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Paints and varnishes — Coating materials and coating systems for exterior wood —

Part 2: Exposure of wood coatings to artificial weathering using fluorescent UV lamps and water

Peintures et vernis — Produits de peinture et systèmes de peinture pour bois en extérieur —
Partie 2: Vieillissement artificiel des revêtements pour bois par exposition à des lampes UV fluorescentes et à de l'eau

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by the European Committee for Standardization (CEN) (as EN 927-6:2018) and was adopted, without modification other than those given below. It was assigned to Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes* and adopted under the "fast-track procedure".

— added CIE 1964 and CIE 1976 as normative references in Clause 2;

— removed redundant UVA-340 peak emission specification from 5.2;

— citation of Annex E added in 6.1;

— text below Figure 1 has been made into a Note;

— changed “mesh” to “grit” in 6.3.2;

— added a bibliography reference to the SERVOWOOD project in Clause 8;

— changed “may” to “can” in Clause 8 to indicate the possibility of the test precision to vary, rather than a permission;

— updated symbols and units and added a Note in Table 2;

— updated symbols in A.1;

— changed “guidance” to “instructions” in A.8.2.2;

— updated grammar in B.2 to improve clarity;

— removed hypothetical statement for testing other wood species from B.4;

— changed the status of Annex C from informative to normative;

— updated the title of Annex D;

— clarified the tape strength procedure in Annex G.

A list of all parts in the ISO 16053 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Coatings from paints, varnishes and similar materials are weathered in a laboratory in order to accelerate ageing processes (caused by temperature, wetness and irradiation) which occur during natural weathering. Generally, a simple accelerating ratio between ageing during artificial and natural weathering cannot be expected due to the influencing factors having different effects according to the nature of the coating and substrate. Predictable relationships can only be expected if the effect of the important parameters (spectral distribution of the irradiance in the photochemically relevant range, temperature of the specimen, type of wetting, wetting cycle relative humidity) on the coating is known. Moreover, acceleration of the coating chemistry can cause alternative degradation pathways to be followed. However, unlike natural weathering, testing in the laboratory can be controlled by the operator and therefore the results are more repeatable and reproducible. This document incorporates the results of a precision investigation that quantifies the capability of the test in terms of repeatability and reproducibility.

Paints and varnishes — Coating materials and coating systems for exterior wood —

Part 2: Exposure of wood coatings to artificial weathering using fluorescent UV lamps and water

1 Scope

This document specifies a method for determining the resistance of wood coatings to artificial weathering performed in an apparatus equipped with fluorescent UV lamps, condensation and water spray devices.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

ISO 2409, *Paints and varnishes — Cross-cut test*

ISO 2813, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

ISO 4618, *Paints and varnishes — Vocabulary*

ISO 4628-1:2016, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 1: General introduction and designation system*

ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

ISO 4628-5, *Paints and varnishes — Evaluation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking*

ISO 4628-6, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 6: Assessment of degree of chalking by tape method*

ISO 16474-3, *Paints and varnishes — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 18314-1, *Analytical colorimetry — Part 1: Practical colour measurement*

EN 927-1, *Paints and varnishes — Coating materials and coating systems for exterior wood — Part 1: Classification and selection*

CIE 1964, *(U*, V*, W*) color space (CIEUVW)*

CIE 1976, *L*, u*, v* color space (CIELUV)*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Principle

Artificial weathering of coatings using fluorescent UV lamps, condensation or water spray is carried out in order to produce a certain radiant exposure or mutually agreed total number of operation hours, based on a given degree of a change in a property or properties. The properties of the exposed coatings are compared with those of unexposed coatings, which are prepared from the same coating materials under identical conditions or with coatings whose degradation properties are known.

Radiation, temperature and humidity all contribute to the ageing process. Therefore, the apparatus specified in this document simulates all three factors.

The results obtained by this method do not necessarily directly relate to the results obtained under natural exposure conditions. The relationship between these results shall be established before the method can be used to predict performance. See B.3 for further explanations on correlation to natural weathering.

The standard test substrate is pine sapwood with the back side of panels coated. However, supplementary information on coating performance may be obtained by conducting optional tests on additional wood species, on pine, modified or impregnated by industrial processes or without coating the back side of the panels. See B.4 for further explanations on wood species.

5 Apparatus

5.1 Test chamber

The test chamber consists of an enclosure made from corrosion-resistant material which houses the lamps, a heated water tray, spray nozzles and test panel racks.

5.2 Lamps

An UV lamp emits UV radiation from a low-pressure mercury arc. The required spectral distribution is achieved by careful selection of the type of phosphor coating on the inner surface of the lamp and the nature of the glass used in the construction of the tubes.

NOTE The principal construction details are described in ISO 16474-1.

The lamp shall be of type UVA 340 in accordance with ISO 16474-3.

5.3 Device for wetting the test panels

The test panels shall be wetted by condensation from the heated water tray and by spray. To prevent spotting on to the test panels, water with a pH value between 5,0 and 7,5 and an electrical conductivity of maximum 2 mS/m, measured at (25 ± 1) °C shall be used. See Annex D.

5.4 Black panel thermometer

Set the apparatus to operate at the specified parameters. The temperature shall be monitored by a remote sensor attached to the black panel. The black panel thermometer shall be exposed to the same exposure

conditions as the specimens. Black panel thermometers shall be calibrated in accordance with the manufacturer's recommendations.

NOTE The construction of the black panel thermometer is described in ISO 16474-1.

5.5 Irradiance control

The irradiance at 340 nm shall be set to 0,89 W/(m^2·nm) (see 7.3.1).

Apparatus equipped with an irradiance control system shall be calibrated in accordance with the manufacturer's recommendations.

Lamps within the apparatus without an irradiance control system shall be rotated and replaced in accordance with the manufacturer's recommendations to compensate for lamp ageing.

6 Test panels

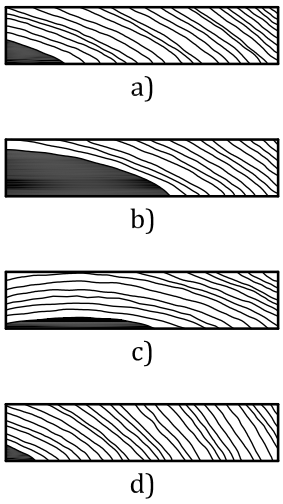
6.1 Wood

The wood shall be Scots Pine (*Pinus sylvestris*) that has been selected free of knots, cracks and resinous streaks, to be straight-grained and of normal growth rate (i.e. 3 to 8 annual rings per 10 mm). The inclination of the growth rings to the face shall be 5° to 45° (see Figure 1 a, c, and d).

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. The procedure in Annex E shall be used to test for abnormal porosity.

The panels shall be selected to give a sapwood test surface on the convex side of the growth rings, with no heartwood (if present), closer than 10 mm to the test surface (see Figure 1b). If the presence of heartwood in the selected pine cannot be detected by a difference in the colour in the wood, it shall be checked using the test described in Annex C.

The wood shall be conditioned at (20 ± 2) °C and a relative humidity of (65 ± 5) %, in accordance with ISO 554, to constant mass.



Key

a) Example of a panel fulfilling the demands of growth ring orientation (5° to 45°) at the front side. No heartwood is closer than 10 mm to the test surface

b) This panel does not meet the specification because the heartwood is too close to the front side

c) This panel does not meet the specification because the growth ring orientation is not within the (5° to 45°) band. The growth rings incline at −10° on the left of the panel and 30° on the right. Consequently, a part of the surface contains a tangentially cut wood surface (growth ring inclination 0°), with considerable risk of crack formation.

d) This panel does not meet the specification because the growth ring orientation is not within the (5° to 45°) band and the growth rings incline 45° on the left of the panel and 70° on the right.

NOTE The topside of the panels is the exposed side; the bottom is the rear face.

Figure 1 — Cross-section of the panels

6.2 Preparation and selection of wood panels

The panels shall be nominally (150 ± 2) mm × (74 ± 1) mm and (18 ± 1) mm thick. The panels shall be planed to a smooth and uniform finish.

Any panels showing surface splitting shall be rejected. Where the presence of some minor defects in the test area are unavoidable, their position should be noted and their influence excluded during assessment of coating performance.

Mark the back of the panels to ensure that they can be identified during subsequent operations.

6.3 Preparation of coated panels

6.3.1 Wood conditioning

Prior to coating, condition the panels at (20 ± 2) °C with a relative humidity of (65 ± 5) % until the constant mass is in accordance with ISO 554. Keep the panels under the same conditions while the coating system is drying, and during subsequent storage of test panels before exposure. Panels may be transferred for brief periods to other ambient conditions where this is required for the conduct of specific operations or assessments.

6.3.2 Preparation of panels for the test coating

For each system, select four panels from the available supply. Three panels shall be used for exposure and the fourth shall serve as an unexposed reference. In order to remove oleophilic films immediately before coating, the panels shall be hand sanded (grit P150). Rounding of edges is not permitted.