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AMENDMENT 3
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High-pressure decorative laminates — Sheets made from thermosetting resins —

Part 2: Determination of properties

AMENDMENT 3: Lightfastness

*Stratifiés décoratifs haute pression — Plaques à base de résines
thermodurcissables —*

Partie 2: Détermination des caractéristiques

AMENDEMENT 3: Résistance à la lumière



Reference number
ISO 4586-2:1997/Amd.3:2002(E)

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Foreword

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Amendment 3 to ISO 4586-2:1997 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

High-pressure decorative laminates — Sheets made from thermosetting resins —

Part 2: Determination of properties

AMENDMENT 3: Lightfastness

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Add the following normative references to Clause 2:

ISO 4892-1:1999, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

ISO 4892-2:1994, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc sources*

ISO 9370:1997, *Plastics — Instrumental determination of radiant exposure in weathering tests — General guidance and basic test method*

CIE Publication No. 85:1989, *Solar spectral irradiance*

Update the normative references already cited in Clause 2 as follows:

Replace ISO 4586-1:1995 by ISO 4586-1:1997 (same title). Note, however, that this amendment is intended to be used not only in conjunction with ISO 4586-1:1997 but also in conjunction with Amendment 3 to ISO 4586-1:1997 (ISO 4586-1:1997/Amd.3:2002).

Replace ISO 6506:1981 by ISO 6506-1:1999, *Metallic materials — Brinell hardness test — Part 1: Test method*.

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Replace Clause 16 “Resistance to colour change in xenon-arc light” by the following clause:

16 Lightfastness

16.1 Method A

16.1.1 Principle

A test specimen taken from the laminate under test is exposed to daylight simulated by the filtered light of one or more xenon-arc lamps. The effect on the colour of the specimen, at a specified radiant exposure, is assessed by the contrast between the exposed and unexposed portions of the test specimen. The radiant exposure is determined both instrumentally and by assessing the effect on blue wool references which are exposed simultaneously.

Daylight spectral distribution is specified since decorative laminates may, in certain applications, be exposed to direct daylight through open windows.

16.1.2 Apparatus

16.1.2.1 Test device, as specified in ISO 4892-1 and ISO 4892-2, equipped with:

- one or more xenon-arc lamps, filtered to provide a spectral energy distribution which closely approximates to that of solar irradiance as described in CIE Publication No. 85:1989, Table 4, and ISO 4892-2:1994, Subclause 4.1.1, method A;
- stainless-steel specimen holders, in the form of an open frame, which provide the test specimens with a solid backing;
- a black-standard thermometer as specified in ISO 4892-1;
- a photoelectronic sensor (radiometer) of one of the types specified in ISO 9370 to measure the irradiance and the radiant exposure at the specimen surface in the wavelength range 300 nm to 400 nm, or at 340 nm.

16.1.2.2 Conditioning chamber, maintained at a temperature of $(23 \pm 2) ^\circ\text{C}$ and a relative humidity of $(50 \pm 5) \%$.

16.1.2.3 Viewing enclosure, having a matt interior colour corresponding approximately to Munsell N5. It shall be equipped with an artificial light source, located at the top, simulating average north sky daylight (e.g. tungsten-halogen incandescent lamps) and generating a colour temperature of $(6\,500 \pm 200) \text{ K}$ and at least 800 lux at the surface of the specimen. The viewing enclosure shall be placed in a position where the surrounding lighting conditions will not affect the visual assessment of the specimen.

16.1.3 Test specimen

One test specimen shall be prepared in accordance with ISO 4892-1. It shall be representative of the laminate to be tested, be cut to the size required for the specimen holder used, and be appropriate for the method of assessment after exposure.

16.1.4 Procedure

The test specimen and a set of blue wool references 5, 6 and 7 (as specified in ISO 105-B02) shall be exposed simultaneously. Blue wool references 5 and 7 are included to provide confirmation that wool reference 6 has degraded to the specified degree of contrast.

Using opaque stainless-steel covers, shield approximately one-half of both the test specimen and the set of blue wool references.

Carry out the test in accordance with ISO 4892-2 under the following operating conditions:

- irradiance at the test specimen surface in the wavelength range 300 nm to 400 nm: $(60 \pm 3) \text{ W/m}^2$; or at wavelength 340 nm: $(0,5 \pm 0,03) \text{ W/m}^2$;
- black-standard temperature: $(65 \pm 3) ^\circ\text{C}$;
- relative humidity: $(50 \pm 5) \%$.

Discontinue the exposure when the contrast between the exposed and unexposed portions of blue wool reference 6 is equal to grade 4 on the grey scale, as defined in ISO 105-A02 (see NOTE 1).

Measure and record the radiant exposure (over 300 nm to 400 nm, or at 340 nm).

Remove the test specimen from the apparatus, take off the cover, and leave the specimen for (24 ± 2) h in dark conditions in the conditioning chamber (16.1.2.2) to prevent extraneous darkening and/or photochromism (see NOTE 2).

NOTE 1 Although the use of blue wool references is no longer the preferred method of measuring radiant exposure (see ISO 4892-2:1994), the method is still in common use and is therefore permitted. Once sufficient data have been collected, the end-point of the test will be defined by the level of radiant exposure.

NOTE 2 Extraneous darkening and/or photochromism are due to the shock effect of accelerated exposure, and are not characteristics of natural exposure. Keeping the specimens in dark conditions for 24 h allows recovery from these effects.

16.1.5 Assessment of specimen and expression of results

Place the test specimen in the viewing enclosure (16.1.2.3).

Examine the surface of the test specimen with the naked eye, corrected if necessary, at a distance of approximately 50 cm for any change in colour, assessing the contrast between the exposed and unexposed portions of the test specimen in terms of a grade on the grey scale in accordance with ISO 105-A02.

The lightfastness of the test specimen is expressed in terms of the contrast being greater than, equal to or less than grade 4 on the grey scale.

16.1.6 Test report

The test report shall include the following information:

- a) a reference to this part of ISO 4586;
- b) the name, type and nominal thickness of the product;
- c) details of the apparatus used;
- d) the irradiance at the test specimen surface;
- e) the radiant exposure;
- f) the exposure time;
- g) the lightfastness of the specimen;
- h) any deviation from the method specified;
- i) the date of the test.

16.2 Method B

16.2.1 Principle

The test assesses the effect on the colour of a test specimen of exposure to a filtered xenon-arc light source having a frequency range approximating to sunlight through window glass.

It is not intended to show the resistance to continuous exposure to outdoor weathering conditions.

16.2.2 Materials

16.2.2.1 White petroleum jelly.

16.2.3 Apparatus

16.2.3.1 Suitable xenon-arc test apparatus, as specified in ISO 4892-1 and ISO 4892-2, capable of providing radiant energy closely approximating to sunlight, with a spectral bandpass of 280 nm to 800 nm and with appropriate filtering to simulate daylight through window glass. The apparatus shall incorporate a system for mounting specimen holders at an equal radial distance from the centre of the light source and revolving them around the light source so as to provide equal radiant exposure.

16.2.3.2 Specimen holders, suitable for the test apparatus, and incorporating a mask to cover half of the exposed face of the test specimen.

16.2.3.3 Overhead white fluorescent lights, with bulb(s) positioned parallel to the line of sight and providing an intensity of 800 lux to 1 100 lux at the specimen surface.

16.2.3.4 Conditioning chamber, maintained at a temperature of $(23 \pm 2) ^\circ\text{C}$ and a relative humidity of $(50 \pm 5) \%$.

16.2.4 Standardization of apparatus

Calibration, maintenance and filter changes shall be strictly in accordance with the equipment manufacturer's recommendations.

The calibration wavelength for the xenon unit shall be 420 nm.

16.2.5 Test specimen

The test specimen shall be of the size specified for the test apparatus being used. The length of the specimen shall be in the machine direction of the laminate.

Condition the specimen for at least 48 h prior to the test at a temperature of $(23 \pm 2) ^\circ\text{C}$ and relative humidity $(50 \pm 5) \%$.

16.2.6 Procedure

Mount the test specimen in a specimen holder (16.2.3.2) so that approximately one-half of the specimen is exposed to the light source, the other half being covered by the mask. Fill all the specimen holders, utilizing blanks if necessary, and keep them filled during the whole of the test, in order to maintain correct air-flow conditions through the test chamber.

Carry out the test under the following operating conditions:

Table 1 — Operating conditions

Parameter	Setting	Tolerance
Total irradiance	279,0 kJ/m ²	$\pm 2,0 \text{ kJ/m}^2$
Irradiance level	1,10 W/m ²	$\pm 0,03 \text{ W/m}^2$
Black-panel temperature	70 °C	$\pm 3 ^\circ\text{C}$
Dry-bulb temperature	50 °C	$\pm 3 ^\circ\text{C}$
Wet-bulb temperature	39 °C	$\pm 1 ^\circ\text{C}$
Conditioning-water temperature	20 °C	$\pm 3 ^\circ\text{C}$
Duration of exposure	72 h	$\pm 1 \%$
Power adjustment	Automatic	To maintain steady irradiance levels, allowing for ageing of xenon burners and solarization of filters