture of the i^{th} pair of specimens before and after a type test

R_L lower estimate of the mean of the ratios at 95 % confidence level of the bending moments at rupture before and after the type test

s standard deviation of the values in the appropriate calculation

V volume of the specimen in cubic centimetres

x_o actual result obtained when dry testing

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 y_{std} specified for the wet method of test in this document

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

y_{std} minimum value specified in the standard for wet testing.

5 Product requirements

5.1 General

5.1.1 Composition

Fibre-cement slates and fittings shall consist essentially of cement or a calcium silicate formed by 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.

This European Standard covers fibre-reinforced cement slates and fittings of type NT.

The reinforcing fibres shall take one or more of the following forms:

— discrete elements randomly dispersed,

— continuous strands or tapes,

— nets or webs.

Process aids, fillers and pigments which are compatible with the composite may be added.

5.1.2 Appearance and finish

The exposed face of the fibre-cement slates may be with or without texture. The fibre-cement slates may be coloured or left in their natural colour. The fibre-cement slates may also receive adherent coloured or uncoloured coatings on their surface.

The fibre-cement slates may be supplied with holes for fixing.

On exposure, the surface and/or its coating will be affected by weathering which may vary with site location, aspect, pitch of roof and duration of exposure. Any deterioration in this respect shall not detract from the minimum mechanical and physical characteristics as specified in this document or from the function of the fibre-cement slate as a durable element.

The fittings shall have a general appearance and finish compatible with the fibre-cement slates with which they are to be used. They may be supplied with holes for fixing.

5.2 Dimensions and tolerance

5.2.1 General

The manufacturer shall specify the shapes, sizes and configuration of edges.

NOTE See 5.6 for designation and information.

Fittings shall have nominal dimensions and shapes determined by the manufacturer and appropriate to the corresponding fibre-cement slates.

5.2.2 Thicknesses

The actual fibre-cement slate thickness determined in accordance with 7.2 shall be not less than that shown in Table 1.

The nominal thickness shall be specified by the manufacturer.

The nominal thickness of the fittings shall be not less than the corresponding nominal thickness of the fibre-cement slates with which the fittings are to be used.

5.2.3 Tolerances on nominal dimensions

The maximum dimensional variation when measured as specified in 7.2 shall be as follows:

— Length and width: ± 3 mm;

— Thickness: $^{+25}_{-10}$ % of the nominal value.

For fittings that replace fibre-cement slates (e.g. ventilation fibre-cement slates) the tolerances shall be the same as those on the fibre-cement slates.

For other fittings (e.g. ridges) the tolerances shall be specified by the manufacturer.

5.3 Physical requirements and characteristics for fibre-cement slates

5.3.1 General

Mechanical and material properties are determined on products as delivered, wherever practicable. The results shall be identified as applying to coated or uncoated material.

NOTE See 6.3 for statistical interpretation.

5.3.2 Apparent density

The manufacturer's literature shall specify the minimum apparent density of the fibre-cement slates. The fibre-cement slates shall have an apparent density equal to or greater than that specified by the manufacturer when tested in accordance with 7.3.1.

5.3.3 Mechanical characteristics

When tested in accordance with 7.3.2, the fibre-cement slates shall have a minimum average bending moment per metre width in newton metres per metre as specified in Table 1.

The minimum bending moment at rupture in the weaker direction shall be not less than 60 % of the values specified in Table 1 for the average in both directions.

Table 1 — Minimum bending moment per metre and minimum thickness

Height h **(mm)**	**Minimum thickness *e*[a] (mm)**	**Minimum bending moment, average of the two directions (Nm/m)**
$h \leq 350$	2,8	30
$350 < h \leq 450$	3,0	40
$450 < h \leq 600$	3,5	45
$600 < h \leq 850$	4,0	55
[a] e is the arithmetic mean of four measurements (according to 7.2.4).		

5.3.4 Water impermeability

When tested in accordance with 7.3.3, traces of moisture may appear on the under face of the fibre-cement slate, but in no instance shall there be any formation of drops of water.

5.4 Durability requirements

5.4.1 General

Mechanical and material properties are normally determined for as delivered products. The results shall be identified as applying to coated or uncoated material. Performance of the coating in the tests specified in 5.4.2 and 5.4.3 shall not be considered in the assessment of the product.

5.4.2 Freeze-thaw

When tested in accordance with 7.4.1 after 100 freeze-thaw cycles, the ratio R_L as defined in 7.4.1.4 shall be not less than 0,75.

5.4.3 Heat-rain

When tested in accordance with 7.4.2 after 50 heat-rain cycles, any visible cracks, delamination or other defects in the fibre-cement slates shall not be of such degree as to affect their performance in use.

Water tightness is assessed according to 5.3.4.

Warping and bowing are visually assessed.

5.4.4 Warm water

When tested in accordance with 7.3.4, after 56 days at 60 °C, the ratio R_L as defined in 7.3.4.4 shall be not less than 0,75.

5.4.5 Soak-dry

When tested in accordance with 7.3.5, after 50 soak-dry cycles, the ratio R_L as defined in 7.3.5.4 shall be not less than 0,75.

5.5 Fire and safety

5.5.1 External fire performance

When subject to regulatory requirements, the external fire performance of the slates shall be declared in accordance with 7.5.1.

5.5.2 Reaction to fire

When subject to regulatory requirements, the reaction to fire of the slates or fittings shall be declared in accordance with 7.5.2.

5.5.3 Release of dangerous substances

〚A1〛 National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction web site on EUROPA accessed through:

http://ec.europa.eu/enterprise/construction/cpd-ds/. 〚/A1〛

5.6 Product information

The designation of the fibre-cement slate shall include at least the following:

— type of product NT (see 5.1.1);

— name of the fibre-cement slate;

— height (*h*), size and shape.

The manufacturer shall include the following in his literature:

a) designation of the fibre-cement slate as above;

b) nominal values for:

   1) thickness;

   2) length and width.

c) minimum apparent density;

d) information relevant to the handling and installation.

6 A1 Assessment and verification of constancy of performance — AVCP

6.1 General

The compliance of fibre-cement slates and fittings with the requirements of this standard and with the performances declared by the manufacturer in the DoP shall be demonstrated by:

— determination of the product type;

— factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the conformity of the product with its declared performance(s).

6.2 Type testing

6.2.1 General

Type tests shall be carried out on products as delivered. If several formats or sizes of the same nominal thickness are being produced from the same composition and by the same A2 manufacturing process A2, type tests only need to be carried out on one size of each nominal thickness.

All characteristics listed in Table 2 shall be subject to product type determination, except reaction to fire Class A1 without testing and external fire performance "deemed to satisfy" products.

Product type determination shall be performed to demonstrate conformity to this standard. Tests previously performed in accordance with the provisions of this standard (same product, same characteristic(s), test method, sampling procedure, same attestation of conformity, etc.) may be taken into account. In addition, product type determination shall be performed for the approval of a new product, or a fundamental change in formulation or A2 manufacturing process A2, the effects of which cannot be predicted on the basis of previous experience.

Whenever a change occurs in the fibre-cement slate design, the raw material or supplier of components or the [A2] manufacturing process [A2], which would change significantly one or more of the characteristics, the type test shall be performed for the appropriate characteristic(s).

6.2.2 Test samples, testing and compliance criteria

The number of samples of fibre-cement slates to be tested / assessed shall be in accordance with Table 2 of this standard.

Table 2 — Number of slates and fittings and compliance criteria

Characteristic	Requirement	Assessment method	Number of samples	Compliance criteria
Mechanical resistance (slates)	5.3.3	7.3.2	Inspection S3 as per ISO 2859-1	5.3.3 Table 1 apply 4 % AQL
Density (slates)	5.3.2	7.3.1	7.3.1	5.3.2 and 7.3.1
External fire performance (slates)	5.5.1	7.5.1	7.5.1	7.5.1
Reaction to fire (slates and fittings)	5.5.2	7.5.2	7.5.2	7.5.2
Water impermeability (slates)	5.3.4	7.3.3	3 test slates	5.3.4
Dimensional variations (slates and fittings)	5.2	7.2	Inspection S3 as per ISO 2859-1	5.2.2 and 5.2.3
Release of dangerous substances (slates and fittings)	5.5.3	5.5.3	-	5.5.3
Warm water (slates)	5.4.4	7.3.4	10 samples	5.4.4 and 7.3.4.4
Soak/Dry (slates)	5.4.5	7.3.5	10 samples	5.4.5 and 7.3.5.4
Freeze-Thaw (slates)	5.4.2	7.4.1	10 samples	5.4.2 and 7.4.1.4
Heat-Rain (slates)	5.4.3	7.4.2	11 samples	5.4.3 and 7.4.2.4

6.2.3 Test reports

The results of the determination of the product type shall be documented in the test reports. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of the fibre-cement slates and fittings to which they relate.

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain a FPC system to ensure that the products placed on the market comply with the declared performance of the essential characteristics.

The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the [A2] manufacturing process [A2] and the product.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures.

This factory production control system documentation shall ensure a common understanding of the evaluation of the constancy of performance and enable the achievement of the required product performances and the effective operation of the production control system to be checked. Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the compliance of the product with the declared performances of the essential characteristics.

6.3.2 Requirements

6.3.2.1 General

The manufacturer is responsible for organizing the effective implementation of the FPC system in line with the content of this product standard. Tasks and responsibilities in the production control organization shall be documented and this documentation shall be kept up-to-date.

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting product constancy, shall be defined. This applies in particular to personnel that need to initiate actions preventing product non-constancies from occurring, actions in case of non-constancies and to identify and register product constancy problems.

Personnel performing work affecting the constancy of performance of the product shall be competent on the basis of appropriate education, training, skills and experience for which records shall be maintained.

In each factory the manufacturer may delegate the action to a person having the necessary authority to:

— identify procedures to demonstrate constancy of performance of the product at appropriate stages;

— identify and record any instance of non-constancy;

— identify procedures to correct instances of non-constancy.

The manufacturer shall draw up and keep up-to-date documents defining the factory production control. The manufacturer's documentation and procedures should be appropriate to the product and manufacturing process. The FPC system should achieve an appropriate level of confidence in the constancy of performance of the product. This involves:

a) the preparation of documented procedures and instructions relating to factory production control operations, in accordance with the requirements of the technical specification to which reference is made;

b) the effective implementation of these procedures and instructions;

c) the recording of these operations and their results;

d) the use of these results to correct any deviations, repair the effects of such deviations, treat any resulting instances of non-conformity and, if necessary, revise the FPC to rectify the cause of non-constancy of performance.

NOTE Manufacturers having an FPC system, which complies with EN ISO 9001 and which addresses the provisions of the present European Standard are considered as satisfying the FPC requirements of the Regulation (EU) No 305/2011.