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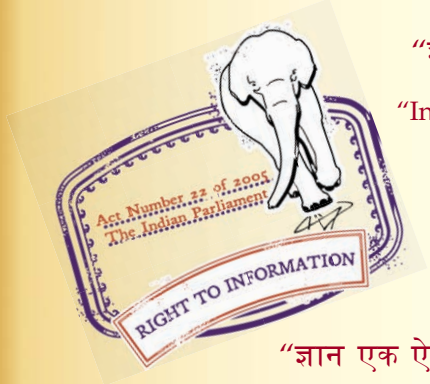
IS 101-6-3 (1990): Methods of sampling and test for paints, varnishes and related products, Part 6: Durability tests on paint films, Section 3: Moisture vapour permeability [CHD 20: Paints, Varnishes and Related Products]



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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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(Reaffirmed 2005)2010

भारतीय मानक

रंग रोगन, वार्निश तथा संबद्ध उत्पादों के नमूने लेने और परीक्षण की पद्धतियां

भाग 6 रंग-रोगन की परतों पर टिकाऊपन परीक्षण

अनुभाग 3 नमी वाष्प पारगम्यता

(तीसरा पुनरीक्षण)

Indian Standard

METHODS OF SAMPLING AND TEST FOR PAINTS, VARNISHES AND RELATED PRODUCTS

PART 6 DURABILITY TESTS ON PAINT FILMS

Section 3 Moisture Vapour Permeability

(Third Revision)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 1991

Price Group 1

FOREWORD

This Indian Standard (Part 6/Sec 3) (Third Revision) was adopted by the Bureau of Indian Standards on 25 April 1990, after the draft finalized by the Paints and Allied Products Sectional Committee had been approved by the Chemical Division Council.

This standard is one of a series of standards on methods of sampling and test for paints, varnishes and related products. In the preparation of this standard, considerable assistance has been derived from ASTM D-1653.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

METHODS OF SAMPLING AND TEST FOR PAINTS, VARNISHES AND RELATED PRODUCTS

PART 6 DURABILITY TESTS ON PAINT FILMS

Section 3 Moisture Vapour Permeability

(Third Revision)

1 SCOPE

1.1 This standard (Part 6/Sec 3) prescribes the method to determine the rate at which moisture passes through films of paint, varnish and related products.

2 DEFINITIONS

Specific permeability of a film is the milligrams of water that permeate 1 cm^2 of a 1 mm thick film in 24 h after a constant rate has been attained under conditions of 27°C and a difference in relative humidity across the film of approximately 100 percent.

3 APPARATUS

3.1 Permeability Cup

A permeability cup that can be weighed in an analytical balance and will permit the exposure of 25 cm^2 of film to a condition of high humidity on one side and of low humidity on the other side. The cup shall have a capacity of approximately 25 ml and shall have a flanged edge. It shall be equipped with a separate corresponding flange so that the film may be held between them. The contacting faces of the flanges shall be ground to such flatness that when the film is in position, no moisture can be lost from the cup except through the 25 cm^2 of exposed area. For very hard film having a very rough surface, a soft rubber gasket may be inserted between the film and the flange. The flanges shall be held together securely with suitable clamps.

3.2 Low-Humidity Chamber

A standard glass desiccator in which a desiccant may be placed which will produce a condition of very low relative humidity. The desiccant may be replaced with a salt solution of known vapour pressure when a condition of more than practically zero vapour pressure is required.

3.3 Balance

An analytical balance, sensitivity of 1 mg.

3.4 Temperature Control

Provision must be made to maintain the desiccator at a uniform temperature within ±1°C of the specified temperature. The standard temperature of 27°C shall be used for normal conditions. Any other temperature may be used as required for special conditions if agreed upon by the purchaser and the supplier.

NOTE — Temperature control is important because of the rapid changes in relative humidity near 100 percent with small changes in temperature.

3.5 Support for Film

For coatings that are too brittle or otherwise unsatisfactory for handling as free films, a suitable support shall be provided. Untreated, unplasticized cellophane is preferred, and such other materials as parchmentized paper and glass cloth may be used, if agreed upon by the purchaser and the supplier.

3.6 Desiccant, having a high affinity for water and a high drying efficiency, that is, giving a low water vapour pressure after absorbing a large amount of water. Phosphorus pentoxide (P_2O_5), Calcium chloride ($CaCl_2$) or magnesium perchlorate [$Mg(ClO_4)_2$] are preferred. The desiccant used shall be agreed upon by the purchaser and the supplier.

NOTE — Use caution in handling phosphorus pentoxide and magnesium perchlorate because of possible violent chemical reactions that may be produced if they come in contact with some materials.

4 TEST SPECIMENS

4.1 The test specimens shall be smooth, completely continuous films of uniforms thickness throughout the test area and entirely free from dust or other foreign matter. The thickness of the coating applied shall be within normal range for the type of material under test and shall not vary by more than 5 percent of total thickness in any test series.

4.2 Air dry or bake the coated material for a specified time at a specified temperature which depend upon the requirements of the coating under test. Permeability may vary with the baking schedule or the time of air drying. If the

material is to be tested as a free film, remove it from the substrate and allow the previously unexposed surface free access to the air for at least 7 days in the case of air-drying materials.

4.3 Preparation of Free Films

Hold the substrate with 25 mm thick tin foil rigidly so that its position is not disturbed during application operation. Over a clean, smooth and levelled surface, usually, a coating of known wet thickness is cast with an applicator. The method of application can be brush, spray, electrostatic electrodeposition, fluidisation and hot melt. After air drying or curing, place the substrate bearing the film in a mercury bath for amalga mation. Remove carefully the detached film from the bath.

NOTE — A device equipped with a perforated metal plate for holding the substrate under vaccum, and a mechanical drive for drawing down the coating with an applicator, serves the purpose better than other modes of application.

4.4 Cut a circular disc from the conditioned free film or coated support by placing the cup on the material and cutting around the flange with a razor blade. Measure the thickness of the disc at several places with a suitable method. With supported films the mass of the support must be subtracted from the total mass of the disc. The amount of film on the 25 cm^2 under test may be calculated from the ratio of the total area of the disc to the 25 cm^2.

4.5 When coatings are applied to one side only of a support, the coated side of the test specimen shall be placed toward the water in the cup and the uncoated side exposed to the dry air of the desiccator.

5 PROCEDURE

5.1 Pour 6 to 8 ml of distilled water in the permeability cup, place the test specimen between the flanges, and adjust the clamps to hold it firmly in position. Place the coatings, with the coated side toward the water in the cup and the uncoated side exposed to the condition of low humidity. Weigh the loaded cup and place it in desiccator. Remove the cup for periodic weighing to determine the loss in mass due to moisture which has permeated through the 25 cm^2 area of the exposed test specimen. In general, the cup shall be weighed every 24 h for a period of one week or until the loss rate has become constant.

6 CALCULATION

6.1 Plot the results of successive weighings against elapsed time and draw a smooth curve through the plotted points. When a straight line adequately fits the plot of four successive 24-h spaced points, a normally steady state exists. The slope of the straight line is the rate of vapour transmission for the test area.

6.2 Calculate the specific permeabitity to moisture as mg/cm^2 mm thickness for 24 h at approximately 100 percent relative humidity differential.

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Amendments Issued Since Publication

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