SLOVENSKI STANDARD
oSIST prEN 17468-2:2020

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Vlaknatocementni proizvodi - Ugotavljanje vlečne odpornosti in strižne trdnosti ter izračun upogibne trdnosti - 2. del: Valovite strešne plošče

Fibre cement products - Determination of pull through and shear resistance and bending strength calculations - Part 2: Profiled sheets

Faserzementprodukte - Bestimmung des Durchzugs- und Querkraftwiderstandes und der Biegefestigkeit - Teil 2: Wellplatten

Produits en fibres-ciment - Détermination des calculs de résistance à la traversée de la tête, au cisaillement et à la flexion - Partie 2 : Plaques profilées

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ICS:

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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English Version

Fibre cement products - Determination of pull through and shear resistance and bending strength calculations - Part 2: Profiled sheets

Produits en fibres-ciment - Détermination des calculs de résistance à la traversée de la tête, au cisaillement et à la flexion - Partie 2 : Plaques profilées

Faserzementprodukte - Bestimmung des Durchzugs- und Querkraftwiderstandes und der Biegefestigkeit - Teil 2: Wellplatten

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

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European foreword

This document (prEN 17468-2:2020) 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 document is currently submitted to the CEN Enquiry.

Introduction

Different fibre-cement profiled sheets on the market are assessed for pull through resistance.

Fibre-cement profiled sheets have been evaluated for pull through and shear resistance by a number of test methods designed to simulate conditions of use.

The results from the different existing methods are not directly comparable.

This document establishes an agreed method for evaluation of the pull through resistance of fibre-cement profiled sheet products, based on the experiences obtained over the last number of years in different countries.

This is a product standard with no classifications, but this test procedure may be used by national regulators to set classifications for roof and wall assemblies.

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

1 Scope

This document specifies test methods for pull through resistance and shear resistance of fibre-cement profiled sheets for roofing and cladding. The results are only applicable to the fibre cement product and not to the complete fixing assembly.

It applies only to products as delivered.

The field of application for pull through resistance is defined in 7.6.

The field of application for shear resistance is defined in 8.6.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 494:2012+A1:2015, *Fibre-cement profiled sheets and fittings - Product specification and test methods*

EN 755-2, *Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties*

EN 1990, *Eurocode - Basis of structural design*

EN 10025 (all parts), *Hot rolled products of structural steels*

EN 10346, *Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions*

EN 14081-1, *Timber structures - Strength graded structural timber with rectangular cross section - Part 1: General requirements*

EN ISO 7500-1, *Metallic materials - Calibration and verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system (ISO 7500-1)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
type test
test carried out to demonstrate conformity with the requirements of this document or for 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

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

3.2
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

3.3
span
distance between the parallel support axes

3.4
lap (overlap)
amount one sheet overlaps another at either the end (end lap) or the side (side lap)

4 Symbols and abbreviations

For the purpose of this document, the following symbols and abbreviations apply.

a	the deformation
e	thickness of a sheet
e_m	average thickness of sheets
e_{nom}	nominal thickness of the sheet according to EN 494
E_m	bending modulus of elasticity
F	load
F_{ax}	pull through load at failure
F_{el}	load at the intersection of the test diagram and the 10% reduced linear regression of the E modulus
$F_{el,i}$	load $F_{el,i}$ at intersection of the test diagram and the 10 % reduced linear regression of the E modulus (see Figure 6)
$F_{max,i}$	breaking load
Fs	breaking load per m width
F_v	shear load at failure
F_{vk}	characteristic shear load at failure
F_{vm}	average shear load at failure
h_t	dimension from the extreme top of the corrugation to the neutral axis
h_b	dimension from the extreme bottom of the corrugation to the neutral axis
k	statistical factor derived from EN 1990
I	second moment of area
I_i	area moment of inertia of fibre-cement profiled sheets
l_A	span between the bearingLs Clear span between supports
MOR	bending moment at rupture
MOR_{BL}	bending strength in the longitudinal direction
MOR_{BM}	bending strength in the transverse direction

MOR_{el}	bending strength by the load $F_{el,i}$ at the intersection of the test diagram and the 10% reduced linear regression of the E modulus (see Figure 6)
$MOR_{el,mean}$	mean value of the yield strength
MOR_k	characteristic bending strength
MOR_d	design bending strength
$MOR_{0.5}$	5% quantile of the maximum bending strength
R_i	mean quotient of the modulus of rupture of exposed and unexposed specimen, where "$_i$" shall stand for 1 testing freeze-thaw, 2 soak-dry and 3 warm-water according to EN 494
$R_{L,i}$	mean quotient of the modulus of rupture of exposed and unexposed specimen at 95% confidence level as defined in EN 494, where "$_i$" shall stand for testing: 1 freeze-thaw, 2 soak-dry and 3 warm-water according to EN 494
R_{vk}	characteristic shear resistance
R_{vm}	average shear resistance
s	standard deviation
W_{elBL}	elastic section modulus corresponding to the breaking load
W_{nomBL}	section modulus corresponding to the breaking load
W_{nomBM}	section modulus corresponding to the bending moment
α	multiplication of the average ageing factors R from the warm water, soak dry and freeze thaw type tests in EN 494
γ_m	material safety factor
γ	confidence level (%)
γ_F	partial factor for the dead load ($\gamma_F = 1,35$)

5 Product requirements

5.1 Composition

Fibre cement profiled sheets shall be manufactured to meet the requirements of EN 494.

5.2 Appearance and finish

The appearance and finish shall be evaluated as defined in EN 494.

6 Sampling procedure

6.1 Sampling method

Take an adequate number of full size sheets from a production batch. The size of the batch is chosen by the manufacturer up to a maximum of one week's production.

6.2 Type testing

The pull through resistance and shear resistance tests are type tests.

6.3 Preparation of test specimens

6.3.1 Preparation of the test specimens for the pull through test

Cut 2 samples from a minimum of 10 profiled sheets to a length of (625 ± 5) mm and a width of 2 corrugations ± 5 mm. For each test, the 2 samples should be taken from the same sheet. For crown fixings, the test specimens shall comprise one crown and two valleys, with the crown central in the width of the test specimen. For valley fixings, the test specimen should comprise one valley and two crowns, with the valley central in the width of the test specimen.

The specimens should be stored for 7 days ± 1 day in ambient laboratory conditions followed by 24 h immersion in water.

The sheets shall be pre-drilled allowing a clearance hole around the fastener as recommended by the sheeting manufacturer (minimum 1mm clearance) or, for tests on winged fasteners, directly using the self-drilling fasteners. The sheets can be pre-drilled before or after conditioning.

6.3.2 Preparation of test specimens for the shear resistance test

Cut a minimum of 20 profiled sheets to a length of (300 ± 5) mm and a width of 3 corrugations with the cuts at the crown corrugations.

The specimens should be stored for 7 days ± 1 day in ambient laboratory conditions followed by 24 h immersion in water.

The sheets shall be pre-drilled allowing a clearance hole around the fastener as recommended by the sheeting manufacturer (minimum 1 mm clearance). The sheets can be pre-drilled before or after conditioning.

The minimum edge distances lmin,long and lmin,perp should be specified by the manufacturer.

7 Test method for the determination of pull through resistance of fibre cement profiled sheets

7.1 Principle

The pull through resistance is determined by the maximum load Fax (in N) required to pull the fastener through the test sheet.

7.2 Test equipment

7.2.1 Tensile testing machine

The test rig shall be essentially composed of a vertical-uniaxial class-1 tensile testing machine as per EN ISO 7500-1 with force capacity appropriate to delivering the loading required (for example: 10 kN), featuring the following main components:

— an upper test-frame part fitted with a specimen-holding device;

— a lower test-frame part fitted with a second specimen-holding device.

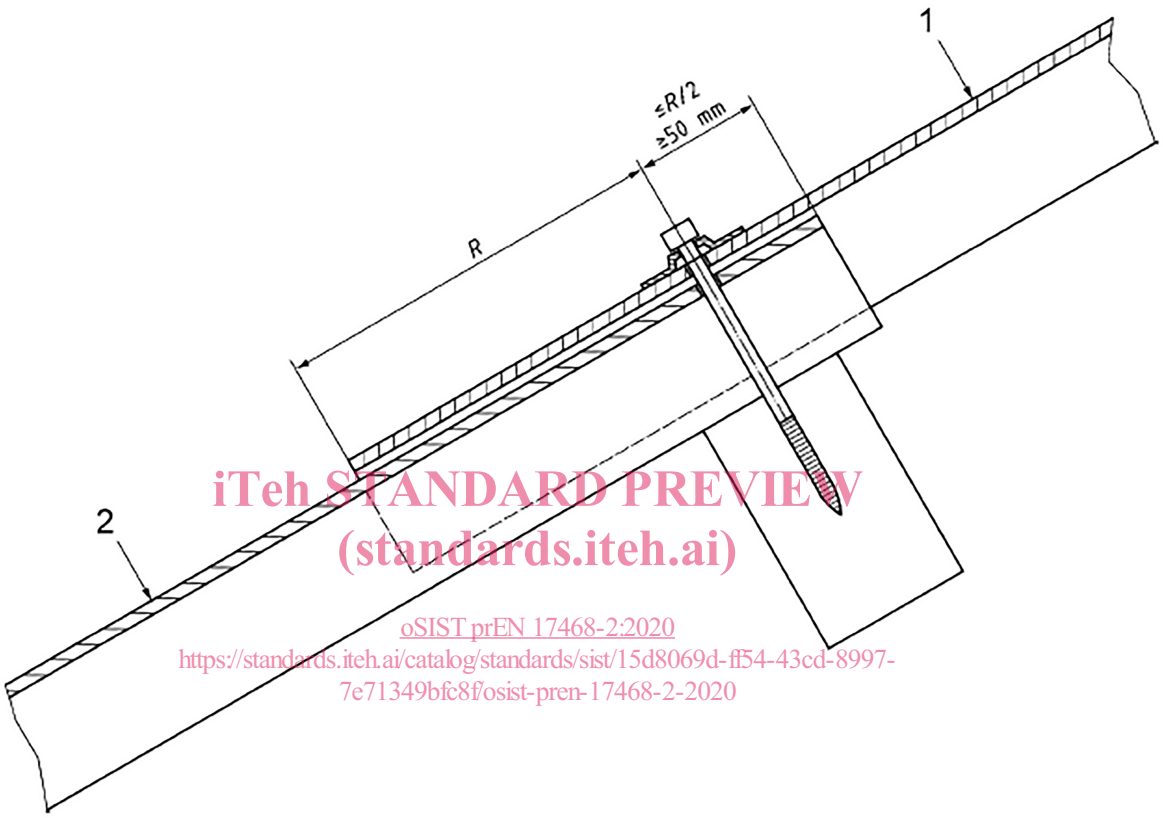
Either or both parts shall, by virtue of design, enable alignment of the fixtures and the vector of loading.

NOTE The test device simulates a fibre-cement profiled sheeting-to-purlin roofing fixture, as illustrated in Figure 1, or by changing the configuration can also be used to simulate sheets fixed through the valley corrugations for use as wall cladding.

The fastener shall be held in the upper-frame grip as illustrated in the schematic diagrams given in Figures 2 and 3.

If the length or geometry of the fastener means it cannot be held directly in the upper-frame grip, then a mechanical system that fixes into the upper-frame grip should be used (see Figures 2 and 3).

Dimensions in mm



Key

1 overlap sheet
2 underlap sheet
R sheet end lap

Figure 1 — example of fixture on a roof