
Prosojna profilirana plastična obloga za enojno pokrivanje streh - 3. del: Posebne zahteve in preskusne metode za plošče iz polivinilklorida (PVC)

Light transmitting profiled plastic sheeting for single skin roofing - Part 3: Specific requirements and test methods for sheets of polyvinyl chloride (PVC)

Lichtdurchlässige profilierte Platten aus Kunststoff für einschalige Dacheindeckungen - Teil 3: Besondere Anforderungen und Prüfmethode für Platten aus Polyvinylchlorid (PVC)

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Plaques profilées éclairantes en matière plastique pour couverture en simple paroi - Partie 3: Exigences spécifiques et méthodes d'essai pour plaques en polychlorure de vinyle (PVC)

Ta slovenski standard je istoveten z: EN 1013-3:1997

ICS:

83.140.10	Filmi in folije	Films and sheets
91.060.20	Strehe	Roofs

SIST EN 1013-3:1998**en**

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EUROPEAN STANDARD

EN 1013-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 1997

ICS 83.140

Descriptors: roofings, plates, plastic products, polyvinyl chloride, light transmission, classifications, specifications, appearances, dimensions, shrinkage, ageing: materials, tests

English version

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einschalige Dacheindeckungen - Teil 3: Besondere
Anforderungen und Prüfmethode für Platten aus
Polyvinylchlorid (PVC)

This European Standard was approved by CEN on 2 November 1997.

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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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EUROPEAN COMMITTEE FOR STANDARDIZATION
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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of an identical text or by endorsement, at the latest by May 1998, and conflicting national standards shall be withdrawn at the latest by May 1998.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.

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1 Scope

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1.1 This part of EN 1013-3 specifies requirements for materials and performance of light transmitting profiled sheets of polyvinyl chloride produced to the desired profile by extrusion and/or forming for single skin applications. It has to be read in conjunction with the general requirements contained in EN 1013-1.

1.2 Requirements specified are relative to:

- Sheet thickness,
- Visual characteristics,
- Longitudinal reversion,
- Retention of profile,
- Tensile impact strength,
- Thermal ageing.

Test methods are indicated as appropriate.

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 amendment 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 1013-1 : 1997	Light transmitting profiled plastic sheeting for single skin roofing - Part 1: General requirements and test methods.
ISO 2602 : 1980	Statistical interpretation of test results - Estimation of the mean - Confidence interval
ISO 2818 : 1980	Preparation of test specimens by machining
ISO 8256 : 1990	Plastics - Determination of tensile-impact strength

3 Material

The sheets shall consist substantially of polyvinyl chloride.

4 Classification

Sheets shall be classified according to prEN 1013-1 for each of the following:

- Light transmission,
- Impact resistance,
- Variation of yellowness index and light transmission after ageing procedure.

5 Thickness

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5.1 General

The value for the nominal sheet thickness shall be quoted by the manufacturer.

5.2 Tolerances (Quality control test)

The sheets shall be measured in accordance with Clause 10.1. The values of sheet thickness obtained shall be the nominal thickness quoted +0,3 mm and -0,2 mm respectively.

6 Visual characteristics (Quality control test)

Both sides of the sheet shall be of regular appearance. Visual or tactile examination shall reveal no evidence of any hole, cracking, splitting or cluster of bubbles greater than 1 mm in diameter or inclusions that are likely to affect properties. The edges of the sheet shall be straight and clean.

7 Longitudinal reversion and profile retention (Type test)

When the sheet is tested by the method described in Clause 10.2 at a temperature of 60 °C for 60 min, the average percentage change in dimensions shall not exceed the following:

- Longitudinal reversion: $\pm 2 \%$
- Profile retention: $\pm 3 \%$

Manufacturer's literature shall give guidance where conditions of use may lead to these figures being exceeded.

8 Tensile impact strength (Type test)

When the sheet is tested by the method described in Clause 10.3 the ratio (R) shall be greater than or equal to:

- for sheets having ageing Classification A_1 ¹⁾: $R \geq 60$ %²⁾
- for sheets having ageing Classification A_2 ¹⁾: $R \geq 40$ %²⁾
- for sheets having ageing Classification A_3 ¹⁾: $R \geq 30$ %²⁾

9 Thermal ageing (Type test)

When the sheet is exposed to dry heat for 3000 h at 65 °C by the method described in Clause 10.4, property levels, with respect to unexposed sheet, shall be maintained at:

- Light transmission: ≥ 85 % of initial value
- Change in yellowness index: ≤ 20 points

10 Test methods

10.1 Sheet thickness

10.1.1 Apparatus

The sheet thickness shall be determined at any point using a micrometer screw with hemispherical anvils of 5 mm in diameter and with an accuracy of +0,01 mm.

10.1.2 Method of measurement

Sheet thickness shall be checked by nine measurements taken at random in the crowns, valleys and flanks across the total sheet width at a distance of 20 mm from the one end. First and last measurements to be within 25 mm of the sheet edges.

10.2 Longitudinal reversion and profile retention

10.2.1 Principle

An elevated temperature test is conducted on test pieces and percentage changes in length and in the pitch of corrugations are determined.

1) Refers to Clause 5.4 of prEN 1013-1.

2) These figures are provisional and subject to review when further information is available on completion of the appropriate UV degradation tests.

10.2.2 Apparatus

- Air circulation oven capable of maintaining a temperature of (60 ± 2) °C.
- Suitable means of measuring test pieces to an accuracy of 0,25 mm.

NOTE: An example of a suitable measuring device is shown in Figure 1.

Suitable means of applying a minimum load to the test pieces shall be provided as necessary to ensure that the horizontal undersides of the valleys are in contact with the flat surface immediately prior to making measurements.

10.2.3 Test pieces

Five rectangular test pieces are required which shall be not less than 250 mm in length. The width of test pieces shall be such that one of the following conditions is satisfied (see also Figure 2):

- for profiles greater or equal to 200 mm: one pitch plus adjacent valleys on both sides.
- for pitches less than 200 mm: the minimum number of pitches which gives a distance greater or equal to 200 mm between outer crowns with adjacent valleys on both sides.
- complete width of the sheet if neither a) or b) can be met.

10.2.4 Test procedure

Carry out the test in a room maintained at a temperature of (23 ± 2) °C.

Scribe two pairs of reference marks on each test piece as follows:

- Longitudinal reversion:**
The line joining the two marks shall be parallel to the axis of the corrugations and the distance between the marks shall be not less than 200 mm.
- Profile retention:**
The marks shall be on the crown of two corrugations. The line joining the two marks shall be at right angles to the direction of the corrugations and the distance between the marks shall be not less than 200 mm.

If the horizontal undersides of the valleys are not in contact with the flat surface apply load(s) to the sheet just sufficient to obtain contact between the horizontal undersides of the valleys and the flat surface before conducting any measurements.

Measure the distances between the two marks of each set of reference marks.

Place the test pieces in the air circulation oven which is at (60 ± 2) °C in such a way that they are under no stress.

After a period of 60 min, which shall commence when the temperature of the oven regains (60 ± 2) °C, remove the test pieces and allow to cool on a flat surface for 10 min.

If the horizontal undersides of the valleys are not in contact with the flat surface apply load/s to the sheet just sufficient to obtain contact between the horizontal undersides of the valleys and the flat surface before conducting repeat measurements.

Repeat the measurement of the distances between the marks on each test piece and calculate the individual and average percentage changes in length and in the pitch of the corrugations.

10.3 Change in tensile impact strength

10.3.1 Principle

The energy required to fracture is determined by the kinetic energy extracted from a pendulum in the process of breaking the test pieces.

Tests are conducted on unaged and aged test pieces and the ratio of tensile impact strengths is determined using statistical techniques.

10.3.2 Apparatus

The apparatus is as described in Clause 5 of ISO 8256 : 1990 for method A using un-notched test pieces.

10.3.3 Test pieces

Test pieces from unaged and aged material shall be:

a) that shown as Type 5 in ISO 8256 : 1990 when the cross section of the sheet allows a flat specimen of (23 ± 2) mm width to be obtained.

b) that shown as Type 3 in ISO 8256 : 1990 when the cross section of the sheet does not permit specimens as given in a) to be taken but allows a flat specimen of $(15 \pm 0,5)$ mm width to be obtained.

Where the cross section of the sheet does not readily allow a flat specimen of Type 5 according to a) or Type 3 according to b) to be taken, the following procedure shall be executed:

The test pieces shall be flattened by heating in a hot air oven at (120 ± 5) °C for between 2 and 5 min. Immediately after removal from the oven the test pieces shall be placed in a suitable press. In these circumstances the shape of the test piece shall be as given in a).

A minimum of 20 test pieces shall be used, at least 10 test pieces each representing unaged and aged material,

Dimensions of sheets for exposure in the Xenon arc apparatus shall be greater than those shown above.

If it is necessary to flatten sheets by heating at (120 ± 5) °C, then this shall be carried out before the material is exposed in the Xenon arc apparatus.

The length dimension shall be parallel to the direction of the profile and this orientation shall be preserved if sheets are flattened.

Ageing shall be carried out in accordance with Clause 7.1 of EN 1013-1:1997.

The final shape of each test piece shall be obtained by machining in accordance with ISO 2818 : 1980. The tool rotation speed for high speed rotary machines may be greater than that specified.

The unaged and aged test pieces shall be the same shape and prepared by the same method.

10.3.4 Test procedure

10.3.4.1 Each test piece shall be visually examined to ensure that it is free from any defects.

10.3.4.2 Each test piece shall be tested in accordance with ISO 8256 : 1990 method A and the tensile impact strength determined.

10.3.5 Determination of results

10.3.5.1 Using the procedures given in ISO 2602 : 1980 determine the upper 95% confidence level (one-sided case) of the mean of the tensile impact strength for the unaged test pieces tested, i.e.

$$x_u + \left[\frac{t_{0,95} x s_u}{\sqrt{n_u}} \right]$$

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where

x_u	arithmetic mean of results obtained from n_u unaged test pieces
n_u	number of unaged test pieces tested
$t_{0,95}$	the value of Student's t distribution with $\nu = n_u - 1$ degrees of freedom at 95% confidence level one-sided case
s_u	estimate of standard deviation of unaged test pieces tested

10.3.5.2 Using the procedures given in ISO 2602 : 1980 determine the lower 95% confidence level (one-sided case) of the mean of the tensile impact strength for the aged test pieces tested, i.e.

$$x_a - \left[\frac{t_{0,95} x s_a}{\sqrt{n_a}} \right]$$

where

x_a	arithmetic mean of results obtained from n_a aged test pieces
n_a	number of aged test pieces tested
$t_{0,95}$	the value of Student's t distribution with $\nu = n_a - 1$ degrees of freedom at 95% confidence level one-sided case
s_a	estimate of standard deviation of aged test pieces tested