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JIS K 5600-7-6 : 2002
(JPMA/JSA)

**Testing methods for paints—
Part 7 : Long-period performance of
film—Section 6 : Natural weathering**

ICS 87.040

Reference number : JIS K 5600-7-6 : 2002 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by the Japan Paint Manufacturers Association (JPMA)/ the Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS K 5600-7-6 : 1999** is replaced with this Standard.

This revision has been made based on **ISO/DIS 2810.2 : 2000** *Paints and varnishes—Natural weathering of coatings—Exposure and assessment* for the purposes of making easy to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of International Standard which is based on Japanese Industrial Standard.

JIS K 5600 consists of the following parts with general title *Testing methods for paints*.

- JIS K 5600-1-1 to JIS K 5600-1-8 *General rule*
- JIS K 5600-2-1 to JIS K 5600-2-7 *Characteristics and stability of paints*
- JIS K 5600-3-1 to JIS K 5600-3-6 *Film formability*
- JIS K 5600-4-1 to JIS K 5600-4-7 *Visual characteristics of film*
- JIS K 5600-5-1 to JIS K 5600-5-11 *Mechanical property of film*
- JIS K 5600-6-1 to JIS K 5600-6-3 *Chemical property of film*
- JIS K 5600-7-1 to JIS K 5600-7-8 *Long-period performance of film*
- JIS K 5600-8-1 to JIS K 5600-8-6 *Evaluation of degradation of paint coatings*

JIS K 5600-7 specifies testing methods for “Long-period performance of film” and consists of the following sections.

- JIS K 5600-7-1 *Resistance to neutral spray*
- JIS K 5600-7-2 *Resistance to humidity (Continuous condensation)*
- JIS K 5600-7-3 *Resistance to humidity (Intermittent condensation)*
- JIS K 5600-7-4 *Humidity and cool-heat cycling test*
- JIS K 5600-7-5 *Light fastness of film*
- JIS K 5600-7-7 *Accelerated weathering (Exposure to filtered xenon-arc radiation)*
- JIS K 5600-7-8 *Accelerated weathering (Exposure to fluorescent UV lamps)*

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Testing methods for paints— Part 7 : Long-period performance of film— Section 6 : Natural weathering

Introduction This Japanese Industrial Standard has been prepared based on **ISO/DIS 2810.2** *Paints and varnishes—Natural weathering of coatings—Exposure and assessment* published in 2000 with modifying some technical contents.

Portions sidlined or underlined with dots are the matters modified the original International Standard. Annex 2 shows comparison between them with explanation.

1 Scope This Standard specifies the conditions which need to be taken into consideration in the selection of the type of natural weathering and the natural weathering procedure to be used to determine the resistance of coatings or coating systems (direct weathering or weathering behind window glass).

Natural weathering is used to determine the resistance of coatings or coating systems to the sun's radiation and the atmosphere. Special atmospheric influences, e.g. industrial pollution, are not taken into account in this Standard.

Remarks : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO/DIS 2810.2 : 2000 *Paints and varnishes—Natural weathering of coatings—Exposure and assessment* (MOD)

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of indicated year constitutes the provision of this Standard but the revision and amendment made thereafter are not applied. The normative references without the indication of the year of coming into effect (or the year of publication) apply limiting only to the most recent edition (including amendments).

JIS K 0557 *Water used for industrial water and wastewater analysis*

JIS K 5600-1-4 *Testing methods for paints—Part 1 : General rule—Section 4 : Standard panels for testing*

NOTE : **ISO 1514 : 1993** *Paints and varnishes—Standard panels for testing* is identical with the said standard.

JIS K 5600-1-7 *Testing methods for paints—Part 1 : General rule—Section 7 : Determination of film thickness*

JIS K 5600-4-3 *Testing methods for paints—Part 4 : Visual characteristics of film—Section 3 : Visual comparison of the colour of paints*

NOTE : **ISO 3668** : 1998 *Paints and varnishes—Visual comparison of the colour of paints* is identical with the said standard.

JIS K 5600-4-4 *Testing methods for paints—Part 4 : Visual characteristics of film—Section 4 : Colorimetry (Principles)*

NOTE : **ISO 7724-1** : 1984 *Paints and varnishes—Colorimetry—Part 1 : Principles* is identical with the said standard.

JIS K 5600-4-5 *Testing methods for paints—Part 4 : Visual characteristics of film—Section 5 : Colorimetry (Measurement)*

NOTE : **ISO 7724-2** : 1984 *Paints and varnishes—Colorimetry—Part 2 : Colour measurement* is identical with the said standard.

JIS K 5600-4-6 *Testing methods for paints—Part 4 : Visual characteristics of film—Section 6 : Colorimetry (Calculation of colour differences)*

NOTE : **ISO 7724-3** : 1984 *Paints and varnishes—Colorimetry—Part 3 : Calculation of colour differences* is identical with the said standard.

JIS K 5600-4-7 *Testing methods for paints—Part 4 : Visual characteristics of film—Section 7 : Specular gloss*

JIS K 5600-8-1 *Testing methods for paints—Part 8 : Evaluation of degradation of paint coatings—Section 1 : General principles and rating schemes*

NOTE : **ISO 4628-1** : 1982 *Paints and varnishes—Evaluation of degradation of paint coatings—Designation of intensity, quantity and size of common types of defect—Part 1 : General principles and rating schemes* is identical with the said standard.

JIS K 5600-8-2 *Testing methods for paints—Part 8 : Evaluation of degradation of paint coatings—Section 2 : Designation of degree of blistering*

NOTE : **ISO 4628-2** : 1982 *Paints and varnishes—Evaluation of degradation of paint coatings—Designation of intensity, quantity and size of common types of defect—Part 2 : Designation of degree of blistering* is identical with the said standard.

JIS K 5600-8-3 *Testing methods for paints—Part 8 : Evaluation of degradation of paint coatings—Section 3 : Designation of degree of rusting*

NOTE : **ISO 4628-3** : 1982 *Paints and varnishes—Evaluation of degradation of paint coatings—Designation of intensity, quantity and size of common types of defect—Part 3 : Designation of degree of rusting* is identical with the said standard.

JIS K 5600-8-4 *Testing methods for paints—Part 8 : Evaluation of degradation of paint coatings—Section 4 : Designation of degree of cracking*

NOTE : **ISO 4628-4** : 1982 *Paints and varnishes—Evaluation of degradation of paint coatings—Designation of intensity, quantity and size of common types of defect—Part 4 : Designation of degree of cracking* is identical with the said standard.

JIS K 5600-8-5 *Testing methods for paints—Part 8 : Evaluation of degradation of paint coatings—Section 5 : Designation of degree of flaking*

NOTE : **ISO 4628-5** : 1982 *Paints and varnishes—Evaluation of degradation of paint coatings—Designation of intensity, quantity and size of common types of defect—Part 5 : Designation of degree of flaking* is identical with the said standard.

JIS K 5600-8-6 *Testing methods for paints—Part 8 : Evaluation of degradation of paint coatings—Section 6 : Rating of degree of chalking*

NOTE : **ISO 4628-6** : 1982 *Paints and varnishes—Evaluation of degradation of paint coatings—Designation of intensity, quantity and size of common types of defect—Part 6 : Rating of degree of chalking by tape method* is identical with the said standard.

ISO/DIS 4628-7 *Paint and varnishes—Evaluation of degradation of paint coatings—Designation of intensity, quantity and size of common types of defect—Part 7 : Determination of chalking of paints on rough surfaces*

ISO 9223 : 1992 *Corrosion of metals and alloys—Corrosivity of atmospheres—Classification*

ISO 12944-2 : 1998 *Paints and varnishes—Corrosion protection of steel structures by protective paint systems—Part 2 : Classification of environments*

EN 13523-19 *Coil coated metals—Test methods—Part 19 : Panel design and method for atmospheric exposure testing*

SAE J1976 : 1989 *Outdoor weathering of exterior materials*

WMO, *Guide to meteorological instruments and methods of observation*, WMO No. 8, Fifth edition, World Meteorological Organization, Geneva, 1983

3 Terms and definitions For the purposes of this Standard, the following terms and definitions apply.

3.1 durability ability of a coating to withstand natural weathering

3.2 time of wetness period during which a metal surface is covered by an aqueous medium that is capable of causing corrosion

4 General The durability of a coating during natural weathering depends on how, where and when the coating is weathered. Therefore, these parameters and the intended use of the coating shall be taken into account when exposures are carried out.

In particular, the following parameters shall be considered:

- a) The location of the exposure site, for example industrial, marine, rural. In choosing sites, those which differ markedly in the type or level of pollution from the normal shall be avoided, unless they are appropriate to the intended end use of the coating under test.
- b) The height, angle and orientation of the exposure rack. These parameters will govern the extent to which the specimens are affected, for example by dew, frost and atmospheric pollutants.

- c) The nature of the terrain on which the rack is constructed (for example concrete, grass, gravel). The terrain may affect the climatic conditions around the specimen under test. It would rarely be feasible to select an ideal terrain in practice, but the effect of such variations in climatic conditions will be minimized by ensuring that all specimens are situated sufficiently high above the ground (see clause 5).
- d) Whether the performance of the coating on the front and/or the back of the specimen is of interest. Certain types of degradation, for example rust formation and/or mould growth, are frequently more severe on the sheltered parts of the specimen.
- e) The intended use of the coating, including its substrate, and whether the coating is to be washed or polished in service.

The results of tests on an exposure rack will apply precisely only to the environment in which they were obtained.

Provided that the test conditions are reasonably appropriate to the intended end use, the relative performance of a number of coatings tested at the same time will enable valid deductions to be drawn. It is recommended that each series of specimens under evaluation include coatings of known performance to act as reference standards.

The results of natural weathering may vary according to the time of year during which the tests are carried out. The influence of these variations will be reduced if the exposure period is sufficiently long. The exposure period should be at least one year, or a multiple of one year. The reproducibility of the results will be improved if the exposure period always starts at the same time of year, preferably in spring.

Natural weathering tests are normally carried out for a fixed period of time. However, in many cases it is preferable to define the test period in terms of a certain degree of degradation or by the radiant exposure (dosage) of solar radiation to which the specimen is to be subjected (see clause 6). The latter procedure may reduce the influence of seasonal variations but does not eliminate it.

Radiant exposure may be determined by measurement of instantaneous irradiance, and integration of the measurements over the period of natural weathering.

The climatic conditions shall be monitored and a complete record reported, together with the other conditions of weathering.

Care is required in the selection of test specimens of substrates with variable (anisotropic) properties, for example wood or steel. In these cases, replication of the tests is essential if misleading results are to be avoided.

Washing and polishing during exposure will affect the durability of the coating. It shall therefore be mentioned in the test report.

5 Exposure racks Unless otherwise specified or agreed, use exposure racks on which the specimens are facing towards the equator. The specimens shall be firmly held on the racks by attachments made of stainless steel or other corrosion-resistant material, in such a manner that they are mechanically stressed as little as possible.

The exposure racks shall be constructed so that the atmosphere has free access to the specimens and that no water drains from one specimen on to another. In

addition, the racks may be designed so that a portion of the specimens can be covered to allow evaluation between an exposed and an unexposed area. By using special devices, particular conditions may be simulated, for example by using a Black Box in accordance with **SAE J1976**¹⁾ to simulate automotive conditions, or backing the test panel with plywood or other insulation material to simulate building side wall or roof area conditions.

Metal substrates for corrosion tests shall not be in electrical contact with metals during the exposure period nor, as far as possible, in direct contact with wood or other porous materials. If specimens are supported in grooves, suitable drainage holes shall be provided to prevent accumulation of water.

Unless otherwise specified or agreed, the racks shall be constructed so that all specimens are supported either at a minimum height of 0.45 m above the ground or at a height sufficient to avoid contact with vegetation and to prevent damage.

The area beneath and in the vicinity of the racks shall be characterized by low reflectance and by ground cover typical of that climatological area. In desert areas, the racks shall be located on gravel, in most temperate areas on low-cut grass.

Usually the panels are supported at an angle of 45° to the horizontal. Depending on the intended end use of the coating or by area, other angles may be agreed, for example 5° for automotive finishes or roof coatings, or vertical exposure for textured wall finishes. When testing corrosion performance, it is appropriate to expose specimens vertically facing away from the equator as well as inclined at 45° and 5° facing towards the equator (see **EN 13523-19**). Specimens facing away from the equator will remain wet for longer periods since they dry less rapidly than those exposed facing towards the equator. This will lead to a higher tendency to corrode.

The racks shall be situated so that at a sun height of 20° and more no shadow falls on to the specimens.

When testing the durability of coatings for interior use which are exposed to radiation which has passed through window glass, racks that are covered by a window pane are used. Since, depending on the quality, the transmission of window glass in the UV range is different, the type of window glass shall be agreed upon between the interested parties for each particular case (see clause 9).

6 Apparatus for measurement of climatic factors

6.1 Measurement of solar radiation

6.1.1 General An ISO Technical Report giving detailed information on measuring devices and the use of the data obtained is in preparation (to become **ISO/TR 15542**).

6.1.2 Pyranometers Pyranometers are radiometers used to measure the total solar radiant energy incident upon a surface per unit time per unit area. The energy measured includes direct and diffuse radiant energy as well as radiant energy reflected from the background.

¹⁾ SAE—Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096, USA