INTERNATIONAL STANDARD

ISO 16938-2

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Building construction — Determination of the staining of porous substrates by sealants used in joints —

Part 2: Test without compression

Construction immobilière — Détermination du tachage des supports poreux par les mastics utilisés dans les joints —
Partie 2: Essai sans compression

Reference number
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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16938-2 was prepared by Technical Committee ISO/TC 59, *Building construction*, Subcommittee SC 8, *Jointing products*.

ISO 16938 consists of the following parts, under the general title *Building construction — Determination of the staining of porous substrates by sealants used in joints*:

— *Part 1: Test with compression*

— *Part 2: Test without compression*

Building construction — Determination of the staining of porous substrates by sealants used in joints —

Part 2:
Test without compression

1 Scope

This part of ISO 16938 specifies a method for determining the staining of porous substrates (e.g. marble, limestone, sandstone, or granite) by sealants used in building construction. The method evaluates the likelihood of a sealant causing an early stain on a porous substrate due to exudation of materials from the sealant. The outcome of the test is specific to the tested sealant and tested substrate and cannot be extrapolated to other sealant formulations or other porous substrates. During this accelerated test, if the sealant does not stain or discolour the substrates, it does not mean that the tested sealant will not stain or discolour the tested porous substrate over a longer time period.

2 Normative references

The following referenced documents are indispensable for the application 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 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

ISO 4892-2:2006, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 6927, *Building construction — Jointing products — Sealants — Vocabulary*

ISO 11431:2002, *Building construction — Jointing products — Determination of adhesion/cohesion properties of sealants after exposure to heat, water and artificial light through glass*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6927 apply.

4 Principle

This method measures the visible staining attributed to joint sealants on porous substrates that is a result of the conditioning specified.

A sealant is applied and cured between two pieces of porous substrate. The test specimens are subjected to heat aging and/or cold aging and/or aging in actinic radiation accelerated weathering equipment. After aging, the test specimens are evaluated and visible staining is recorded on the exterior surface and in the interior of the substrate after visual inspection of changes in surface appearance and measurements of maximum and minimum stain width and stain penetration.

5 Apparatus

5.1 Substrate materials, for the preparation of each test specimen; two substrate pieces of the same material are required with dimensions as shown in Figure 1.

5.2 Spacers, for the preparation of the test specimens, of cross-section 12 mm × 12 mm, with non-adherent surface (see Figure 1).

NOTE If the spacers are made of a material to which the sealant adheres, their surfaces should be made non-adherent, e.g. by a thin wax coating.

5.3 Non-adherent substrate, for the preparation of test specimens, e.g. polyethylene (PE) film, preferably on the advice of the sealant manufacturer.

5.4 Masking tape, suitable for covering the tested surface of the substrates (see Figure 1) to prevent sealant contamination during specimen preparation.

5.5 Ventilated convection-type oven, capable of being maintained at (70 ± 2) °C.

5.6 Refrigerated enclosure, capable of being maintained at (-20 ± 2) °C.

5.7 Actinic radiation accelerated aging apparatus.

Fluorescent ultraviolet radiation/condensation test apparatus or xenon light test apparatus shall be employed as actinic radiation accelerated aging apparatus.

NOTE Test results can differ between the exposure to fluorescent ultraviolet radiation/condensation and xenon light because of differences in the spectral power distribution of the radiation source and differences in the exposure conditions a) to d). See 8.4.

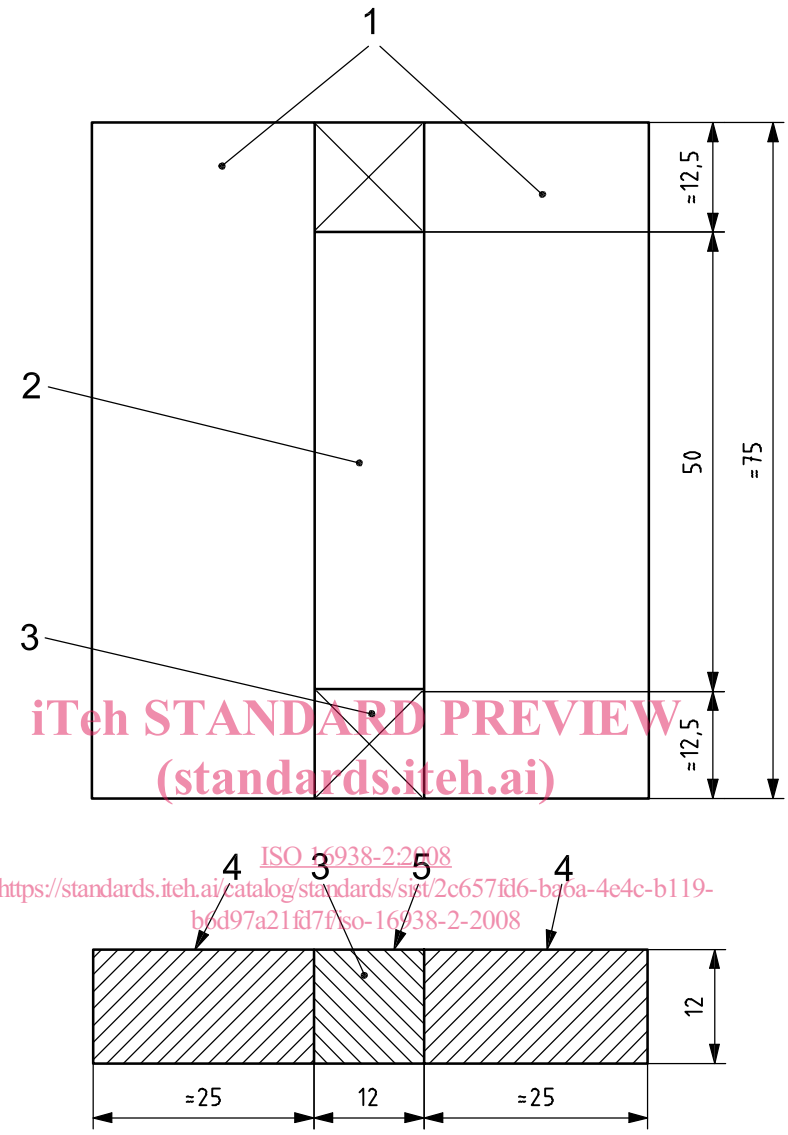
5.7.1 Fluorescent ultraviolet radiation/condensation test apparatus, fitted with fluorescent UVA-340 lamps having their peak emission at 343 nm, capable of exposing the test specimens to radiation under controlled conditions of temperature and moisture or water, complying with the requirements of ISO 4892-3. Standard practices for operating such accelerated weathering chambers are described in ISO 4892-1. The target value for irradiance at 340 nm shall be $(0,77 \pm 0,02)$ Wm^2 at 60 °C.

5.7.2 Xenon light test apparatus, fitted with xenon light source with daylight filter, capable of exposing the test specimens to radiation under controlled conditions of temperature and water, complying with the requirements of ISO 4892-2:2006, Table 3, Method A (cycle 1 or 2). Irradiance at the surface of the test specimens between the wavelength of 290 nm and 800 nm shall be (550 ± 75) W/m^2. Irradiance below 300 nm shall not exceed 1 W/m^2.

5.8 Black standard thermometer, complying with the requirements of ISO 4892-1. All temperatures reported in this part of ISO 16938 for the UV exposure apparatus are measured with the black standard thermometer. Black panel thermometer may also be used. Under given operating conditions, they tend to indicate lower temperatures than the black standard thermometer. The temperature difference between the measurements will depend on the test temperature, but can be up to 10 °C.

5.9 Measuring device, scaled in half millimetres.

Dimensions in millimetres



Key

1	substrate
2	sealant
3	spacer
4	tested surface
5	tooled surface

Figure 1 — Test specimen assembly

6 Preparation of test specimens

Four test specimens for each sealant and each aging method shall be prepared.

For each test specimen, two substrate materials (5.1) and two spacers (5.2) shall be assembled (see Figure 1) and set up on the non-adherent substrate (5.3).

The instructions of the sealant manufacturer concerning, for instance, whether a primer is to be used, and the mixing procedure for multi-component sealants, shall be followed.

The following procedure shall be used for specimen preparation:

a) the sealant and the substrate materials (5.1) shall be brought to (23 ± 2) °C;

b) the tested surface of both substrate materials shall be placed in the same plane as the tooled surface of the sealant (see Figure 1).

c) masking tape (5.4) shall be applied on the tested surfaces of the substrate materials to prevent sealant contamination during specimen preparation;

d) the hollow volume formed by the substrate materials and spacers (5.2) shall be filled with the sealant (avoiding the formation of air bubbles);

e) the sealant shall be pressed to the inner surfaces of the substrate materials;

f) the sealant surface shall be trimmed so that it is flush with the masking tapes on the faces of the substrate materials and spacers;

g) immediately following application and tooling of the sealant, the masking tape shall be removed;

h) the test specimens shall be set on edge on one of the substrate materials and the non-adherent substrate removed as soon as possible; the specimens shall remain in this position with the spacers in place for another 48 h to allow curing or optimum drying of the sealant.

7 Conditioning

The test specimens shall be conditioned for 28 d at (23 ± 2) °C and (50 ± 5) % relative humidity.

8 Aging procedures

8.1 General

One or more of the following aging procedures (8.2, 8.3, 8.4) shall be carried out as agreed between the concerned parties.

8.2 Heat aging

Four of the specimens shall be placed in an oven (5.5) at (70 ± 2) °C. Remove two specimens after 14 d and the other two specimens after 28 d.

8.3 Cold aging

Four of the specimens shall be placed in a refrigerated enclosure (5.6) at (-20 ± 2) °C. Remove two specimens after 14 d and the other two specimens after 28 d.

8.4 Actinic radiation aging

As agreed between the concerned parties, the test specimens shall be exposed to actinic radiation according to one of the following aging procedures:

— UV fluorescent radiation condensation apparatus (5.7.1) with wet exposure condition [see a)];

— xenon lamp test apparatus (5.7.2) with wet exposure condition [see b)];

— UV fluorescent radiation condensation apparatus (5.7.1) with dry exposure condition [see c)];

— xenon lamp test apparatus (5.7.2) with dry exposure condition [see d)].

Four of the specimens shall be placed in the actinic radiation exposure apparatus, with the tested surface perpendicularly facing the radiation source. Two specimens shall be removed after 14 d and the other two specimens after 28 d.

Wet exposure.

a) In the UV fluorescent radiation/condensation test apparatus the sealant surface shall be held 50 mm from the radiation source. The cycle of the UV fluorescent radiation/condensation test apparatus shall be set to 8 h UV radiation at (60 ± 2) °C, and 4 h condensation at (50 ± 2) °C.

b) In the xenon-lamp test apparatus, the specimens shall be exposed to cycles of dry periods with radiation followed by wet periods (water spray or immersion) as defined in ISO 11431:2002 , 8.2.2 (automatic cycling) or 8.2.3 (manual cycling).

Dry exposure.

c) In the UV fluorescent radiation/condensation test apparatus, the sealant surface shall be held 50 mm from the radiation source. The UV fluorescent radiation/condensation test apparatus shall be set to UV radiation at (60 ± 2) °C.

d) In the xenon-lamp test apparatus, the specimens shall be exposed dry to radiation for a period of 500 h at a temperature of (65 ± 2) °C as measured on the black standard thermometer (5.8).

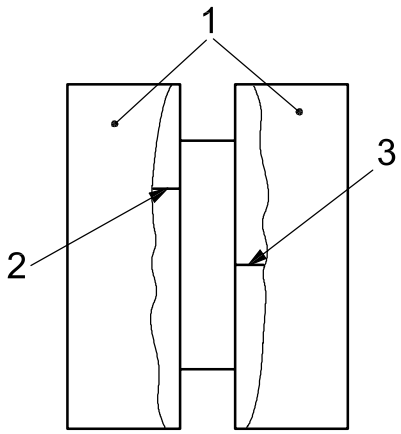
9 Detection of staining

9.1 General

After aging, the test specimens shall be conditioned at (23 ± 2) °C and (50 ± 5) % relative humidity for one day.

9.2 Detection at the surface of the substrate

The substrates shall be examined to determine if the sealant caused the tested surface to change in appearance in any way. If so, the maximum and minimum dimensions of the stain width on the tested surface of the substrate shall be measured to the nearest 0,5 mm, using the measurement device (5.9) (see Figure 2), and recorded.



Key

1 substrate material
2 minimum stain width
3 maximum stain width

Figure 2 — Determination of minimum and maximum stain width