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General introductory document on European (or CEN) methods of tests for wood preservatives

Einführendes Rahmendokument für die europäischen (oder CEN-) Verfahren zur Prüfung von Holzschutzmitteln

Document général d'introduction aux méthodes d'essais européennes (ou CEN) des produits de préservation du bois

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GENERAL INTRODUCTORY DOCUMENT ON EUROPEAN (or CEN)
METHODS OF TESTS FOR WOOD PRESERVATIVES

Document général d'introduction aux méthodes d'essais européennes (ou CEN) des produits de préservation du bois.

Einführendes Rahmendokument für die europäischen (oder CEN) Verfahren zur Prüfung von Holzschutzmitteln.

This Harmonization Document was approved by CEN on 1983-06-15 (date of ratification). All texts prepared by CEN exist in the three official versions (English, French and German).

According to the CEN Internal Regulations the CEN members are bound to announce the existence of this Harmonization Document at national level

by or before : 1984-06-06 (date of announcement)

and to withdraw all conflicting national standards

by or before : 1984-06-06 (date of withdrawal)

and to bring any national standards into line with this Harmonization Document.

The CEN members are the national standards organizations of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

Central Secretariat : Rue Bréederode 2, B-1000 Brussels

BRIEF HISTORY

This harmonization document was prepared by Technical Committee CEN/TC 38 "Methods of test for wood preservatives" of which the Secretariat is held by AFNOR.

The document was intended to provide background information for users on the concepts and factors taken into account by the CEN Committee in preparing the published series of European Standards dealing with test methods for wood preservatives in order to facilitate their application but did not itself prescribe standard procedures.

It was studied and submitted to voting as Pr EN 160 and received the necessary approval for publication as EN. However some members did not consider that it could be implemented nationally because the content of this document, although important for the presentation of standardized methods and the facilitation of their application, did not have the real character of a Standard and it was finally decided to publish the document as a harmonization document.

This harmonization document was adopted by CEN on the strength of its acceptance by the following member countries :

Austria - Belgium - Denmark - France - Germany - Italy - Norway - Portugal - Spain - Sweden - Switzerland, United Kingdom.

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0. INTRODUCTION

Preserving wood against biologically destructive agents such as insects and fungi is necessary in certain situations where the natural durability of the species of wood used is insufficient, in relation to the environment in which the wood is used.

The resistance which can be conferred artificially to the wood depends on a number of factors, not only on the effectiveness and the permanence of the chemical preservatives used, but also on the ways in which these products are applied, the anatomical structure of the wood to be treated and the physical state of the wood at the time of treatment. These latter factors are particularly important with regard to the depth of penetration of the preservatives into the wood and their distribution in the different tissues.

The level of preservation necessary also depends on a number of factors : climatic conditions (temperature and relative humidity), exposure to the elements, ventilation, contact of the wood with the soil (and in this case the nature of the soil), or with other materials, the diversity of the biological agents and their virulence, etc.

None of these factors can be ignored when considering wood preservation and their interdependence shall be taken into account in order to make a valid study of the problems to be resolved.

It is no less true that the intrinsic characteristics of each of these factors may also be examined individually.

This is the case for wood preservatives, for which it is important to have information, with all other conditions remaining constant, on their action on insects, fungi or other destructive organisms, their stability, penetrating power and how well they are held within the wood.

Various methods of tests may be used to this end, whether in the natural environment, or in the laboratory. Each one has its advantages and disadvantages and they may complement or overlap each other.

There is no intention of imposing one method rather than the other on research whose initiative is required for developing products and for advancing knowledge on this subject.

If wood preservatives are to be compared not only between laboratories in the same country but between laboratories in different countries, it is essential that the test conditions remain constant in each laboratory. The tests shall therefore be accurately described and strictly adhered to.

It is to allow such exchanges of views that the European Committee for Standardization set up Technical Committee 38 whose work has resulted in the standardization of a certain number of methods of test. Each one deals with a particular aspect of the necessary qualities of a wood preservative ; recourse may be made to one or more, or all of these methods in order to establish that the preservative has the properties required for a given application.

1. SCOPE

This Harmonization Document outlines European Standards for the evaluation of wood preservatives in order to facilitate their use, in order to assist the international exchange of views in this field and, in particular, to allow the extension of homologation between countries.

2. FIELD OF APPLICATION

The methods given in clause 8 characterize the inherent qualities of a preservative without considering the industrial techniques used for applying them or the nature of the wood which is likely to be treated ; these two factors shall be taken into account into the practical application of these products. These methods permit the determination of the preventive and eradicator action of a preservative with regard to wood-destroying fungi, e.g. insects and fungi ; it also verifies the probable duration of this action.

3. GENERAL PRINCIPLES

In preparing these methods emphasis has been placed on their reproducibility, despite the limitations on attaining it arising from the behaviour of living organisms which destroy the wood and the heterogeneity of this material, itself once a living organism. That is why the operating conditions and the criteria for selecting the agents used (organisms, wood and other substances) have been accurately defined, sometimes in a very detailed manner.

The need to obtain results quickly has also been studied, insofar as this is possible when dealing with biological matters, and that is why an acceleration of the degradation processes and of the ageing phenomena of the preservatives in the wood has been covered in the proposed methods.

Only laboratory tests can meet these needs of reproducibility and for rapid results which would not be possible under practical conditions.

On the other hand, although these laboratory tests cannot cover all the complex factors interacting with each other in a natural environment, they can be of value as a guide. Therefore CEN attaches equal importance to the establishment of the experimental principles of tests made under natural conditions of exposure to biological attack and ageing and is drafting corresponding test methods, primarily for complex biological situations (e.g. soil microflora) or if it is difficult and/or expensive to properly simulate the conditions in a laboratory (e.g. marine environment). The results can only be interpreted with sufficient experience and enable an estimate of the minimum capacity of the products to give the desired protection to be made. This can only be confirmed by practical experience of use in natural conditions (see 9.4).

4. SELECTION OF WOOD SUBSTRATE FOR THE PRODUCTS UNDER TEST

The choice of wood used for the tests is of great importance and can have a considerable influence on the results obtained. It is therefore made according to very strict criteria.

As the objective is to determine the effectiveness of the product in impregnated wood, the test specimens have to be prepared from wood that can be impregnated to a homogenous extent, such as pine sap wood and beech, rather than from other woods which are more resistant to penetration, even if the latter are used to a much greater extent in the construction industry. The two wood species also have the advantage, that if untreated they suffer severe deterioration by the test organisms.

If the destructive agent concerned has specific requirements e.g. a need for starch and an adequate vessel diameter, this is obviously taken into account, and is the reason for using oak sap wood in the case of Lyctus.

In an effort to obtain the maximum reproducibility, in spite of the extreme heterogeneity of wood, not only the botanical species of the wood used, but also the anatomical and physical characteristics are defined (position in the tree : sap wood, width of annual rings, proportion of late wood, etc.). The orientation of the grain and of the annual rings are also taken into account when preparing the test specimens, if this is important for the particular test.

5. TREATING THE TEST SPECIMENS WITH THE PRODUCT UNDER TEST

As stated in clause 4, the aim of the test is to submit wood impregnated by the product to be studied, to the action of the destructive organism.

The techniques adopted in each of the methods are not intended, therefore, to reproduce any particular industrial treatment of wood, but to obtain satisfactory penetration and distribution in the laboratory test specimens ; it could be that total impregnation of the mass of the test specimens may be required or, for other methods, distribution over the surface areas, more representative of superficial protection, may be preferable. In this latter case, sealing the transverse sections prevents excessive longitudinal penetration via the axial paths which would falsify the results, especially in the case of small test specimens.

In order to attain good reproducibility, the method of treating the test specimens has been described very precisely in each of the methods.

The aim of a certain number of methods is to determine the toxic value of a preservative, i.e. the concentration below which the wood is no longer adequately protected and the concentration above which a product ensures protection. Several series of test pieces are impregnated, as uniformly as possible, with increasingly diluted amounts of the product under test, in a known solvent which does not affect the destructive organism concerned.

Attention is drawn to the precautions to be taken when applying the recommended methods in order to avoid any accidents or health risks to the operators. The safety standards required for the handling of inflammable or toxic substances (ventilation of the working areas for example), and for the use of vacuum desiccators should be complied with. Excessive exposure of the operators to the solvents or to their vapours shall be prohibited, as well as the use of those solvents with a high health risk, such as benzene, which, because of this, is not recommended in any Standard.

6. WOOD DESTROYING ORGANISMS TO WHICH THE PRODUCTS UNDER TEST ARE SUBMITTED

The deteriorating organism to be used in each of the methods are defined under "biological material".

There can be no question of testing with all the biological agents liable to attack wood in service or even with a majority of them.

Therefore, those biological agents most suitable for evaluating a preservative have been selected.

The following factors were taken into account in this selection :

- the economic importance of the damage done by these destructive organisms to wood in service, their frequency and geographical distribution,
- the extent to which they represent a type of deterioration,
- the greater or lesser ease with which they lend themselves to laboratory techniques and artificial culture or rearing,
- the amount of damage they cause which enables valid measurements to be taken and the results to be obtained more quickly,
- the confidence which can be placed in the results, justified by past experience especially with regard to reproducibility of results.

To the selection of the biological material shall be added the requirement that the organisms used should be in a good state, which means that they should be cultivated, conserved and that their reproduction should be in compliance with the requirements laid down in the corresponding Standards.

6.1 Fungi

The fungi included represent the major types of rot which are liable to destroy wood in service.

That is to say, several types of brown rot and one type of white rot among the Basidiomycetes (EN 113) for which several fungi shall always be used in the same test.

Account was also taken of the specificity of these organisms with respect to softwoods or hardwoods or, alternatively, their broad spectrum of attack.

Others were included because of their tolerance to certain categories of fungicide.

However, the definition of the fungi used as test organisms has not been limited to the designation of the species, but also involves specifying the strain to be used. Indeed, it has been observed that the virulence of the attacks and their sensitivity to the fungicides varies not only from one species to another but also from one strain to another. Regular checks are therefore made to check that the organism retains its capacity for destructive action against the wood.

The obligatory use of these strains to characterise a product, may be complemented by using extra optional fungi which are of particular interest for a geographical region or for a particular envisaged end-use. In these cases, it is necessary to be assured of their performance under the artificial conditions of laboratory tests (see EN 113 - Annex F).

No decision has yet been made regarding the fungi responsible for soft rot (Ascomycetes and Deuteromycetes). Indeed, CEN/TC 38 has found the state of knowledge inadequate for a common method to be drawn up and the International Research Group on Wood Preservation (IRG) has been asked to carry out further research.

Blue stain fungi do not rot timber but do cause bad discolouration in wood in service and can disfigure and destroy layers of paint applied to the wood. For this reason EN 152 examines the combination of preservative treatments and finishing coats. It can also be used for testing the effectiveness of a decorative finish on its own. Part 1 of this standard refers to products applied using straight forward methods such as brushing and dipping and Part 2 enables the testing of preservatives applied by more sophisticated industrial techniques.

As these products are for the protection of timber exposed to the exterior, external ageing is included in the test prior to laboratory biological testing (it is anticipated that, in the future, natural ageing will be replaced by artificial ageing, provided that research in progress shows that this produces valid results).

6.2 Insects

Four insects of great economic importance in Europe have been included, for which there are specific test methods which sometimes vary according to whether the action is eradicant or preventive: three belong to the order Coleoptera:

- Hylotrupes bajulus (Linnaeus), (Cerambycidae);
<https://standards.iteh.ai/catalog/standards/sist/76dc482c-9e6-409a-a8e3-1001-2005>
- Anobium punctatum (de Geer), (Anobiidae);
- Lyctus brunneus (Stephens), (Lyctidae).

The fourth insect is an Isoptera, the termite and from the many species Reticulitermes santonensis (de Feytaud) has been included.

7. ARTIFICIAL AGEING OF PRESERVATIVES IN WOOD

A short time after the wood preservatives are applied they can be very active. This activity can decrease with time, either by chemical decomposition, leaching, vaporization or sublimation of certain active elements.

The tests described in the methods of evaluation are usually carried out for only a few weeks after the test specimens have been treated.

As the loss of the initial action is an important risk, it is desirable to measure its extent by appropriate tests.

The most significant test could be carried out in natural ageing conditions letting all the factors involved interact with each other. However this procedure has two major disadvantages which prevent it being adopted.

The first is the time that it would take (some years). The second is its lack of reproducibility.

Therefore, it has been necessary to devise accelerated methods which can be carried out in the laboratory, bringing together the most important factors responsible for the loss of activity of the treatments, i.e. evaporation and leaching. The small dimensions of the test specimens enable acceleration of the ageing process.

These artificial ageing methods, applicable to a number of the tests, have been described in two separate documents (EN 73 and EN 84) rather than being repeated in a number of documents. They are an additional stage in the preparation of the test specimens for the biological methods in which they are included.

The results of ageing tests are also comparative in character. They cannot be translated into a number of years of service life as no coefficient has been established with certainty together with the fact that the idea of number of years service cannot be fixed and varies according to a large number of factors of which some are foreseeable and some are not.

8. LIST OF METHODS STANDARDIZED BY CEN/TC 38 (1983-06-15)

The methods which have been the object of a European Standard at the time that this Harmonization Document was issued are:

- EN 20 - Wood preservatives - Determination of the preventive action against Lyctus brunneus (Stephens) (Laboratory method)
- EN 21 - Wood preservatives - Determination of the toxic values against Anobium punctatum (de Geer) by larval transfer (Laboratory method)
- EN 22 - Wood preservatives - Determination of eradicant action against Hylotrupes bajulus (Linnaeus) larvae (Laboratory method)
- EN 46 - Wood preservatives - Determination of the preventive action against recently hatched larvae of Hylotrupes bajulus (Linnaeus) (Laboratory method)
- EN 47 - Wood preservatives - Determination of the toxic values against Hylotrupes bajulus (Linnaeus) larvae (Laboratory method)
- EN 48 - Wood preservatives - Determination of eradicant action against the larvae of Anobium punctatum (de Geer) (Laboratory method)
- EN 49 - Wood preservatives - Determination of the toxic values against Anobium punctatum (de Geer) by egg laying and larval survival (Laboratory method)
- EN 73 - Wood preservatives - Accelerated ageing tests on treated wood prior to biological testing - Evaporative test
- EN 84 - Wood preservatives - Accelerated ageing tests on treated wood prior to biological testing - Leaching procedure