
Polimerni materiali - Plastificirane membrane iz polivinilklorida (PVC-P) za bazene, ki so vgrajeni v tla - 2. del: Okrepljene membrane z nominalno debelino, enako ali večjo od 1,5 mm

Plastics - Plasticized poly(vinyl chloride) (PVC-P) membranes for inground swimming pools - Part 2: Reinforced membranes of nominal thickness equal to or greater than 1,5 mm

Kunststoffe - Membranen aus weichmacherhaltigem Polyvinylchlorid (PVC-P) für erdverlegte Schwimmbäder - Teil 2: Verstärkte Membranen mit einer Nenndicke von mindestens 1,5 mm

Plastiques - Membranes en poly(chlorure de vinyle) plastifié (PVC-P) pour piscines enterrées - Partie 2: Membranes armées d'épaisseur nominale supérieure ou égale à 1,5 mm

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Plastics - Plasticized poly(vinyl chloride) (PVC-P) membranes
for inground swimming pools - Part 2: Reinforced membranes of
nominal thickness equal to or greater than 1,5 mm

Plastiques - Membranes en poly(chlorure de vinyle) plastifié
(PVC-P) pour piscines enterrées - Partie 2: Membranes
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mm

Kunststoffe - Kunststoffbahnen aus weichmacherhaltigem
Polyvinylchlorid (PVC-P) für erdverlegte Schwimmbäder -
Teil 2: Verstärkte Bahnen mit einer Nenndicke von
mindestens 1,5 mm

This European Standard was approved by CEN on 19 May 2010.

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Contents

Page

Foreword.....	4
1 Scope	5
2 Normative references	5
3 Terms, definitions, symbols and abbreviations	6
3.1 Terms and definitions	6
3.2 Symbols	6
3.3 Abbreviations	6
4 Sampling and conditioning	6
4.1 Sampling	6
4.2 Conditioning of test pieces	6
5 Membrane composition	7
5.1 Characteristics of the membrane	7
5.2 Heavy metals and other dangerous substances	7
5.3 Environmental aspects	7
6 Visual characteristics	7
6.1 Appearance	7
6.2 Colour (plain coloured membranes)	8
6.3 Abrasion resistance (printed and/or coated reinforced membranes)	8
6.3.1 Test method	8
6.3.2 Requirement	9
7 Physico-chemical characteristics	9
8 Dimensional characteristics	9
9 Mechanical characteristics	10
10 Characteristics for durability	11
11 Storage conditions	11
12 Installation, refurbishment, exploitation and maintenance	12
13 Designation and marking	12
13.1 Designation	12
13.2 Marking	12
Annex A (normative) Determination of the contents of CaCO₃, heavy metals and other elements	13
Annex B (normative) Testing of slip resistance	14
B.1 Principle	14
B.2 Testing person	14
B.3 Test rig	14
B.4 Test liquid	14
B.5 Test specimen	14
B.6 Test procedure	14
B.7 Evaluation	15
B.8 Classification	15
B.9 Test report	15
Annex C (normative) Assessment of chlorine resistance	16
C.1 Principle	16
C.2 Test liquid	16
C.3 Apparatus	16

C.4	Test pieces	16
C.5	Procedure	16
C.6	Test report	17
Annex D	(normative) Assessment of the resistance to staining agents	18
D.1	Principle	18
D.2	Staining agents	18
D.3	Apparatus	18
D.4	Test specimens	18
D.5	Procedure	18
D.6	Expression of results	19
D.7	Test report	19
	Bibliography	20

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[SIST EN 15836-2:2010](https://standards.iteh.ai/catalog/standards/sist/550e3a17-09b2-4086-a31c-644e48a33190/sist-en-15836-2-2010)

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Foreword

This document (EN 15836-2:2010) has been prepared by Technical Committee CEN/TC 249 "Plastics", 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 December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

EN 15836, *Plastics — Plasticized poly(vinyl chloride) (PVC-P) membranes for inground swimming pools*, consists of the following parts:

- *Part 1: Homogenous membranes of nominal thickness equal to or greater than 0,75 mm*
- *Part 2: Reinforced membranes of nominal thickness equal to or greater than 1,5 mm [this standard]*

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This European Standard specifies the visual, dimensional, mechanical and durability characteristics of reinforced membranes made of plasticized poly(vinyl chloride) (PVC-P) sheets assembled together a polyester reinforcement, whose nominal thickness is greater than or equal to 1,5 mm, intended to be used to contribute to the leaktightness of inground swimming pools, implemented in situ. It also specifies the characteristics of the composition of the PVC-P used to produce the membranes.

It applies specifically to reinforced membranes intended for use in swimming pools where the water temperature is less than or equal to 32 °C. If the membrane manufacturer permits a temperature of water continuously maintained above 32 °C, this document also applies.

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 438-2:2005, *High-pressure decorative laminates (HPL) — Sheets based on thermosetting resins (usually called Laminates) — Part 2: Determination of properties*

EN 495-5, *Flexible sheets for waterproofing — Determination of foldability at low temperature — Part 5: Plastic and rubber sheets for roof waterproofing*

EN 1107-2, *Flexible sheets for waterproofing — Determination of dimensional stability — Part 2: Plastic and rubber sheets for roof waterproofing*

EN 1848-2, *Flexible sheets for waterproofing — Determination of length, width, straightness and flatness — Part 2: Plastic and rubber sheets for roof waterproofing*

EN 1849-2, *Flexible sheets for waterproofing — Determination of thickness and mass per unit area — Part 2: Plastic and rubber sheets*

EN 1850-2:2001, *Flexible sheets for waterproofing — Determination of visible defects — Part 2: Plastic and rubber sheets for roof waterproofing*

EN 12310-2, *Flexible sheets for waterproofing — Determination of resistance to tearing — Part 2: Plastic and rubber sheets for roof waterproofing*

EN 12311-2:2000, *Flexible sheets for waterproofing — Determination of tensile properties — Part 2: Plastic and rubber sheets for roof waterproofing*

EN 12316-2, *Flexible sheets for waterproofing — Determination of peel resistance of joints — Part 2: Plastic and rubber sheets for roof waterproofing*

EN 20105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour (ISO 105-A02:1993)*

EN ISO 62:2008, *Plastics — Determination of water absorption (ISO 62:2008)*

EN ISO 175:2000, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175:1999)*

EN ISO 291, *Plastics — Standard atmospheres for conditioning and testing (ISO 291:2008)*

EN ISO 846:1997, *Plastics — Evaluation of the action of microorganisms (ISO 846:1997)*

EN 15836-2:2010 (E)

EN ISO 4892-2:2006, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2:2006)*

EN ISO 5470-1:1999, *Rubber- or plastics-coated fabrics — Determination of abrasion resistance — Part 1: Taber abrader (ISO 5470-1:1999)*

3 Terms, definitions, symbols and abbreviations**3.1 Terms and definitions**

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

3.1.1**reinforced membrane**

sheet made of plasticized poly(vinyl chloride) sheets and a polyester reinforcement

NOTE 1 These membranes can be manufactured e.g. by extrusion, calendaring or cast spreading.

NOTE 2 The membrane is waterproof and gas-pervious, package in roll form and intended to be implemented in situ.

3.1.2**inground swimming pool**

permanent installation containing treated water for water activities totally or partially realized under the ground level with a water depth $\geq 0,85$ m or a water volume ≥ 8 m³

3.2 Symbols

E_n thickness of the membrane declared by the manufacturer, in millimetres

l_n width declared by the manufacturer, in metres or millimetres

L_n length of the roll declared by the manufacturer, in metres

M_s mass per unit area declared by the manufacturer, in grams per square metre

3.3 Abbreviations

CaCO₃ calcium carbonate

PVC-P plasticized poly(vinyl chloride)

4 Sampling and conditioning**4.1 Sampling**

The test pieces shall be taken only from rolls of unused membranes.

4.2 Conditioning of test pieces

Unless otherwise specified by the applicable test method, the test pieces used for the determination of the characteristics shall be conditioned before testing for at least 4 h in standard atmosphere 23/50 [(23 ± 2) °C, (50 ± 10) % HR] according to EN ISO 291.

5 Membrane composition

5.1 Characteristics of the membrane

When tested in accordance with the test methods as specified in Table 1 using the parameters indicated, the membrane shall have characteristics conforming to the requirements given in Table 1.

Table 1 — Characteristics of the membrane

Characteristic	Requirement	Test parameters		Test method
Mass per unit area	$M_s \begin{smallmatrix} +10 \\ -5 \end{smallmatrix} \% \text{ g/m}^2$ M_s mass per unit area declared by the manufacturer			EN 1849-2
Water absorption	$\leq 1 \% \text{ mass}$	Duration of immersion	168 h	EN ISO 62:2008, Method 1 ^a
		Test temperature	$(23 \pm 2) ^\circ\text{C}$	
CaCO ₃ content	$\leq 3 \% \text{ mass}$			Annex A

^a The edges of the test pieces may be made leaktight by dissolution of PVC-P in tétrahydrofurane (THF).

5.2 Heavy metals and other dangerous substances

The PVC-P membranes should conform to all national and international regulations in force.

The PVC-P membranes shall consist of materials that are not substances classified as carcinogen category 1 or carcinogen category 2, mutagen category 1 or mutagen category 2, toxic to reproduction category 1 or toxic to reproduction category 2 (see Directive 76/769/EEC [1]).

The total concentration of lead (Pb), cadmium (Cd), mercury (Hg), hexavalent chromium [Cr(VI)] and arsenic (As) shall not exceed 100 mg/kg.

NOTE This requirement is based on the concentration levels of heavy metals present in packaging as defined in Directive 94/62/EC, Article 11 [2].

For the determination of the total concentration of Pb, Cd, Hg, Cr(VI) and As, the method given in Annex A shall be used.

5.3 Environmental aspects

The PVC-P compounds are recyclable materials that can be treated in a material recovery process intended to save resources while minimising harmful emissions into air, water and soil as well as their impacts on human health.

NOTE A scheme for the characterisation of plastics waste is given in EN 15347 [3] and data for the characterisation of PVC recyclates are given in EN 15346 [4].

6 Visual characteristics

6.1 Appearance

Visible defects in the reinforced membrane shall be determined using the method specified in EN 1850-2.

EN 15836-2:2010 (E)

A visual inspection shall be made on a minimum area of the reinforced membrane that is 2 m long and as wide as the membrane itself. The inspection shall be performed on samples of both sides of the membrane taken at random from a roll laid down, without tension, on a flat, opaque surface.

The reinforced membrane shall have no defects visible to the naked eye, such as bubbles, blisters, coloured streaks, pinholes, mottles, folds or ripples. However air inclusion and mottles cannot be completely avoided in PVC-P sheet.

The appearance shall be uniform, as even as that of the reference test piece, irrespective of the area examined. The surface condition (smooth or embossed) and the colour reflection shall be in conformance with those of the reference test piece.

Non-printed reinforced membranes shall have an even surface finish.

In the case of a printed reinforced membrane, the imprint shall be even with no smudging. No ink shall be transferred to the non-printed side.

An embossed reinforced membrane shall have a regular appearance with an even pattern.

The pigments shall be homogenously and evenly distributed throughout the material. Slight differences in colour, related to composition and manufacture shall generally be permissible.

The rolls of reinforced membranes shall be suitably and sufficiently tight.

The result of the visual examination shall be expressed as "appearance conform" or "appearance non-conform". In the latter case, the defects noted shall be listed.

6.2 Colour (plain coloured membranes)

The colour of the unused (new) membrane, as delivered, shall be the same as that of the reference sample as agreed between the supplier and the customer.

The contrast or visual differences between the unused membrane and the reference sample shall be assessed in accordance with EN 20105-A02.

NOTE The trichromatic coordinates L^* , a^* and b^* determined according to ISO 7724-1 [5], ISO 7724-2 [6] and ISO 7724-3 [7] can be used to assess the colour of the membrane, as well as any differences in colour between the membrane and the reference sample. However, permissible limits cannot be defined in this document.

6.3 Abrasion resistance (printed and/or coated reinforced membranes)

6.3.1 Test method

In the case of printed and/or coated reinforced membranes, the abrasion resistance on the pattern shall be assessed by means of the method specified in EN ISO 5470-1:1999, with the following test conditions:

- set of abrasive wheels (in accordance with Table 1 of EN ISO 5470-1:1999): CS 17 for severe abrasive action;
- load applied to each wheel during the test: 5 N;
- number of abrasion cycles applied: 100 cycles;
- rotational speed of the test specimen holder: 60 r/min.

6.3.2 Requirement

When the printed and/or coated reinforced membrane is tested in accordance with 6.3.1, no signs of abrasion attack on the pattern shall be visible to the naked eye after 100 cycles.

7 Physico-chemical characteristic

Reinforced membranes are materials that are permeable to water vapour.

The manufacturer may declare the water vapour resistance factor, μ , measured over an unused membrane in accordance with EN ISO 12572.

8 Dimensional characteristics

When tested in accordance with the test methods as specified in Table 2 using the parameters indicated, the reinforced membrane shall have dimensional characteristics conforming to the requirements given in Table 2.

Table 2 — Dimensional characteristics

Characteristic	Requirement	Test parameters		Test method
Width l	$l_n \pm 5 \text{ mm}$ l_n : width as declared by the manufacturer			EN 1848-2
Roll length L	$L \geq L_n$ L_n : roll length as declared by the manufacturer			EN 1848-2
Flatness p	$p \leq 10 \text{ mm}$	Test width	Width of the membrane	EN 1848-2
Straightness g	$g \leq 30 \text{ mm}$	Test width	Width of the membrane	EN 1848-2
Mean thickness (Transverse direction) ^a	$E_n \pm 5 \%$ E_n : thickness as declared by the manufacturer			EN 1849-2 ^b
Single point thickness	$E_n \pm 8 \%$			EN 1849-2 ^{b, c}
NOTE The presence of the reinforcement, its structure and positioning can generate variations of the membrane thickness.				
^a Arithmetic mean of the thicknesses measured along the same transverse line of the membrane.				
^b Only using the mechanical measurement.				
^c Take five measurements twice over the width of the membrane at 3 m intervals or at the beginning and the end of the roll.				