

SRI LANKA STANDARD 1256: Part 44: 2019
(ISO 16053: 2018)
UDC 667.661

**METHODS OF TEST FOR
PAINTS AND VARNISHES
PART 44: COATING MATERIALS AND
COATING SYSTEMS FOR EXTERIOR WOOD -
NATURAL WEATHERING TEST**

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard
METHODS OF TEST FOR PAINTS AND VARNISHES
PART 44: COATING MATERIALS AND COATING SYSTEMS FOR EXTERIOR
WOOD- NATURAL WEATHERING TEST

SLS 1256: Part 44: 2019
(ISO 16053: 2018)

Gr. L

Copyright Reserved
SRI LANKA STANDARDS INSTITUTION
17, Victoria Place
Elvitigala Mawatha
Colombo - 08
Sri Lanka.

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This Standard does not purport to include all the necessary provisions of a contract

© ISO 2018 - All right reserved.

© SLSI 2019

All right reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the SLSI.

Sri Lanka Standard
METHODS OF TEST FOR PAINTS AND VARNISHES
PART 44: COATING MATERIALS AND COATING SYSTEMS FOR EXTERIOR
WOOD- NATURAL WEATHERING TEST

NATIONAL FOREWORD

This Standard was approved by the Sectoral Committee on Chemical and Polymer Technology and authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2019-09-11.

The text of the International Standard ISO 16053: 2018 Paints and varnishes – Coating materials and coating systems for exterior wood- Natural weathering test has been accepted for adoption as a Sri Lanka Standard which specifies a natural weathering test for exterior wood coating systems mainly intended for the decoration and protection of planed and sawn wood.

This Standard is identical with ISO 16053: 2018 Paints and varnishes – Coating materials and coating systems for exterior wood- Natural weathering test, published by the International Organization for Standardization (ISO).

TERMINOLOGY AND CONVENTIONS

The text of the International Standard has been accepted as suitable for publication, without deviation, as a Sri Lanka Standard. However, certain terminology and conventions are not identical with those used in Sri Lanka Standards. Attention is therefore drawn to the following:

- a) Wherever the words “International Standard” appear referring to a particular Standard they should be interpreted as “Sri Lanka Standard”.
- b) The comma has been used throughout as a decimal marker. In Sri Lanka Standards it is the current practice to use the full point at the base as the decimal marker.
- c) Wherever page numbers are quoted, they are ISO page numbers.

Cross References

International Standard	Corresponding Sri Lanka Standard
ISO 1513, Paints and varnishes - Examination and preparation of test samples	SLS 1256, Methods of test for paints and varnishes Part 1: Examination and preparation of samples for testing
ISO 2409, Paints and varnishes - Cross-cut test	SLS 1256, Methods of test for paints and varnishes Part 22: Cross cut test
ISO 2431, Paints and varnishes - Determination of flow time by use of flow cups	SLS 1256, Methods of test for paints and varnishes Part 2: Determination of flow time by the use of flow cups
ISO 2808, Paints and varnishes - Determination of film thickness	SLS 1256, Methods of test for paints and varnishes Part 15: Determination of film thickness
ISO 2810, Paints and varnishes - Natural weathering of coatings - Exposure and assessment	SLS 1256, Methods of test for paints and varnishes Part 25: Guidance on the conduct of natural weathering tests
ISO 2813, Paints and varnishes - Determination of gloss value at 20°, 60° and 85°	SLS 1256, Methods of test for paints and varnishes Part 31: Determination of gloss value at 20°, 60° and 85°
ISO 4618, Paints and varnishes - Terms and definitions	SLS 1541, Terms and definitions for Paints and varnishes
ISO 4628-1, 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	SLS ISO 4628-1, 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	SLS 1256 Part 32: Method of test for paints and varnishes - determination 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	SLS 1256 Part 46: Method of test for paints and varnishes — determination of degree of cracking

<p>ISO 4628-5, Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 5: Assessment of degree of flaking</p>	<p>SLS 1256 Part 47, Method of test for paints and varnishes – Determination of degree of flaking</p>
<p>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</p>	<p>SLS 1256 Part 48, Method of test for paints and varnishes – Determination of degree of chalking by tape method</p>
<p>ISO 15528, Paints, varnishes and raw materials for paints and varnishes — Sampling</p>	<p>SLS 523, Methods of sampling for paints, varnishes and raw materials for paints and varnishes</p>

.....

**Paints and varnishes — Coating
materials and coating systems for
exterior wood — Natural weathering
test**

*Peintures et vernis — Produits de peinture et systèmes de peinture
pour bois en extérieur — Essai de vieillissement naturel*





COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	2
5 Apparatus and materials	2
6 Sampling	2
7 Test panels	3
7.1 Wood.....	3
7.2 Preparation and selection of wood panels.....	3
7.3 Preparation of coated panels.....	4
7.3.1 Wood conditioning.....	4
7.3.2 Preparation of panels for the test coating.....	4
7.3.3 Preparation of panels for the Internal Comparison Product (ICP).....	4
7.3.4 Sealing and ageing.....	4
7.3.5 Thickness of the coating.....	5
8 Procedure	5
8.1 General.....	5
8.2 Examination before exposure.....	6
8.3 Exposure.....	6
8.4 Examination after exposure.....	6
8.4.1 Examination on the exposure racks.....	6
8.4.2 Laboratory examination of unwashed panels.....	6
8.4.3 Laboratory examination of washed panels.....	6
9 Precision data	7
10 Expression of results and test report	7
Annex A (normative) ICP alkyd stain	8
Annex B (normative) Details of test methods	10
Annex C (normative) Assessment requirements for panels of test coatings and ICP	13
Annex D (informative) Suggested format for a test report	14
Annex E (informative) Optional tests including variations to standard weathering test procedure to obtain additional information on coating performance	17
Annex F (informative) Explanatory notes	20
Annex G (informative) Precision data	21
Bibliography	22

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This third edition cancels and replaces the second edition (ISO 16053:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

- precision data are added in [Annex G](#);
- using the multi-blade cutting tool for cross-cut test is allowed.

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.

Paints and varnishes — Coating materials and coating systems for exterior wood — Natural weathering test

1 Scope

This document specifies a natural weathering test for exterior wood coating systems mainly intended for the decoration and protection of planed and sawn wood.

The test provides a means of evaluating the performance of a wood coating system during outdoor exposure. It forms the basis for the performance specification in accordance with EN 927-2.

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 1513, *Paints and varnishes — Examination and preparation of test samples*

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

ISO 2431, *Paints and varnishes — Determination of flow time by use of flow cups*

ISO 2808:2007, *Paints and varnishes — Determination of film thickness*

ISO 2810, *Paints and varnishes — Natural weathering of coatings — Exposure and assessment*

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

ISO 4618, *Paints and varnishes — Terms and definitions*

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 degradation of coatings — Designation 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 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Principle

The resistance to natural weathering of the coating system under test, applied to a wood substrate, is assessed. Durability is evaluated by determining the changes in decorative and protective properties of coatings after 12 months of exposure.

The standard test substrate selected was *Pinus sylvestris* (European redwood or Scots pine, subsequently referred to as pine) in order to obtain relevant results more rapidly. The sapwood, which is usually present in joinery timber, was chosen for use instead of heartwood because paint failure is more evident on the former.

Differences in quality of wood and in the weather and site conditions, are recognized and allowed for in the method by comparing the test with a reference system. The composition of the reference system (designated as "Internal Comparison Product" or "ICP") shall be as specified in [Annex A](#).

The standard test substrate is pine sapwood with the rear side of panels untreated. 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, by using a pine panel containing a water trap in its exposed face, or by coating the rear side of the panels.

Optional tests are described in [Annex E](#). It is emphasised that they can serve only to provide additional information.

5 Apparatus and materials

5.1 Exposure racks, inclined at an angle of 45° to the horizontal, on which the specimens are facing towards the equator in accordance with ISO 2810.

5.2 Glossmeter, for the measurement of specular gloss in accordance with ISO 2813, at 60° geometry.

5.3 Tristimulus colorimeter or spectrophotometer, for the measurement of colour and calculation of colour difference in CIELAB colour coordinates.

5.4 Tape and cutting tool, for the assessment of adhesion in accordance with ISO 2409.

5.5 Microscope, with a magnification of ×10 for the assessment of surface defects.

5.6 Microscope, for measurement of film thickness in accordance with ISO 2808:2007, method 6A.

5.7 Self-adhesive, transparent tape, in accordance with ISO 4628-6 for the assessment of chalking.

5.8 Climate chamber.

6 Sampling

Take a representative sample of the product tested or of each product in the case of a multi-coat system, as described in ISO 15528.

Examine and prepare each sample for testing as described in ISO 1513.

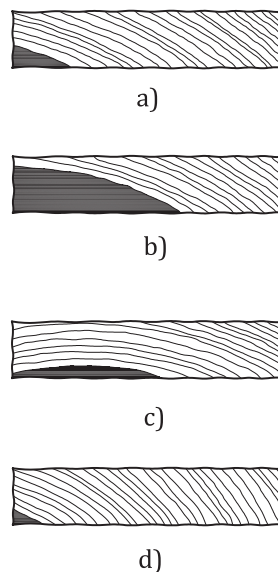
7 Test panels

7.1 Wood

The wood shall be pine that has been selected to be free from knots, cracks and resinous streaks and 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](#)).

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 in accordance with [B.10](#).

The wood shall be conditioned at $(20 \pm 2)^{\circ}\text{C}$ and a relative humidity of $(65 \pm 5)\%$ to an equilibrium moisture content of $(13 \pm 2)\%$.



Key

- a) Example of a panel with no heartwood (if present) closer than 10 mm to the test surface fulfilling the requirement for growth ring orientation (5° to 45°) at the front side.
- 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 -10° at the left of the panel and 30° at the right. Consequently a part of the surface contains 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. The growth rings incline 45° at the left of the panel and 70° at the right.

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

Figure 1 — Cross section of panels

7.2 Preparation and selection of wood panels

The panels shall be cut from boards planed all round and shall be nominally (375 ± 2) mm \times (78 ± 3) mm and (20 ± 2) mm thick. For details of panel preparation see [Figure 2](#). The panels shall be planed to a smooth and uniform finish. In order to avoid aged wood surface, the panels shall be hand sanded (mesh 150) immediately before coating. Rounding of edges is not permitted.

The panels shall be selected to give a sapwood test surface on the convex side of the growth rings, with any heartwood confined to a zone no closer than 10 mm from the front side. Heartwood shall be checked with the reagent described in [B.11](#), at both ends of each panel.

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

7.3 Preparation of coated panels

7.3.1 Wood conditioning

Prior to coating, condition the panels at (20 ± 2) °C and a relative humidity of (65 ± 5) % until constant mass. Keep the panels under the same conditions during drying of the coating system 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.

7.3.2 Preparation of panels for the test coating

For each system, select four panels on a random basis from the available supply. Three panels shall be used for exposure and the fourth shall be for unexposed reference.

Apply the coating system to the front and side faces of each panel. The front side of the panel is the side facing the bark of the tree. The back of the panel and end-grains shall be left uncoated.

Apply the coating system using the method specified by the manufacturer to give a wet film thickness corresponding to the mean value (± 20 %) of the manufacturer's recommended spreading rate.

Record the quantity of coating applied to each test panel and subsequently calculate a mean value for the four panels. The values should be stated preferably in g/m^2 , but may also be expressed as wet film thickness (in micrometres).

7.3.3 Preparation of panels for the Internal Comparison Product (ICP)

Prepare four panels by applying the ICP to the front and side faces of each panel. The back of the panel and end-grains shall be left uncoated. Apply the ICP by brushing in three coats, allowing 16 h to 24 h drying between coats. The spreading rate shall correspond to a total of (150 ± 30) g/m^2 wet film. The dry film thickness shall be (50 ± 10) μm on pine.

One set of ICP panels exposed at the same time may serve as the comparison for one or more test coatings.

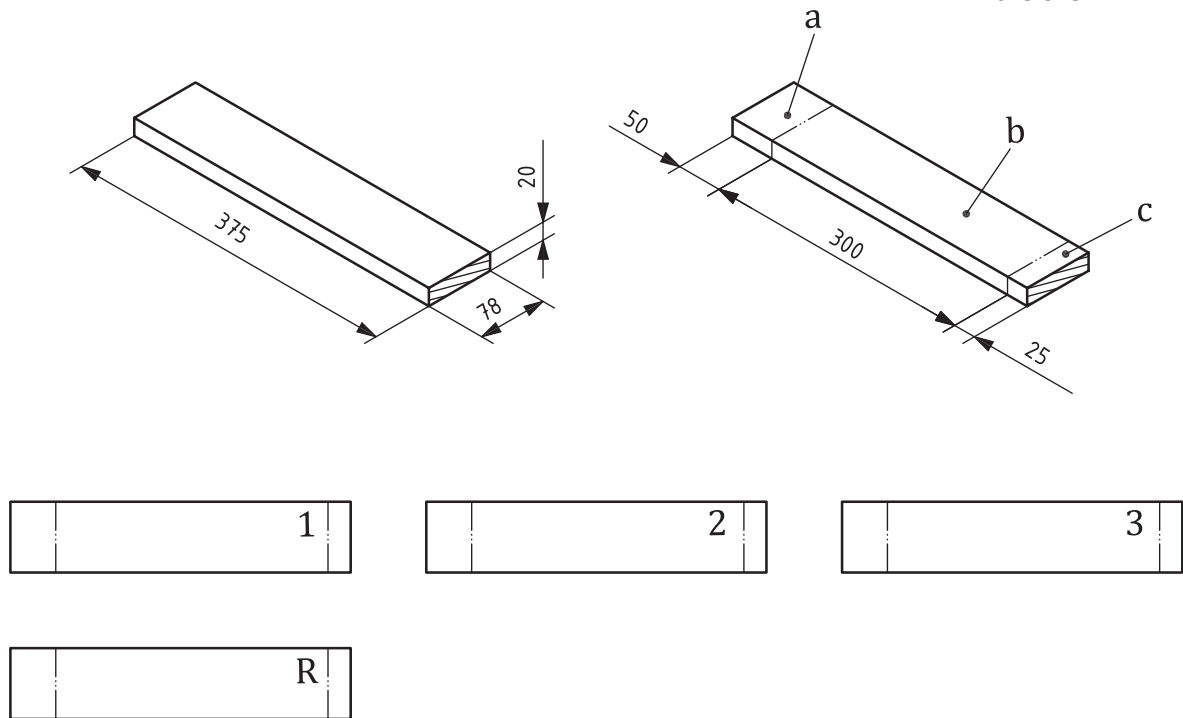
7.3.4 Sealing and ageing

When the test coatings and ICP have dried, seal thoroughly the ends of the panels with at least two coats of a flexible, moisture-impermeable white paint, for example of long-oil alkyd type, and capable of withstanding 2 years of natural exposure without breakdown. The sealer may be applied by brushing or dipping. The sealer shall be applied to the bands marked "a" and "c" at the ends of the panel shown in [Figure 2](#). It is important that the sealer is applied all round, i.e. that front, sides, end grains and rear face of the bands are coated.

After sealing, age the panels for approximately 7 days in the controlled environment at (20 ± 2) °C and a relative humidity of (65 ± 5) %, before carrying out initial panel examinations.

Exposure shall start at the latest 28 days after completion of sealing.

Dimensions in millimetres



Key

- 1, 2 and 3 exposure panels
- R unexposed reference panel
- a Sealed end (may be used for the numbering of test panels).
- b Section for the application of the coating system.
- c Sealed end.

NOTE The figure is not to scale.

Figure 2 — Details of test panels

7.3.5 Thickness of the coating

Determine the dry film thickness of the ICP and the test coating using the unexposed reference panels. Examine three small chips of coated wood removed from each reference panel by microscopy in accordance with ISO 2808:2007, method 6A. The three chips shall be removed at three different places spaced evenly across the panel width. Make five measurements on each of the three chips and calculate and record the mean value in micrometres.

The thickness is stated in micrometres and refers to the layer on (above) the wood surface. Systems may penetrate the wood material to some extent, but this part is not included in the determination.

8 Procedure

8.1 General

Carry out all examinations in accordance with [Annex B](#) and [Annex C](#).

8.2 Examination before exposure

Before exposure, carry out the following measurements on the test panels and the ICP:

- mass of the coating system applied (by weighing) (see [7.3.2](#));
- coating thickness (see [7.3.5](#));
- gloss;
- colour.

Assess the adhesion on the reference panel for the test coating and the ICP.

As wood is a natural material, unexpected defects can be detected in the coated panels just before exposure, even though the wood material has been selected, inspected and prepared along the guidelines of [7.1](#) and [7.2](#). If such panels as an exception are exposed, the type, size and position of defects shall be noted, so as to avoid any influence on the assessment after exposure.

For further details, see [Annex B](#) and [Annex C](#).

8.3 Exposure

Expose three of the four panels with their long edge horizontal and the 50 mm band to the left of the exposed face, for a period of 12 months, using the exposure racks ([5.1](#)). Record the starting and ending dates.

Store the reference panels indoors at a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %.

8.4 Examination after exposure

8.4.1 Examination on the exposure racks

At the end of the 12 months exposure period, examine the panels on the exposure racks and record any blistering. Remove the panels from the racks to the laboratory and condition for 7 days at a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %.

8.4.2 Laboratory examination of unwashed panels

Assess the panels for the following properties:

- flaking;
- cracking;
- mould growth;
- chalking;
- general appearance.

8.4.3 Laboratory examination of washed panels

After the first examinations ([8.4.1](#) and [8.4.2](#)), wash the panels by sponging with clean lukewarm water to remove surface deposits and atmospheric pollutants, and allow the panels to dry.

Examine the coating on the reference and exposed panels for gloss and colour.

Examine the coating on the exposed panels for mould growth, adhesion and general appearance.

9 Precision data

Further information for precision data is given in [Annex G](#).

10 Expression of results and test report

The test report shall contain at least the following information:

- a) all details necessary to identify the product tested, including name and address of the manufacturer or supplier of the coating system tested, name or other identification marks of the coating system tested, including the batch number, description of the coating system tested, method and date of application, coating thickness and colour;
- b) a reference to this document, i.e. ISO 16053;
- c) the name and address of the testing laboratory;
- d) the exposure site;
- e) an identification number of the test report;
- f) the name and address of the organization or the person who ordered the test;
- g) the method of sampling, date and person responsible for the sampling;
- h) the date of receipt of the coating system tested;
- i) the exposure period (start and finishing dates);
- j) any deviations from the test methods specified;
- k) the test results (see [8.2](#), [8.4.2](#) and [8.4.3](#));
- l) the date of authorization of the test report;
- m) the type of cutting tool used for adhesion measurement (see [B.9.2.1](#)).

An example for a suitable form is given in [Annex D](#).

A copy of the test report together with data sheets should be stored to comply with quality assurance requirements.

Annex A (normative)

ICP alkyd stain

Table A.1 — ICP alkyd stain

Component	Name	Supplier	Remarks	Amount % (by mass)
Alkyd	Synolac™ 6005 WDA	Cray Valley	70 % non volatile matter content	49,05
Solvent	Varsol™ 40	Exxon		3,77
Pigment, red	Sicoflush™ L2817	BASF	40 % pigment in paste ^a	4,63
Pigment, yellow	Sicoflush™ L1916	BASF	40 % pigment in paste ^a	2,30
Rheological additive	Bentone™ 34	Elementis Specialties	10 % premix in white spirit (85 %), and ethanol (5 %)	0,60
Ca drier	Nuodex™ Ca 5 %	Rockwood Pigments	5 % calcium, non volatile matter content about 55 %	2,77
Co drier	Nuodex™ Co 10 %	Rockwood Pigments	10 % cobalt, non volatile matter content about 75 %	0,37
Zr drier	Nuodex™ Zr 12 %	Rockwood Pigments	12 % zirconium, non volatile matter content about 45 %	0,30
Biocide	Preventol™ A5S	Lanxess	Powder (96 % active ingredients)	0,72
HALS ^b	Tinuvin™ 292	BASF		0,45
Antiskin	Exkin™ 2	Rockwood Pigments	Methyl ethyl ketoxime	0,20
Solvent	Varsol™ 40	ExxonMobil chemical		34,84
Total % (by mass)				100,00
<p>NOTE 1 ICP receipt is no longer in conformity with VOC directive 1999/13/EC. It only serves to characterise the climatic conditions during exposure and it has no commercial relevance. It has only been retained for continuity until a replacement has been validated.</p> <p>NOTE 2 The trademarks and suppliers are given for the convenience of users of this document and do not constitute an endorsement by ISO of these products. Equivalent products may be used if they can be shown to lead to the same results.</p> <p>^a Particle size ≤10 µm.</p> <p>^b Hindered Amine Light Stabilizer (Free radical quencher).</p>				

The following properties and values shall be controlled by the manufacturer.

Density: 0,90 g/cm³ to 0,91 g/cm³.

Viscosity: 33,5 s, determined with a 4 mm flow cup as specified in ISO 2431, which corresponds to a kinematic viscosity of 39 mm²/s.

Colour: Apply the ICP with a wet film thickness of 90 µm on the non-absorbing side of a Leneta™¹⁾ card. After 24 h of drying, determine the colour as described in [B.2](#). The following values are guidelines for final colour:

- $L \approx 56$;
- $a \approx 42$;
- $b \approx 52$.

Add the ingredients in the order given and follow good manufacturing practice.

Record the date of manufacture on the containers.

Store in well-sealed containers and use within 2 years of manufacture.

1) Leneta™ is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Annex B (normative)

Details of test methods

B.1 Gloss and change of gloss

Measure the specular gloss in accordance with ISO 2813 using a glossmeter at 60° incident light angle. Determine the value for each area along the grain, i.e. with the light beam parallel to the grain. Obtain three measurements on separate areas along the length of the panel. Displace the glossmeter sidewise and obtain three measurements on adjacent areas with the light beam incident on the panel from the opposite direction. Take the mean of the six measurements obtained.

Calculate the gloss change of each of the three exposed panels, CG_{ex} and of the unexposed reference panel, CG_{ref} . Calculate the mean of the gloss change of the three exposed panels. State the final result to one decimal place.

B.2 Colour and colour change

Measure the colour using the measurement geometry 45/0 or d/8 with specular component included (sci/spin). The geometry used shall be stated in the test report. Determine the CIE 1976 colour coordinates (L^* , a^* , b^*) for the standard illuminant D65 and standard observer 10° for each panel as a mean of 6 single measurements.

Calculate the colour change ΔE_{ab}^* of each of the three exposed panels and of the unexposed reference panel. Calculate the mean of the colour change of the three exposed panels. State the final result to one decimal place.

B.3 Blistering

The assessment for quantity (density) and size shall be made on each exposed panel separately in accordance with ISO 4628-2.

Calculate and record the mean value for quantity and size to one decimal place.

B.4 Flaking

The assessment for quantity (density) and size shall be made on each exposed panel separately in accordance with ISO 4628-5, using a microscope with a magnification of $\times 10$ (see [5.5](#)).

Calculate and record the mean value for quantity and size to one decimal place.

B.5 Mould growth

The assessment shall be made on each exposed area separately, using a microscope with a magnification of $\times 10$ (see [5.5](#)) in accordance with ISO 4628-1.

B.6 Cracking

The assessment for quantity (density) and size shall be made on each exposed panel separately in accordance with ISO 4628-4.

Calculate and record the mean value for quantity and size to one decimal place.

B.7 Chalking

The assessment shall be made on each exposed panel separately in accordance with the procedure described in ISO 4628-6. Take care to distinguish between chalking and dust.

Calculate and record the mean value to one decimal place.

B.8 General appearance

The assessment shall be made on each exposed panel separately in accordance with ISO 4628-1:2016, Table 3, in comparison to the unexposed reference panels.

Calculate and record the mean value to one decimal place.

B.9 Adhesion

B.9.1 General

The assessment shall be made on each exposed panel separately in accordance with the procedure described in ISO 2409.

B.9.2 Apparatus

B.9.2.1 Cutting tool

Use a single-blade cutting tool with a 20° to 30° edge and other dimensions as specified in ISO 2409 or a multiblade cutting tool. The single-blade cutting tool is the preferred tool. The type of cutting tool used shall be stated in the test report.

B.9.2.2 Transparent pressure-sensitive adhesive tape

The transparent pressure sensitive adhesive tape shall be (25 ± 10) mm wide, with a minimum tensile strength of 200 N per 25 mm width and an adhesion of 6 N to 10 N per 25 mm width. The tape shall be stored at (20 ± 2) °C and a relative humidity of (65 ± 5) %.

B.9.3 Procedure

Perform the test twice on each exposed panel, recording individual results without decimals. Calculate and record the mean value for each panel to one decimal place. Calculate and state the mean value for all three panels to one decimal place.

B.10 Test for abnormally porous wood

Abnormally porous wood can be detected qualitatively by the rapid absorption of a drop of propan-2-ol (isopropanol) applied to the surface; the drop should not be absorbed in less than 30 s by normal wood. The test should be carried out at not less than six places, widely separated, on the rear face of the test panel.

B.11 Test for heartwood in pine

Heartwood content shall always be checked on the end grain of both ends of each test panel using a fresh solution of for example Fast Red B salt (5 g/l in deionized water) or Solid Blue Salt B (2 % in deionized water).

Fast Red B has no reported mutagenic or teratogenic effects; however, it should be treated as a suspected carcinogen. Reference should be made to up-to-date, relevant health and safety data sheets.

Annex C (normative)

Assessment requirements for panels of test coatings and ICP

Table C.1 — Assessment requirements for panels of test coatings and ICP

Panel designation (Test coatings and ICP)	Exposure panels			Unexposed reference panels
	1	2	3	R
Wood species	Pine			
Inspection^a				
Before exposure				
a) Spreading rate	x	x	x	x
b) Coating thickness				x
c) Gloss	x	x	x	x ^b
d) Colour	x	x	x	x
e) Initial defects	x	x	x	x
After exposure				
f) Blistering (on site)	x	x	x	x
g) General appearance	x	x	x	
h) Flaking	x	x	x	x
i) Cracking	x	x	x	x
j) Chalking	x	x	x	x
k) Mould growth	x	x	x	x
After exposure and washing				
l) General appearance	x	x	x	x ^b
m) Mould growth	x	x	x	x
n) Gloss	x	x	x	x
o) Colour	x	x	x	
p) Adhesion	x	x	x	
^a The inspections should preferably be carried out in the order indicated, a) to p). ^b The gloss measurement is repeated on the unwashed unexposed reference panel at the end of the exposure period (see B.1).				

Annex D (informative)

Suggested format for a test report

Exterior wood coating system – Natural weathering test (ISO 16053)

Table D.1 — Test report

TEST REPORT					
Test system:					
Classification in accordance with EN 927-1:					
Tested on: (Substrate)					
Assignment: (Job No. etc.)					
Tested for: (Client)					
Tested by: (Laboratory)					
Exposure site:					
Starting date:			Ending date:		
Coat No.	Manufacturer	Trade name (or sample reference)	Description	Application method and date	Amount applied (mean value)
1					
2					
3					
4					
Application interval Coat 1-2 2-3 3-4					
Dry film thickness in μm (see 7.3.5)	Test system:				
Similarly for ICP	ICP: Manufacturer, batch number, production date				
Remarks:					

Exterior wood coating system – Natural weathering test (ISO 16053)

Result:

Table D.2 — System: Internal comparison product (ICP)

Property Code	Wood species	Evaluation scale test method	Reference panel	Results after 12 months exposure			
				Individual values			Mean value
Change of gloss CG		ISO 2813					
Change in colour ^a DE							
Blistering ^b BL		ISO 4628-2					
Flaking ^b FL		ISO 4628-5					
Cracking ^b CR		ISO 4628-4					
Chalking CH		ISO 4628-6					
Mould growth MG		ISO 4628-1					
Adhesion AD		ISO 16053, Annex B					
General appearance GA		ISO 4628-1					
^a Measurement geometry: (45/0 or d/8). ^b Only the quantity is considered for the performance specification in EN 927-2.							

Exterior wood coating system – Natural weathering test (ISO 16053)

Result:

Table D.3 — Test system

Property Code	Wood species	Evaluation scale test method	Reference panel	Results after 12 months exposure			
				Individual values			Mean value
Change of gloss CG		ISO 2813					
Change in colour ^a DE							
Blistering ^b BL		ISO 4628-2					
Flaking ^b FL		ISO 4628-5					
Cracking ^b CR		ISO 4628-4					
Chalking CH		ISO 4628-6					
Mould growth MG		ISO 4628-1					
Adhesion AD		ISO 16053, Annex B					
General appearance GA		ISO 4628-1					
^a Measurement geometry: (45/0 or d/8). ^b Only the quantity is considered for the performance specification in EN 927-2.							

Conclusion:

Signature:

Date:

The result of this test is only to be stated in full; extracts may only be published with the written permission from the testing laboratory.

Enclosed:

- Results in detail
- Photographs (optional)

Annex E (informative)

Optional tests including variations to standard weathering test procedure to obtain additional information on coating performance

E.1 Principle

The standard weathering test described in earlier clauses of this document specifies that the test be conducted on a flat panel of pine with a planed surface.

This annex describes variations to the standard test procedure which provide the means of obtaining additional information on coating performance through the use of alternative wood substrates, and also through the inclusion of a water trap in the exposed panel surface, which for some weathering characteristics might pose an additional challenge to the coated wood. The modified test panel is intended to simulate coating performance on wood components which might be at risk from water entry. From experiences in the past in different European countries, the presence of the water trap served to obtain test results on wood cracking, flaking, blistering and mould growth in a reasonable time period (12 months) compared to panels tested without water traps.

NOTE These optional tests serve only to provide additional information. The level of performance achieved in the standard test employing a pine panel without back sealing and water trap constitutes the sole basis of conformance with the requirements of the performance standard.

E.2 Tests on alternative wood substrates

When the information on specific wood substrates is required, the following tests may be carried out:

- alternative wood species, for example spruce (*Picea abies*) or tropical hardwoods;
- panels with a sawn finish;
- pine modified or impregnated by industrial processes.

E.3 Tests with water trap²⁾

E.3.1 Apparatus and materials

In addition to the apparatus and materials listed in [Clause 5](#), the following is needed:

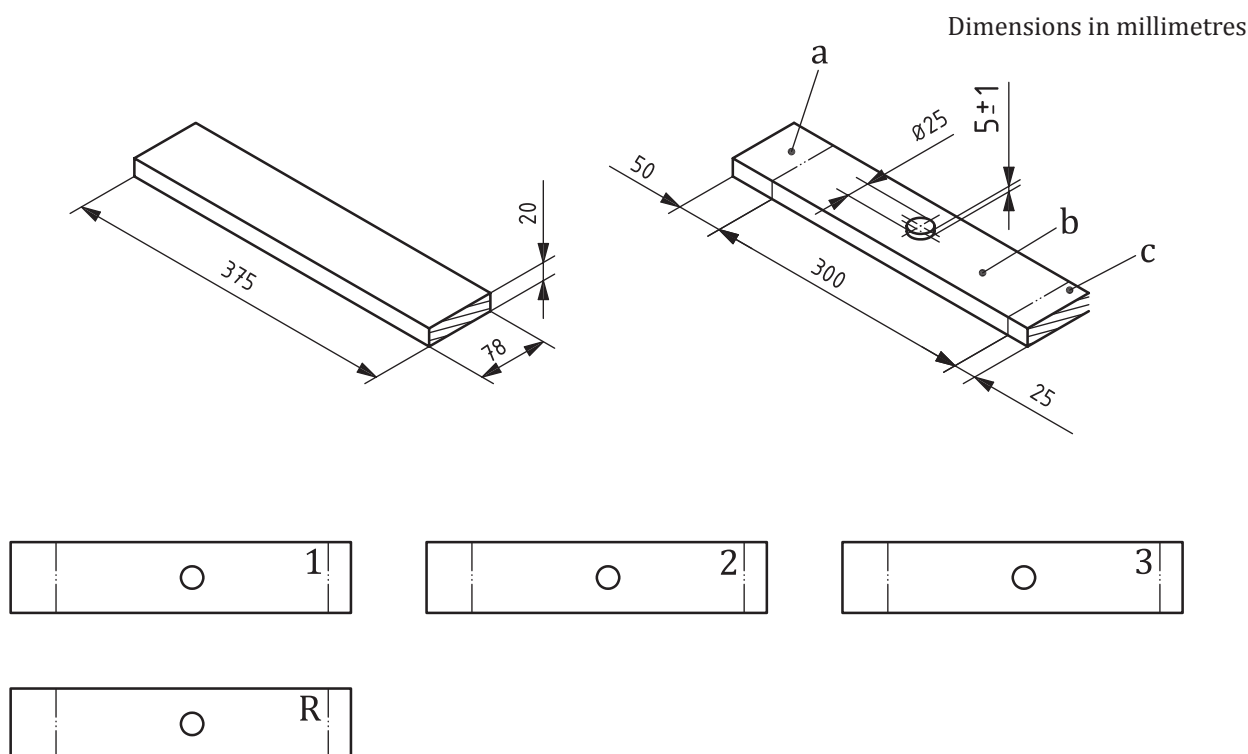
- Milling cutter, cylindrical with a diameter of 25 mm, for drilling of water traps.

E.3.2 Preparation

The preparation of panels shall be in accordance with [Clause 7](#) except that a water trap is introduced as a final operation by the following procedure:

2) This test is based on Nordtest Build 229, 1989, *Coating systems on exterior wood — Performance accelerated test*.

Machine a water trap into the centre of the face of the test and reference systems by milling a circular hole, approximately 25 mm in diameter, through the paint system and to a depth of (5 ± 1) mm into the wood, as shown in [Figure E.1](#).



- Key**
- 1, 2 and 3 exposure panels
 - R unexposed reference panel
 - a Sealed end (may be used for the numbering of test panels).
 - b Section for the application of the coating system.
 - c Sealed end.

NOTE The figure is not to scale.

Figure E.1 — Details of test panels with a water trap

E.3.3 Panel assessment

Panel examination shall be carried out in accordance with [Clause 8](#).

For the evaluation of flaking, mould growth and cracking on panels containing the water trap see [Tables E.1](#) and [E.2](#). Flaking, mould growth and cracking on the coated areas of the panels containing the water trap are evaluated within a radius of 50 mm from the centre of the water trap excluding the actual water trap.

Table E.1 — Flaking (FL) on panels containing the water trap

Classification if both demands have been met	Affected area	
	Around the water trap	Remaining test area
0	0 %	0 %
1	Not greater than 5 %	Class 1 in accordance with ISO 4628-5
2	Greater than 5 %, but not greater than 10 %	Class 2 in accordance with ISO 4628-5

Table E.1 (continued)

Classification if both demands have been met	Affected area	
	Around the water trap	Remaining test area
3	Greater than 10 %, but not greater than 20 %	Class 3 in accordance with ISO 4628-5
4	Greater than 20 %, but not greater than 40 %	Class 4 in accordance with ISO 4628-5
5	Greater than 40 %	Class 5 in accordance with ISO 4628-5

Table E.2 — Cracking (CR) on panels containing the water trap

Classification if both demands have been met	Affected area	
	Around the water trap	Remaining test area
0	No cracking	No cracking
1	Very few cracks Quantity (density) 1 in accordance with ISO 4628-4	No cracking
2	A few cracks permitted Quantity (density) 2 in accordance with ISO 4628-4	One single crack permitted
3	A moderate amount of cracks permitted Quantity (density) 3 in accordance with ISO 4628-4	A few cracks permitted
4	A considerable amount of cracks permitted Quantity (density) 4 in accordance with ISO 4628-4	A considerable amount of cracks permitted
5	Dense pattern of cracks Quantity (density) 5 in accordance with ISO 4628-4	A considerable amount of cracks

E.4 Tests with back sealing of the panels

In order to obtain additional information, the portion of the back of the exposure panels that is normally uncoated may be sealed by the following methods:

- one coat of the ICP;
- first coat of the test coating system;
- full test coating system.

Annex F **(informative)**

Explanatory notes

F.1 Natural weathering test

Natural weathering tests give an indication of the durability of the system tested. The closer the conditions of actual use are to the conditions of the test, the better the correspondence.

However, as conditions vary considerably, variations in performance also occur.

In EN 927-1, systems are classified according to their appearance and end use.

Generally, the test provides objective guidance in this respect, particularly when the evaluation is combined with considerations of local microclimatic variations and of the influence on durability exerted by the substrate and by constructional details.

F.2 Validity of test reports

F.2.1 System

Generally, test reports are only valid for systems equal to those tested.

Minor changes in composition, e.g. from one shade to another, might not alter the performance significantly. Predicting the actual behaviour of a system different from the one tested however is dependent on the manufacturer's experience and is his responsibility.

F.2.2 Climate and region

Test results reflect, among other things, the climatic conditions at an actual test site during a specific 12 months exposure period.

Test reports characterize the system tested under similar climatic conditions. These, however, vary from one place to another and from period to period. Therefore, test results should be considered more as qualified indications of the performance than as absolute values.

As variations in performance, as well as in test results, to a large extent are due to climatic differences, it should be noted in test reports within which location the test has been carried out. The date and period of exposure should also be recorded.

Annex G (informative)

Precision data

Test precision (repeatability and reproducibility) of the ISO 16053 natural weathering test was estimated in an interlaboratory study by members of the CEN/TC 139/WG 2 "Coating systems for wood" (see Round Robin IV, 2004-2006). The study consisted of three consecutive exposures of 1 year duration (in 3 months intervals) at five different exposure sites in Central Europe with sets of three replicate pine panels coated with the semi-transparent ICP. Test panels were produced by the five participants individually, applying a common batch of ICP. Performance assessments were carried out by different operators at the five exposure sites.

The calculated repeatability and reproducibility limits of the ICP are regarded as typical for this test method (see [Table G.1](#)) and may be used as basic estimates. However, test precision of exposures according to ISO 16053 varies with specific exposure conditions, coating systems and assessed material properties.

Table G.1 — Repeatability and reproducibility of selected performance parameters on ICP-coated pine panels after 1 year of natural exposure according to ISO 16053

Parameter		General mean	Median	Repeatability (within laboratories)		Reproducibility (between laboratories)		
				(mean) repeatability standard deviation	95 % Repeatability limit	Between laboratory standard deviation	Reproducibility standard deviation	95 % reproducibility limit
				m	med	s_r	$r = 1,96 \cdot \sqrt{2 \cdot s_r}$	s_L
Blistering ^a	Quantity	0,00	0,00					
	Size	0,00	0,00					
Cracking	Quantity	0,13	0,00	0,24	0,7	0,14	0,28	0,8
	Size	0,16	0,00	0,27	0,7	0,24	0,36	1,0
Flaking ^a	Quantity	0,00	0,00					
	Size	0,00	0,00					
Chalking ^a		0,00	0,00					
Mould growth	unwashed	0,73	0,00	0,24	0,7	1,12	1,15	3,2
	washed	0,42	0,00	0,43	1,2	0,91	1,01	2,8
Adhesion		0,51	0,00	0,58	1,6	0,41	0,71	2,0
General appearance		0,84	1,00	0,09	0,2	0,85	0,85	2,4
Gloss change		-5,49	-4,20	9,23	25,6	2,55	9,58	26,5
Colour change	$\Delta E_{ab}^*_{sci}$	10,78	10,38	2,75	7,6	2,93	4,02	11,1

^a No blistering, flaking and chalking were observed after 1 year of exposure. Therefore no meaningful calculation of repeatability and reproducibility was possible.

Bibliography

- [1] EN 927-1, *Paints and varnishes — Coating materials and coating systems for exterior wood — Part 1: Classification and selection*
- [2] EN 927-2, *Paints and varnishes — Coating materials and coating systems for exterior wood — Part 2: Performance specification*

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI which includes surveillance inspection of the factory, testing of both factory and market samples.

Further particulars of the terms and conditions of the permit may be obtained from the Sri Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.



SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development and formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such fields of standardization as are of special interest to Sri Lanka.