



**SLOVENSKI STANDARD
SIST EN 252:2004**

01-januar-2004

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Field test method for determining the relative protective effectiveness of a wood preservative in ground contact

Freiland-Prüfverfahren zur Bestimmung der relativen Schutzwirkung eines Holzschutzmittels im Erdkontakt

Essai de champ pour déterminer l'efficacité protectrice d'un produit de préservation du bois en contact avec le sol

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Ta slovenski standard je istoveten z: EN 252:1989

ICS:

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EUROPEAN STANDARD

EN 252

NORME EUROPEENNE

EUROPAISCHE NORM

June 1989

UDC 674.04:620.197.682:620.193.82:620.193.873

Key words: Wood preservatives, wood, stake, ground, determination, effectiveness, protection against Micro-organisms, termite, test report

English version

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Ref. No. EN 252:1989 E

BRIEF HISTORY

This European Standard was drawn up by the Technical Committee CEN/TC 38 "Durability of wood and wood products" the Secretariat of which is held by afnor.

According to the Common CEN/CENELEC Rules, following countries are bound to implement this European Standard :

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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INTRODUCTION

This European Standard is based on the document "Suggested Standard Method for Field Tests with Wooden Stakes" (published as a supplement to PANS (1) Volume 18 N° 1, 1972) which was produced after extensive international consultation within IUFRO (2).

The method is primarily concerned with protection against fungal attack. However, it is also capable of being used in areas where a termite hazard exists. It should also be noted that fungal decay may alter the resistance of a stake to termite attack and that termite attack may obliterate evidence of fungal decay.

The main objective of the method described is to evaluate the effectiveness of a preservative relative to a reference preservative. For this reason permeable timbers are used throughout so that the protective efficacy of various retentions of wood preservative can be determined.

However, it is recognized that modifications of this method may be used for other purposes e.g. to determine the relative efficacy of a preservative treatment or to determine the natural durability of the heartwood or sapwood of a selected timber species.

The method is intended for determining the relative protective effect of a preservative in timber in ground contact.

The test should run for a minimum period (usually 5 years or until the point of failure) before any interpretation of the results can be made.

Since the wood samples are partly buried in the soil in the open field during the test period, variations in test conditions from one test field to another can not be avoided. Differences in climate, soil conditions and microflora will inevitably influence the general rate of decay. However, by comparing the results obtained for stakes treated with the test product with those obtained with stakes treated with a reference preservative and those obtained with untreated control stakes, the relative protective effectiveness of the samples under test can be evaluated.

1 OBJECT

This European Standard describes a field test method for determining the relative effectiveness of wood preservatives that are applied by vacuum/pressure impregnation or other processes giving complete penetration in order to prevent degradation of timber in ground contact by micro-organisms. This method may also be used in areas in which a termit hazard exists.

The protective effect of the test preservative is assessed in relation to the effect of a reference preservative applied by a standard treatment. The relationship between the results of this field test and performance in service may vary for different preservatives.

- (1) PANS : "Pest Articles and News Summaries" published by Centre of Overseas Pest Research, College House, Wright's Lane, LONDON W8 5SJ.
- (2) IUFRO : International Union of Forest Research Organizations

2 FIELD OF APPLICATION

The method is suitable for testing any type of preservative, providing that complete penetration of the test stake is achieved.

- After suitable modification, it is possible to assess the effectiveness of a preservative product in other wood species or its effectiveness when applied by methods other than vacuum and pressure impregnation but only provided that a complete impregnation of the test stake is achieved (3).

3 WORKING PRINCIPLE

Wooden stakes are treated with preservative solutions to give a range of preservative retentions. After drying and, if necessary, an appropriate fixation period, the stakes are partially buried in soil in selected test fields in the open. A single site is regarded as adequate.

The stakes are regularly inspected and their condition compared with that of untreated controls and that of a group of stakes treated with a reference preservative both of which indicate the aggressiveness of the individual field.

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4 WOOD SPECIMENS

4.1 WOOD SPECIES

Susceptible wood species that can be completely penetrated with preservative shall be chosen as follows:

- for every test the sapwood of Pinus sylvestris (Linnaeus) (European redwood, Scots pine) shall be used,
- it is recommended that a hardwood species of local importance is included if the preservative is expected to be used in this type of wood,
- if desired, other wood species may be incorporated in the test.

(3) The only specific European aspect of this standard lies in the choice of the obligatory reference species, Pinus sylvestris. The method can be used with any other timber species of preference and is not specific to Europe in its field of application. See also Appendix 1.

4.2 WOOD QUALITY

The wood shall be of uniform growth and free from knots, cracks, stain, decay, insect holes or other defects. Stakes of resinous appearance shall be avoided. The wood shall not have been water-stored, floated, chemically treated or steamed.

The Pinus sylvestris shall show an average rate of growth of 2.5 - 8 annual rings per 10 mm.

If additional wood species are to be used the variation in the number of annual rings for each species shall be mentioned in the report. The test report shall also include mean density for the wood used in the preparation of the stakes.

4.3 CHARACTERISTICS AND DIMENSION OF STAKES

Stakes for test shall be cut from the test wood(s) as follows :

Each stake shall be straight grained and planed to within the thickness tolerance indicated. When viewed at the cross-out end, the rings shall be oriented tangentially to one of the 50 mm edges within the limits $0^\circ \pm 15^\circ$.

The dimensions shall be :

$(500 \pm 1) \text{ mm} \times (50 \pm 0,3) \text{ mm} \times (25 \pm 0,3) \text{ mm}$

when measured at a moisture content of $14\% \pm 2\%$ (m/m)

Each test shall be carried out with stakes of comparable density and any stakes in a test batch which have densities outside the range $\pm 15\%$ of the mean density shall be rejected.

Stakes may be shaped to a point prior to test or after treatment. If shaping of a point to the stake is carried out before treatment the calculation of the stake volume for use in determining the preservative retention should take this into account.

NOTE : additional stakes of different dimensions may also be included in the tests.

4.4 NUMBER OF STAKES

At least ten stakes per field for each preservative and retention shall be tested.

To avoid inclusion of "anormal" specimens in the test groups, a greater number shall be treated so that the required number can be selected after treatment. Additional stakes may also be included for chemical analysis, to aid determination of retentions and/or distribution (para 6.3).

To assess the virulence of the field conditions a series of at least 10 untreated "control" stakes shall be included in each field (see 8). Such stakes shall be regularly installed in the test field.

Include in each field at least two series of 10 standard reference stakes of Pinus sylvestris treated according to paragraph 6.2 with a reference preservative (see 7. below) to at least two different retention levels.

4.5 LABELLING OF STAKES

Each stake shall be adequately labelled with an inert, long-lasting label or tag.

5 SAMPLE OF WOOD PRESERVATIVE

The sample shall be representative of the preservative to be tested. It shall be stored and handled in accordance with written recommendations from the manufacturer.

6 CONDITIONING AND TREATMENT OF THE STAKES

6.1 DRYING iTeh STANDARD PREVIEW

The stakes shall be air dried inside, to a moisture content at which a good penetration of the preservative can be obtained. For vacuum/pressure processes the moisture content of the specimens shall be $14\% \pm 2\%$.

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6.2 TREATING PROCESS

For the reference stakes and unless otherwise specified for the test stakes a full-cell process is to be used. Initial vacuum shall be more than 90 % (≤ 10 kPa) (4) and maintained for at least 30 minutes. Pressure of at least 1 MPa shall be applied for at least 90 minutes. Complete records of treatment shall be made for each charge.

6.3 DETERMINATION OF RETENTION OF WOOD PRESERVATIVE

Calculate the volume of each stake before treatment from its dimensions (see 4.3). If shaping to a point before treatment this shall be taken into account in the calculation. Determine the mass of each stake by weighing to the nearest 0,5 g.

(4) 1 kPa = 10 mbar.

After treatment, allow the stake to drain for several minutes or wipe off with a cloth excess solution from the surface. Reweigh each stake to the nearest 0,5 g to determine the mass of treatment solution absorbed.

Calculate the retention value of each stake from the mass of treatment solution absorbed, the concentration of the treating solution and the calculated stake volume. Express the retention of the active ingredient as kilograms of preservative per cubic metre of wood. Calculate the mean retention for each series of test stakes.

Stakes with individual retentions deviating by more than 10 % from the mean value shall be rejected.

NOTE : if a highly volatile solvent is used as the carrier it may be necessary to calculate the retentions from chemical analysis on additional stakes treated for this purpose (see 4.4). It may also be desirable to carry out chemical analysis to determine the retention or distribution of preservatives within the stakes before and at intervals during the exposure period.

If retentions are calculated from analysis the methods of sampling and analysis shall be indicated in the test report.

6.4 RANGE OF PRESERVATIVE RETENTION

Test each preservative with at least three and preferably five different retention levels. These different levels shall be achieved by using fresh preservative solutions at different dilutions and without varying the treatment conditions.

NOTE : use a fresh solution at each dilution ; the dilution of a quantity of solution which has been used already may be unsatisfactory because preferential absorption may have occurred during the previous treatment schedule.

The middle retention of the series shall correspond to that value recommended by the developer or manufacturer as suitable for use in ground contact ($x \text{ kg/m}^3$). A suitable range would then be : 0,25 x, 0,5 x, x, 2 x and 3 x kg/m^3 . A narrower range can be used if sufficient information exists on the effective range of the product, for example a geometrical series with a factor of $\sqrt{1,7}$.

If the preservative is unsuitable for dilution, the different retentions shall be achieved by varying the treatment parameters given in 6.2 provided that complete penetration is obtained (see clause 2).

6.5 POST TREATMENT CONDITIONING OF STAKES

For those products requiring a fixation period the recommendations of the manufacturer should be followed. For the reference preservatives the stakes shall first be close-stacked, each retention group separately, and kept wrapped for an appropriate period in polyethylene or similar material to avoid rapid drying.

For drying after fixation, make open piles protected from rain and frost, with 10 mm stickers between the stakes.

7 REFERENCE STAKES

7.1 REFERENCE PRESERVATIVE

Stakes of Pinus sylvestris sapwood shall be treated according to paragraph 6.2 using the reference preservative, with the following composition :

CuSO ₄ .5H ₂ O	35.0 % m/m
K ₂ Cr ₂ O ₇	45.0 % m/m
As ₂ O ₅ .2H ₂ O	20.0 % m/m

Chemical purity of individual components should be at least 98 %.

Two dry salt retentions shall be used approximating to 9 kg/m³ and 2 kg/m³ respectively. The precise retentions obtained will be dependent on the concentration and uptake of the solution. For instance, at an uptake of 600 l/m³ these loadings will be achieved with solution concentrations of 1,5 % (m/V) and 0,3 % (m/V) respectively. The uptake of Pinus sylvestris sapwood should be in the region of 600 - 700 l/m³.

At least 10 stakes shall be tested with each preservative concentration.

7.2 ALTERNATIVE REFERENCE PRESERVATIVE

If it is not possible to use a preservative containing arsenic, the reference stakes may be treated with an alternative preservative although this preservative is unsuitable for areas where attack by termites is expected. This preservative shall have the following composition :

CuSO ₄ .5H ₂ O	50.0 % m/m
K ₂ Cr ₂ O ₇	48.0 % m/m
Cr O ₃	2.0 % m/m

Chemical purity of individual components should be at least 98 %.

Two dry salt retentions shall be used approximating to 17 kg/m³ and 4 kg/m³ respectively. The precise retentions obtained will be dependent on the concentration and uptake of the solution. For instance at an uptake of 600 l/m³ these loadings will be achieved with solution concentrations of 2,8 % (m/V) and 0,7 % (m/V) respectively. The uptake of Pinus sylvestris sapwood should be the region of 600 - 700 l/m³.

At least 10 stakes shall be tested with each preservative concentration.

NOTE : additional reference preservatives and wood species may be employed as desired.

8 UNTREATED CONTROL STAKES

A series of at least 10 untreated control stakes shall be included in each test field and replaced when they fail.

If no subsequent tests have been installed, a new control serie should be added when 9 of the original 10 per serie have reached an average rating 3 or more. The control stakes shall be seasoned and stored in the same way as treated specimens before installation.

The object of using untreated controls is to compare the rate of attack of untreated wood with that of wood treated with the preservative under test and that of wood treated with the standard reference preservative. The rate of decay in the controls indicates the aggressiveness of the test field.

9 TEST FIELDS

9.1 NUMBER OF TEST FIELDS

The method is valid using one test field. However it may be useful to select, two or more test fields having different conditions of climate, type of soil, etc.

9.2 CONDITION OF THE TEST FIELD

A specific area selected for the test field shall be of uniform soil character, on level, moist but well drained land. Heavy clay soils and other soils liable to be water-logged as well as very dry grounds should be avoided. In some countries the fire-hazard in summer must be considered very seriously and the site selected and protected accordingly.

In order to promote reproducibility and to reduce variation in the test results avoid overabundant vegetation on the field. For example a very tight grass turf may lead to poor contact between the soil and the stake surface and high and tight vegetation may extend or cause a transfer upwards of the high hazard zone of the stake.

The vegetation shall be cut by physical means and in such a way that the buried stakes remain untouched. Chemicals to control the growth of vegetation (herbicides) may affect the fungal attack and shall therefore not be used.

9.3 INSTALLATION OF THE STAKES IN THE TEST FIELD

The stakes of each test series shall be installed vertically at random within the appropriate section of the test field with at least 300 mm between the stakes. The stakes shall be buried to half their length (250 mm). A template aids installation.

The stakes shall not be hammered down into the soil, since this may damage the wood (fractures, splits) and influence the test results. A spike, a spade or other convenient tool can be used to make a suitable hole in the ground. Having inserted the stake in the hole it is important to press the surrounding soil tight to the stake so that a good contact is achieved between the soil and all the surfaces of the buried half of the stake.