SLOVENSKI STANDARD

SIST-TP CEN/TR 14839:2005

marec 2005

Zaščitna sredstva za les – Ugotavljanje preventivne učinkovitosti zaščitnih sredstev proti glivam odprtotrosnicam

Wood preservatives - Determination of the preventive efficacy against wood destroying basidiomycetes fungi

ICS 71.100.50

Referenčna številka
SIST-TP CEN/TR 14839:2005(en)

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 14839

February 2004

ICS 71.100.50

English version

Wood preservatives - Determination of the preventive efficacy against wood destroying basidiomycetes fungi

Produits de préservation du bois - Détermination de l'efficacité préventive vis-à-vis des champignons lignivores basidiomycètes

Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegen holzzerstörende Basidiomyceten

This Technical Report was approved by CEN on 12 November 2003. It has been drawn up by the Technical Committee CEN/TC 38.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. CEN/TR 14839:2004: E

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Foreword

This document (CEN/TR 14839:2004) has been prepared by Technical Committee CEN/TC 38 "Durability of wood and wood-based products", the secretariat of which is held by AFNOR.

The status of this document as Technical Report has been chosen because it has been judged useful to maintain this old method former ENV 839:1993 superseded by ENV 839:2002 for the use of laboratories.

Introduction

This Technical Report specifies a laboratory method of test which gives a basis for assessing the effectiveness of a wood preservative, when applied mainly as a surface treatment, against basidiomycetes fungi. In contrast the method for determining the toxic values against wood rotting fungi (EN 113) provides a mean of determining the loading at which impregnated wood of a susceptible species can be regarded as adequately protected under the test conditions.

This laboratory method provides one criterion by which the effectiveness of a product can be assessed. In making this assessment the methods by which the preservative may be applied should be taken into account. It is also recommended that results from this test should be supplemented by those from other relevant tests and above all by practical experience.

The procedures described in this standard method are intended to be carried out by suitably trained and/or supervised specialists. Appropriate safety precautions should be observed throughout the use of this Technical Report.

1 Scope

This Technical Report specifies a method of test for the determination of the preventive action of a wood preservative against basidiomycetes fungi when the preservative is applied as a surface treatment to wood.

This method is applicable to formulations of preservatives in a ready to use form as :

— water-insoluble chemicals which are being studied as active fungicides ; or

— organic formulations, as supplied or as prepared in the laboratory by dilution of concentrates ; or

— organic water-dispersible formulations as supplied or as prepared in the laboratory by dilution of concentrates ; or

— water-soluble materials, for example salts.

NOTE This method can be used in conjunction with an appropriate ageing procedure, for example EN 73.

2 Reference

EN ISO 3696, *Water for analytical laboratory use — Specification and test methods* (ISO 3696:1987).

3 Terms and definitions

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

3.1
representative sample
sample having its physical or chemical characteristics identical to the volumetric average characteristics of the total volume being sampled

3.2
supplier
sponsor of the test

3.3
superficial application process
process which does not include particular features or procedures intended to overcome the natural resistance of wood to penetration by a wood preservative product in its ready to use form

4 Principle

The test preservative is applied by brushing to the longitudinal faces of a series of test specimens of a susceptible wood species. The treated test specimens are exposed to feeder blocks colonized by pure cultures of basidiomycetes fungi. The lateral penetration of the different fungi through the exposed surface of the test specimens is assessed from sawn cross-sections of the test samples at the end of the exposure period.

5 Test materials and apparatus

5.1 Biological material

The test fungi to be used are as follows :

5.1.1 Obligatory test fungi (brown rots) on Scots pine sapwood.

Coniophora puteana (Schumacher ex Fries) Karsten (BAM Ebw. 15).

Gloeophyllum trabeum (Persoon ex Fries) Murrill (BAM Ebw. 109).

Poria placenta (Fries) Cooke sensu J. Eriksson (FPRL 280).

The strains shall be obtained and maintained in accordance with annex B.

5.1.2 Obligatory fungus (white rot) on beech, if tests including a white rot fungus are also to be undertaken.

Coriolus versicolor (Linnaeus) Quélet (CTB 863 A).

The strain shall be obtained and maintained in accordance with annex B.

5.1.3 Additional fungal species

If additional fungi are used, a description of the strain(s) equivalent to that of the obligatory fungi given in annex B shall be recorded in the test report.

The strain(s) shall be maintained in accordance with the instructions from their laboratory of origin.

5.2 Feeder blocks

5.2.1 Wood species

Scots pine sapwood (*Pinus sylvestris* Linnaeus) shall be used for feeder blocks for brown rot fungi and beech (*Fagus sylvatica* Linnaeus) for white rot fungi.

5.2.2 Wood quality

The wood shall be sound and without knots. The wood shall not have been water-stored, floated, chemically treated or steamed. The Scots pine shall be exclusively sapwood containing little resin.

NOTE Wood that has been kiln dried at temperatures below 60 °C may be used.

5.2.3 Dimensions

The dimensions of feeder blocks measured at 12 % (*m/m*) moisture content shall be :

(50 ± 0,5) mm × (25 ± 0,5) mm × (15 ± 0,5) mm

5.2.4 Number of feeder blocks

Four feeder blocks shall be prepared for each test specimen that is to be used (see 7.5).

5.3 Products and reagents

5.3.1 Water complying with grade 3 of EN ISO 3696.

5.3.2 Culture medium for feeder blocks :

— malt extract containing (0,9 ± 0,3) % (*m/m*) nitrogen :

  — concentrated : 50 g ;

  — in powder form : 40 g ;

— agar containing approximately 0,3 % (*m/m*) nitrogen and causing no inhibition of growth of fungi : 20 g ;

— water : 1 000 ml.

Combine the ingredients and heat to dissolve. Dispense into each culture vessel (5.4.5) a sufficient quantity to give a depth of between 3 mm and 4 mm. Close the vessels and sterilize in the autoclave (5.4.7) at 121 °C for 20 min. Cool to room temperature whilst lying flat.

NOTE Alternatively, the medium can be sterilized then dispensed into sterile vessels under aseptic conditions.

5.3.3 Test substrate for test specimens

An hydrated, laminar, aluminium-iron-magnesium silicate[1)] exfoliated to yield particles up to 3 mm diameter. Particles less than 1 mm shall be removed by sieving. Before use, thoroughly mix the sample of test substrate.

The test substrate shall be used only once.

5.3.4 Acidifying solution for the test substrate

An acidifying solution shall be prepared with the following composition :

— potassium chloride (KCl) solution, 0,1 mol/l : 950 ml ;

— hydrochloric acid (HCl), solution 0,1 mol/l : 50 ml.

5.3.5 End-sealing product

A material resistant to the penetration of the test preservative and the test fungi and without any fungistatic or fungicidal activity within the test specimen.

NOTE Three coats of a 2-component epoxy lacquer have been found to be suitable.

5.3.6 Fungicidal solution for assessment

Prepare a stock solution of the following composition :

Phenol	0,5 g
(methyl-1-(butylcarbamoyl) benzimidazol-2-ylcarbamate):active ingredient (benomyl[2)])	0,16 g
2, 6-dichloro-4-nitroaniline	0,16 g
Ethanol solution 50 % (V/V)	50 ml

Prepare the ready-for-use solution by adding 5 ml of the stock solution to 1 l water (see 5.3.1).

5.3.7 Staining solution[3)]

A solution of 0,04 % (*m/m*) bromophenol blue in ethanol solution, 50 % (V/V).

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1) Vermiculite is suitable.

2) Propriety products normally contain 50 % (m/m) benomyl.

3) Optionally as an aid to assess penetration of mycelium into the wood after exposure.

5.4 Apparatus

5.4.1 Conditioning chamber, well ventilated and controlled at (20 ± 2) °C and (65 ± 5) % relative humidity.

5.4.2 Culture chamber (incubator or room), dark and controlled at (22 ± 2) °C and (70 ± 5) % relative humidity.

5.4.3 Laboratory work area, well ventilated, where treatment of the test specimens is carried out

CAUTION — It is essential to follow safety procedures for handling flammable and toxic materials.

5.4.4 Test containers

Made of a material which does not have a toxic effect on the test fungi, and provided with a ventilated lid. They shall have a volume of between 2 l and 3 l, and minimum dimensions of (140 × 120) mm and 85 mm in depth.

NOTE 1 These dimensions are necessary to allow a minimum of 20 mm between the two test specimens and 10 mm between each test specimen and the container.

NOTE 2 A suitable container is shown in Figure 5.

NOTE 3 It is convenient if the containers can be sterilized by autoclaving.

5.4.5 Culture vessels

With a capacity of between 400 ml and 650 ml, providing a flat surface area of between 90 cm^2 and 120 cm^2 for the medium and provided with a ventilated closure.

NOTE Culture vessels used in EN 113 are suitable.

5.4.6 Ordinary laboratory equipment including a balance capable of weighing to the nearest of 0,01 g.

5.4.7 Autoclave

Capable of being controlled and maintaining a temperature of 121 °C.

5.4.8 Sawing equipment

Fine toothed sawing machine for cutting of test specimens for evaluation at the end of the test.

5.4.9 Test specimen supports

Made of a material which has no effect on the test fungi and does not react with the preservative. They shall be of an open texture, have a thickness of (3 ± 0,5) mm and of a sufficient area to support securely the test specimen on the feeder blocks.

NOTE Polyethylene mesh has been found to be suitable.

5.4.10 Feeder block supports

Made of a material which does not react with the culture medium and has no effect on the test fungi. They shall be of an open texture, have a thickness of (3 ± 0,5) mm and of sufficient area to support securely the feeder blocks.

NOTE Polyethylene mesh, glass rods and stainless steel rods have been found to be suitable.

5.4.11 Drying supports, that will give a minimum contact with the treated test specimens to be placed on them. The supports shall be made of a material which does not react with the test solvent or test preservative, for example glass for organic products or plastics material for salts containing fluorine.

5.4.12 Equipment for chemical gas sterilization or access to a radiation service (see annex C).

5.4.13 Facilities for vacuum filtration

Comprising vacuum source, filter flask, Büchner funnel and coarse grade fitting filter papers of 125 mm diameter.

6 Sampling of the preservative

The sample of preservative shall be representative of the product to be tested. Samples shall be stored and handled in accordance with any written instructions from the supplier.

NOTE For the sampling of preservatives from bulk supplies, the procedure given in EN 212 should be used.

7 Test specimens

7.1 Species of wood

The test shall be carried out on Scots pine sapwood (*Pinus sylvestris* Linnaeus) for softwoods and beech (*Fagus sylvatica* Linnaeus) for hardwoods.

7.2 Wood quality

The wood shall be free from cracks, stain, decay, insect damage or other defects. The wood shall not have been water-stored, floated, chemically treated or steamed.

NOTE 1 Wood that has been kiln dried at temperatures below 60 °C can be used.

The Scots pine shall be exclusively sapwood containing little resin. The growth rate shall be between 2,5 and 8 annual growth rings per 10 mm. The proportion of latewood in the annual rings shall not exceed 30 % of the whole.

The beech shall be even-grained, free from tyloses, discolouration and red heart. It shall have between 2 and 6 annual growth rings per 10 mm.

NOTE 2 It is recommended that specimens of similar growth rate are used within a single test.

7.3 Provision of the test specimens

Cut the test specimens from planed strips having a cross section (30 × 50) mm.

The orientation of the test specimen shall be with the annual rings having a minimum contact angle of 10° to the same broad face.

NOTE The preferred orientation is with the annual rings at (45 ± 10)° to the broad face which is to be exposed to the test fungus.

The cross sections shall be cut cleanly and have sharp edges. Avoid using test specimens from the butt or crown of the tree.

7.4 Dimensions of test specimens

The dimensions of each specimen after conditioning to a moisture content of (12 ± 2) % (m/m) shall be:

(100 ± 0,5) mm × (50 ± 0,5) mm × (30 ± 0,5) mm

NOTE A moisture meter of the two-pronged electrical conductivity type is suitable for assessing moisture content.

Mark each specimen so that it can be identified throughout the test.

7.5 Number of tests specimens

The specimens shall be divided into :

— e_1: treated test specimens : use at least four treated test specimens for each combination of preservative, test fungus ;

— e_2 : untreated test specimens : use at least four test specimens for each fungus.

NOTE These untreated test specimens are used to confirm the virulence of the test fungi. They are exposed in separate test containers to avoid possible effects due to the test preservative.

8 Procedure

8.1 Preparation of test specimens

8.1.1 Conditioning of test specimens before treatment

Place the test specimens (7.4) in the conditioning chamber (5.4.1) until consecutive weightings at 24 h intervals are within ± 0,1 g.

8.1.2 End-sealing

Apply the end-sealing product (5.3.5) to both end-grain surfaces of each test specimen. End-sealing shall be applied three times, allow to dry between each application.

8.1.3 Treatment with the test product

Treat the e_1 test specimens (7.5) on all longitudinal faces with the test preservative under test by brushing, weighing each test specimen before and after treatment to the nearest 0,01 g. The application rate shall follow the supplier's instructions.

NOTE The test specimens can be used to examine other treatment processes, for example dipping, and double vacuum; the method used should be recorded in the test report.

Calculate the uptake of preservative and express it in grams per square metre of treated surface.

8.1.4 Drying

Following treatment (8.1.3), place the treated test specimens on drying supports (5.4.11) with the broad face which subsequently will be remote from the feeder blocks in contact with the supports. Dry the test specimens until weightings at 24 h intervals are within ± 0,1 g.

NOTE 1 The length of drying period will vary with the nature of preservative.

NOTE 2 If test specimens are to be subjected to an ageing procedure or the assessment procedure described in annex E is to be used, the appropriate procedures should be carried out at this stage.

8.2 Preparation of test containers

8.2.1 Inoculation of feeder blocks

Sterilize the feeder blocks (5.2) by one of the methods described in annex C.