DANSK STANDARD

DS/EN 330

1. udgave

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Træbeskyttelsesmidler
Prøvning i fri luft til bestemmelse af et træbeskyttelsesmiddels relative beskyttelsesvirkning anvendt under en overfladebehandling og eksponeret uden jordkontakt: L-joint metoden

Wood preservatives – Field test method for determining the relative protective effectiveness of a wood preservative for use under a coating and exposed out-of-ground contact: L-joint method

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Nationalt forord

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National foreword

This publication is approved as Danish Standard. It is identical with European Standard EN 330:1993.

Contents

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English version

Wood preservatives — Field test method for determining the relative protective effectiveness of a wood preservative for use under a coating and exposed out-of-ground contact: L-joint method

Produits de préservation du bois — Essais de champ pour déterminer l'efficacité protectrice d'un produit de préservation du bois pour emploi sous un revêtement et hors de contact avec le sol: Méthode avec un assemblage en L

Holzschutzmittel — Freilandversuch zur Bestimmung der relativen Wirksamkeit eines Holzschutzmittels zur Anwendung unter einem Anstrich und ohne Erdkontakt: L-Verbindungs-Methode

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

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

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been drawn up by the Technical Committee CEN/TC 38 'Durability of wood and wood-based products' of which the secretariat is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at least by October 1993, and conflicting national standards shall be withdrawn at the latest by October 1993.

This European Standard has been approved by CEN, and in accordance with the common CEN/CENELEC Rules, the following countries are bound to implement this European Standard: Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden and United Kingdom.

Contents

Introduction

This European Standard describes a method of test for wood preservatives that are intended for use in timber to be exposed out of contact with the ground but with a paint or similar surface coating.

The main objective of the method is to evaluate the relative effectiveness of the preservative, applied to jointed samples of Scots pine sapwood by a treatment method relevant to its intended practical use. Effectiveness is evaluated relative to a reference preservative treatment.

The method is concerned with protection against attack by the complete sequence of micro-organisms occurring under natural conditions, including eventually those basidiomycete fungi that cause decay. It takes into account also the effects of weathering (light, rain and heat) on the effectiveness of the preservative under the paint.

The method may be used, after modification, for other purposes including evaluating the effectiveness of a test preservative:

- in timber of a different wood species;
- under different types of coating.

Since the L-joints are exposed to natural outdoor conditions during the test period, variations in test conditions from one area to another have to be expected. Differences in climate, especially rainfall, will inevitably influence the general rate of development of decay fungi. However, by comparing the results obtained for the test preservative with those obtained with the reference preservative and with those for untreated control L-joints, the relative protective effectiveness of the preservative under test can be evaluated.

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

1 Scope

This European Standard specifies a method for determining the relative protective effectiveness against fungal decay of a wood preservative applied to wood, in combination with a subsequent surface coating, and exposed out of contact with the ground.

The method is applicable to the testing of commercial or experimental preservatives applied to non-durable timbers by methods appropriate to commercial practice and subsequently overcoated with a specified coating system. The method is applicable to products and processes used individually or in combination to prevent the development of the decay in the wood.

2 Normative reference

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 2808 : 1974 *Paints and varnishes — Determination of film thickness*

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 representative sample

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

3.2 supplier

The sponsor of the test.

4 Principle

Jointed samples (L-joints) are treated, assembled, coated and placed out of doors, out of contact with the ground and exposed to the normal environmental and ecological factors which affect coated wood so exposed in practice. The fungi that colonise such units invade in their natural sequence of moulds, blue stain fungi, soft rot fungi and basidiomycetes. Colonization by basidiomycetes, as shown by the presence of visible decay, is assessed at least annually by visual inspection of the L-joints after being disassembled. In addition, periodically, sets of samples are examined after sawing to reveal their internal condition. These data are compared with those generated using a reference preservative and untreated samples to assess relative performance.

NOTE 1. It is recommended that the replicates for non-destructive inspection continue to be exposed beyond the minimum 5 year period, preferably until failure.

NOTE 2. Inspection after sawing is necessary because application by processes such as dipping or double vacuum treatment does not result in the complete penetration of the L-joint members. The untreated core of the samples, therefore, may show visible decay before it becomes visible on surfaces within the joint.

5 Materials

5.1 End-seal compounds

5.1.1 *Preservative resistant end-seal*

A material resistant to the penetration of the reference and test preservative solutions (or separate materials for each).

NOTE. Polyvinyl acetate (PVAc) glues have been found to be suitable for most organic solvent formulations.

5.1.2 *Weatherproof end-seal*

A material which prevents water entry and remains effective during long term exposure to the weather.

NOTE. Two coats of an epoxy-resin/pitch compound have been found to be suitable.

5.2 Reference coating

A medium-build, opaque, gloss or semi-gloss, solvent-borne, alkyd-based paint applied in two or three coats to give a dry film build of 50 μm ± 5 μm when measured by method 4A (microscope method) of ISO 2808.

If a particular coating system is specified, by the supplier of the test preservative, to be an integral part of the protection system, this shall be used in conjunction with the test preservative, instead of the reference coating. Details of the coating system used shall be given in the test report.

5.3 Reference preservative

Containing hexabutyldistannoxane (bis(tri-*n*-butyltin)oxide) as the active ingredient and with the following formulation:

Hexabutyldistannoxane (minimum 95 % (*m/m*) active ingredient)	1 % (*m/m*)
Aliphatic neutral hydrocarbon resin	5 % (*m/m*)
Hydrocarbon solvent (distillation range 160 °C to 215 °C; aromatic content < 17 % (*m/m*))	94 % (*m/m*)

The hexabutyldistannoxane shall be in the form known as 'stabilized' containing either 0,1 % (*m/m*) 2-hydroxypropanoic acid or 1 % (*m/m*) mercaptoethanoic acid.

5.4 Wood specimens

5.4.1 *Wood species*

For every test, sapwood of *Pinus sylvestris* (Linnaeus) (Scots pine, redwood) shall be used. Some heartwood is permitted in the mortise member (see **5.4.3**)

NOTE. Optionally, other wood species may be chosen that are in use or proposed for exterior use. They should include a hardwood if the preservative is expected to be used in hardwoods, for example beech. Specimens should be cut exclusively from sapwood or heartwood.

5.4.2 *Quality of wood*

Use sound, straight-grained wood without knots. Material of a resinous appearance shall be avoided.

Use wood with between 2,5 annual growth rings per 10 mm and 8 annual growth rings per 10 mm in the case of Scots pine sapwood. The proportion of latewood in the annual rings shall not exceed 30 % of the whole for Scots pine sapwood.

The wood shall not have been floated, stored in water or heated above 60 °C or treated with chemical agents.

NOTE. If additional wood species are used, the density and the number of annual rings for each species should be mentioned in the report.

5.4.3 *Preparation of test specimens*

Condition the timber stock to (14 ± 2) % (*m/m*) moisture content. Prepare sticks of (38 ± 1) mm × (38 ± 1) mm cross-section by sawing and planing from the timber (**5.4.1**) with the grain parallel to the long axis and annual rings aligned parallel with one lateral face.

NOTE 1. A moisture meter of the two-pronged electrical conductivity type is suitable for assessing moisture content.

The L-joint is prepared as two members (figure 1) both (203 ± 1) mm long. The tenon members shall be cut from the most accurately prepared and orientated sticks and the mortise members from the remaining material. The joint region shall be free from any minor defects.

NOTE 2. Heartwood up to 50 % of the cross-section is permitted in the mortise member of sapwood specimens, except within the joint itself.

Machine the joints to the dimensions given in figure 1, with a tolerance such that the two members provide a firm but not tight push-fit. Align the tenons and the mortises at 90° to the annual rings (figure 1). Round the longitudinal edges of the tenon members exposed during the test to a radius of 2 mm (figure 1). Store the L-joint members in the conditioning chamber (**6.2**) until required for treating.

5.4.4 *Number of L-joints*

The specimens are divided into:

L_1 – L-joints for non-destructive visual inspection (at least 5 years' exposure);

NOTE 1. To obtain the maximum information from the test, specimens should be retained on the rack and inspected annually until failure.

Prepare at least 10 for each combination of test parameters (wood species (**5.4.1**), test preservative (**8.2**), reference preservative (clause **9**), untreated control (clause **10**) and coating system (**5.2**)).

L_2 – L-joints for destructive visual inspection (up to 5 years' exposure);

Prepare at least 10 for each combination of test parameters.

NOTE 2. This allows 5 replicates for sampling at each of two exposure periods.

NOTE 3. It is normally necessary to treat a higher number of replicates so that the required number can be selected after treatment (see **8.3**) and the inclusion of specimens achieving abnormally high of low retention of preservative avoided.

5.4.5 *Labelling of L-joints*

Individual members of L-joints shall be assigned unique identification numbers in such a way that these numbers are retained through all preparation operations. After application of coatings, an identification label or tag (**6.6**) of suitably inert and long-lasting material shall be affixed to each L-joint.

6 Apparatus

6.1 *Sawing equipment*. A sawing machine capable of producing a fine-sawn finish.

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

6.3 *Preservative treatment plant*. Equipment suitable for carrying out vacuum, vacuum-pressure or immersion treatment of specimens.

6.4 *Balance*, capable of weighing to the nearest 0,1 g.

6.5 *Safety equipment and protective clothing*, appropriate for the test product and the reference preservative, to ensure the safety of the operator.

6.6 *Labels*. Inert, long-lasting labels and corrosion resistant fixing pins.

6.7 *Exposure site*. An open area free from tall vegetation (see **6.8**) and extremes of local environmental influences especially industrial pollution.

6.8 *Weathering racks*. L-shaped racks facing the prevailing weather[1)], approximately 900 mm above ground level, 500 mm above any low vegetation (grass is acceptable), sloping back at 10° and made of durable materials. The racks shall be provided with slots or holes to prevent the collection of water in the angle of the rack. The racks shall be provided with stickers of a durable unreactive material, (for example *Pinus sylvestris* heartwood) cross-section, minimum 5 mm × 5 mm, maximum 10 mm × 10 mm, to separate the tenon member of the L-joint from the rack, and with spacing pieces affixed to the back, to separate the L-joints and to maintain their orientation. The cross-section of a suitable exposure rack is shown in figure 2.

6.9 *Ordinary laboratory equipment.*

7 Sampling

The sample of preservative shall be representative of the product to be tested.

If a particular coating system is specified by the preservative supplier as an integral part of the protection system, it shall be representative of that to be tested.

Samples shall be stored and handled in accordance with any written requirements from the supplier.

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

8 Treatment and handling of test L-joints

NOTE. The sequence of operations involved in the preparation and exposure of the L-joints is summarized in annex A.

8.1 End-sealing

Remove the L-joints from the conditioning chamber (**5.4.3**). Seal the end of the tenon members (but not the mortise members) remote from the joint with the preservative resistant end-seal (**5.1.1**); allow to dry.

8.2 Treating process

Determine and record the volume of each of the L-joint members and the mass to the nearest 0,1 g.

Apply the test preservative to the test L-joints using the process specified by the supplier of the preservative/protection system.

NOTE 1. A range of model treatments is given in annex B.

NOTE 2. For development products it is preferable to test at more than one retention, ideally three, ranged about that thought to be appropriate for out-of-ground contact use. The concentration or retention (X) may be achieved by varying the concentration of active ingredient(s) in the formulation. Alternatively, the parameters of the treatment process can be altered. A suitable range of retentions could be $0{,}5X$ $1X$ and $2X$. A narrower range can be used if the capability of the product is sufficiently well known, for example, a geometrical series with a factor of $\sqrt{2}$.

8.3 Retention of preservative

After treatment, the excess of solution on the surface of the L-joint members shall be allowed to drip off or be removed with a cloth. Reweigh each member immediately and record the mass after treatment to the nearest 0,1 g. Calculate the uptake of preservative solution for each member and express it in kilograms of preservative per cubic metre of wood for penetrating processes and in grams of preservative per square metre of wood for superficial application methods.

Reject any member with retentions deviating by more than 10 % from the median for that type of member and substitute an appropriate alternative (see note 3 to **5.4.4**) which falls within this range.

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1) In most of the European area this would normally be south-west.

8.4 Post-treatment handling of the L-joints

8.4.1 *Conditioning*

Dry the treated L-joint members in a well-ventilated covered area protected from rain and frost. Ensure free ventilation by storing members horizontally on supporting rods of a material that does not react with the preservative, for example, glass for organic products.

Dry the L-joints treated with the test preservative in accordance with the supplier's instructions for its use.

8.4.2 *Coating*

Assemble the pairs of L-joint members (**5.4.3**). Apply the reference coating or, for test preservatives, the particular coating specified by the supplier of the test preservative (see **5.2**) to all lateral faces of the L-joints and allow to dry.

NOTE. If the test is to be exposed for the minimum 5-year period, it is not necessary to maintain the coating. If the test is to be exposed beyond 5 years, then the coating on the replicates for non-destructive visual inspection (L_1) should be maintained in accordance with the supplier's instructions. Following such maintenance, the joint should be separated (see **8.4.5**) before the L-joints are returned to the racks. Details of maintenance should be included in the test report.

8.4.3 *Labelling*

Ensure permanent labels (**6.6**) are affixed to the mortise member, well away from the joint area, and positioned so that they can be read when the L-joints are in position on the weathering rack (**6.8**).

8.4.4 *End-sealing*

Apply the weather-proof end-seal (**5.1.2**) to the two ends of the assembled L-joint and carry it over 2 mm to 3 mm onto the lateral coated surfaces to provide a complete seal.

8.4.5 *Separating the L-joint*

When the surface coating is thoroughly dry, take the L-joint apart so as to break the coating across the joint itself. Reassemble the L-joint.

NOTE. This operation ensures that all L-joints will start to take up water at the same time, and therefore prevents variation due to the coating excluding water from some L-joints longer than from others.

9 Reference L-joints

Prepare at least 20 reference L-joints ($10L_1$ + $10L_2$, see **5.4.4**) of *Pinus sylvestris* sapwood as described in **8.1**. Determine and record the volume and mass of each of the L-joint members before treatment. Apply the reference preservative (**5.3**) using either a dip treatment or a double vacuum treatment. The method of treatment selected shall be appropriate to the preservative system under test. The process parameters shall be as follows:

- dip process	- total immersion	3 min
- double vacuum	- initial vacuum 70 kPa	3 min
	- atmospheric pressure	3 min
	- final vacuum 35 kPa	20 min

After treatment, weigh the L-joint members, calculate the retention of the preservative in each L-joint member and select the samples for exposure as described in **8.3**. Condition the treated L-joints, under the conditions given in **8.4.1**, for a minimum period of 14 days. Prepare the L-joints for testing as described in **8.4.2** to **8.4.5**.

NOTE. Additionally, the reference preservative may be applied by another treatment process, for example the same treatment process as that used for the test preservative. For some test preservatives, alternative reference preservatives may be more appropriate (see annex B).

10 Untreated control L-joints

A series of at least 20 untreated control L-joints ($10L_1$ + $10L_2$ see **5.4.4**) of *Pinus sylvestris* sapwood shall be installed at each exposure site at the start of every experiment or group of experiments. The control specimens shall be prepared, stored, coated and handled in the same way as treated specimens before installation.

NOTE. The object of using untreated controls is to compare the rate of decay of untreated wood with that of wood treated with the preservative under test and of wood treated with the reference preservative. The rate of decay in the controls indicates the aggressiveness of the particular exposure site during the period of the test.

11 Exposure test site

11.1 Number of test sites

The test is valid using one test site; however, it may be advantageous to select more than one test site representing markedly different conditions of climate and risk of microbiological attack.

11.2 Installation of the L-joints at the test site

Place the L-joints on the weathering racks (**6.8**) with the tenon member resting on the horizontal stickers on the shelf of the rack and with the mortise member in contact with the back (figure 2).

12 Inspections

12.1 L-joints for non-destructive inspection

The L-joints shall be inspected at least annually, but it is preferable to inspect them every six months.

All external surfaces shall be inspected visually and the condition recorded. The inspection shall not include probing or the use of other aids to inspection that would result in damage to the coating. Each L-joint shall next be taken apart and the condition of the surfaces within the joint inspected, using gentle probing where necessary, and recorded. Each L-joint shall be given a rating using the rating system given in table 1.

NOTE. The condition of the coating should also be recorded.

Each L-joint shall then be reassembled and returned to the same position on the exposure racks from which it was removed.

12.2 L-joints for destructive inspection

The L-joints for destructive inspection shall be removed from the exposure racks in sets after 3 years and after 5 years or when the notional mean rating (V^n) for the untreated control replicates for non-destructive inspection (L_1) is equal to or greater than 2,0.

The L-joints for destructive inspection shall be inspected at the time of their removal from the exposure rack. Initially, inspect and rate the L-joints in the same way as those for non-destructive visual inspection. In addition, each tenon member shall be cut up as shown in figure 3, using the sawing equipment (**6.1**). The faces created by sawing shall then be inspected and given a rating using the grading system given in table 1.

13 Evaluation

13.1 General

The effectiveness of the test preservative in the L-joints is assessed on the basis of comparison with the reference preservative taking into account, after each inspection, the assessments of decay development for the non-destructively inspected specimens and, where appropriate, from the specimens inspected destructively.

13.2 Assessment

The subjective grading system given in table 1 shall be used to assess the extent of attack of the L-joints. Observations shall be made on the external surfaces, and on surfaces within the joint exposed by dismantling the joint (**12.1**). In the case of L-joints being examined destructively, observations shall be made additionally on the surfaces revealed by sawing (**12.2**). A notional mean rating shall be calculated (V^n), for each set of replicates for non-destructive inspection, following each assessment. Notional mean ratings shall be calculated for each set of replicates inspected destructively; separate notional mean values shall be calculated for the ratings given following inspection of the external surfaces and those visible within the joint (V^e) and following sawing to reveal the internal condition (V^i). These can be used as interim values to compare the relative performance of treatments before all the specimens have failed.

When all the specimens in a set for non-destructive inspection have failed (rating 4), the mean life (in years) of the L-joints in that set shall be calculated, together with the standard deviation.

Table 1. Grading system

Rating	Description	Definition
0	sound	no evidence of deterioration
1	slight attack	slight discolouration, often dark and in streaks; no significant softening or weakening of the wood
2	moderate attack	distinct discolourations, but in discrete patches and streaks, with small areas of decay (softened, weakened wood); typically no more than 25 % of the visible area affected
3	severe attack	marked softening and weakening of the wood typical of fungal decay and in extensive patches or streaks; distinctly more than 25 % of the visible area affected
4	failure	very severe and extensive rot; tenon often capable of being easily broken

NOTE. Observations made on specimens for non-destructive inspection will often yield a lower rating than when surfaces created by sawing are available for evaluation.

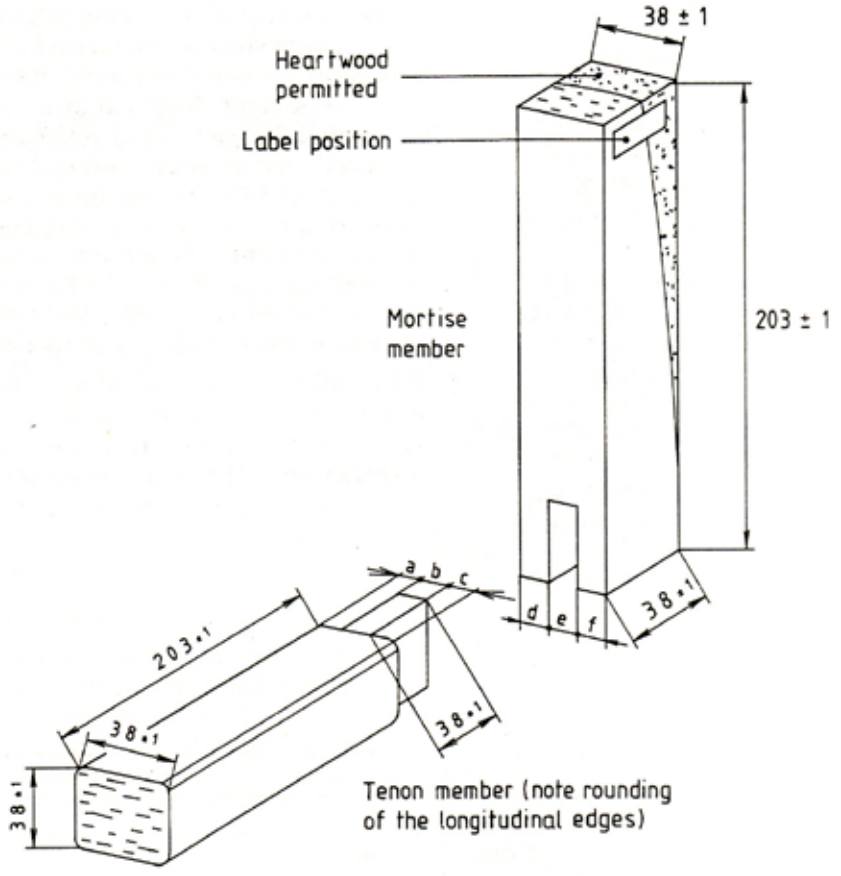
14 Duration of the test

When carried out in Europe or other temperate regions, the test shall run for a minimum period of 5 years or until the notional mean rating (V^n) for the untreated control replicates for non-destructive inspection (L_1) is equal to or greater than 2,0.

NOTE. It is recommended that the test should continue until all specimens for non-destructive inspection have failed (rating 4).

15 Validity of the test

The results shall be accepted as valid provided that the notional mean rating (V^n) for the untreated control replicates for non-destructive inspection (L_1) is equal to or greater than 2,0.



Tolerances in the joint:

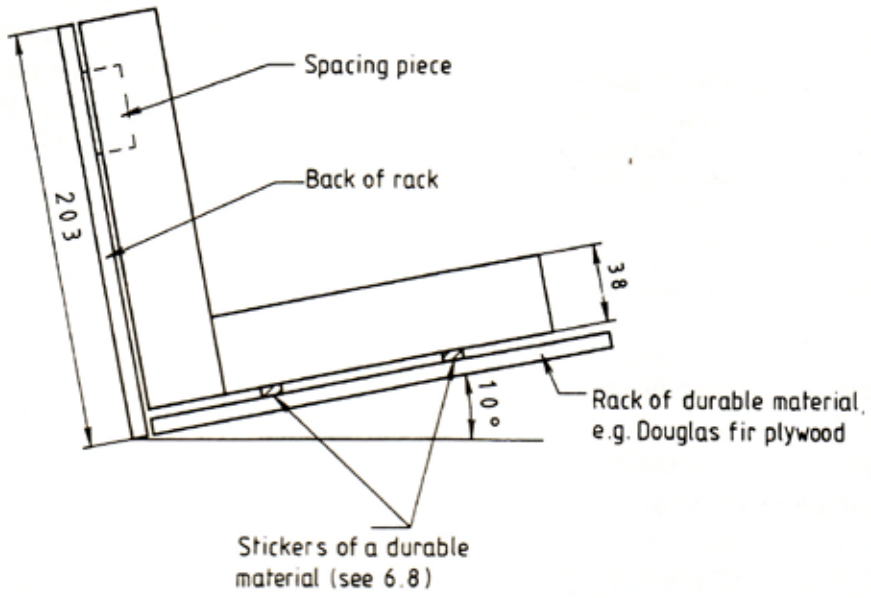
a), c), d), f) } 13 ± 1

b), e) } 12 ± 1

The two members shall provide a firm but not tight push-fit

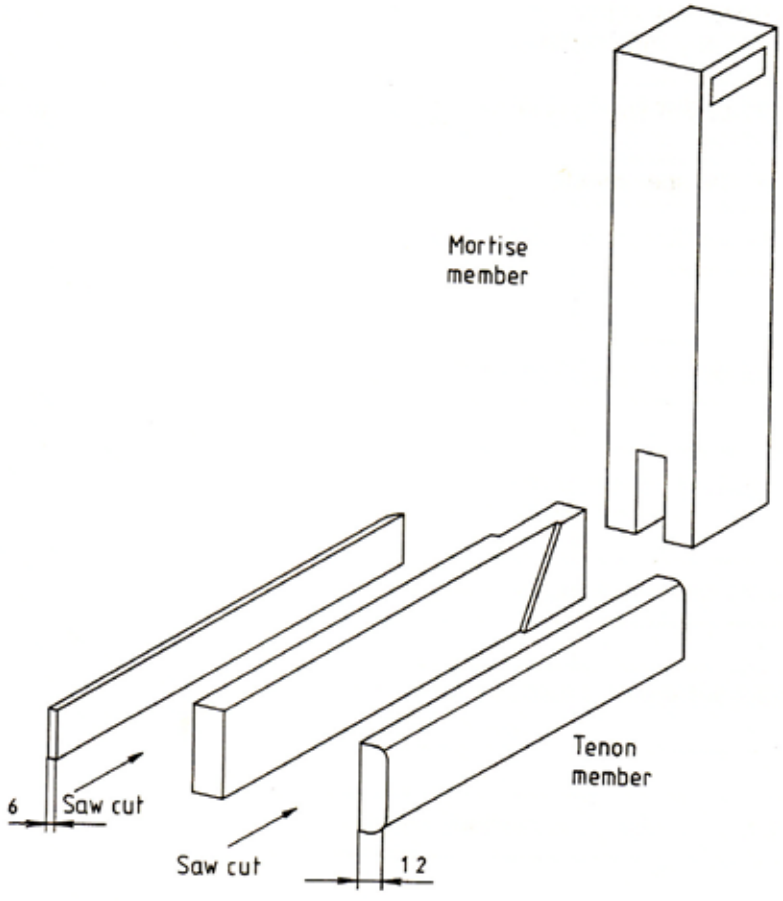
All dimensions in mm.

Figure 1. The L-joint



All dimensions in mm.

Figure 2. L-joint during exposure



All dimensions in mm.

Figure 3. Method of conversion of an L-joint for visual assessment

16 Test report

The test report shall include:

a) the number of this European Standard;

b) the specific and unique name or code of the preservative tested, with an indication of whether or not the composition has been declared;

c) the solvent or diluent used;

d) the wood species used and the density of the wood selected;

e) the number of replicates for both non-destructive and destructive inspection;

f) the concentration(s) tested;

g) the method and date of treatment;

h) the method and length of drying;

i) the mean retention of preservative in kilograms per cubic metre or grams per square metre as appropriate (tenons and mortises separately);

j) the reference preservative with concentration, retention, method and date of treatment and method and length of drying;

k) the reference coating system, any other coatings applied and details of any maintenance carried out;

l) the location and characteristics of the exposure site;

m) the date of installation of the specimens;

n) the date of each inspection;

o) the duration of the exposure period;

p) the grading system used for visual inspection;

q) the notional mean rating (V^m) and, if available, the mean life (with standard deviation) for the controls, reference and test L-joints inspected non-destructively;

r) the notional mean ratings (V^e and V^i) for the controls, reference and test L-joints inspected destructively;

s) the name of the Institute responsible for the report and the date of issue;

t) the name(s) and signature(s) of the officer(s) in charge;

u) the name and address of the sponsor of the test;

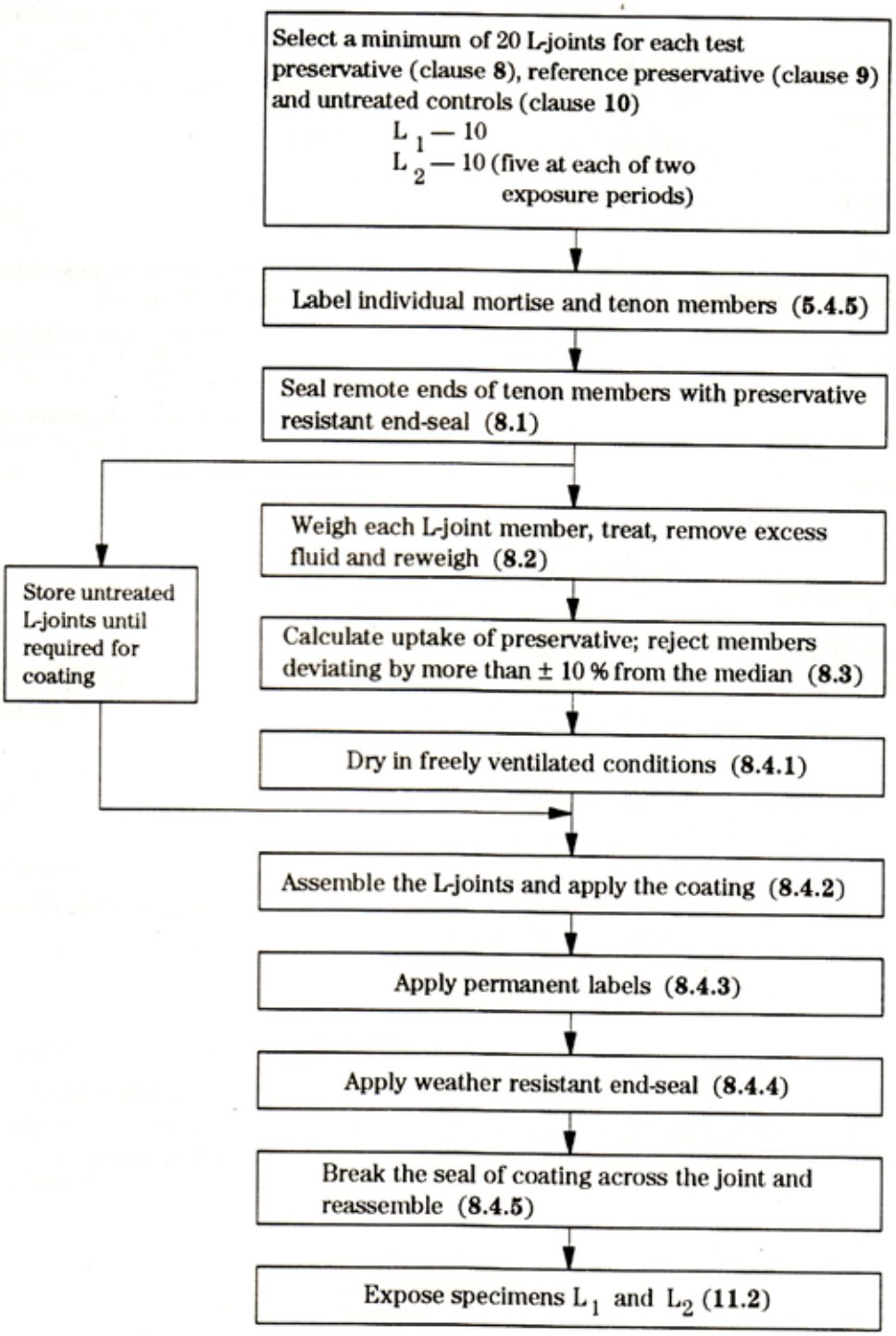
v) the following note:

'The interpretation and practical conclusions that can be drawn from a test report demand a specialized knowledge of the subject of wood preservation and, for this reason, this test report cannot of itself constitute an approval certificate.'

w) any deviations from the standard and any special factors which may have influenced the results, such as the condition of the coating.

An example of a test report is given in annex C.

Annex A (informative)
Flow chart for preparation and exposure of L-joints for test



Annex B (informative)

Information on treatment processes and alternative reference preservatives

B.1 Model treatment methods

B.1.1 *General*

The following treatment methods are given for guidance and should be regarded as providing model treatment parameters; the double vacuum and dip processes are those used for the reference preservative (1 % hexabutyldistannoxane). The full-cell process would be a suitable method for the application of both alternative reference preservatives (**B.2**).

B.1.2 *Double vacuum process:*

- initial vacuum 70 kPa	3 min
- atmospheric pressure	3 min
- final vacuum 35 kPa	20 min

B.1.3 *Dip process:*

- total immersion	3 min

B.1.4 *Full-cell process:*

- initial vacuum 20 kPa	30 min
- pressure 1,35 MPa	60 min

B.2 Alternative reference preservatives

B.2.1 *General*

In some cases, it may be more appropriate to the preservative under test, to compare its performance with that of alternative reference preservatives instead of, or in addition to, 1 % (*m/m*) hexabutyldistannoxane.

B.2.2 *Alternative reference preservative 1*

$CuSO_4.5H_2O$	35 % (*m/m*)
$K_2Cr_2O_7$	45 % (*m/m*)
$AS_2O_5.2H_2O$	20 % (*m/m*)

The chemical purity of the individual components should be at least 98 % (*m/m*).

NOTE. A dry salt retention approximating to 5.3 kg m^3, when applied by a full-cell process (**B.1.4**), would be applicable to out-of-ground contact use.

B.2.3 *Alternative reference preservative 2*

$CuSO_4.5H_2O$	50 % (*m/m*)
$K_2Cr_2O_7$	48 % (*m/m*)
CrO_3	2 % (*m/m*)

The chemical purity of the individual components should be at least 98 % (*m/m*).

NOTE A dry salt retention approximating to 9.0 kg m^3, when applied by a full-cell process (**B.1.4**), would be applicable to out-of-ground contact use.

Annex C (informative)

Example of a test report

Specimen test report

Title: ***Test of the protective effectiveness of Product A as a wood preservative out-of-ground contact***

Number of European Standard	:	EN 330 : 1993	
Test Product	:	Product A; an organic solvent type joinery preservative containing 5 % (*m*/*m*) active ingredient X in hydrocarbon solvent distilling between 153 °C and 193 °C	
Solvent	:	None	
Wood species/density	:	Scots pine sapwood; density 550 kg/m^3	
Number of replicates	:	10 for non-destructive inspection 5 for each destructive inspection	
Concentration(s) tested	:	Preservative used undiluted	
Method and date of treatment	:	Double vacuum Dip	1982.06.01 1982.06.02
Mean retention of preservative	:	Double vacuum	57,0 kg/m^3 tenons 62,9 kg/m^3 mortises
		Dip	275 g/m^2 tenons 285 g/m^2 mortises
Reference preservative	:	1 % (*m*/*m*) hexabutyldistannoxane (TnBTO)	
Mean retention reference preservative	:	Double vacuum tenons Double vacuum mortises	49,9 kg/m^3 54,5 kg/m^3
Method and length of drying	:	Air dried horizontally on stickers for 4 weeks	
Reference coating system	:	Crown wood primer (white) Crown undercoat Crown liquid gloss	
Exposure site	:	A B Laboratory; on the edge of open country; trees of both hardwood and softwood species not nearer than 300 m	
Date of installation	:	1982.07.27	
Exposure periods and sampling dates	:	1 yr 1983.07.21 (non-destructive only) 2 yr 1984.07.18 (non-destructive only) 3 yr 1985.08.01 4 yr 1986.07.28 (non-destructive only) 5 yr 1987.07.22	
Visual observations	:	See table C.1	
Deviations from the standard	:	None	

The interpretation and practical conclusions that can be drawn from a test report demand a specialized knowledge of wood preservation and, for this reason, this test report cannot of itself constitute an approval certificate.

Tested for	:	Chemical Company A (Address)
Tested by	:	A B Laboratories Ltd. (Address)
Test supervised by	:	Dr A Smith (Signature)
	:	Dr B Jones (Signature)
Date	:	1987.09.10

Table C.1 Visual observations — mean fungal attack rating*

Treatment	Type of sample (number of replicates)	Exposure period - years				
		1	2	3	4	5
Untreated	Non-destructive (10)- V^n	0	0,9	1,6	2,1	2,6
	Destructive (5) - V^e	na	na	1,4	na	2,4
	- V^i	na	na	2,0	na	2,8
1 % (*m/m*) TnBTO (d. vac)**	Non-destructive (10)- V^n	0	0,3	0,8	1,0	1,0
	Destructive (5) - V^e	na	na	0,8	na	1,0
	- V^i	na	na	0,8	na	1,0
Product A (dip)	Non-destructive (10)- V^n	0	0,3	0,6	0,7	1,0
	Destructive (5) - V^e	na	na	0,8	na	1,0
	- V^i	na	na	1,0	na	1,2
Product A (d. vac)	Non-destructive (10)- V^n	0	0	0,2	0,4	0,6
	Destructive (5) - V^e	na	na	0,4	na	0,8
	- V^i	na	na	0,4	na	0,8

* For grading system see table C.2

** Reference preservative

na Not assessed

Table C.2 Grading system

Rating	Description	Definition
0	sound	no evidence of deterioration
1	slight attack	slight discolouration, often dark and in streaks; no significant softening or weakening of the wood
2	moderate attack	distinct discolourations, but in discrete patches and streaks, with small areas of decay (softened, weakened wood); typically no more than 25 % of the visible area affected
3	severe attack	marked softening and weakening of the wood typical of fungal decay and in extensive patches or streaks; distinctly more than 25 % of the visible area affected
4	failure	very severe and extensive rot; tenon often capable of being easily broken

Annex D (informative)
Bibliography

EN 212 : 1986 *Wood preservatives — Guide to sampling and preparation of wood preservatives and treated timber for analysis.*

DS
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