PD CEN/TS 16499:2013

BSI Standards Publication

Paints and varnishes — Coating materials and coating systems for exterior wood — Resistance to blocking of paints and varnishes on wood

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of CEN/TS 16499:2013.

The UK participation in its preparation was entrusted to Technical Committee STI/28, Paint systems for non-metallic substrates.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 78946 5

ICS 87.040

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 November 2013.

Amendments issued since publication

Date	Text affected

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16499

November 2013

ICS 87.040

English Version

Paints and varnishes - Coating materials and coating systems for exterior wood - Resistance to blocking of paints and varnishes on wood

Peintures et vernis - Produits de peinture et systèmes de peinture pour le bois en extérieur - Résistance au blocage des peintures et vernis sur bois

Beschichtungsstoffe - Beschichtungsstoffe und Beschichtungssysteme für Holz im Außenbereich - Bestimmung der Blockfestigkeit

This Technical Specification (CEN/TS) was approved by CEN on 12 February 2013 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN/TS 16499:2013: E

Contents

Page

Foreword

This document (CEN/TS 16499:2013) has been prepared by Technical Committee CEN/TC 139 “Paints and varnishes”, the secretariat of which is held by DIN.

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

Remark about climatic conditions:

EN 23270, *Paints and varnishes and their raw materials — Temperatures and humidity for conditioning and testing (*ISO 3270*)* prescribe the use of standard conditions 23/50 [(23 ± 2) °C and (50 ± 5) % relative humidity]. Historically for wooden substrates there are a lot of mechanical properties which refer to the alternative standard conditions 20/65 [(20 ± 2) °C and (65 ± 5) % relative humidity] according to ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*. Therefore, the use of standard conditions 20/65 instead of standard conditions 23/50 could be arranged but should be noted.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This Technical Specification specifies a test method for determining, under standard conditions, whether a single-coat film or a multi-coat system of paints and varnishes on wood after a specified drying period is sufficiently dry to avoid damage when two painted surfaces or one painted surface and another surface are placed in contact under pressure and subsequently separated. The method is intended to simulate the conditions when painted articles come into contact which each other. In comparison to EN ISO 9117-2, the conditioning and parameters which influences the behaviour of wood coatings are more specific.

NOTE In some countries, the test is called a “block or blocking resistance” test.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 927-1, *Paints and varnishes - Coating materials and coating systems for exterior wood - Part 1: Classification and selection*

EN 23270, *Paints and varnishes and their raw materials - Temperatures and humidities for conditioning and testing (ISO 3270)*

EN ISO 1513, *Paints and varnishes - Examination and preparation of test samples (ISO 1513)*

EN ISO 2808, *Paints and varnishes - Determination of film thickness (ISO 2808)*

EN ISO 15528, *Paints, varnishes and raw materials for paints and varnishes - Sampling (ISO 15528)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
blocking
unwanted adhesion between two surfaces, at least one of which has been coated, when they are left in contact under load after a given drying period

[SOURCE: EN ISO 4618:2006; 2.29]

Note 1 to entry: Blocking does not apply to bonding of coated surfaces after insufficient drying.

Note 2 to entry: In practice, blocking can occur if coated wood panels are stacked on each other or on windows and doors if the frames are in direct contact with the faces. Blocking depends on temperature and load (pressure).

Note 3 to entry: The term blocking is also sometimes used to describe agglomerated caked powder.

Note 4 to entry: Unwanted adhesion can lead to damage upon separation.

3.2
load
mass needed to achieve a suitable test pressure

Note 1 to entry: High temperature and humidity increase the challenge at a given load. The application method, film thickness, drying conditions and climatic conditions should also be taken into account.

3.3
after tack
property of a film to remain sticky after normal drying or curing

[SOURCE: EN ISO 4618:2006; 2.8]

Note 1 to entry: The term after tack can also mean a subjectively stickiness of the surface (“finger tack” or “surface tack”). This effect however might not necessarily be related to blocking.

3.4
stable mass
mass achieved when the difference between two subsequent weighings within 24 h does not exceed 0,2 %

[SOURCE: EN 927-5:2006; 3.3]

3.5
stackability
resistance to damage due to unwanted adhesion between adjacent surfaces of articles that develops when these articles are left in contact

[SOURCE: EN ISO 9117-2:2010; 3.1]

4 Principle

The coating material or the coating system under test is applied on test panels or cut strips under specified conditions. After specified drying time and under specified climatic conditions, the two test panels or cut stripes are placed crosswise in contact with each other. This assembly is subsequently placed in a test apparatus to be subjected to a specified load under specified climatic conditions. After a specified period of time, the load is removed and the test panels manually separated under specific climatic conditions and the contact areas examined for any damage to the coating in the area of contact.

5 Apparatus

5.1 Weights, of a mass which correspond to the requirements of 12.1.

5.2 Oven or conditioning chamber, depending on the selected climatic conditions during load (see Clause 11 or 12.3):

— Oven of appropriate size, controlled at a temperature of (50 ± 2) °C or (60 ± 2) °C;

— climatic conditioning chamber where the selected climatic conditions can be achieved.

5.3 Inert substrate for application on Specimen s3.

5.3.1 Test panels[1)] (“strips”) made of polyvinyl chloride film free of migrating plasticizers, of sufficient rigidity to ensure a flat surface, impervious to and unaffected by water or aliphatic organic solvents and of nominal

1) Suitable test foil made of plasticised PVC is available from Leneta Co. Whitney Road, Mahawa, NJ 07430-3129, USA, or Erichsen GmbH, Am Iserbach 14, D-58675 Hemer, Germany, or Sheen Instruments, Unit 4, St George’s Industrial Estate, Richmond Road, Kingston, Surrey KT2 5BQ, United Kingdom. This information is given for the convenience of users of the document and does not constitute an endorsement by CEN of the product named.

thickness 0,25 mm. Other types of plastics film might be used where the coating material contains solvents which may adversely affect the PVC film. If the coating delaminates from the substrate before or during the test, another, more suitable substrate should be used.

5.3.2 Film applicator, preferably automatic, used at an application speed of 10 mm/s to 15 mm/s and fitted with a doctor blade (see 8.2) with an appropriate gap clearance and a gap width of at least 60 mm.

5.3.3 Use cutting knife, metal template or straight-edge ruler to cut the foils.

5.4 Tools for application on test specimen s1, s2, s4, (e.g. roller, brush, spray equipment) depending on the paint manufacturer's specification.

6 Sampling

Take a representative sample of the product to be tested (or of each product in the case of a multi-coat system), in accordance with EN ISO 15528. Examine and prepare each sample for testing in accordance with EN ISO 1513.

7 Test panels – substrate – test specimens

7.1 General

Depending on the specimens provided for use, different application methods can be required (see Table 1)

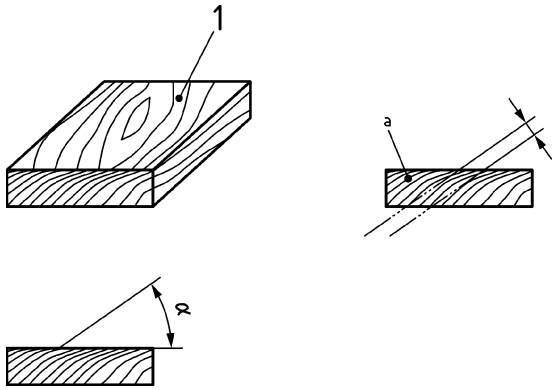
Table 1 — Substrate

Substrate (s)	Type	Description	Recommended use
s1	wood	spruce (*Picea abies*) (see 7.1)	standard test method to check a coating system or a individual top coat.
s2	other wood substrates	any wood species (see 7.2)	individual wood species on customer-specific requirement (e.g. a coated test specimen from which test panels can be cut)
s3	inert substrate	PVC-foil (see 5.3)	lab test method to compare different top coats (simulation of the blocking behaviour on not absorbing substrates)
s4	other plane substrates	e.g. plywood according to EN 636	lab test method to compare different coating materials or coating systems.

7.2 Substrate s1 – Spruce

The wood shall be spruce (*Picea abies*) that has been selected to be free from knots and cracks, to be straight-grained and of normal growth rate (i.e. between 3 and 8 annual rings per 10 mm).

The panels shall be planed all round to a smooth and uniform finish. The inclination of the growth rings to the test face shall be (45 ± 10)°. See Figure 1. The wood shall be free from blue stain and evidence of surface or bulk infection. Abnormal porosity shall be avoided. Condition the wood prior to conversion into test panels in accordance with EN 23270 at (23 ± 2) °C and a relative humidity of (50 ± 5) %. The density of the wood shall be between 0,4 g/cm^3 and 0,5 g/cm^3 when measured at an equilibrium moisture content at standard climate in accordance with EN 23270 at (23 ± 2) °C and a relative humidity of (50 ± 5) %.



Key

1 *f*ront of panel (test face)

a min. 3, max. 8 growth rings per 10mm (applies for the whole panel)

α angle of growth rings to test face min. 35°, max. 55°

Figure 1 — Selection of wood

7.3 Substrate s2 – Other wood species

In case of customer-specific requirements or if it might be assumed that other types of wood might give a different result an alternative wood species should be used as substrate. It is also an option for manufacturers to provide an already coated test specimen from which test panels can be cut. The chosen panel shall be precisely described in the test report. The surface of the specimens provided shall be plane. The test substrate shall be conditioned until constant mass at standard conditions according to EN 23270 [(23 ± 2) °C and (50 ± 5) % relative humidity].

7.4 Substrate s3 – Inert substrate

See 5.3.

7.5 Substrate s4 – Other plane substrates

The selected substrate should be precisely described in the test report. Alternatives that may be used include absorbing substrates (e.g. plywood) as well as non absorbing substrates (e.g. glass, aluminium, coated paper, polymer panels). Absorbing substrates should be conditioned until achieving constant mass at standard conditions according to EN 23270 [(23 ± 2) °C and (50 ± 5) % relative humidity].

8 Application to the test specimens

8.1 General

Depending on the specimens provided for use, a different type of application might be required (see Table 2).

Table 2 — Type of application

Substrate (s)	Type	Description	Recommended application
s1	wood	spruce (*picea abies*) (see 7.1)	According to manufacturer's specification
s2	other wood species	any wood species (see 7.2)	According to manufacturer's specification or customer's specification Optional use of already coated test specimen from which test panels can be cut.
s3	inert substrate	PVC-foil (see 5.3)	application of the top coat to be investigated in a dry film thickness related to practice, by means of a film applicator
s4	other plane substrates	e.g. plywood according to EN 636	According to manufacturer's specification, customer's specification or by application of the top coat to be investigated in a dry film thickness related to practice, by means of a film applicator

8.2 Application to substrate s1 – spruce, s2 – other wood substrates, or substrate s4 - other plane substrates

If nothing else is specified by the manufacturer of the coating system, the conditioned, planed wood specimens (test panels), shall be manually sanded with abrasive paper (180 grade) just before application. Dust shall be removed completely. The test panels are coated with the coating system to be tested, closely following manufacturer's instructions or specification. Examples of possible suitable application methods and their specification are given in Annex B.

8.3 Application to substrate s3 – inert substrate or substrate s4 - other plane substrates

Use an automatic film applicator fitted with a doctor blade with an appropriate gap clearance and gap width (somewhat wider than the intended final width). Make a draw-down of the prepared sample of coating material on the test panel to achieve a uniform even film at least 10 mm longer than the intended final test surface. Apply the coating material under test on the matt surface of the foil. Ensure that the gap clearance is sufficient to achieve a final dry film thickness corresponding with the paint manufacturer's specification. The applied wet

and the resulting dry film thickness of the coating under test shall be reported. Recommended application speed is 10 mm/s to 15 mm/s.

8.4 Typical dry film thickness on stable wood constructions

The dry film thicknesses below refer to Original Equipment Manufacturer (OEM) coating systems.

Spray applied coating systems:[2)]

Coating thickness > 80 µm for high build opaque, transparent and semi-transparent wood coating systems (according to EN 927-1).

Coating thickness > 100 µm for opaque coating systems.

Brush applied coating systems:[3)]

Coating thickness approximately 30 µm to 50 µm for medium to high build opaque, transparent and semi-transparent wood coating systems (according to EN 927-1).

Coating thickness approximately 60 µm to 100 µm for opaque coating systems.

EXAMPLE Gap clearance of a doctor blade: 400 µm for spray coating systems and 200 µm to 300 µm for brush coating systems. In each case a uniform smooth film is necessary.

9 Drying time

Drying and/or curing of each coated test panel should correspond to the manufacturer's specifications. Select the climatic conditions during drying and the proposed drying method according to the manufacturers' specifications. If nothing else is agreed, the top coat should be dried for 24 h at standard conditions according to EN 23270 [(23 ± 2) °C and (50 ± 5) % relative humidity].

10 Preparation of test strips and specimen

10.1General

When the top coat has dried (see Clause 9), at least 6 test strips of the same type should be cut from the coated specimens (test panels) with a width of 20 mm to 50 mm and a length of not less than twice the width. When cutting the test strips, the surface to be tested shall not be damaged. Particular attention should be paid to the edges of the test strips. Burrs should be avoided. Other formats of the test strips may be used, but shall be indicated in the test report. After cutting the panels, the resulting test strips should be conditioned immediately.

10.2Determination of the dry film thickness

The end sections of the test strips, i.e. the part of the strip or panel that has not been stacked towards another sample should be used for determination of the dry film thickness of the coating according to EN ISO 2808. The measurement of the dry film thickness should be made after the blocking test procedure. The selected measurement method and the resulting film thickness shall be stated in the test report.

---

2) Refers to a complete coating system.

3) Refers to a complete coating system.

NOTE On wood, the dry film thickness of the coat on the wood surface is measured. Many coating substances can penetrate into the wood to a certain degree, but this part is not included in the determination

11 Conditioning of test strips

See Table 3.

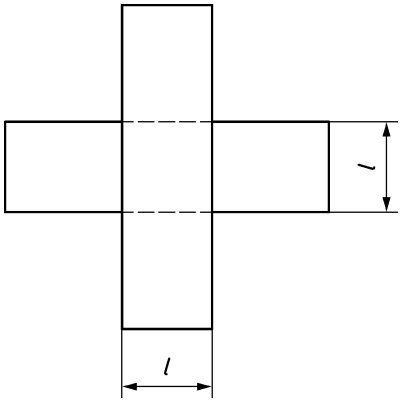
Table 3 — Conditioning of test strips

Conditioning, classification	Description	Conditioning	
		Temperature	Relative humidity
c0	Early resistance to blocking	no conditioning; initial loading to start immediately after the manufacturer's prescribed drying time	
c1	24 hours (standard conditioning)	(23 ± 2) °C	(50 ± 5) %
c2	120 hours (final resistance to blocking)	(23 ± 2) °C	(50 ± 5) %
c3[a]	24 hours (resistance to blocking at high humidity)	(23 ± 2) °C	(50 ± 5) %
	followed by:		
	120 hours	(23 ± 2) °C	(98 ± 2) %
[a] Conditioning procedure c3 is normally not applicable on substrate s3.			

12 Application of load

12.1General

After conditioning, put two test strips each of the same type on top of each other, offset by (90 ± 2)°, so that the surfaces to be tested are in contact. The test strips shall be arranged so that they are resting evenly on each other and the length of the test panel shall be no less than twice the width (see Figure 2). For a triple determination, three pairs of specimens may so be loaded at the same time. When using of test strips made of wood (substrate s1, s2 or s4) the use of a rack or holder to stabilise the strips is recommended (example see Figure 3).



Key

l width of the square of the overlapping test pieces in contact (see 12.2)

Figure 2 —Typical arrangement of the test specimens

Figure 3 — Example of a holder to load the specimens

When using foils or other thin and/or flexible substrates (substrate s3 or s4) as test strips, these may be placed between two plane surfaces (e.g. glass panels) for stabilisation, prior to load. The dimensions of the plane panels for stabilisation should correspond to and align with the test strips.

Subsequently the agreed weights are carefully placed on the test specimens and the assembly exposed to the specified test climate for the required period of time.

12.2Load to be applied

The mass of the applied weights should be selected as a function of the loaded surface, to achieve the desired pressure p (see Table 4) on the test surface (see Table 5).

Table 4 —Load be applied during test

Pressure Pa	
p_1	10 000
p_2	28 000
p_3	by agreement

If required, pressure p, in Pascal, to the coated test strips may be calculated according to Formula (1):

$$p = \frac{m_1 + m_2}{l^2} \cdot g \cdot 10^3 \approx \frac{m_1 + m_2}{l^2} \cdot 10^4 \quad (1)$$

where

p pressure, in pascal;

m_1 mass of panels possibly supported for stabilisation, in grams[4)];

m_2 mass of applied weight pieces, in grams;

l is the width, in millimetres, of the square of the overlapping test pieces in contact (see Figure 2);

g is the acceleration of free gravity, in newton per kilogram (approximately 10 N/kg).

Table 5 — Dimensions of specimen

Classification	**Pressure** Pa	**Width** mm	**Contact surface** mm^2	**Total mass** (m_1+ m_2) kg
p1	10 000	20	400	0,4
		50	2 500	2,5
p2	28 000	20	400	1,12
		50	2 500	7,0

NOTE The required pressure p_1 (10 000 Pa) was calculated considering wood density (around 400 kg/m^3 to 600 kg/m^3) and a maximum of up to 2 m high stacks e.g. of window frames. Pressure p_2 (28 000 Pa) is in line with some already existing national standards and guidance papers, which takes a worst case scenario on site into account.

12.3Climatic conditions during loading

After the coated test strips have been loaded with a pressure p_1 or p_2, the test strips are exposed to the agreed climatic conditions according to Table 6.

4) When using multiple stacks of panels the increasing pressure down the stack may be taken into consideration.

Table 6 — Climatic conditions during loading

Climatic condition	Time period h	Temperature T °C	Relative humidity %
t1	24	(23 ± 2)	(50 ± 5)
t2	24	(50 ± 2)	–
t3	24	(60 ± 2)	–
t4[a]	24	(23 ± 2)	(50 ± 5)
	followed by		
	120	(23 ± 2)	(98 ± 2)

[a] Climatic condition t4 usually is not applicable on substrate s3 – inert substrate.

At the end of the selected time period and climatic conditions (e.g. t2 24 h at 50 °C), remove the load carefully from the coated test strips. The manual separation of the test strips however is carried out only after a subsequent resting period of not less than one hour at standard conditions according to EN 23270 [(23 ± 2) °C and (50 ± 5) % relative humidity].

13 Evaluation

After expiry of the resting period, the unloaded test strips are carefully manually separated from each other. Record both the subjectively perceived force (a – adherence, see Table 7) required to separate an identical pair of specimens and the visible changes of the surface (d – damage, see Table 8) at the contact areas. The visual assessment is accomplished with normal or corrected vision at standard light D65. The viewing distance shall be between 0,25 m and 1,0 m. A coating or a coating system with a test result < a3 and < d3 is considered resistant to blocking in terms of this standard. Coating materials or coating systems with an assessment of the test result ≥ a3 or ≥ d3 are not considered resistant to blocking.

Table 7 — Adherence (a)

Adherence	Description
a0	The pair of specimens is loosely resting on top of each other without adhesion and/or the test strips fall apart.
a1	The test strips adhere slightly, but can be separated without any effort.
a2	The test strips adhere slightly, but can be separated with only slight effort.
a3	Blocking - The test strips adhere strongly and can only be separated with considerable effort.
a4	Blocking - The test strips adhere strongly and can only be separated with maximum effort.
a5	Blocking - The test strips adhere together so strongly that they cannot be separated by hand.

Table 8 — Resulting surface changes (d - damage)

Damage	Description
d0	The contact surfaces have no visual surface changes.
d1	The contact surfaces have slight visual surface changes (e.g. discoloration or changes of gloss). The coating however is without any damage.
d2	The contact surfaces have obvious visual surface changes (e.g. discoloration or changes of gloss) or slight traces of pressure marks. The coating however is without any damages impairing the function.
d3	Blocking - The contact surfaces have considerable visual surface changes (e.g. discoloration or changes of gloss) or pressure marks. The coating shows tear-off points (e.g. stress whitening on the coating), however no film tear-off from the substrate.
d4	Blocking - The contact surfaces have considerable visual surface changes (e.g. discoloration or changes of gloss) or pressure marks. The coating shows tear-off points (e.g. stress whitening on the coating) and some film tear-off from the substrate.
d5	Blocking - The contact surfaces have considerable visual surface changes (e.g. discoloration or changes of gloss) or pressure marks. The coating shows strong tear-off points (e.g. stress whitening on the coating) including some tear-off from the substrate. The contact surfaces possibly are not able to be assessed because manual separation is impossible. If adherence reaches a5 then blocking will also be rated as d5.

14 Precision

No precision data are currently available.

15 Test report

The test report shall include the following information:

a) details necessary to identify the product under test;

b) reference to this technical specification;

c) relevant detailed information which Annex A refers to;

d) results of the test in terms of adherence and damage (e.g. a2/d2; see Clause 13);

e) any unusual features (anomalies) observed during the test;

f) any deviations from the test procedure specified;

g) date of the test.

Annex A
(normative)

Necessary additional information

The information listed in this annex is necessary to apply the test method. Interested parties shall reach an agreement about the details, preferably by reference to national or international standards or other technical specifications which relate to the coating materials under test.

a) substrate: description of material coated (e.g. s3; see Table 2) and dimensions of the test pieces;

b) application method (an example is given in Annex B);

c) drying conditions of the top-coat;

d) the thickness, in micrometres, of the dry coating system and method of measurement in accordance with EN ISO 2808, and whether it is a single coat or a multi-coat system;

e) conditioning of the test pieces prior to and during loading (e.g. c1; see Clause 11);

f) pressure in pascal (e.g. p_1; see Table 4);

g) contact surface, in square millimetres;

h) climatic conditions during loading period (e.g. t2; see 12.3).

Annex B
(informative)

Suggested form for specifying application parameters

B.1 General

The influence of the application process is sometimes underestimated and might affect the performance of the applied coating. It is therefore necessary that application is thoroughly discussed, considered and planned before carrying out a test. If a test laboratory does not have a specific type of equipment required for the application, or if the laboratory is not sufficiently experienced in the application process, it should be considered whether the preparation of test panels might better be done at a professional paint shop or alternatively at the manufacturers premises, under suitable surveillance by the test laboratory.

If no specific guidelines are available for the application process and equipment, the test systems should be brush applied in a climatic chamber at (23 ± 2) °C and (50 ± 5) % relative humidity. Storage of panels and drying and curing should be carried out under the same climatic conditions. If not against the paint manufacturer's specification, wood panels should be sanded by hand just before applying the first coating using abrasive paper mesh 180 to 220, in order to avoid aged wood surface. Dust should be removed carefully with compressed air.

B.2 Specifying complete coating systems

When testing a multicoat system make sure that it is applied according to specifications and record the individual products and coats and the applied amounts (spreading rate).

B.3 Equipment

Systems intended for spraying should be spray applied with the type of equipment recommended by the supplier; systems intended for brush application should be brushed on with the type of brush recommended. Similarly applies for roller coating, flow coating, dipping etc.

B.4 Process

Specifications may describe nozzle size (spray application), air-cap type (air-assisted airless spray), paint pressure, air pressure, distance between spray nozzle and panel. For other types of application equipment: type of bristles (brush application), type of roller. Climatic conditions at application. Planning and sanding of substrate before application. Time interval between machining and coating. Time interval between individual coats.

B.5 Spreading rate

Achieve a wet film thickness, in micrometers, or spreading rate, in millilitre per square metre, corresponding to the mean value of the manufacturer’s recommendation for each coat. An individual variation on and between panels of maximum 20 % of the mean value is permitted.

B.6 Flash-off

If the manufacturer recommends a specific flash-off time, it should be respected when preparing test panels. Temperature, relative humidity, air velocity and time are decisive parameters during flash-off. If the coating manufacturer does not specify a flash-off time, the panels should be dried immediately after application.

B.7 Drying and curing

The manufacturer may recommend specific equipment (convection oven, infrared or ultraviolet radiation etc, condensation drying) for drying and curing. The same applies for drying conditions (time, temperature profile, humidity, radiation wavelength and dose) and for subsequent cooling.

B.8 Overcoating intervals

The manufacturer may recommend minimum and or maximum overcoating intervals, i.e. the time permitted between application of two individual layers.

B.9 Sanding

If requested by the manufacturer, the dried surface of an individual coating layer should be (lightly) sanded with abrasive paper (or other abrasive media if requested) with a specific grit size before application of the next coat. Dust from sanding should be carefully removed, typically with clean pressurized air.

B.10 Examples for specifying application parameters

An example for specifying brush application parameters are given in Table B.1. Table B.2 gives an example for specifying spray application parameters.

Table B.1 — Example for specifying brush application parameters

Application parameters	Specification from manufacturer	Performance at testing
1st layer: coating (brand, type)	Description: blue stain protection primer; solvent borne coating, colourless	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	Application by brush	
Description of equipment (tools):	round paint brush (pure bristle): Ø 30 mm to 40 mm	
Spreading rate	50 ml/m^2 to 70 ml/m^2	
Drying time and conditions	8 h to 12 h at 23 °C, 50 % RH	
Sanding	If applicable remove the grain by using a fresh abrasive paper (grade > 150) to avoid grain raising. Remove dust from sanding carefully with pressurized air.	

2nd layer: coating (brand, type)	Description: trim paint; lacquer; solvent borne, opaque white	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	Application by brush	
Description of equipment (tools)	round paint brush (pure bristle): Ø 30 mm to 40 mm	
Spreading rate	80 ml/m^2 to 110 ml/m^2	
Drying time and conditions	24 h at 23 °C, 50 % RH	
Sanding	To avoid grain raising remove the grain by carefully using a fresh abrasive paper (mesh > 150). Remove dust from sanding carefully with pressurized air.	
3rd layer: coating (brand, type)	Description: lacquer; solvent borne, opaque white	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	Application by brush	
Description of equipment (tools)	round paint brush (pure bristle): Ø 30 mm to 40 mm	
Spreading rate	70 ml/m^2 to 100 ml/m^2	
Drying time and conditions	24 h at 23 °C, 50 % RH	
Sanding	If applicable, remove the grain and dust by carefully using a fresh abrasive paper (grade 180). Afterwards remove dust from sanding carefully with pressurized air.	
4th layer: coating (brand, type)	Description: lacquer; solvent borne, opaque white	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	Application by brush	
Description of equipment (tools):	round paint brush (pure bristle): Ø 30 mm to 40 mm	
Spreading rate	70 ml/m^2 to 100 ml/m^2	
Drying time and conditions	24 h at 23 °C, 50 % RH	

This list of parameters is not exhaustive and should be adapted to each individual case.

Table B.2 — Example for specifying spray application parameters

Application parameters	Specification from manufacturer	Performance at testing
1st layer: coating (brand, type)	Description: blue stain protection primer; water borne coating, colourless	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	(short time) dipping (30 s in a tank)	
Description of equipment (tools)	Tank to dip in	
Spreading rate	135 ml/m^2 to 195 ml/m^2	
Drying time and conditions	4 h at 23 °C, 50 % RH	
Sanding	To avoid grain raising remove the grain by carefully using a fresh abrasive paper (grade > 150). Remove dust from sanding carefully with pressurized air.	
2nd layer: coating (brand, type)	Description: translucent water borne primer;	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	(short time) dipping (30 s in a tank)	
Description of equipment (tools)	Tank to dip in	
Spreading rate	105 ml/m^2 to 140 ml/m^2	
Drying time and conditions	6 h at 23 °C, 50 % RH	
Sanding	To avoid grain raising remove the grain by carefully using a fresh abrasive paper (grade > 150). Remove dust from sanding carefully with pressurized air.	
3rd layer: coating (brand, type)	Description: intermediate coat and finish, translucent (lasure), water borne	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	Airless spraying: material pressure 100 bar to 120 bar; distance spray gun – substrate: 25 cm	
Description of equipment (tools)	Diaphragm pump or pneumatic piston pump nozzle size / angle 0,28 mm (0,011 inch) / 20° to 40°; beam 120 mm to 200 mm	
Spreading rate	70 ml/m^2 to 100 ml/m^2; wet film thickness about 75 µm	
Drying time and conditions	6 h at 23 °C, 50 % RH	

Sanding	If applicable, remove the grain and dust by carefully using a fresh abrasive paper (mesh 180). Afterwards remove dust from sanding carefully with pressurized air.	
4th layer: coating (brand, type)	Description: intermediate coat and finish, translucent (lasure), water borne (identical with 3rd layer)	
Ambient climatic conditions	23 °C, 50 % RH	
Method of application	Airless spraying: material pressure 100 bar to 120 bar; distance spray gun – substrate: 25 cm	
Description of equipment (tools)	Diaphragm pump or pneumatic piston pump nozzle size / angle 0,28 mm (0,011 inch) / 20° to 40°; beam 120 mm to 200 mm	
Spreading rate	70 ml/m^2 to 100 ml/m^2; wet film thickness about 75 µm	
Drying time and conditions	8 h at 23 °C, 50 % RH	

This list of parameters is not exhaustive and should be adapted to each individual case.

Bibliography

[1] ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

[2] EN 636, *Plywood - Specifications*

[3] EN 927-5:2006, *Paints and varnishes - Coating materials and coating systems for exterior wood - Part 5: Assessment of the liquid water permeability*

[4] EN ISO 4618:2006, *Paints and varnishes - Terms and definitions (ISO 4618:2006)*

[5] EN ISO 9117-2:2010, *Paints and varnishes - Drying tests - Part 2: Pressure test for stackability (ISO 9117-2:2010)*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™