SLOVENSKI STANDARD
SIST EN 1013-1:1998

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Prosojna profilirana polimerna plošča za enoslojno strešno kritino - 1. del: Splošne zahteve in preskusne metode

Light transmitting profiled plastic sheeting for single skin roofing - Part 1: General requirements and test methods

Lichtdurchlässige profilierte Platten aus Kunststoff für einschalige Dacheindeckungen - Teil 1: Allgemeine Anforderungen und Prüfverfahren

Plaques profilées éclairantes en matiere plastique pour couverture en simple paroi - Partie 1: Exigences générales et méthodes d'essai

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English version

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

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by May 1998, and conflicting national standards shall be withdrawn at the latest by May 1998.

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

Introduction

This Standard describes the general requirements and test methods for transluscent roofing sheets.

The physical properties of translucent profiled plastics sheets differ from bituminuous, metal and fibre reinforced cement sheets, as defined in EN 534, prEN 506, prEN 508-1, prEN 508-2, prEN 508-3 or EN 494. They do not necessarily have the same span capabilities and alternative fixing specifications are generally required.

Until code of practices are established, determination of span capabilities and/or method of fixing is based on specific test results.

Reference should be made to national codes and/or manufacturer literature for requirements concerning design, storage and installation, including all safety aspects, according to material.

1 Scope

This European Standard specifies the general requirements for profiled plastics transluscent sheets for single skin roofing irrespective of the material used to produce the sheets. The specific requirements according to the material itself are given in specific Parts of this standard, e.g. prEN 1013-2 and EN 1013-3.

The standard specifies test methods and each (excepting that for dimensional tolerances) is defined either as a type test or a quality control test. The test method for dimensional tolerances has been inctuded to provide a common approach for the purchaser and the

manufacturer in cases of dispute over measurements.

This standard is applicable to all types of translucent roofing sheets used in any kind of buildings.

NOTE: Material complying with this standard is also applicable for single skin vertical cladding.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 494	Fibre-cement profiled sheets and fittings for roofing - Product specification and test methods
prEN 506	Roofing product from metal sheet - Self supporting products of copper and zinc-copper-titanium sheet
prEN 508-1	Roofing product from metal sheet - Self supporting products of steel, Aluminium or stainless steel sheet - Part 1: Steel
prEN 508-2	Roofing product from metal sheet - Self supporting products of steel, Aluminium or stainless steel sheet - Part 2: Aluminium
prEN 508-3	Roofing product from metal sheet - Self supporting products of steel, Aluminium or stainless steel sheet - Part 3: Stainless steel
EN 534	Corrugated bitumen sheets
prEN 1013-2	Light transmitting profiled plastic sheets for single skin roofing - Part 2: Specific requirements and test methods for sheets of glass fibre reinforced polyester (GRP)
EN 1013-3	Light transmitting profiled plastic sheets for single skin roofing - Part 3: Specific requirements and test methods for sheets of polyvinyl chloride (PVC)
ISO 4892	Plastics - Methods of exposure to laboratory light sources.
EN ISO 6603-1 : 1996	Plastics - Determination of multiaxial impact behaviour of rigid plastics Symbols and abbreviations - Part 1: Falling dart method (ISO 6603-1 : 1985)

3 Definitions

For the purposes of this standard the following definitions apply:

3.1 Diffusing sheets

Sheets which give transmission of light and a dull (blurred) image of an object placed 1 m behind the sheet.

3.2 Non diffusing sheets

Sheets which give transmission of light and a sharp image of an object placed 1 m behind the sheet.

3.3 Type test

Tests which are concerned with the introduction of a new product and/or a fundamental change in formulation and/or method of manufacture and/or change in product design or whenever signifikant change of property logically can be expected.

3.4 Quality control test

Tests which are performed on sampies drawn either from continuous production or from a consignment, to establish whether a batch of products conforms to this specification.

3.5 Yellowness

Deviation in chroma from whiteness or water-whiteness in the dominant wavelength range from 570 nm to 580 nm.

3.6 Yellowness index

Magnitude in yellowness relative to CIE Source C.

4 Symbols and abbreviations

C_c	Change in light transmission
DYI	Change in the yellowness index
E	Energy applied during ageing procedure
H_{50}	Velocity which has a probability of 50 % to cause failure, expressed in meter per second, during the hail test
L_a	Light transmission of an aged test piece
L_{an}	Light transmission of the nth aged test piece
L_c	Light transmission of an unaged test piece

L_{cn}	Light transmission of the *n*th unaged test piece
L_s	Light transmission of a test piece
L_{sn}	Light transmission of the *n*th test piece
LT	Nominal value of the light transmission of the sheet expressed in %
M_a	Light transmission of the aged sample
M_c	Average of R_4 and R_6
MFE	Energy which has a probability of 50 % to cause failure, expressed in J, during the impact test
M_s	Average of R_1 and R_3
M_t	Average of R'_4 and R'_6
M_u	Light transmission of the unaged sample
M_v	Light transmission of the sample
R_1 and R_3	Reading of galvanometer without any test piece
R_2	Reading of galvanometer with the test piece
R_4 and R_6	Reading of galvanometer without any test piece, before ageing procedure
R_5	Reading of galvanometer with the test piece, before ageing procedure
R'_4 and R'_6	Reading of galvanometer without any test piece, after ageing procedure
R'_5	Reading of galvanometer with the test piece, after ageing procedure
S_f	Average of shooting energy when test result was a failure
S_p	Average of shooting energy when test result was a pass
YI	Value of the yellowness index of aged test piece
YI_0	Value of the yellowness index of unaged test piece

5 Requirements

5.1 Visual aspect

The visual characteristics are defined in material related other Parts of this standard. The sheets are classified in two categories in accordance with their visual aspect:

- diffusing sheets,
- non diffusing sheets.

5.2 Light transmission

According to their light transmission, sheets are classified in five categories:

L_0: 85 % ≤ *LT*
L_1: 75 % ≤ *LT* < 85 %
L_2: 65 % ≤ *LT* < 75 %
L_3: 50 % ≤ *LT* < 65 %
L_4: *LT* < 50 %

For the sheets of class L_0, L_1, L_2 and L_3, the average of the measurements of five specimens, in accordance with 6.1, shall be within the interval of its category.

For the sheets of class L_4, the average of the measurements on five specimens in accordance with 6.1 shall be within ± 5 % of the manufacturer declared light transmission.

5.3 Impact resistance

5.3.1 General

According to their impact resistance, sheets are classified in five classes:

I_1: 50 J ≤ *MFE*
I_2: 30 J ≤ *MFE* < 50 J
I_3: 15 J ≤ *MFE* < 30 J
I_4: 5 J ≤ *MFE* < 15 J
I_5: 0,5 J ≤ *MFE* < 5 J

The average, in accordance with 6.2.7, shall be within the interval of its category.

5.3.2 Hail resistance

For zones where heavy hail storms occur, special hail resistant sheets are recommended. Those sheets shall pass the test as described in 6.3 (optional type test).

The value H_{50} shall be equal to or greater than 5 m/s. The manufacturer may declare its personal value of H_{50}, provided it is greater than 5 m/s.

5.4 Variation of yellowness index and light transmission after ageing procedure

The ageing test shall be conducted in accordance with 6.4. Light transmission shall be maintained at a minimum level of 85 % of the original requirement. For mechanical characteristics refer to appropriate standards. The yellowness index of non coloured sheets shall not vary by more than 20 %, as described in 7.2.

Four classes of exposure, with a spectral distribution of 1120 W/m^2 as given in ISO 4892, are applicable according to the level of sun irradiance:

A_0: 18 GJ/m^2 $\leq E$
A_1: 10 GJ/m^2 $\leq E <$ 18 GJ/m^2
A_2: 6 GJ/m^2 $\leq E <$ 10 GJ/m^2
A_3: 4 GJ/m^2 $\leq E <$ 6 GJ/m^2.

5.5 Dimensional tolerances

5.5.1 General requirements

All tolerances shall apply to nominal values as indicated by manufacturer (see Annex A).

The manufacturer may choose any method to control that the dimensions of his products meet the requirements of this standard as a routine quality control test.

5.5.2 Thickness

For the thickness, the tolerances and method of measurement are described in the material related Parts of this standard.

5.5.3 Shape of the profile

When the sheet is positioned as described in 6.4.3.2, the template shall be introduced onto the sheet up to 100 mm from the end and slide over it freely.

5.5.4 Cover width

When measured as defined in 6.4.3.3, the actual cover witdh shall be within ± 0,8 % of the stated cover width.

5.5.5 Length

When measured as defined in 6.4.3.4, the actual length shall be within the interval from 0 mm to +20 mm of the stated length, for stated length up to 2,5 m, or from 0 % to +0,8 % if the stated length is longer.

5.5.6 Straightness

When measured as defined in 6.4.3.5, the actual straightness shall be less than or equal to 2,0 mm/m length.

5.5.7 Squareness

When measured as defined in 6.4.3.6, the actual out of squareness shall be less or equal to 0,5 % of the stated cover width.

6 Test methods

6.1 Light transmission (quality control test)

6.1.1 Apparatus (see figure 1)

The apparatus shall consist of:

- An open box painted matt white[1] inside with internal measurements of 600^{+5}_{0} mm square in plan by 900^{+5}_{0} mm high. An internal flange 25^{+5}_{0} mm wide by 25^{+5}_{0} mm deep shall be provided at a distance (from the top of the box) of 100 mm, or the maximum depth of profile to be tested, plus 5 mm, whichever is the greater.

- A 40 mm colour and cosine-corrected selenium photocell is mounted, facing downwards, at the centre of the aperture formed by the flange but 600^{+5}_{0} mm below it. The spectral response of this photocell is such as to give a maximum reading between 400 nm to 700 nm. The photocell is connected to a galvanometer.

- A light source designed to have a colour temperature of about 6500 K is fitted to the top of the box. It consists of an optically neutral opal acrylic plastics diffuser (opal polymerized methyl methacrylate or equivalent may be used [2] mounted flush with the top of the box with eight 600 mm long 20 W fluorescent "cold white" tubes above it and control apparatus mounted outside.

- A regulator circuit, if necessary, to maintain a constant voltage supply to the lamps.

- Suitable devices shall be provided to measure temperature
  a) in the centre of and on the surface of the diffuser,
  b) immediately above the photocell.

6.1.2 Test pieces

The five test pieces shall be cut from the sheet and be square in shape, each side being 575 mm in length.

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[1] Colour 00E55BS may be used.
[2] For example, "Perspex", grade 040, which is a suitable product available commercially. This information is given for the convenience of users of this standard and does not constitute an endorsement by CEN of this product.

6.1.3 Procedure

6.1.3.1 Before testing fit top to box and switch on lamps and leave to stabilise for a minimum period of 30 min.

6.1.3.2 The temperature levels from each device shall be monitored. Tests shall be discontinued if the temperatures recorded in the centre and on the surface of the diffuser exceed 35 °C and/or the temperature recorded immediately above the photocell exceeds 30 °C.

6.1.3.3 Note the reading (R_1) of the galvanometer without any test piece in position.

6.1.3.4 Remove top from the box and place test piece on internal flange. Refit top to box and with the sample in position, note the reading (R_2) of the galvanometer.

6.1.3.5 Remove top from the box, remove test piece. Refit top to box and note the reading (R_3) of the galvanometer.

6.1.3.6 Compare R_1 and R_3, and if there is less than 5 % difference, accept the results. If there is more than 5 % difference repeat the test until satisfactory results are obtained.

6.1.3.7 Repeat 6.1.3.3 to 6.1.3.6 four times with different test pieces.

6.1.4 Expression of results

6.1.4.1 Determine the mean value M_s of R_1 and R_3 for each test piece :

$$M_s = \frac{R_1 + R_3}{2}$$

6.1.4.2 Express light transmission (L_s) of each test piece as

$$L_s = \frac{R_2}{M_s} \times 100\ \%$$

6.1.4.3 Determine mean value of light transmission of test pieces

$$M_v = \frac{1}{5} \times \sum_{n=1}^{n=5} L_{sn}$$

6.1.5 Alternative test method

Alternative test methods may be used as a routine quality control test provided manufacturer may demonstrate correlation of results with method described in 6.1.1 to 6.1.4. This is not applicable for classification.