SLOVENSKI STANDARD

oSIST prEN 1013:2007

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Prosojna profilirana plastiļ na obloga za enojno notranje ali zunanje pokrivanje streh zidov in stropov - Zahteve in preskusne metode

Light transmitting single skin profiled plastics sheets for internal and external roofs, walls and ceilings - Requirements and test methods

Lichtdurchlässige, einschalige profilierte Platten aus Kunststoff für Innen- und Außenanwendungen an Dächern, Wänden und Decken — Anforderungen und Prüfverfahren

Plaques d'éclairement profilées, simple paroi, en matiere plastique, pour toitures, bardages et plafonds intérieurs et extérieurs — Exigences et méthodes d'essai

Ta slovenski standard je istoveten z: **prEN 1013**

ICS:

83.140.10	Filmi in folije	Films and sheets
91.060.01	Stavbni elementi na splošno	Elements of buildings in general

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English Version

Light transmitting single skin profiled plastics sheets for internal and external roofs, walls and ceilings - Requirements and test methods

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 128.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (prEN 1013:2007) 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.

This document will supersede EN 1013-1:1997, EN 1013-2:1998, EN 1013-3:1997, EN 1013-4:2000, EN 1013-5:2000.

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, which is an integral part of this document.

Introduction

This document describes the requirements and test methods for light transmitting single skin profiled plastics sheets.

The physical properties of light transmitting single skin profiled plastics sheets differ from bituminous, metal and fibre reinforced cement sheets, as defined in EN534[1], EN 506[2], EN 508-1[3], EN 508-2[4], EN 508-3[5] or EN 494[6]. They do not necessarily have the same span capabilities and alternative fixing specifications are generally required.

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

1 Scope

This document specifies the requirements for light transmitting single skin profiled plastics sheets for internal and external walls, roofs and ceilings. It is applicable to single skin sheets which are used as a single layer or when assembled to form multiple layer construction.

It also specifies the test methods and provides for the evaluation of conformity of the sheets.

2 Normative references

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 59, *Glass reinforced plastics — Measurement of hardness by means of a Barcol impressor*

ENV 1187, *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 test data from external fire exposure to roof 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 178, *Plastics — Determination of flexural properties (ISO 178:1993)*

EN ISO 472, *Plastics — Vocabulary (ISO 472:1999)*

EN ISO 527-1, *Plastics —Determination of tensile properties — Part 1: General principles (ISO 527-1:1993)*

EN ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:1993)*

EN ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics (ISO 1043-1:2001)*

EN ISO 1043-2, *Plastics — Symbols and abbreviated terms — Part 2: Fillers and reinforced materials (ISO 1043-2:2000)*

EN ISO 1172:1999, *Textile-glass-reinforced plastics — Prepregs, moulding compounds and laminates. Determination of the textile-glass and mineral-filler content — Calcination methods (ISO 1172:1996)*

EN ISO 4892-1:2000, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance (ISO 4892-1:1999)*

EN ISO 4892-2:1999, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc sources (ISO 4892-2:1994)*

EN ISO 6603-1, *Plastics — Determination of puncture impact behaviour of rigid plastics — Part 1: Non-instrumented impact testing (ISO 6603-1:2000)*

EN ISO 9001:2000, *Quality management systems — Requirements (ISO 9001:2000)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2)*

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

EN ISO 13468-1, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 1: Single-beam instrument (ISO 13468-1:1996)*

EN ISO 14125, *Fibre-reinforced plastic composites — Determination of flexural properties (ISO 14125:1998)*

ISO 11359-2, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear expansion and glass transition temperature for plastics*

ISO 13468-2, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 2: Double-beam instrument.*

ISO/CIE 10526, *CIE standard illuminants for colorimetry*

ISO/CIE 10527, *CIE standard colorimetric observers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 472, EN ISO 1043-1, EN ISO 1043-2 and Annex A and the following apply.

3.1
initial type testing
testing performed to demonstrate compliance with this document, and which is performed 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 significant change of property can be expected

3.2
factory production control testing
testing performed on samples drawn either from continuous production or from a delivery, to establish whether a batch of products conforms to this specification

3.3
yellowness
deviation in chroma from whiteness or water-whiteness in the dominant wavelength range from 570 nm to 580 nm

3.4
yellowness index
magnitude in yellowness relative to CIE standard illuminant D 65 (ISO/CIE 10526)

4 Symbols and abbreviations

4.1 Symbols

A_n	class for the exposure to artificial ageing
E	total radiant energy applied during ageing
I_n	class for the impact resistance
YI	yellowness index of a test specimen exposed to ageing
YI_0	yellowness index of a test specimen unexposed to ageing
ΔYI	change of the yellowness index after ageing

4.2 Abbreviations

FPC	factory production control
GRA	glass-fibre reinforced acrylic (PMMA)
GRP	glass-fibre reinforced polyester
ITT	initial type testing
PC	polycarbonate
PET	poly(ethylene terephthalate)
PMMA	poly(methyl methacrylate)

PVC-U unplasticized poly(vinyl chloride)

PVF poly(vinyl fluoride)

5 Requirements

5.1 Visual appearance

Both sides of the sheets 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. For GRP sheets, any defects such as resin ribs, glass folds or glass knots shall not exceed 5 mm in size.

The edges of the sheet shall be straight and clean.

Further requirements concerning the visual aspects of the sheets are to be agreed upon between the manufacturer and the customer.

The manufacturer may declare the sheet as diffusing or non diffusing depending on whether the image of an object placed 1 m behind the sheet appears blurred or sharp, respectively.

5.2 Dimensional tolerances and mass per square metre

The dimensional tolerances and mass per square metre shall be assessed when subject to regulatory requirement and may be assessed otherwise.

When measured in accordance with the test methods as specified in Table 1, the dimensional tolerances and mass per square metre of the sheets shall conform to the requirements given in Table 1.

The test methods given in Table 1 are used for initial type testing, and are the reference test methods. The manufacturer may choose any method for factory production control purposes provided that it is sufficiently accurate to ensure that the dimensions of the products meet the requirement of this document.

Table 1 — Dimensional tolerances and mass per square metre requirements

Characteristic	Test method	Requirement
Sheet thickness	6.1.4	The manufacturer shall declare the nominal thickness of the profiled sheet. The mean value of the thickness of the profiled sheet shall not vary by more than ± 10 % of this value. The sheet thickness at any point of a sheet including crown, trough and sides of corrugation shall not vary by more than ± 20 % from the nominal thickness of the profiled sheet, declared by the manufacturer.
Mass per square metre	6.1.5	Manufacturers shall control the mass per square metre of the material in flat form, prior to profiling, which is the reference value. Manufacturers shall declare this value, and may also declare the mass per linear metre of profiled sheet, which can be calculated from the mass per square metre of the material in flat form. The mean value of the mass per square metre shall not vary by more than ± 10 % of the nominal mass per square metre declared by the manufacturer.
Cover width	6.1.6	The measured cover width shall be within ± 0,8 % of the nominal cover width as declared by the manufacturer.
Shape of the sheet profile	6.1.7	When it is intended that the profile of the sheets shall match the shape of a dissimilar material (e.g. metal or fibre cement), the shape of the profile shall match the nominal shape with a maximum tolerance (deviation) at any point of 4 mm.
Sheet length	6.1.8	The sheet length shall be within the interval from: 0 mm to + 20 mm of the sheet length as declared by the manufacturer, for sheet length up to 2,5 m; 0 % to + 0,8 % for sheet length greater than 2,5 m.
Sheet straightness	6.1.9	The sheet straightness shall be less than or equal to 2,0 mm/m length.
Squareness of a sheet	6.1.10	The out of squareness of a sheet shall be less than or equal to 0,5 % of the cover width as declared by the manufacturer.

5.3 Light transmission

The total luminous transmittance shall be determined by testing five samples in accordance with 6.2 and calculating the mean value. The manufacturer shall declare the total luminous transmittance based on the mean value and the mean value of subsequent measurements shall be within ± 5 % of the declared value.

5.4 Flexural/tensile strength

The flexural/tensile strength shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The flexural strength and flexural modulus or the tensile strength and Young's modulus, as applicable, of the material of the sheets shall be measured in accordance with 6.5.

The manufacturer shall declare the flexural strength and flexural modulus or the tensile strength and Young's modulus, as applicable, based on the mean values and any subsequent measurement shall be a minimum of 80 % of the declared value.

5.5 Durability

5.5.1 General

The durability shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The durability of profiled sheets shall be demonstrated by testing the variations after artificial ageing of the yellowness index, light transmission and flexural/tensile strength and declaring the results according to 5.5.3, 5.5.4 and 5.5.5, respectively.

5.5.2 Artificial ageing performance

Artificial ageing shall be carried out in accordance with 6.3 using one or more of the classes given in Table 2.

Table 2 — Artificial ageing classification

Class	Global irradiance (300 nm to 3 000 nm) GJ/m^2
A_0	$18 \leq E$
A_1	$10 \leq E < 18$
A_2	$6 \leq E < 10$
A_3	$4 \leq E < 6$

5.5.3 Variation of the yellowness index after artificial ageing

Variation of the yellowness index after artificial ageing shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The yellowness index shall be measured in accordance with 6.4. The manufacturer shall declare the amount of variation in yellowness for each of the classes of Table 2 he applies. The manufacturer may declare the performance at class A_3, but shall only declare the performance at higher classes of exposure provided that the yellowness index does not change by more than 20 units at any higher class(es) declared.

5.5.4 Variation of the light transmission after artificial ageing

Variation of the light transmission after artificial ageing shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The total luminous transmittance shall be measured in accordance with 6.2.

The manufacturer shall declare the variation of the total luminous transmission for each of the classes of Table 2 he applies, defined as the percentage reduction in the light transmission of an unaged sample:

$$\text{variation of total luminous transmission} = \frac{\text{light transmission of unaged sample - light transmission of aged sample}}{\text{light transmission of unaged sample}}$$

The manufacturer may declare the performance at class A_3, but shall only declare the performance at higher classes of exposure provided that the variation of the total luminous transmission is not greater than 20% at any higher class(es) declared.

5.5.5 Variation of the flexural/tensile strength after ageing

The variation of the flexural/tensile strength after ageing shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The variation of properties after ageing shall be determined by assessing the variations of either the flexural strength and flexural modulus by a bending test, or the tensile strength and Young's modulus by a tensile test, according to 6.5.

The percentage reductions of the flexural/tensile strength and flexural/Young's modulus between unexposed test specimens and test specimens aged at the maximum exposure declared for variation of yellowness index and variation of total luminous transmittance shall then be expressed within the ranges ≤ 10%, > 10 % to ≤ 20 %, > 20 % to ≤ 30 %, or > 30 %.

5.6 Thermal ageing resistance (only for thermoplastic sheets)

The thermal ageing resistance of thermoplastic sheets shall be determined by assessing the variations of the total luminous transmittance, yellowness index and flexural/tensile strength, before and after exposure to dry heat according to 6.6.

The manufacturer shall declare the variation of each property (yellowness index, light transmission, and flexural/tensile strength, measured in accordance with 6.4, 6.2 and 6.5 respectively) defined as the percentage reduction compared to an unaged sample:

$$\text{variation} = \frac{\text{value of unaged sample value of aged sample}}{\text{value of unaged sample}}$$

5.7 Longitudinal reversion and profile retention (only for thermoplastic sheets)

When tested in accordance with 6.7, the mean variations in dimensions of the sheet shall not exceed ± 2 % for the longitudinal reversion and ± 3 % for the profile retention.

Where the conditions of use may lead to these figures being exceeded, the manufacturer's documentation shall give guidance.

5.8 Impact resistance

The impact resistance shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The impact resistance shall be measured in accordance with 6.8 and the sheets shall be classified as follows:

— I_0 for sheets which pass the test result as specified in 6.8.6,

— I_1 for sheets which do not pass the test result as specified in 6.8.6.

5.9 Resistance to deflection (mechanical resistance)

5.9.1 Resistance to deflection

The resistance to deflection shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The resistance to deflection shall be evaluated by determining according to 6.9 the deflection of an unfixed sheet of the nominal thickness declared by the manufacturer as measured in 6.1.4. The bending stiffness of the sheet, $(EI)_{Test}$, after 6 min shall be declared by the manufacturer.

NOTE The performance of sheets when installed is not covered by this document. Information can be found in manufacturers' documentation. Appropriate test methods are included in ETAG 010[7].

5.9.2 Material stiffness factor

The stiffness factor of the material (in N.m) can be defined as E x t^3

where

E is the flexural modulus as defined in 5.4, in pascals,

t is the nominal thickness of the sheet, in metres.

The deflection of a sheet of any given profile can be assumed to be approximately proportional to the material stiffness factor.

5.10 Water vapour permeability

The water vapour permeability coefficient shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The manufacturer may declare the value of the water vapour permeability coefficient of the sheet material according to Table 3. When the manufacturer wishes to declare a higher performance, the water vapour permeability coefficient of the material used for the sheet shall be determined according to EN ISO 12572.

Table 3 — Typical values for water vapour permeability coefficient

Material	Reference value mg/(m.h.Pa)
GRA	$3{,}8 \times 10^{-5}$
GRP	$1{,}5 \times 10^{-5}$
PC	$3{,}8 \times 10^{-5}$
PVC-U	$0{,}8 \times 10^{-5}$
PMMA	$3{,}8 \times 10^{-5}$

5.11 Water/air permeability

The water/air permeability shall be assessed when subject to regulatory requirement and may be assessed otherwise.

All plastics sheets covered by this document are deemed to satisfy the water/air permeability requirement without the need for testing provided that there are no defects in the sheets. The absence of defects shall be evaluated by examination of visual appearance according to 5.1.

5.12 Linear thermal expansion

The linear thermal expansion shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The manufacturer may declare the value of the coefficient of linear thermal expansion of the sheet material according to Table 4. When the manufacturer wishes to declare a higher performance or to use an other material, the thermal expansion coefficient of the material used for the sheet shall be determined according to EN ISO 11359-2.

Table 4 — Reference values for the coefficient of linear thermal expansion

Material	Reference value K^{-1}
GRA [a]	26×10^{-6}
GRP [a]	30×10^{-6}
PC	65×10^{-6}
PMMA	70×10^{-6}
PVC-U	67×10^{-6}
a Chopped glass-fibre laminates with a glass-fibre content of 25 % to 40 %.	

5.13 Reaction to fire

The reaction to fire shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The reaction to fire performance of light transmitting profiled sheets shall be determined in accordance with 6.10 and declared by the manufacturer according to EN 13501-1.

Test samples shall be the same weight/thickness as the final product. Where there is a range of thicknesses of product, the manufacturer can test 2 (or more) thicknesses of sample, and the poorer of the two results can be applied to all products between the two thicknesses tested. Test results shall not be assumed to apply to products thicker than the thickest sample tested, or thinner than the thinnest sample tested.

Test results on flat samples can be applied to all profiles within the product range provided the effect of the profile does not add more than 30 % additional material.

Where the effect of the profile adds more than 30 % material, the thickness of the test sample shall be increased to ensure the difference in material mass between the test sample and profiled sheet is less than 30 %.

Where the product has no surface protection on the inner surface of the product, or where the surface protection on this surface is a co-extrusion of the same base material, or is less than 75 μm thick, then samples can be tested either with or without this surface protection. The test results achieved can be applied both to products with or without such surface protection.

Where the product has a surface protection which is not co-extruded of a similar material and is more than 75 μm thick, it shall be present on the specimens tested, and the results will only apply to specimens with such surface protection.

5.14 External fire performance

The external fire performance shall be assessed when subject to regulatory requirement and may be assessed otherwise.

The external fire performance of light transmitting profiled sheets shall be determined in accordance with 6.11 and declared by the manufacturer according to EN 13501-5.

Test samples shall be the same weight/thickness as the final product. Where there is a range of thicknesses of product, the manufacturer can test 2 (or more) thicknesses of sample, and the poorer of the two results can be applied to all products between the two thicknesses tested. Test results shall not be assumed to apply to products thicker than the thickest sample tested, or thinner than the thinnest sample tested.

Material shall be tested as flat sheets for Test 2 of ENV 1187, and/or profiled sheets (with cover width 1 metre, depth 30 mm to 35 mm and pitch 200 mm to 250 mm) for Tests 1, 3 and 4 of ENV 1187. Test results on these samples can be applied to all profiles within the product range, provided the effect of the profile does not add more than 30 % additional material.

Where the effect of the profile adds more than 30 % material, the thickness of the test sample shall be increased to ensure the difference in material mass between the test sample and profiled sheet is less than 30 % (Test 2 of ENV 1187), or the profile tested shall be selected to ensure the difference in material mass between the test sample and profiled sheet is less than 30 % (Tests 1, 3 and 4 of ENV 1187).

Samples shall be tested with the same surface protection as used on the external surface of the product. However, where this surface protection is a coextrusion of the same base material, or is less than 75 μm thick, then the test results can be applied to products which do not have any surface protection or which incorporate alternative surface protection up to 75 μm thick.

Where the product has a surface protection which is not co-extruded of a similar material and is more than 75 μm thick, it shall be present on the specimens tested, and the results will only apply to specimens with such surface protection.

5.15 Glass-fibre content (only for glass-fibre reinforced sheets)

When tested in accordance with 6.12 the minimum glass-fibre content shall be declared by the manufacturer.

5.16 Barcol hardness (only for glass-fibre reinforced sheets)

When tested in accordance with 6.13 the arithmetical mean of Barcol hardness after the exposure to the dry environment shall not increase by more than 10 % of its initial value.

NOTE This test is performed only to check that the cure of the resin is correct during the production.

5.17 Presence of protective coating

5.17.1 Protective coating on GRP/GRA sheets

The presence of a protective coating on GRP/GRA sheets shall be confirmed in accordance with 6.14.1. The effects of the immersion of the specimens according to the nature of the coating are given in Table 5.