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BSI Standards Publication

Paints and varnishes — Coating materials and coating systems for exterior wood — Assessment of film extensibility by indentation of a coating on a wooden substrate

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Paints and varnishes - Coating materials and coating systems for exterior wood - Assessment of film extensibility by indentation of a coating on a wooden substrate

Peintures et vernis - Produits de peintures et systèmes de peintures pour bois en extérieur - Évaluation de l'extensibilité du feuil par poinçonnement d'un revêtement sur un support en bois

Beschichtungsstoffe - Beschichtungsstoffe und Beschichtungssysteme für Holz im Außenbereich - Beurteilung der Verformbarkeit durch Eindrücken einer Beschichtung auf einem Holzsubstrat

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Foreword

This document (CEN/TS 16360:2012) has been prepared by Technical Committee CEN/TC 139 “Paints and varnishes”, the secretariat of which is held by DIN.

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Introduction

A suitable extensibility of a coating film on wood in exterior use is of importance to follow dimensional changes of the wood and to resist some mechanical impacts without formation of cracks in the coating film. The simple method described in this document gives evidence on extensibility of a coating film on wood on an ordinal scale and provides first evidence on mechanical behaviour. A similar method exists in EN 13696:2008 for coated wood floorings in interior use but in the present document the description of a carefully selected substrate is added to enable testing of coating materials and coating systems for exterior wood. The method should preferably be used on coatings that have not been exposed to weathering but it may also be applied after ageing of the coating film or under different climatic conditions to gain additional experience.

1 Scope

This Technical Specification specifies a test method for assessing film extensibility by indentation of a coating on a defined and carefully selected wooden extensibility substrate for coatings on stable wood components in exterior use. The method is preferably be used on coatings that have not been exposed to weathering.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 927-3:2012, *Paints and varnishes — Coating materials and coating systems for exterior wood — Part 3: Natural weathering test*

EN ISO 4618:2006, *Paints and varnishes — Terms and definitions (ISO 4618:2006)*

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 3131, *Wood — Determination of density for physical and mechanical tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 4618:2006 and the following apply.

3.1
film extensibility
ability of a dry film to follow without damage the deformations of the substrate to which it is applied

4 Principle

A metal plate with 12 cones with different heights is pressed into a coated wood surface and after removing the plate coating cracks in the areas indented by the cones are assessed.

5 Apparatus

5.1 Cone plate, metal plate with 12 cones with different heights (see Figure 1). The tips of cones are slightly rounded, bases of all cones lie on the level of the metal plate, measures of cones are listed in Table 1.

Dimensions in millimetres

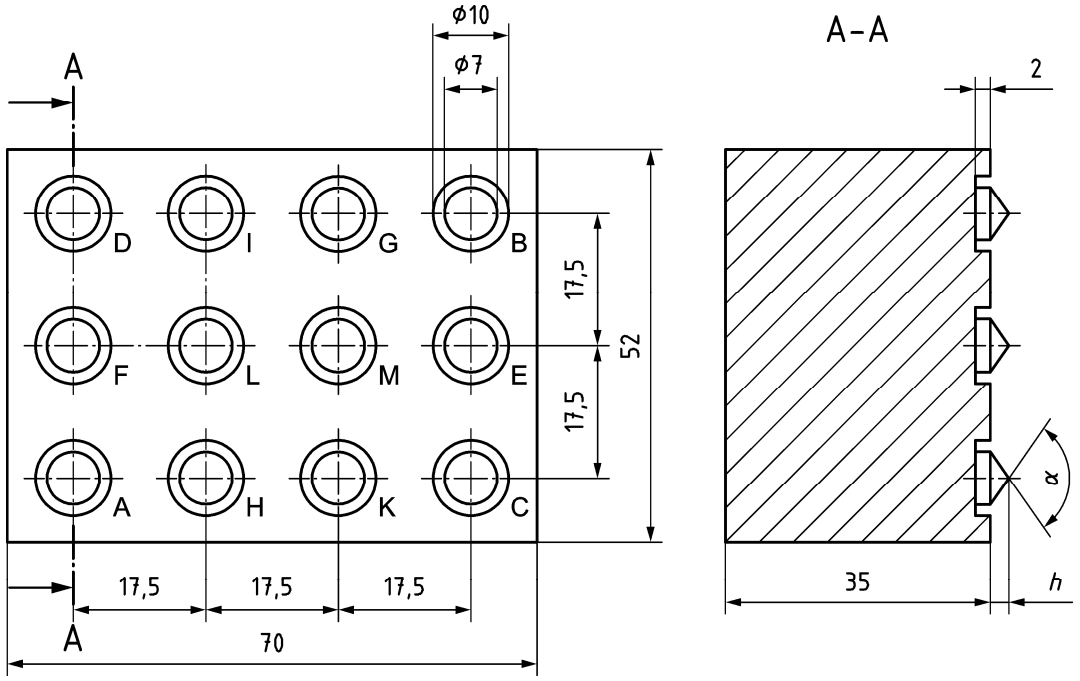

Figure 1 — Metal plate with 12 different cones for assessment of film extensibility

Table 1 — Heights and angles of cones

Cone	Height h in mm	Angle α [a]
A	2,6	106°45´
B	2,4	110°05´
C	2,2	115°40´
D	2,0	120°30´
E	1,8	125°40´
F	1,6	130°50´
G	1,4	136°25´
H	1,2	142°10´
I	1,0	148°05´
K	0,8	154°15´
L	0,6	160°35´
M	0,4	167°00´[a]

[a] Rounded to a multiple of 5´.

5.2 Universal testing machine for compression tests with a maximum force of 100 kN, a constant speed of 8 mm/min and an adapter to mount the cone plate with flexible connection.

5.3 Microscope with a magnification of min. 50 ×.

6 Procedure

6.1 Wood panels

Boards of Norway spruce (Picea abies) are selected with normal growth rate (i.e. 3 annual rings to 8 annual rings per 10 mm), a density between 0,4 g/cm^3 and 0,5 g/cm^3 (measured after conditioning) and straight grain. The wood shall be free from blue stain and evidence of surface or bulk fungal infection. Abnormal porosity (caused by bacterial attack) shall be avoided according to EN 927-3:2012, B.9. From these boards panels with the dimensions min. 170 mm × min. 70 mm × (20 ± 2) mm free from knots, cracks and resinous streaks are produced, that the inclination of the growth rings to the test surface is 60° to 90°. The panels shall be planed to a smooth and uniform finish. In order to avoid aged wood surface, the panels shall be hand sanded (mesh 150) immediately before coating.

The wood shall be conditioned at (20 ± 2) °C and a relative humidity of (65 ± 5) % in accordance with ISO 554 to an equilibrium moisture content of (13 ± 2) %. After conditioning, wood density is determined according to ISO 3131.

6.2 Coating application

Apply the coating system to the front side of one panel using the method specified by the manufacturer to give a wet film thickness corresponding to the mean value (± 20 %) of the manufacturer's recommended spreading rate. Record the quantity of coating applied. The values should be stated preferably in g/m^2, but may also be expressed as wet film thickness (in micrometres).

After coating application, age the panels for 21 days in the controlled environment at (20 ± 2) °C and a relative humidity of (65 ± 5) % in accordance with ISO 554.

6.3 Assessment of film extensibility

The cone plate is mounted into the universal testing machine in compression mode using an adapter for a flexible connection. After ageing the coating system for 21 days the cones are pressed into the coated wood surface with a constant speed of 8 mm/min so far that the metal plate is just in contact with the panel surface. The metal plate is kept in contact with the panel surface for 10 s. Three tests shall be carried on the test panel.

After removing the cone plate the areas indented by the cones are observed under a microscope with a magnification of min. 10 x to observe coating cracks in the region of the cones. The first cone of Table 1 where no concentric cracks in the coating film can be observed is taken as rating of film extensibility. In the event of no cracking occurring, the extensibility shall be rated as higher than 'A'. Straight cracks in direction of the grain of the wood substrate shall be ignored. If the three tests give results spreading more than one cone number the test shall be repeated.

7 Test report

The test report shall contain at least the following information:

a) reference to this Technical Specification;

b) name and address of the testing laboratory;

c) type of apparatus used;

d) identification number of the test report;

e) name and address of the organisation or the person who ordered the test;

f) date and person responsible for the sampling;

g) date of receipt of the coating system tested;

h) test results according to 6.3 including wood density;

i) authorisation date of the test report.

Bibliography

EN 13696:2008, *Wood flooring — Test methods to determine elasticity and resistance to wear and impact resistance*

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