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Product Guideline No.12

Reflective products

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1 Purpose

This Product Guideline supplements the measures in the General Guidelines.

This Product Guideline concerns products having at least one external reflective surface (i.e. with low emissivity) and constituted of:

- One or more reflective films (internal and/or external);
- One or more layers based on bubble film, synthetic fibres, polypropylene or polyethylene foam or other expanded thermoplastic, mineral wool, animal or plant fibres.

2 Additional elements of the certificate application technical file

The technical file defined in paragraph 2.2 of the General Guidelines is supplemented by the following items.

- Proof of fitness for use: Valid favourable Technical Assessment, Technical Application Document or type A ATEx; Pass'innovation
- Description of the product:
    - surface density of the component and each film and/or underlayer
    - base weight and thickness of the layers of aluminium or aluminium foil
    - identification of any protective varnish (types, thicknesses)
    - gluing, seams, welding
    - density of the layers (wadding, wool, foam, etc.)
    - level of compression of the product in its packaging
    - The curves showing how the product recovers its thickness after unpacking up to stabilisation, according to the level of compression and the length of time the product has been stored in its packaging. These curves must represent *at least* the changing thickness of the product for a product unpacked after 9 weeks of storage.
- Description of manufacturing and internal control
    - place of manufacturing of the different films and intermediate layers and description of the manufacturing processes
    - place of assembly and description of the manufacturing process

In the case of products containing one or more plant or animal fibre-based layers, the additional elements listed in Product Guideline No.11 must be provided for these layers.

3 Characteristics which can be certified

The characteristics which can be certified are the characteristics listed in the table below, supplemented by the following characteristics:

- Service compression strength, normal service deformation
- Class of insulating underlayers beneath screed or floating slab and under tiles
- Emissivity
- Specific heat capacity

Characteristics	**Test method**	**Length and width of the test specimen** [a, b]	**Minimum number of measurements to obtain a test result**	**Specific conditions**
Thermal resistance	NF EN 12667 or NF EN 12939	See NF EN 12667 or NF EN 12939	1	
Thickness	NF EN 823	Finished product	Roll: 1 Panels and strips: 3	Method B.1, 50 Pa or 250 Pa, see 4.2.3 of standard NF EN 13162
Emissivity	See Technical Specification No.7			
Reaction to fire	See Technical Specification No.3			
Resistance to traction parallel to the surfaces	NF EN 1608	See NF EN 1608	2	
Tear resistance	NF EN 12310-1	See NF EN 12310-1	5	
Dimensional stability under the specified temperature conditions	NF EN 1604	200×200	3	
Compression stress or compression strength	NF EN 826	200×200 300x300	5 3	
Point load	NF EN 12430	300×300	3	
Creep in compression	NF EN 1606	200x200	3	
Short-term water absorption	NF EN 1609	200×200	4	Method A
Transmission of water vapour	NF EN 12086	See 6.1 in NF EN 12086	3	External surfaces only for multiple layers [c]
Dynamic stiffness	NF EN 29052-1	200×200	3	
Thickness, d_L	NF EN 12431	200×200	3	
Thickness, d_B	NF EN 12431			
Long-term thickness reduction	NF EN 1606			

a) Thickness of the finished product apart for reaction to fire.

b) Dimensions in millimetres

c) Products with a vapour barrier are tested in compliance with standard EN 12086, the thickness of the test specimen is that of the vapour barrier plus 2 to 3 millimetres.

4 Methods of determination of the certified characteristics by the pilot laboratories

The test methods applied by the pilot laboratory for each of the characteristics are defined in the previous table, supplemented by the following measures.

4.1 Thermal conductivity

For this type of product, the thermal resistance is measured directly, without using thermal conductivity.

4.2 Thermal resistance

Certified thermal resistance is defined according to the procedures in Technical Specification No.2.

Thermal resistance is determined at the thickness defined below:

4.2.1 Products not compressed in packaging

Thermal measurement is carried out at the thickness measured according to standard NF EN 823.

4.2.2 Products compressed in packaging

Thickness is measured in compliance with standard NF EN 823 after storage of the material in its packaging for 9 weeks. Thermal measurement is made:

- at nominal thickness if it is lower than or equal to the average thickness measured,
- otherwise, at the average thickness measured.

For compressed products which expand over several days after opening the packaging, the thickness adopted is that measured 15 minutes after opening the packaging.

So that the results of determination of thermal resistance by the verification body can be transmitted to the manufacturer within a reasonable period of time, these measurement and those for thickness are made independently of each other. Measurements corresponding to determination of thermal resistance are made without waiting for the storage period defined above. Thickness measurements are made on additional samples after storage. If the thickness measured is less than the nominal thickness, thermal measurement is made and its result incorporated in the sampling programme instead of that of the next sample.

4.3 Reaction to fire

The measures in Technical Specification No.3 apply.

4.4 Service compression strength, normal service deformation

The measures in Technical Specification No.5 apply.

4.5 Class of insulating underlayers beneath screed or floating slab and under tiles

If the class of insulating underlayers beneath screed or floating slab and under tiles defined in the DTU guideline 52.10 P1-2 is certified, the procedures in Technical Specification No.6 apply.

4.6 Emissivity

If the product has a surface coating for which the emissivity is certified, the procedures in Technical Specification No.7 apply.

4.7 Specific heat capacity

The measures in Technical Specification No.10 apply.

4.8 Creep in compression

Creep in compression, Xct, and the total reduction in thickness, Xt, must be determined after at least one hundred and twenty-two days of testing under a declared compression stress, σc, given in intervals of at least 1 kPa, and the results must be extrapolated thirty times, which corresponds to ten years, to obtain the declared levels in accordance with standard EN 1606. Creep in compression and the total reduction in thickness must be respectively declared in levels, i_2 and i_1, of equal intervals of 0.1 mm under the declared stress. No test result must be higher than the levels declared under the declared stress.

NOTE 1: For designation code $CC(i_1/i_2/y)\sigma_c$, a declared level such as e.g. CC(2.5/2/10)50 indicates a creep in compression of less than 2 mm and a total reduction in thickness of less than 2.5 mm, after extrapolation corresponding to 10 years (or thirty times one hundred and twenty-two days of testing) under a declared compression stress of 50 kPa.

NOTE 2: Extrapolation of the results beyond the four months of tests can only be done if at least 5 years of experience are available of the same kind of material and on condition that Findley's Power Law is validated.

4.9 Compression at 10%

Compression at 10% is determined by a compression strength test according to NF EN 826 with 5 test specimens 200 mm x 200 mm or 3 test specimens 300 mm x 300 mm.

5 Factory production control

Production control in the production unit satisfies the requirements of the table below, according to the characteristics relevant to the target application.

<table>
<tr><th rowspan="3">Characteristic</th><th colspan="4">Minimum test frequency [a]</th></tr>
<tr><th colspan="3" rowspan="2">Direct test</th><th colspan="2">Indirect test</th></tr>
<tr><th>Test method</th><th>Frequency</th></tr>
<tr><td rowspan="4">Thermal resistance</td><td colspan="3">Once a day or</td><td>–</td><td>–</td></tr>
<tr><td colspan="3" rowspan="3">Once every 3 months for each product/group of products and indirect test</td><td>Air permeability; and</td><td>Once every 2 hours</td></tr>
<tr><td>Either surface density or apparent density; or</td><td>Once an hour</td></tr>
<tr><td>manufacturer method</td><td>Once an hour</td></tr>
<tr><td>Length and width</td><td>Rolls
Once every 4 hours</td><td>Strips
Once every 2 hours</td><td>Panels
Once every 2 hours</td><td>Manufacturer method</td><td>Once every 2 hours</td></tr>
<tr><td>Thickness</td><td>Once every 4 hours</td><td>Once every 4 hours</td><td>Once every 4 hours</td><td>–</td><td>–</td></tr>
<tr><td>Emissivity</td><td colspan="5">Once a week (see Technical Specification No.7)</td></tr>
<tr><td>Reaction to fire</td><td colspan="5">See Technical Specification No.3 (paragraph 5.2)</td></tr>
<tr><td>Resistance to traction parallel to the surfaces</td><td colspan="3">Once a year and indirect test</td><td>Manufacturer method</td><td>Once every 8 hours</td></tr>
<tr><td>Dimensional stability at specified temperature</td><td colspan="3">Type tests [b]</td><td>–</td><td>–</td></tr>
<tr><td>Compression stress or compression strength</td><td colspan="3">Once every 8 hours and indirect test</td><td>Apparent density</td><td>Once every 4 hours</td></tr>
<tr><td>Point load</td><td colspan="3">Type tests [b]</td><td>–</td><td>–</td></tr>
<tr><td>Creep in compression</td><td colspan="3">Type tests [b]</td><td>–</td><td>–</td></tr>
</table>

Characteristic	Minimum test frequency [a]		
	Direct test	Indirect test	
		Test method	Frequency
Short-term water absorption	Once a month and indirect test	Manufacturer method	Once a day
Long-term water absorption	Once a month and indirect test	Manufacturer method	Once a day
Transmission of water vapour	Once a year	–	–
Dynamic stiffness	Once a year and indirect test	Manufacturer method	Once a day
Thickness, d_L	Once every 2 hours	–	–
Thickness, d_B	Once a day		
Long-term thickness reduction	Type tests [b]		
Biological resistance for plant or animal fibre-based layers	Type tests [b] once/3 years and indirect tests	Manufacturer method	Once a week
Emission of dangerous substances	Test method unavailable [c]	–	–

a) By minimum testing frequency, expressed in test results, is meant the minimum frequency for each unit/production line under stable conditions. In addition to the testing frequencies given above, testing of the pertinent properties of the product must be repeated in case of changes or modifications likely to affect product compliance. With regard to the mechanical properties, the testing frequencies are given independently of product changes. Moreover, the manufacturer must establish internal rules for adjustment of the procedure affecting these properties when a product change occurs.

b) Type testing, see EN 13172 (paragraph 6).

c) No frequency is given, due to the fact that the test methods are not available yet.

d) for raw material controls, refer to §3.3.3 of the General Guidelines

In addition to these measures, for the following certified characteristics for the purposes of these regulations and described in detail in the various Technical Specifications, the procedures (methods and minimum test frequencies) provided for in this Technical Specification apply:

- Reaction to fire
- Service compression strength and normal service deformation
- Class of insulating underlayers beneath screed or floating slab and under tiles
- Emissivity
- Specific heat capacity

Moreover, the manufacturer must have at least ten thermal resistance or thermal conductivity test results corresponding to direct internal or external measurements. The direct measurements of thermal resistance or thermal conductivity must have been conducted at regular intervals over the last twelve months. If less than ten test results are available, this period may be extended to maximum period of three years until ten results are obtained. The product and production conditions must not have been significantly changed during this period.

For new products, the ten thermal resistance or thermal conductivity test results must come from measurements spread over a minimum period of ten days.

The thermal conductivity values at fractile 90/90 must be calculated in compliance with the method described in Technical Specification No.1 and must be recalculated at intervals which must not exceed three months of production.

6 Tests performed during follow-up

For characteristics requiring monitoring, random tests are conducted at least once a year according to the table below when relevant to the product in question.

The tests are conducted in accordance with the measures in paragraph 3 of this guideline, supplemented if applicable by the procedures described in the Technical Specifications corresponding to the characteristics tested.

Characteristics (Paragraph 3)	**Test methods**	**Place of performance of the tests**
Thermal resistance – Thermal conductivity	NF EN 12667 NF EN 12939	Pilot laboratory
Length and width	NF EN 822	Production unit and pilot laboratory
Thickness	NF EN 823 or NF EN 12431	Production unit and pilot laboratory
Squaring	NF EN 824	Production unit
Flatness	NF EN 825	Production unit
Reaction to fire[1]	NF EN 13501-1	Pilot laboratory
Emissivity	Technical Specification No.7	Pilot laboratory
Density	NF EN 1602	Pilot laboratory
Service resistance (R_{CS})	Technical Specification No.5	Production unit and if not compliant at the pilot laboratory

The certifying body may also perform verification tests to verify other characteristics not listed in the table below, in particular if there is any doubt as to the compliance of the certified values.

Random testing is performed for reaction to fire in the case of products coming under conformity certificate system 1 for CE marking, in the case of the key-mark or at the manufacturer's request. In addition, for the follow-up tests, the following measures apply: one SBI test on the worst case according to the initial type testing.

[1] The reaction to fire classification is monitored by conducting random tests once every two years.

7 Certificate maintenance rules

The certificate maintenance rules are defined in paragraph 4 of the General Guidelines.

Based on the results of the tests performed by the pilot body, product compliance is verified:

- For the dimensional characteristics according to the requirements of paragraph 4 of European standard NF EN 13162[1] or in relation to the manufacturer's specifications defined in the product technical file;
- For thermal performance according to paragraphs 2.3 of Technical Specification E;
- For the following characteristics certified under these regulations and described in detail in the various Technical Specifications, according to the conditions stipulated in these Technical Specifications:
    - Reaction to fire
    - Service compression strength and normal service deformation
    - Emissivity

8 Marking Rules

The marking rules laid out in Technical Specification D apply.

In particular, the information label complies with the measures in paragraph 3.1 of this Technical Specification.

[1] Due to an inconsistency between the French and English versions of the 2009 edition of this standard, the English version is to be used for evaluation of the thickness tolerances.