PD CEN/TS 16700:2014

BSI Standards Publication

Paints and varnishes — Coating materials and coating systems for exterior wood — Assessment of resistance to impact of a coating on a wooden substrate

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of CEN/TS 16700:2014.

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 84745 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 31 August 2014.

Amendments issued since publication

Date	Text affected

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16700

August 2014

ICS 87.040

English Version

Paints and varnishes - Coating materials and coating systems for exterior wood - Assessment of resistance to impact of a coating on a wooden substrate

Peintures et vernis - Produits de peinture et systèmes de revêtements pour le bois en extérieur - Evaluation de la résistance au choc d'un revêtement sur un subjectile en bois

Beschichtungsstoffe - Beschichtungsstoffe und Beschichtungssysteme für Holz im Außenbereich - Beurteilung der Schlagfestigkeit einer Beschichtung auf Holzusubstrat

This Technical Specification (CEN/TS) was approved by CEN on 17 May 2014 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 16700:2014 E

Contents

Page

Foreword 3

Introduction 4

1 Scope 5

2 Normative references 5

3 Terms and definitions 5

4 Principle 6

5 Apparatus and materials 6

6 Procedure 7
6.1 Wood panels 7
6.2 Coating application 7
6.3 Assessment of resistance to impact 7
6.3.1 General 7
6.3.2 Impact test 8
6.3.3 Examination of test panel 8
6.3.4 Assessment of results 8

7 Test report 10

Bibliography 11

Foreword

This document (CEN/TS 16700:2014) 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.

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.

Introduction

During the use coated wood surfaces are exposed to various impacts. A suitable resistance of a coating on wood to impact is of importance to keep the substrate further protected with intact coating without cracks or flakes. The simple method described in this document provides quick information if a coating on wood is capable to withstand impacts without cracks or not. A similar method exists in ISO 4211-4 for furniture surfaces in interior use but in the present document the procedure is adopted and description of a carefully selected substrate is added to enable testing of coating materials and coating systems for exterior wood. The method should preferably be used on coatings that have not been exposed to weathering but it may also be applied after ageing of the coating or under different climatic conditions to gain additional experience.

1 Scope

This Technical Specification specifies a test method for assessing the resistance of a coating to impact on a defined and carefully selected wooden substrate for coatings on wood components in exterior use.

The method is preferably used on coatings that have not been exposed to weathering. The method is suitable for use either as a means of comparing different coating systems or as a quality control test to ensure that a specified performance level is being achieved or maintained.

The nature of the substrate will have a major effect on the results obtained in the test. Therefore use of any other substrate than the one specified should be clearly stated in the test report.

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.

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

ISO 3131, *Wood — Determination of density for physical and mechanical tests*

3 Terms and definitions

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

3.1
coating
layer formed from a single or multiple application of a coating material to a substrate

[SOURCE: FprEN ISO 4618:2014, 2.50.1]

3.2
impact resistance
ability of a coating to resist deformation from a sudden blow without damage

3.3
cracking
rupturing of a dry film or coat

[SOURCE: FprEN ISO 4618:2014, 2.65, modified — Notes have been left out]

3.4
flaking
detachment of small parts of a coating due to a loss of adhesion

[SOURCE: FprEN ISO 4618:2014, 2.114]

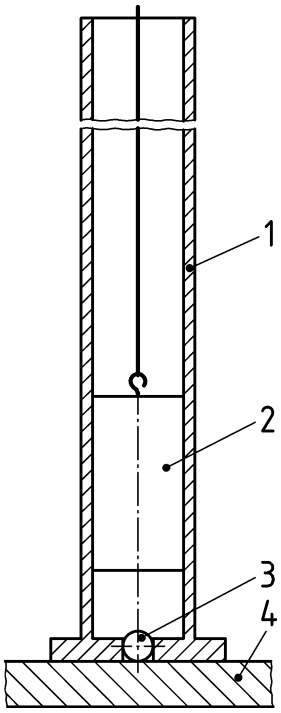
4 Principle

A cylindrical steel weight is dropped from specified heights through a vertically-mounted guide onto a steel ball of specified diameter and hardness positioned on the test panel. The degree of damage to the test area is assessed by reference to a descriptive numerical rating code.

5 Apparatus and materials

5.1 Horizontal base which provides rigid support for the test panel.

5.2 Vertically-mounted guide tube with an inside diameter of (40 ± 5) mm (1 in Figure 1). A (10 ± 0,5) mm thick disc with a centre hole of diameter (14,25 ± 0,25) mm for the ball (5.4) shall be attached to the bottom end of the guide tube.



Key

1 vertically-mounted guide tube
2 cylindrical steel weight
3 steel ball
4 test panel

Figure 1 — Impact on surface

5.3 Cylindrical steel weight (2 in Figure 1) with a mass of (500 ± 5) g and a diameter that is approximately 1 mm less than the inside diameter of the guide tube. This weight shall be made of softer alloy than the ball, so that it will not make indentations on the ball. Provision shall be made for the weight to be raised and lowered.

5.4 Steel ball (3 in Figure 1) with a diameter of 14 mm and Rockwell hardness of 60 HRC to 66 HRC, (see EN ISO 6508-1), a rolling bearing ball for example, (see ISO 3290-1).

5.5 Microscope (magnifier) with a magnification of at least ×10 for the assessment of surface defects.

6 Procedure

6.1 Wood panels

Boards of Norway spruce (*Picea abies* [L]. Karst) are selected with normal growth rate (i.e. 3 annual rings to 8 annual rings per 10 mm), a density between 0,4 g/cm^3 and 0,5 g/cm^3 (measured after conditioning) and straight grain. 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 (see EN 927-3:2012, B.10). From these boards panels with the dimensions min. 170 mm × min. 70 mm × (20 ± 2) mm free from knots, cracks and resinous streaks are produced so that the inclination of the growth rings to the test surface is 60° to 90°. 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.

The wood shall be conditioned at (20 ± 2) °C and a relative humidity of (65 ± 5) % in accordance with ISO 554 to an equilibrium moisture content of (13 ± 2) %. After conditioning wood density is determined according to ISO 3131.

6.2 Coating application

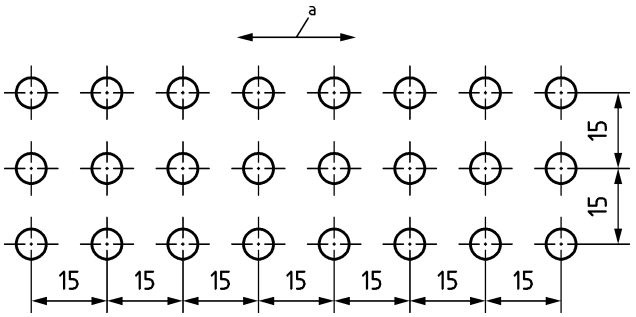
For each system, select three panels on a random basis from the available supply. Apply the coating system to the front side of one panel using the method specified by the manufacturer to give a wet film thickness corresponding to the mean value ± 20 % of the manufacturer's recommended spreading rate. Record the quantity of coating applied. The values should be stated preferably in grams per square metre, but may also be expressed as wet film thickness (in micrometres).

After coating application, age the panels for 21 days in the controlled environment at (20 ± 2) °C and a relative humidity of (65 ± 5) % in accordance with ISO 554.

6.3 Assessment of resistance to impact

6.3.1 General

No impact point shall be less than 15 mm from any edge of the test panel. The centres of impact points shall not be less than 15 mm apart. If the grid pattern method detailed in 6.3.2 is to be used, then eight lines spaced at least 15 mm apart shall be marked out on the surface that is to be tested. The lines shall be perpendicular to the direction of grain. Three impact points spaced at least 15 mm apart shall be marked off along each line (see Figure 2).



Key

a direction of grain

Figure 2 — Impact points on surface

The test panel shall be placed in a stable position on the horizontal base (5.1) in such way that all impact points are inside the area covered by the base.

The tests should be carried out at an ambient temperature of (23 ± 2) °C, and at a relative humidity of (50 ± 5) %.

6.3.2 Impact test

On each panel make six impacts from each of the following dropping heights: 10 mm; 25 mm; 50 mm and 100 mm. The dropping height, which shall be measured within ± 0,5 mm, is the distance from the top of the ball to the bottom surface of the weight.

Either make a random selection of impact sites, making provision to identify the dropping height for each site adequately, or preferably use the grid pattern described in 6.3.1 making three impacts on each numbered line with dropping heights as follows:

— on line 1 from a dropping height of 10 mm;

— on line 2 from a dropping height of 25 mm;

— on line 3 from a dropping height of 50 mm;

— on line 4 from a dropping height of 100 mm;

— on line 5 from a dropping height of 10 mm;

— on line 6 from a dropping height of 25 mm;

— on line 7 from a dropping height of 50 mm;

— on line 8 from a dropping height of 100 mm.

For each test, position the guide tube (5.2) on the test area with the ball (5.4) in direct contact with the surface. Drop the cylindrical weight (5.3) once from the specified height onto the ball.

After each test, the ball should be examined for possible deformation and if necessary replaced by an undamaged ball.

After completion of the test, the application of penetrating stain or other suitable marker (like whiteboard marker of suitable colour) to the test area can assist with the identification of surface cracks. After few seconds after marking, carefully wipe the impact mark with the soft paper towel to remove residue of the marker.

6.3.3 Examination of test panel

Carefully examine the test area under magnification and good direct light using the following procedure.

Keeping the test area directly under the light, rock the panel or the light, so that the angle between the direction of the light and the plane of the panel varies between 0° and 30°. During the rocking movement, examine the test area using the microscope (5.5).

Turn the test area of the panel through 90° and repeat the procedure.

6.3.4 Assessment of results

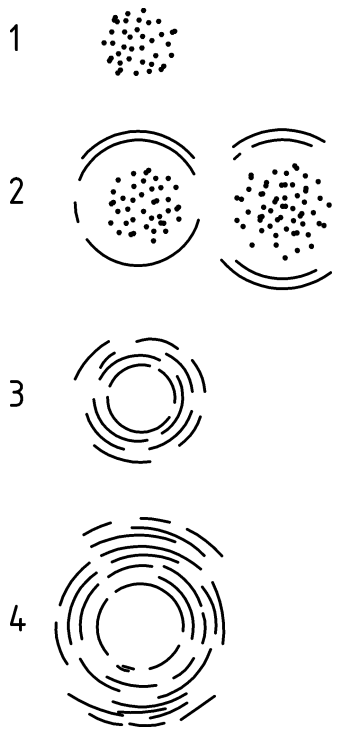
Rate the test areas according to the descriptive numerical rating code in the Table 1 (see also Figure 3).

Table 1 — Descriptive numerical rating code

Rating	Description
0	No visible changes (no damage).
1	No cracks in the surface but the impact mark is visible when light from the source is reflected from the surface at or very near the test point, and the reflected light strikes the observer's eye.
2	Slight cracking at the surface, usually one or two circular cracks within the impact mark.[a]
3	Moderate to heavy cracking limited to the impact mark.[b]
4	Cracks which extend outside the impact mark and/or flaking of the coating.

[a] The cracks need not form full circles; they can form circle arcs or straight lines in the direction of the grain. Arcs usually form across the grain. In such cases, damage is estimated on the basis of the number of cracks or circle arcs inside the impact mark. Straight cracks in direction of the grain of the wood substrate should not be ignored.

[b] A certain amount of care should be taken when deciding whether cracks lie inside or outside the impact mark, since its boundaries are often obscure.



Key

1 to 4 rating in accordance with Table 1

Figure 3 — Visible changes

Calculate the rating to be reported as the mean value (to one decimal place) of all 18 ratings on three panels for each height used.

If ratings from the same dropping height defer for more than one, all individual values should be reported beside the mean value.

If ratings from the same dropping height defer for more than two, additional impacts should be made and extreme values to be ignored. If this does not resolve the situation the test shall be repeated.

If the rating is doubtful than each test area should be rated by more than one observer experienced in this type of assessment.

7 Test report

The test report shall contain at least the following information:

a) reference to this Technical Specification;

b) name and address of the testing laboratory;

c) identification number of the test report;

d) name and address of the organization or the person who ordered the test;

e) date and person responsible for the sampling;

f) date of receipt of the coating system tested;

g) test results according to 6.3.4;

h) any deviation from this Technical Specification;

i) authorization date of the test report.

Bibliography

[1] EN 927-3:2012, *Paints and varnishes - Coating materials and coating systems for exterior wood - Part 3: Natural weathering test*

[2] FprEN ISO 4618:2014, *Paints and varnishes — Terms and definitions (ISO/FDIS 4618:2014)*

[3] EN ISO 6508-1, *Metallic materials - Rockwell hardness test - Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T) (ISO 6508-1:2005)*

[4] ISO 3290-1, *Rolling bearings — Balls — Part 1: Steel balls*

[5] ISO 4211-4, *Furniture — Tests for surfaces — Part 4: Assessment of resistance to impact*

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.™