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English Version

Flexible sheet for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics

Feuilles souples d'étanchéité - Feuilles d'étanchéité de toiture plastique et caoutchouc - Définitions et caractéristiques

Abdichtungsbahnen - Kunststoff- und Elastomerbahnen für Dachabdichtung - Definitionen und Eigenschaften

This European Standard was approved by CEN on 22 July 2005.

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Foreword

This European Standard (EN 13956:2005) has been prepared by Technical Committee CEN/TC 254 "Flexible sheets for waterproofing", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by March 2006, and conflicting national standards shall be withdrawn at the latest by June 2008.

This European Standard 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 European 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies the definitions and characteristics of plastic and rubber sheets including sheets made out of their blends and alloys (thermoplastic rubber) for which the intended use is roof waterproofing. It specifies the requirements and test methods and provides for the evaluation of conformity of the products with the requirements of this European Standard.

NOTE For typical materials and applications, see Annex E.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 1297:2004, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing - Method of artificial ageing by long term exposure to the combination of UV radiation, elevated temperature and water*

prEN 1548, *Flexible sheets for waterproofing — Plastic and rubber sheets for roof waterproofing - Method for exposure to bitumen*

EN 1844, *Flexible sheets for waterproofing — Determination of resistance to ozone — Plastic and rubber sheets for roof waterproofing*

EN 1847, *Flexible sheets for waterproofing — Plastic and rubber sheets for roof waterproofing — Methods for exposure to liquid chemicals, including water*

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 for roof waterproofing*

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

EN 1928, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of watertightness*

EN 1931, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of water vapour transmission properties*

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

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

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

EN 12317-2, *Flexible sheets for waterproofing - Determination of the shear resistance of joints - Part 2: Plastic and rubber sheets for roof waterproofing*

EN 12691 *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of resistance to impact*

EN 12730, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of resistance to static loading*

EN 13416, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Rules for sampling*

EN 13501-1:2002, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

prEN 13501-5, *Fire classification of construction products and building elements — Part 5: Classification using results from external fire exposure to roof tests*

EN 13583, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of hail resistance*

prEN 13948, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of resistance to root penetration*

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 11925-2:2002)*

3 Terms and definitions

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

3.1

waterproofing

action to prevent the passage of water from one plane to another

3.2

roof waterproofing system

assembly of roof waterproofing components in its applied and jointed form, which has certain performance characteristics, to be assessed as a whole

3.3

roofing

waterproofing used in the roof of a building including roofs used for parking of vehicles and for roof gardens

3.4

flexible sheet for roof waterproofing

factory made waterproofing sheet, which can be rolled up or folded for easy transport to the site

3.5

sampling

procedure used to select or constitute a sample

3.6**sample**

sheet from which a test piece is taken

3.7**test piece**

part of the sample from which test specimens are taken

3.8**test specimen**

piece of precise dimensions taken from the test piece

3.9**surface texture**

textured pattern on one or both surfaces of the sheet creating a difference between the effective and overall thickness not exceeding 0,1 mm

3.10**surface profile (surface structure)**

raised area on the surface of the sheet creating a difference between the effective and overall thickness exceeding 0,1 mm or a backing exceeding 80 g/m²

3.11**internal fabric**

layer of woven or non-woven fabric of synthetic or mineral fibres incorporated in the sheet. This layer may or may not constitute reinforcement

3.12**backing**

layer of woven or non-woven fabric of synthetic or mineral fibres or other material fixed to the bottom of the sheet. This layer may or may not constitute reinforcement

3.13**overall thickness (e)**

thickness of the sheet excluding any surface profile

3.14**effective thickness (e_{eff})**

thickness of the sheet providing the waterproofing function including any surface texture or backing equal to or less than 80 g/m² but excluding any surface profile and backing greater than 80g/m²

3.15**welding**

process of jointing by softening the surfaces to be united, either by heat or with the aid of a solvent (solvent welding, solvent bonding), and then pressing the softened surfaces together

3.16**adhesive bonding**

process of jointing by applying adhesives to the surfaces to be united or by applying an adhesive tape, and then applying pressure

3.17**hot bonding**

process of bonding by vulcanising a non vulcanised rubber tape between the two sheets to be jointed by means of heat and pressure

3.18

manufacturer's limiting value, (MLV)

value stated by the manufacturer to be met during testing. The MLV can be a minimum or a maximum value according to statements made under product characteristics of this European Standard

3.19

manufacturer's declared value, (MDV)

value declared by the manufacturer accompanied by a declared tolerance

4 Roofing system related characteristics

Testing shall be carried out according to Table A.1.

5 Product characteristics

5.1 General

5.1.1 Where a tolerance is limited by this European Standard it does not have to be declared by the manufacturer.

5.1.2 When tested for purposes other than initial type testing or factory production control, the tests to determine product characteristics indicated in this European Standard shall be started within 1 month of delivery from the manufacturer.

5.2 General characteristics

5.2.1 Visible defects

The product shall be free of visible defects in accordance with EN 1850-2.

5.2.2 Dimensions, tolerances and mass per unit area

The length, width, straightness and flatness shall be determined in accordance with EN 1848-2 and shall meet the requirements given in Table 1. The values for straightness and flatness only apply to sheets supplied in the form of rolls. The values for straightness and flatness do not apply to folded sheets.

Table 1 — Length, width, straightness and flatness requirements

| | |
|---------------|---|
| Length: | The measured length shall lie within the declared tolerance of the MDV. The tolerance of the MDV shall lie within -0% and $+5\%$. |
| Width: | The measured mean width shall lie within the declared tolerance of the MDV. The tolerance of the MDV shall lie within $-0,5\%$ and $+1\%$. |
| Straightness: | The deviation of the straightness g shall not exceed 50 mm. |
| Flatness: | The deviation of the flatness p shall not exceed 10 mm. |

Thickness and mass per unit area shall be determined in accordance with EN 1849-2, except that where the surface structure is caused by the inner layer, the mechanical thickness measurement method shall be applied and the result shall meet the requirements given in Table 2. Terms and definitions of this European Standard shall have priority over those given in EN 1849-2.

Table 2 — Thickness and mass per unit area requirements

| | |
|----------------------|--|
| Effective thickness: | Thickness of the sheet providing the waterproofing function including any surface texture but excluding any surface profile and backing shall be greater than 80 g/m ² . The measured effective thickness shall lie within the declared tolerance of the MDV. The tolerance of the MDV shall lie within –5 % and +10 %. |
| Single measurement: | Each single measurement value shall lie within the declared tolerance of the MDV. The tolerance of the MDV shall lie within ±10 %. |
| Mass: | The mass per unit area shall lie within the declared tolerance of the MDV. The tolerance of the MDV shall lie within –5 % and +10 %. |

5.2.3 Watertightness

The watertightness shall be determined in accordance with EN 1928 using method B at an applied water pressure of 10 kPa (0,1 bar) and shall give a pass result.

5.2.4 Effects of liquid chemicals including water

Information on the effect of liquid chemicals on plastics and rubber is given in Annex C. When further information on resistance to liquid chemicals is required, tests shall be conducted according to EN 1847 at a temperature of 23 °C for 28 days.

5.2.5 Fire performance

5.2.5.1 External fire performance

Where the manufacturer wishes to declare external fire performance (e.g. when subject to regulatory requirements), the product shall be tested and classified in accordance with prEN 13501-5. Where the defined system meets the deemed to satisfy criteria¹ no testing is required.

5.2.5.2 Reaction to fire

Where required, the product shall be tested and classified in accordance with EN 13501-1:2002, Table 1. When tested according to EN ISO 11925-2, the products shall be tested under conditions of surface flame attack.

NOTE It is currently considered that the Euroclasses Classification system at Classes D and above requires investigation to determine its appropriateness to the products covered by this European Standard (the SBI test may be inappropriate for products covered by the European Standard). Pending results of such an investigation and discussions in the Fire Regulators Group, products covered by this European Standard are tested to EN ISO 11925-2.

If and when a new fire test scenario and test method are developed for the products, this European Standard will be amended to refer to them.

¹ See Commission Decision 2000/553/EC [5].

5.2.6 Hail resistance

Where required, the hail resistance of the sheet shall be determined in accordance with EN 13583 and shall be greater than or equal to the manufacturer's limiting value (MLV).

5.2.7 Joint strength

Where required, the peel resistance of joints shall be determined in accordance with EN 12316-2. The peel resistance shall be greater than or equal to the manufacturer's limiting value (MLV). Where required, the shear resistance of joints shall be determined in accordance with EN 12317-2. The shear resistance shall be greater than or equal to the manufacturer's limiting value (MLV). If no result can be obtained due to too great an elongation, the grip distance may be reduced.

5.2.8 Water vapour properties

If necessary, the moisture resistance factor μ of plastic and rubber sheets may be determined in accordance with EN 1931 and the result shall lie within the declared tolerance of the MDV. The tolerance of the MDV shall lie within ± 30 %.

5.2.9 Tensile properties (strength and elongation)

The tensile properties for homogenous sheets and sheets with a non-woven inner layer (e.g. fibre glass mat) of less than or equal to 80 g/m^2 shall be determined in accordance with Method B of EN 12311-2. For all other sheets Method A of EN 12311-2 shall be used to determine tensile properties. The tensile force (Method A) or the tensile stress (Method B) shall be greater than or equal to the manufacturer's minimum limiting value (MLV) for the longitudinal and transverse direction of the sheet. The mean of the elongation at maximum tensile force (Method A) or the mean of the elongation at break (Method B) shall be greater than or equal to the manufacturer's limiting value (MLV) for the longitudinal and transverse direction of the sheet.

5.2.10 Resistance to impact

Where required, the resistance to impact shall be determined in accordance with EN 12691 and shall be greater than or equal to the manufacturer's limiting value (MLV).

5.2.11 Resistance to static loading

Where required, the resistance to static loading of the sheet shall be determined in accordance with either method A or method B of EN 12730 and shall be greater than or equal to the manufacturer's limiting value (MLV). If method A is used, the depth of the penetrating tool shall not exceed 10 mm.

5.2.12 Tear resistance

Where required, the tear force shall be determined in accordance with EN 12310-2. The mean of the tear resistance (maximum tensile force of pre-cut test specimen) shall be greater than or equal to the manufacturer's limiting value (MLV) for the longitudinal and transverse direction of the sheet.

5.2.13 Resistance to root penetration

The resistance to root penetration shall only be determined for products used as root barriers. Where required, the resistance to root penetration determined in accordance with prEN 13948 shall give a pass result.

5.2.14 Dimensional stability

Dimensional stability shall be determined in accordance with EN 1107-2. The mean of the dimensional change in length (ΔL) and width (ΔT) shall be less than or equal to the manufacturer's limiting value (MLV).

5.2.15 Foldability at low temperature

Foldability at low temperature shall be determined in accordance with EN 495-5. Only the top surface (the upper side of the sheet as used in-situ) shall be tested. The cold folding temperature shall be less than or equal to the manufacturer's limiting value (MLV).

5.2.16 Behaviour following exposure to UV radiation, elevated temperature and water

Where required, when the product is subjected to exposure according to EN 1297, the duration of exposure to UV shall be 1 000 h.

Following exposure, the change in visual aspects shall be determined according to EN 1297:2004, Annex B. Surface cracks according to EN 1297:2004, Table B.1, Grades 0, 1 and 2 will give a pass result for the visual examination. Grade 3 will give a fail result.

NOTE 1 The purpose of testing in accordance to EN 1297 is to characterize the long-term ageing behaviour of plastic and rubber sheets. The test does not give results corresponding to the service conditions in practice. Results should only be used to compare products of similar thickness, construction and composition, and they cannot be used for general durability classification. The chosen exposure duration for artificial ageing in accordance to EN 1297 has no relevance to a real product lifetime.

NOTE 2 Sheets passing ETAG 006 requirements are considered to comply with the criteria for behaviour following exposure to UV radiation, elevated temperature and water.

5.2.17 Resistance to ozone

Where required, the sheet shall be tested according to EN 1844 and the sheet shall show no cracks. This test is only required for sheets made of rubber materials.

5.2.18 Exposure to contact with bitumen

Where required, the behaviour of the sheet where it may come in contact with bitumen shall be determined in accordance with prEN 1548. The sheet is compatible with bitumen if:

- a) for sheets with an inner layer or backing, the percentage loss in mass is less than or equal to 5 %;
- b) for sheets without an inner layer or backing, the change in Young's Modulus is less than or equal to 50 %.

Results obtained by this test method from sheets without an inner layer or backing can be applied to sheets manufactured with same chemical formulation but having inner reinforcement layers or backing. The results obtained on a given thickness apply to any product of the same formulation with greater thickness. By experience, sheets with a non-woven backing of at least 150 g/m² or equivalent, which prevents any contact of the waterproofing membrane with bitumen, are considered as bitumen compatible.

5.3 Dangerous substances

For products placed on the market within the European Economic Area see ZA.1. Outside the EEA products shall conform to any applicable provisions related to dangerous substances valid in the place of use.

NOTE See also [3] and [4].

6 Evaluation of conformity

6.1 General

The compliance of the product with the requirements of this European Standard and with the stated values (including classes) shall be demonstrated by:

- initial type testing;
- factory production control by the manufacturer, including product assessment.

Test specimens shall be prepared from the sample taken in accordance with EN 13416.

For the purposes of testing, products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for all products within that same family (a product may be in different families for different characteristics).

6.2 Type testing

6.2.1 General

Initial type testing shall be performed to show conformity with this European Standard. Tests previously performed in accordance with the provisions of this European Standard (same product, same characteristic(s), test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account. In addition, initial type testing shall be performed at the beginning of the production of a new product type (unless a member of the same family) or at the beginning of a new method of production (where this may affect the stated properties).

All characteristics in Clause 5 shall be subject to initial type testing, where relevant.

Whenever a change occurs in the product design, the raw material or supplier of the components, or the production process (subject to the definition of a family), which would change significantly one or more of the characteristics, the type tests shall be repeated for the appropriate characteristic(s).

6.2.2 Sampling

Samples shall be taken according to EN 13416. The minimum number of tests to show compliance for type testing shall be one for all characteristics.

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market conform with the stated performance characteristics. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product.

If a manufacturer claims compliance with FPC requirements by operating an EN ISO 9001 system, it is essential that EN ISO 9001 be applied in full and be made specific to the requirements of this European Standard.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded.

6.3.2 Frequency of testing

Minimum frequencies of testing for factory production control are shown in Table B.1.

7 Product data sheet

The characteristics of the product, determined in accordance with the test methods specified in this European Standard, shall be listed in a technical data sheet. The technical data sheet shall give the following information:

- a) product trade name and manufacturer's name;
- b) origin/source of manufacture or traceable code;
- c) type of application and roofing system (see also Table A.1);
- d) results of tests (see also Table A.1) according to intended end use system where relevant;
- e) certification mark, if any;
- f) consumer information, e.g. restrictions concerning use² and storage and safety precautions during installation and disposal;
- g) description of the product (e.g. type of base material, type of reinforcement, mass or thickness, type of surfaces).

An example of a product data sheet is shown in Annex D.

8 Marking, labelling and packaging

The following information shall be indicated on each roll and/or in the accompanying technical or commercial documentation:

- a) production date or identification number;
- b) product trade name;
- c) length and width;
- d) thickness or mass;
- e) labelling according to national regulations related to dangerous substances and/or health and safety.

Where ZA.3 covers the same information as required by this clause, the requirements of this clause are met.

² Where the product is not suitable for all installation conditions, it is essential that the manufacturer declare those installation conditions for which the product is suitable.

Annex A (normative)

Applicability of characteristics

Table A.1 gives the relevant characteristics depending on the roofing system and/or regulatory requirements.

Table A.1 — Roofing system-related characteristics

| Clause | Testing for | Type of application/roofing system | | | |
|---------|--|------------------------------------|-----------------------|------------------|-------------------------------------|
| | | Exposed sheets | | Covered sheets | |
| | | Adhered | Mechanically fastened | Gravel ballasted | Roof gardens, park decks or similar |
| 5.2.1 | Visible defects | + | + | + | + |
| 5.2.2 | Length | + | + | + | + |
| 5.2.2 | Width | + | + | + | + |
| 5.2.2 | Straightness | ± | ± | ± | ± |
| 5.2.2 | Flatness | ± | ± | ± | ± |
| 5.2.2 | Mass per unit area | + | + | + | + |
| 5.2.2 | Effective thickness | + | + | + | + |
| 5.2.3 | Water tightness | + | + | + | + |
| 5.2.5.1 | External fire performance | ± | ± | - ^a | - ^a |
| 5.2.5.2 | Reaction to fire | ± | ± | ± | ± |
| 5.2.7 | Joint peel resistance | ± | + | + | + |
| 5.2.7 | Joint shear resistance | ± | - | - | - |
| 5.2.9 | Tensile strength | + | + | + | + |
| 5.2.9 | Elongation | + | + | + | + |
| 5.2.10 | Resistance to impact | + | + | + | + |
| 5.2.11 | Resistance to static load | - | - | + | + |
| 5.2.12 | Tear resistance | - | + | - | - |
| 5.2.13 | Resistance to root penetration | - | - | - | + ^b |
| 5.2.14 | Dimensional stability | + | + | + | + |
| 5.2.15 | Foldability at low temperature | + | + | + | + |
| 5.2.16 | UV exposure (1 000 h) | + | + | - | - |
| 5.2.4 | Effects of liquid chemicals, including water | ± | ± | ± | ± |
| 5.2.6 | Hail resistance | ± | ± | - | - |

Table A.1 (concluded)

| Clause | Testing for | Type of application/roofing system | | | |
|---|-------------------------|------------------------------------|-----------------------|------------------|-------------------------|
| | | Exposed sheets | | Covered sheets | |
| | | Adhered | Mechanically fastened | Gravel ballasted | Roof gardens or similar |
| 5.2.8 | Water vapour properties | ± | ± | ± | ± |
| 5.2.17 | Resistance to ozone | + ^c | + ^c | + ^c | - |
| 5.2.18 | Exposure to bitumen | ± | ± | ± | ± |
| Key + Relevant - Not relevant ± Dependant on roofing system, material, climatic condition or regulatory requirement. ^a Where the covering is in accordance with Commission Decision 2000/553/EC [5]. ^b For sheets used as root barriers in roof gardens only. ^c For rubber sheets only. | | | | | |

Annex B (normative)

Initial type test and frequencies of testing for factory production control

B.1 Type testing

Initial type testing is necessary for all characteristics, which are relevant in relation to the roofing system, material, climatic condition or regulatory requirement.

Initial type testing does not need to be repeated as long as the stated product properties remain valid.

For characteristics under 5.2.5.1 External fire performance and 5.2.13 Resistance to root penetration the type testing is a system test.

B.2 Testing for factory production control (FPC)

The minimum frequencies of testing for factory production control are given in Table B.1. All other relevant characteristics shall be controlled indirectly (e.g. by control of product composition).

Table B.1 — Frequencies of testing for FPC

| Clause | Characteristic | Minimum frequencies of testing per | | | |
|--------|---|------------------------------------|----------------|-------|----------------|
| | | batch | week | month | year |
| 5.2.1 | Visible defects | 1 | | | |
| 5.2.2 | Width | 1 | | | |
| 5.2.2 | Straightness | | | 1 | |
| 5.2.2 | Flatness | | | 1 | |
| 5.2.2 | Effective thickness or mass per unit area | 1 | | | |
| 5.2.9 | Tensile strength | | 1 ^a | | |
| 5.2.9 | Elongation | | 1 ^a | | |
| 5.2.12 | Tear resistance | | | | 1 ^a |
| 5.2.15 | Dimensional stability | | | | 2 ^b |

^a Where a manufacturer is continuously producing numerous different sheets, which contain the same core (type and mass) and the same type of coating, the frequency of these tests, which relate essentially to the core, may be considered on the total number of these different sheets.

^b Not necessary for sheets with non-woven glass mat carrier or composite reinforcement containing glass.

Annex C (informative)

Information about chemical resistance

The best judgement about the long term fitness for purpose of membranes under chemical environments is based on practical experience. Table C.1 describes the chemical resistance concerning common substances (where the behaviour of all synthetic membranes in the market is assumed to be equal). The judgement is based on the changes of mechanical performance but note that changes in colour are not considered. The statements are valid for room temperature (23 °C) with a typical test period of 28 days. It is the responsibility of the manufacturer to inform the customer about chemical resistance.

It is recognized that a large amount of data concerning the chemical resistance is available. The table shown here is based on:

- Kunststoff Handbuch Band II Polyvinylchlorid, Krekeler/Wick (Hsg.), Carl Hanser Verlag München, 1963,
- Kunststoff-Tabellen, Carlowitz, 4. Auflage, Carl Hanser Verlag München, 1995.

If detailed information or the behaviour concerning further substances is required, please refer to the original literature.

Table C.1 — Chemical resistance of plastic and rubber sheets

| Substance | Concentration (%) | Resistance |
|------------------------|-------------------|------------|
| Inorganic acids | | |
| Sulphuric acid | ≤ 25 | + |
| | > 25 and ≤ 98 | Δ |
| | > 98 | - |
| Sulphurous acid | ≤ 6 | + |
| Oleum | | - |
| Nitric acid | ≤ 5 | + |
| | > 5 and ≤ 50 | Δ |
| | > 50 | - |
| Hydrochloric acid | ≤ 10 | + |
| | > 10 | Δ |

Table C.1 (continued)

| Organic acids | | |
|--|---------------|---|
| Benzoic acid | | + |
| Butyric acid | | Δ |
| Acetic acid | ≤ 10 | + |
| | > 10 | Δ |
| Oleic acid | | Δ |
| Oxalic acid | | + |
| Phenols | | Δ |
| Phthalic acid | | + |
| Tartaric acid, aqueous | | + |
| Citric acid, aqueous | | + |
| Inorganic bases | | |
| Ammonium hydroxide, aqueous | | Δ |
| Potassium hydroxide, aqueous | | Δ |
| Sodium hydroxide | ≤ 10 | + |
| | > 10 and ≤ 50 | Δ |
| | > 50 | - |
| Organic bases | | |
| Pyridine and derivatives | | Δ |
| Triethanolamin | | Δ |
| Salt solutions | | |
| Chlorides | | + |
| Nitrates | | + |
| Sulphates | | + |
| Different substances | | |
| Drinking water | | + |
| Beer | | + |
| Glycol | | Δ |
| Soap solution | | + |
| Liquid manure | | Δ |
| Key | | |
| + All polymeric materials are resistant. | | |
| Δ Not stable in all cases (see literature or to be checked). | | |
| - None of the polymeric materials are resistant. | | |

Annex D (informative)

Example of a product data sheet

Date and reference of this technical data sheet.

- Product trade name.
- Manufacturer/supplier.
- Origin /source of manufacturing.
- Type of application and roofing system (see Annex A).
- Product performance, see Table D.1³⁾.
- Certification mark where relevant.
- Consumer information⁴⁾.
- Description of product (e.g. type of base material, type of reinforcement, thickness).

Table D.1 — Information from testing (where relevant according to roofing system, see Table A.1)

| Clause | Characteristic | Test method | Unit | Tolerance | Expression of results | Value or statement |
|---------|---------------------------|-----------------|-------------------|-----------------------------|---------------------------------|--------------------|
| 5.2.1 | Visible defects | EN 1850-2 | | | Pass | |
| 5.2.2 | Length | EN 1848-2 | m | -0 % and +5 % | MDV | |
| 5.2.2 | Width | EN 1848-2 | m | -0,5 % and +1 % | MDV | |
| 5.2.2 | Straightness | EN 1848-2 | mm | | MLV | ≤ |
| 5.2.2 | Flatness | EN 1848-2 | mm | | MLV | ≤ |
| 5.2.2 | Mass per unit area | EN 1849-2 | kg/m ² | -5% and +10 % | MDV | |
| 5.2.2 | Effective thickness | EN 1849-2 | mm | -5 % and +10 % ^a | MDV | |
| 5.2.3 | Water tightness | EN 1928Method B | kPa | | Pass | ≥ |
| 5.2.5.1 | External fire performance | ENV 1187 | | | In accordance with prEN 13501-5 | |

³⁾ See ZA.3, which limits information to be given in association with CE marking.

⁴⁾ e.g. restrictions concerning use and storage and safety precaution during installation and disposal.

Table D.1 (continued)

| Clause | Characteristic | Test method | Unit | Tolerance | Expression of results | Value or statement |
|---|---------------------------------------|----------------------|---------------------------------|-----------|-------------------------------------|--------------------|
| 5.2.5.2 | Reaction to fire | EN 13501-1 | | | EN 13501-1 (see Note in 5.2.5.2) | |
| 5.2.7 | Joint peel resistance | EN 12316-2 | N/50 mm | | MLV | ≥ |
| 5.2.7 | Joint shear resistance | EN 12317-2 | N/50 mm | | MLV | ≥ |
| 5.2.9 | Tensile strength | EN 12311-2 | N/50 mm or N/mm ² | | MLV | ≥ |
| 5.2.9 | Elongation | EN 12311-2 | % | | MLV | ≥ |
| 5.2.10 | Resistance to impact | EN 12691 | mm | | MLV | ≥ |
| 5.2.11 | Resistance to static load | EN 12730 Method B | Kg | | MLV | ≥ |
| 5.2.12 | Tear resistance | EN 12310-2 | N | | MLV | ≥ |
| 5.2.13 | Res. to root penetration ^b | prEN 13948 | | | Pass | |
| 5.2.14 | Dimensional stability | EN 1107-2 | % | | MLV | ≤ |
| 5.2.15 | Foldability at low temp. | EN 495-5 | °C | | MLV | ≤ |
| 5.2.16 | UV exposure | EN 1297 | Visual | | Pass | |
| 5.2.4 | Liquid chem. incl. water ^c | EN 1847 | | | See Annex C | |
| 5.2.6 | Hail resistance ^d | EN 13583 | m/s | | MLV | ≥ |
| 5.2.8 | Water vapour properties | EN 1931 | | ±30% | MDV | |
| 5.2.17 | Resistance to ozone ^e | EN 1844 | | | Pass | |
| 5.2.18 | Exposure to bitumen | prEN 1548 | | | Pass | |
| Key ^a Single values within ± 10 % ^b For sheets used as root barriers in roof gardens only ^c On request only ^d Where required ^e Rubber materials only | | | | | | |

Annex E (informative)

Typical materials, structure of sheets and roofing systems

E.1 Typical materials

E.1.1 General

Three groups of synthetic materials are used in the application of flexible sheets for waterproofing: plastics, rubbers and thermoplastic rubbers.

Within these three groups there are various materials, which can be different in their nature and way of manufacturing. In the following there are listed some typical materials for the individual groups. Other materials may be possible, because this European Standard should not hinder further development. For some materials short code designations have been established in the marketplace that differ from normative codes.

E.1.2 Plastics

| | |
|--------------|---|
| CSM or PE-CS | Chlorosulfonyl polyethylene |
| EEA | Ethylene/ethyl acetate |
| | Ethylene/ethyl acetate terpolymer (stated in full in words) |
| EBA | Ethylene/butyl acetate |
| ECB or EBT | Ethylene, copolymer, bitumen |
| EVAC | Ethylene/vinyl acetate |
| FPO or PO-F | Flexible polyolefin |
| FPP or PP-F | Flexible polypropylene |
| PE | Polyethylene |
| PE-C | Chlorinated polyethylene |
| PIB | Polyisobutylene |
| PP | Polypropylene |
| PVC | Polyvinylchloride |

E.1.3 Rubbers

| | |
|------|--|
| BR | Butadiene rubber |
| CR | Chloroprene rubber |
| CSM | Chlorosulfonyl polyethylene rubber |
| EPDM | Terpolymer of ethylene, propylene and a diene with residual unsaturated portion of diene in the side chain |
| IIR | Isobutene-isoprene rubber (butyl rubber) |
| NBR | Acrylonitrile-butadiene rubber (nitrile rubber) |

E.1.4 Thermoplastic rubbers

| | |
|-----------------|--|
| EA | Elastomeric alloys |
| MPR | Melt processible rubber |
| SEBS | Styrene ethylene butylene styrene |
| TPE | Thermoplastic elastomers, not cross-linked |
| TPE-X | Thermoplastic elastomers, cross-linked |
| TPS or TPS-SEBS | SEBS-copolymers |
| TPV | Thermoplastic rubber vulcanisate |

E.2 Installation

Plastic and rubber sheets for roof waterproofing are normally installed as a single layer roof waterproofing membrane. The joints between sheets are often welded by the action of heat or solvent but they may also be sealed using adhesive or adhesive tape or in the case of rubber material hot bonded. In all cases it is important that the sheets are jointed by the method recommended by the manufacturer.

The roof waterproofing sheet may be fastened to the substructure with adhesive, be mechanically fastened, or can be ballasted. The sheet has different requirements for each method of application and it is important that the manufacturer's advice is sought as to the suitability of the sheet for the application.

At perimeter details it is normal to use special trims and these are often made from metal, which can be laminated with a material compatible with the main roof membrane, to enable the trim to be jointed to the main membrane.

However when the sheet is applied, it is important that the system can withstand the expected wind uplift forces. With mechanically fastened membranes fastenings can be varied to meet the exposure conditions.

With ballasted roofs, the membrane is loose laid, with only the perimeter being fastened, which allows for maximum movement of the substrate. The weight of the ballast (e.g. gravel or paving) has to provide the resistance to wind uplift forces. Separation layers are sometimes needed to prevent reaction between the insulation and the roof waterproofing sheet (see Figure E.1).

With ballasted roofs the thermal insulation can be placed above the waterproofing membrane, avoiding the need for a separate vapour control layer and providing protection from mechanical damage. In these so called 'inverted roof' systems it is usual to provide a filter layer over the insulation to prevent fine particles from the ballast penetrating down to the membrane, where it could cause damage.

With mechanically fastened roof systems, the fastenings (usually screws with plate washers) are fixed through the roof waterproofing sheet and covered with another layer of sheet. This can conveniently be done where the sheet is jointed (see Figure E.3). Another way of fixing the sheet is to use fastenings anywhere on the sheet independent from the overlaps and then waterproofing the penetrations with cover strips.

Plastic and rubber roof waterproofing sheets can be incorporated into suitable designs for roof gardens (see Figure E.4).

With adhered plastic and rubber roof waterproofing, the membranes are often backed with a layer of other material (e.g. polyester fleece) in order to provide a good key for the adhesive, to help smooth out steps in the insulation and to allow for a degree of movement (see Figure E.5). With appropriate membranes these roof waterproofing sheets with backing can be applied as overlays to old bitumen roofs (see Figure E.6).

E.3 Typical roofing systems

In the following figures, examples of the most common roofing systems are shown (see Key after Figure E.6).

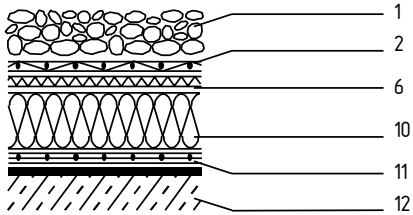


Figure E.1 — Gravel ballasted roof

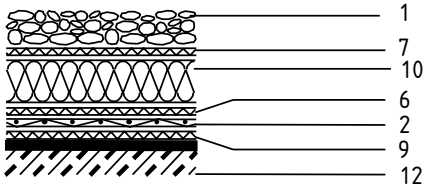


Figure E.2 — Gravel ballasted inverted roof

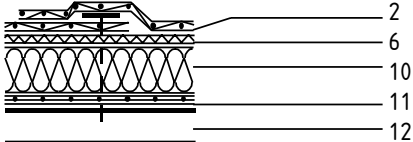


Figure E.3 — Mechanically fastened roof

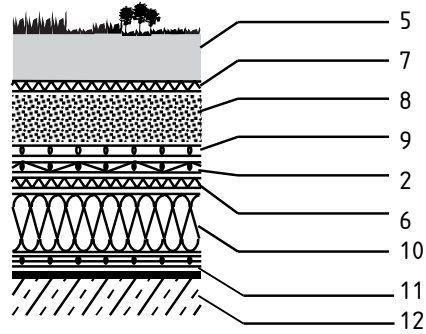


Figure E.4 — Roof garden

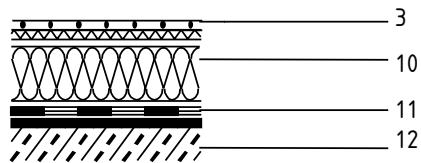


Figure E.5 — Adhered roof

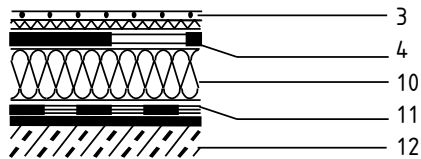


Figure E.6 — Adhered roof – re-roof

Key to Figures E.1 to E.6

- | | |
|---|-------------------------------|
| 1 Gravel, 50 mm | 7 Trickling filter |
| 2 Roof waterproofing sheet | 8 Drainage and water storage |
| 3 Roof waterproofing sheet with backing | 9 Protection layer |
| 4 Bitumen roof waterproofing sheet | 10 Thermal insulation |
| 5 Garden substrate | 11 Water vapour control layer |
| 6 Separation layer (if necessary) | 12 Substrate |

Annex ZA (informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under mandate M/102 Flexible sheets for waterproofing (as amended) given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the plastic and rubber sheets covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

WARNING: Other requirements and other EU Directives, not affecting the fitness for intended uses, can be applicable to the plastic and rubber sheets falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this European Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through <http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm>).

The following clauses of this European Standard meet the requirements of the Mandate M/102 and its amendments M/126 and M/130 given under the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products (89/106).

Clauses with reference to the mandate for membranes:

- Clause 1 Scope;
- Clause 2 Normative references regarding tests for mandated characteristics;
- Clause 3 Definitions;
- Clause 5 Product characteristics indicated in Table ZA.1;
- Clause 6 Evaluation of conformity.

Table ZA.1 — Characteristics meeting Mandate M 102 given under CPD

| Essential characteristics | Requirement clauses in this EN | Levels and/or classes | Notes |
|--|--------------------------------|--|--|
| External fire performance | 5.2.5.1 | In accordance with prEN 13501-5 or deemed to satisfy | To comply with regulatory requirements |
| Reaction to fire | 5.2.5.2 | Classes in accordance with EN 13501-1 | See Note in 5.2.5.2 |
| Watertightness | 5.2.3 | - | |
| Tensile properties | 5.2.9 | - | |
| Root resistance | 5.2.13 | - | Only for root barriers |
| Resistance to static loading | 5.2.11 | - | |
| Resistance to impact | 5.2.10 | - | |
| Tear resistance | 5.2.12 | - | |
| Joint strength | 5.2.7 | - | |
| Durability | 5.2.16 | - | |
| Foldability | 5.2.15 | - | |
| Dangerous substances | 5.3 | - | See relevant note in ZA.1 |
| - means that no classes or levels are specified by the mandate | | | |

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these Member States are not obliged either to determine nor to declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see ZA.3) may be used.

ZA.2 Procedure for attestation of conformity of plastic and rubber sheets

ZA.2.1 Systems of attestation of conformity

The systems of attestation of conformity of plastic and rubber sheets indicated in Table ZA.1, in accordance with the Decision of the Commission as given in Annex III of the mandate M/102 as amended, are shown in Table ZA.2 for the indicated intended use and relevant classes.

Table ZA.2 — System of attestation of conformity

| Product | Intended use | Level(s) or class(es) | Attestation of conformity system ^a |
|---------------------------------|---|---|---|
| Plastic and rubber sheets | Roof waterproofing subject to reaction to fire | (A1, A2, B, C)* | 1 |
| | | (A1, A2, B, C)**, D, E | 3 |
| | | F | 4 |
| | Roof waterproofing subject to external fire performance | prEN 13501-5 for products requiring testing | 3 |
| | | Class F _{ROOF} products | 4 |
| Roof waterproofing ^b | - | 2+ | |

^a System 1: See Directive 89/106/EEC (CPD) Annex III.2(i) without audit-testing of samples.
System 2+: See CPD Annex III.2.(ii), First possibility, including certification of the factory production control by an approved body on the basis of initial inspection of factory and of factory production control as well as of continuous surveillance, assessment and approval of factory production control.
System 3: See CPD Annex III.2(ii) second possibility.
System 4: See CPD Annex III.2(ii) third possibility.
* Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic materials).
** Products/materials not covered by footnote (*).
^b Because all roofing sheets have a requirement on watertightness, all products covered by this standard come under attestation system 1 or 2+. Systems 3 and 4 in Table ZA.2 indicate only that the characteristics 'reaction to fire' and/or 'external fire performance' are either tested by a notified test laboratory or are not tested at all.

For products under attestation of conformity system 2+, the characteristics external fire performance and reaction to fire shall be subject to initial type testing by a notified test laboratory under the responsibility of the manufacturer.

For products under attestation of conformity system 2+, for the initial inspection of the factory and of the factory production control (FPC), and for the continuous surveillance, assessment and approval of FPC, parameters related to relevant characteristics of Table ZA.1, in particular watertightness, shall be of interest to the notified FPC certification body.

Initial type testing of the relevant characteristics of Table ZA.1, carried out by the manufacturer, or by a notified test laboratory in the case of reaction to fire and external fire performance, shall be in accordance with the provisions of 6.2. The manufacturer shall operate a factory production control system in accordance with the provisions of 6.3. The systems of attestation of conformity are shown in tabular form in Tables ZA.3.1 and ZA.3.2.

Table ZA.3.1 — Assignment of evaluation of conformity tasks for plastic and rubber sheets under system 1

| Tasks | | Content of the task | Evaluation of conformity clauses to apply |
|--|---|---|---|
| Tasks under the responsibility of the manufacturer | Factory production control (FPC) | Parameters related to all relevant characteristics of Table ZA.1 | 6.3 |
| | Initial type testing by the manufacturer | All relevant characteristics of Table ZA.1 except reaction to fire and, external fire performance | 6.2 |
| | Initial type testing by a notified test laboratory | External fire performance where testing is required | 6.2 |
| Tasks under the responsibility of the product certification body | Initial inspection of factory and of FPC | Parameters related to all relevant characteristics of Table ZA.1, in particular reaction to fire and watertightness | 6.3 |
| | Continuous surveillance, assessment and approval of FPC | Parameters related to all relevant characteristics of Table ZA.1, in particular reaction to fire and watertightness | 6.3 |
| | Initial type testing | Reaction to fire Classes (A1, A2, B, C)* | 6.2 |

Table ZA.3.2 — Assignment of evaluation of conformity tasks for plastic and rubber sheets under system 2+

| Tasks | | Content of the task | Evaluation of conformity clauses to apply | |
|--|--|---|--|-----|
| Tasks under the responsibility of the manufacturer | Factory production control (FPC) | Parameters related to all relevant characteristics of Table ZA.1 | 6.3 | |
| | Initial type testing by the manufacturer | All relevant characteristics of Table ZA.1 except reaction to fire and, external fire performance | 6.2 | |
| | Initial type testing by a notified test laboratory | Classification – Reaction to fire (A1, A2, B, C)**, D, E (see Note in 5.2.5.2) – External fire performance for products requiring testing | 6.2 | |
| | Certification of FPC by the FPC certification body on the basis of | Initial inspection of factory and of FPC | Parameters related to all relevant characteristics of Table ZA.1, in particular watertightness | 6.3 |
| | | Continuous surveillance, assessment and approval of FPC | Parameters related to all relevant characteristics of Table ZA.1, in particular watertightness | 6.3 |

ZA.2.2 EC Certificate and declaration of conformity

When compliance with the conditions of this annex is achieved, and once the notified body has drawn up the certificate mentioned below, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include:

- name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production;
- description of the product (type, identification, use), and a copy of the information accompanying the CE marking;
- provisions to which the product conforms (i.e. Annex ZA) and a reference to initial type testing reports and factory production control reports if applicable;
- particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);
- the number of the accompanying product certificate or factory production control certificate;
- name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The declaration shall be accompanied by either a product certificate (products under system 1) or a factory production control certificate (products under system 2+), drawn up by the notified body, which shall contain, in addition to the information above, the following:

- name, address and identification number of the notified body;
- the number of the product certificate or factory production control certificate;
- conditions and period of validity of the certificate, where applicable;
- name of, and position held by, the person empowered to sign the certificate.

The above mentioned declaration and certificate shall be presented in the language or languages accepted in the Member States where the product is used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC. The CE marking symbol, the number of the EC certificate of factory production control and the information required by Clause 8 (except 8a)) shall be shown on a label attached to the product.

The CE marking symbol shall also appear on the accompanying commercial (technical) documentation, together with the following:

- identification number of the product or FPC certification body;
- name or identifying mark and registered address of the producer;
- the last two digits of the year in which the marking is affixed;
- the number of the EC product certificate or certificate of factory production control;

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- reference to this European Standard (EN 13956);
- a description of the product: the information required by Clause 8 (except 8 a)), type of base material, type of carrier, type of surfacing, and intended type of application⁵;
- information on the relevant essential characteristics in Table ZA.1, namely:
 - values and, where relevant, level or class to declare for each essential characteristic;
 - characteristics against which the “No performance determined” (NPD) option (or Class F for reaction to fire or external fire performance) is relevant.

The "No performance determined" (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements.

Figure ZA.1 gives an example of the information to be given on the accompanying commercial (technical) documentation.

⁵ Where the product is not suitable for all installation conditions, it is important that the manufacturer declare those installation conditions for which the product is suitable.

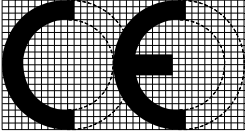
| | |
|---|---|
|  01234 | CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC Identification number of the FPC certification body |
| AnyCo Ltd, PO Box 21, B-1050 06 01234-CPD-00234 | Name or identifying mark and registered address of the producer Last two digits of the year in which the marking was affixed FPC Certificate number |
| <p style="text-align: center;">EN 13956</p> 2 m x 30 m x 1,2 mm PVC with synthetic fabric as reinforcing material. Exposed application: mechanically fastened roof External fire performance: B _{ROOF} (t1) see manufacturer's document XYZ* Reaction to fire: E Watertightness: Pass Tensile strength in longitudinal direction: 600 N/50 mm Tensile strength in transverse direction: 600 N/50 mm Elongation: 15% Resistance to impact: 700 mm Resistance to static loading: 20 kg Tear resistance: 180 N Joint peel resistance: 450 N/50 mm Joint shear resistance: 600 N/50 mm Root resistance: NPD Foldability at low temp: -30 °C Durability: Grade 1, -20 °C | No. of European Standard Description of product and information on regulated characteristics * This document to contain details of the system(s), of which the roofing sheet is a part, which were tested |

Figure ZA.1 — Example CE marking information to be given on the accompanying commercial (technical) documentation, for a product in reaction to fire Class E

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned.

Bibliography

- [1] Guidance paper F "Durability and the Construction Products Directive".
- [2] Guidance paper D "CE marking under the Construction Products Directive".
- [3] Guidance paper H "A harmonized approach to dangerous substances under the Construction Products Directive".
- [4] Essential Requirements (ER) n° 3 "Hygiene, health and environmental protection" of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to constructions products (89/106/EEC).
- [5] Commission Decision 2000/553/EC, of 6 September 2000, implementing Council Directive 89/106/EEC as regards the external fire performance of roof coverings (notified under document number C (2000) 2266); Official Journal L 235, 19/09/2000p. 0019-0022.
- [6] ENV 1187, *Test methods for external fire exposure to roofs*.
- [7] EN ISO 9001 *Quality management systems - Requirements (ISO 9001:2000)*.